

Portable Collections Program

Urban Naturalist



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Urban Naturalist: Exploring the New York Environment

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What's in the Case?

Specimens



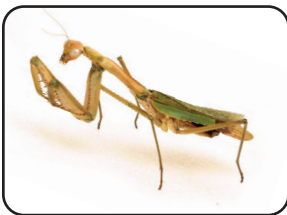
Gray squirrel



Red-winged blackbird



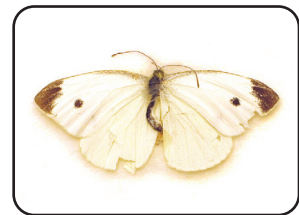
Bird nest



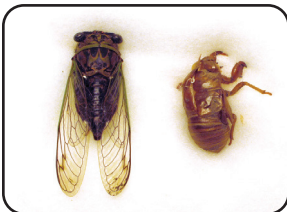
Praying mantis



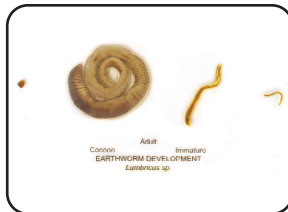
Dragonfly



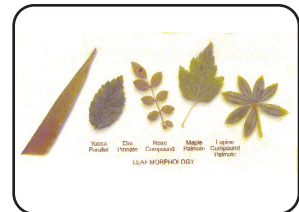
Cabbage butterfly



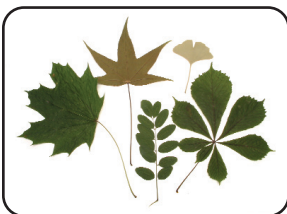
Cicada and cicada shell



Earthworm lifecycle block



Leaf morphology block



Local leaves



Local Seeds



Chewed and bored seeds and nuts



Tree branch with bark beetle tunnels



Pigeon feathers



Dragonfly lifecycle block

What's in the Case? (continued)

Tools & Resources



Birdsong identifier

Bug goggles

Binoculars

Hand lenses

In the City by Ann Cooper

Go Wild in New York City by Brad Matsen

Peterson First Guide to Urban Wildlife by Sarah B. Landry

Urban Leaf & Tree Handbook by Susan Goberman

Discovering Nature with Young Children by Ingrid Chalufour and Karen Worth

How to Handle Museum Objects

Learning to handle specimens from the Museum's natural history collection with respect can be part of your students' educational experience of the case. Please share these guidelines with your class, and make sure your students follow them in handling specimens in the case:

- **Students may handle the objects, carefully, under your supervision.**
- **Hold objects with two hands.** Hold them by the solid part of the body or by the strongest area rather than by rims, edges or protruding parts.
- **Paint, feathers, fur and fibers are especially fragile** and should be touched as little as possible. Remember that rubbing and finger oils can be damaging.
- **Do not shake objects** or the plexiglass cases they are housed in.
- **Temperature differences, direct sunlight, and water can be very harmful to certain objects.** Please keep the objects away from radiators and open windows, and keep them secure.

Notes about Object-Based Learning and Inquiry

Learning about nature by exploring a habitat or examining a specimen is much different from learning about these things by reading about them in a book.

Natural history specimens (and other objects) have the power to fascinate people with their mere physical presence. Holding a preserved animal in their hands forms a tangible link between your students and the natural world. This sense of physical connection makes it easier for students to think concretely about the ideas and concepts you introduce to them in your lessons.

Objects have the power to tell us many things, provided we are willing to look at them in detail and think about what those details mean. Encourage your students to examine carefully the plant and animal specimens (both those included in the case and those you and your students collect yourselves), touch them gently, and look at their physical design. Have them describe the specimen's shape, size, and color. Ask them questions about what they see, and what their observations might tell them. For example:

- What shape is this leaf? How does it compare to the leaves of other trees?
- What animal might have chewed on this branch? How can you tell?
- Based on its physical characteristics, what type of environment do you think this animal might inhabit?

Studying Nature in the City

To the teacher

Children make good naturalists because they are full of curiosity and they rely on observing and thinking to figure things out. This case encourages students to build their observational and questioning skills, and to turn these skills towards building an appreciation of the nature that is around them in the city. And yes, there is nature all around us in the city. Most of the specimens in the case were collected right here in Brooklyn. They are examples of what you and your students can find and bring back to your classroom to inspire further studies of nature as well as reading, writing, art, and other studies.

What is a naturalist?

A **naturalist** is a scientist who studies nature. Naturalists observe plants and animals in their natural **habitats**. They collect, identify, and classify them. They use their observations to create theories about how living things grow and interact. An urban naturalist practices this science in the city, studying the plants, animals, and insects with which human beings live every day.

These scientists are also sometimes known as field biologists. They may also be called ecologists because they may be involved in the study of **ecology**, a branch of science that examines the interrelationships between living things and their environment.



How naturalists learn about the natural world

A naturalist learns about the world by going out into the **field** and observing how the plants and animals interact with each other and with their environment. They may choose a quiet spot and sit there silently (sometimes for hours at a time), or they may move around from one place to another (but they walk quietly so as not to disturb the wildlife). They also collect **specimens** (such as leaves, **nuts**, insects, or animal tracks) to bring back to their laboratories to study.

In making observations, the naturalist might ask: Where does this animal live? What does it eat? How does it hunt? Or, where does this plant grow? How much sunlight or water does it need? How does it reproduce? What animals feed off it? The naturalist's goal in asking these questions is to gain a better idea of how different **organisms** relate to each other and to their habitat. He or she uses this knowledge to create theories or answer questions about the natural world. Naturalists know how to "read" the natural world so that every leaf or animal track tells them a story.

In their quest to learn more about the natural world, naturalists use all of their senses. Visual cues are important, but naturalists do not rely solely on their eyes to help them make their observations. They listen carefully to the sounds of the environment around them, trying to pick out birdcalls or the light footsteps of small mammals. They sniff the air to catch the scent of a particular plant or animal. They touch tracks (or even **scat!**) left behind by animals to help determine how old they are and what species created them. They may even taste leaves or berries to figure out if a plant is poisonous (although this is not recommended for beginners!). Using all of their senses helps naturalists create a fuller and more accurate picture of the natural world around them.



Studying Nature in the City (continued)



Observing nature in the city

Different environments have different lessons to teach us. Even a city street has wildlife to observe. A walk around the block may turn up earthworms, especially after a rain; squirrels; trees and their roots; dead leaves; grass; perhaps some flowers planted in front of a house; birds and bird feathers; and insects of various kinds. Even when the animals and insects themselves are not present, evidence of their activity can remain in the form of tracks, scat, nests and feathers, chewed nuts and discarded seed pods, and insect borings. The books included with the case suggest the living things that inhabit even the most apparently barren street.

The parks of New York City offer a valuable opportunity for young naturalists to study urban plants and wildlife. Students can examine the variety of tree species, or look for signs of animal life. City parks may not offer the rich assortment of small mammals one might expect to find in the woods, but they often feature a diverse assortment of birds and insects. In studying a park environment with your students, try to encourage them to use all of their senses and observational skills in order to see this familiar environment through new eyes.

Perhaps after studying a park near your school, you and your students can take a field trip to a “wilder” environment, such as a patch of woodlands. Here your students can expand on what they learned from studying their local park. The newness of this habitat may prompt them to observe the world around them more closely than they would in an urban environment. They may see different species of trees or a greater variety of animal signs than in a

city park. Encourage your students to compare and contrast the urban and “wild” environments, and to think about why they are different (for example, why do deer live in wooded areas but not in most city parks?).

However, while a trip to the woods would be an excellent addition to this unit, it is important to remind students that there is plenty for them to learn and discover about the natural world in their own backyards or neighborhoods.

The tools of the naturalist

The most important tools naturalists take into the field with them are their senses: their eyes, ears, noses, and hands. They enhance their eyesight with binoculars (for observing things from far away) and a magnifying glass (for examining things up close). They may carry a camera and for sure they carry a notebook and a pencil to record what they see, hear, and smell, as well as where and when they collected specimens. Field guides or keys help them identify the plants, animals, and insects they see around them.

Naturalists also bring tools such as a pair of forceps or a bug net, for helping them collect specimens and small containers for holding the specimens, such as empty film canisters, resealable plastic bags, or a bug box. They may carry a compass and maps to help them find their way through the woods.

Finally, naturalists take some basic precautions before they go out, as should you and your students before you take a field trip. Naturalists dress properly for the environment, in good shoes and weather-appropriate clothing; field trips are not the place for party clothes! They take a First Aid kit for emergencies. Before they touch anything, they make sure they know what it is and that it is safe to touch. □

Words in boldface have been included in the Vocabulary Words section on 18 page .

Information About the Specimens in the Case

All of the plant and animal specimens in the case may be found in both city parks and more rural, forested areas. As you introduce these specimens to your students, encourage them to think about how each plant or animal fits into its environment, and how they can find evidence of its presence (such as fallen leaves, a nest, or animal tracks). In addition, they should think about how the plants and animals in the case might interact with one another, and what evidence those interactions might leave behind. For example, squirrels eat the fruit or nuts of trees, often leaving behind broken nutshells or shredded cones. Many birds nest in trees, and some leave other signs of their presence there (like the woodpecker leaving holes in the bark). Certain insects may destroy a tree's bark or munch large holes in its leaves.

In thinking about these plants and animals specimens, ask your students these key questions:

- What signs do each of these animals or plants leave behind in the landscape?
- How might they interact with each other?
- Where should you look for evidence of their interactions, and what might you expect to find?

GRAY SQUIRREL



Gray squirrels are a familiar part of urban nature as well as the woodlands. This specimen is shown chewing one of its favorite foods, a nut, in order to get at the nutritious seed inside. The squirrel buries its food for storage and finds it again through its sense of smell. Squirrels spend most of their time in trees. Their big, bushy tails help them keep their balance when they leap about in the trees, and provide them with warmth in the winter. Squirrels build nests in trees, in a crook or on a branch near the top. Their empty nests, half-chewed nuts, and chattering cries are all evidence of the presence of squirrels, even when they are not visible. Squirrels live throughout North America, Great Britain, and South Africa.

RED-WINGED BLACKBIRD



The red-winged blackbird is the most abundant bird throughout North America. It can be seen year round in Brooklyn, especially near wetlands or in open woods. This specimen has a red band on his upper wing that identifies him as a male. Males plump up and half-open their wings to display this red band in order to attract females or deter predators. Female red-winged blackbirds do not have this red band; they are smaller, brown, and striped. The blackbird's song is a gurgling "oak-a-lee," and its call is a dry "chek" and "cheer." It eats insects, seeds, and grain. It builds a cup-shaped nest from leaves and mud with a lining of grasses (similar to the nest in the case).

BIRD NEST



This nest has the characteristic mud and grass or straw construction of a robin's or red-winged blackbird's nest. Robins are common in New York City and throughout the eastern part of the U.S. Their nests are usually in trees or bushes. When you and your students look at the nest, think about how the bird got the materials and put them together. Can you tell how big the bird is from the size of the nest? How many eggs would it hold? Students may also notice that there are fine grasses in the cup of the nest—what purpose do they serve? Have they heard of the color "robin's egg blue"?

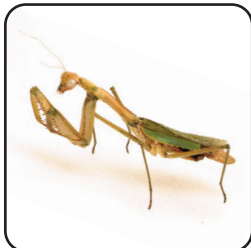
Information About the Specimens in the Case (continued)

PIGEON FEATHERS



Because birds rely on their feathers to keep warm and to help them fly, it is important that their feathers be in tip-top shape. When feathers get old or damaged, new feathers grow in and push out the old feathers. Feathers are not solid, which would weigh the bird down. Instead, they are made up of thin strands that are held together by tiny barbs on each strand, leaving air pockets between (similar to a knitted sweater, which has holes but is warm). Students may be able to see these strands and barbs with a magnifying lens.

PRAYING MANTIS



This praying mantis was found dead in the Museum's garden at the end of the summer. Baby praying mantis eggs are laid at that time and hatch in the spring. During the summer they grow into adulthood, breed, and die. As they grow, they **molt** several times. Students may find molts as well as carcasses. (Teachers should discourage killing live praying mantises.) In observing this specimen, pay special attention to its color, its eyes, the spines on its forelegs, and its turning head.

DRAGONFLY



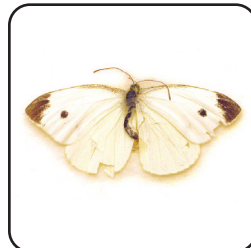
Dragonflies are common in Brooklyn. Even small bodies of water can support some species. There are over 5,000 species of dragonflies in the world. Observe the long body and two pairs of transparent wings held straight out from the dragonfly's body. Dragonflies can fly quickly, which helps them catch the small insects they feed on.

DRAGONFLY LIFECYCLE BLOCK



This plastic block contains a dragonfly in larval, emergent, and full adult stages. The **larva**, or **nymphs** are born from eggs laid in water. They use gills to breathe and eat small aquatic organisms and later may even eat tadpoles and small fish. As they grow, they molt many times (unlike organisms with internal skeletons, insects must shed their **exoskeleton** in order to grow bigger). Dragonfly molts can sometimes be found on the backs of leaves near water. When the nymphs emerge as adults, they fly away from water, feeding on plants and other insects, until it is time to return to the water to breed. The life expectancy of adult dragonflies in Brooklyn is about four to six weeks in the summer.

CABBAGE WHITE BUTTERFLY



Cabbage white butterflies overwinter as **pupae** and emerge in early spring. After mating they lay their eggs on plants of the mustard family, particularly cabbage and broccoli plants. The caterpillars are a velvety green with faint white lines along the sides. They chew big holes in leaves. Cabbage white butterflies are commonly seen in Brooklyn, often in large numbers. They are originally from Europe.

Information About the Specimens in the Case (continued)

CICADA AND CICADA MOLT



Male cicadas like this one are known for their high-pitched, continuous drone or “song.” This one is shown with a molt (also known as a shed). Molts, as well as dead cicadas, are “evidence” of nature at work that students may find in yards

and parks in their neighborhoods where there are trees. Nymphs and adults feed on the fluids inside plants. The lifecycle of a cicada may be from two to eight years in length, depending on its species. Most of this time is spent in the nymph stage, underground. Adults live only a season, to mate and lay eggs in trees. Like the dragonfly’s, the cicada’s molts can sometimes be found on the backs on leaves near water.

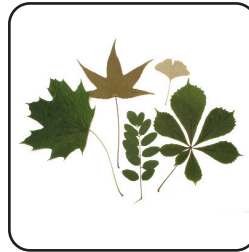
EARTHWORM LIFECYCLE BLOCK



Earthworms are abundant underground, but are often seen on sidewalks after a heavy rain. They emerge from their burrows underground because it is easier for them to move on the wet sidewalk surface than through thick

mud. They also emerge from the soil to breed. This plastic lifecycle block contains a cocoon in which the earthworm lays its eggs, and several examples of growing earthworms as well as an adult. Earthworms help process organic material into soil and aerate the soil. They were brought to North America by European settlers in the seventeenth and eighteenth centuries.

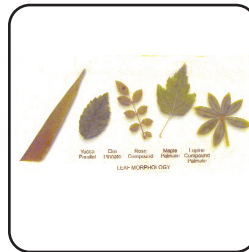
LOCAL LEAVES



Leaves are the “food factories” of plants. They produce food for the plant and oxygen for the air by using the sun’s energy to convert carbon dioxide from the air and water from the soil. This process is called **photosynthesis**. Plants

(especially trees) can be identified by the shape, size, and edges of their leaves. The leaves in the case represent five of the many varieties of leaves students will be able to find in the neighborhood. (Note: Students should collect leaves on the ground; they should not pick living leaves from the trees.)

LEAF MORPHOLOGY BLOCK



The leaves in this plastic block are not all local, but they show some common leaf types and characteristics often used for identifying leaves. For identification purposes, leaves may be broad (generally **deciduous**) or needle-like (usually **coniferous**).

If broad, the leaves may be single or compound (with many leaves on a single stem). If compound, the leaves may be arranged in opposition or alternating. Leaves also have different types of veining and different edges.

LOCAL SEEDS



This box contains selected examples of common seeds and seed varieties that students are likely to find. The seed is an important stage in the life cycle of the tree. Every seed has a whole tree inside it, ready to grow. Besides identifying

seeds (there are many Internet resources for this), students can soak them and open them to see the plant inside. (Please do not use the seeds in the case for this experiment. Beans are especially good for this exercise.)

Information About the Specimens in the Case (continued)

CHEWED AND BORED SEEDS AND NUTS



Students can look for signs of animal and insect life in plant material they find on the ground. This box contains seedpods that have been chewed by squirrels or bored by insects in order to get to the nutritious seeds within. If you see a lot of these around the base of a tree, you know that the tree is hosting squirrels or insects. The case also has two oak **galls**, which are out-growths of plant tissue caused by fungi or insects. Sometimes insects also occupy them.

TREE BRANCH WITH BARK BEETLE TUNNELS



This piece of branch is another specimen that can be “read” for the insect activity it illustrates. Bark beetles bore tunnels to lay their eggs beneath the bark of a tree and newly hatched larvae bore tunnels to get to the edible bark. Usually bark beetles attack trees that are already ill or dying, because they might be caught in the strong secretions of a healthy tree.

You can learn more about these specimens and others from our natural history collection by visiting the Collections Central Online database at www.brooklynkids.org/emuseum. There are also many excellent Internet sites devoted to plants, animals, and insects. Just enter “earthworms” in your browser’s search field, for example, and see what you turn up!

ACTIVITY 1

Introductory Activity: Honing Your Senses

All Grades

Related Specimens: Gray squirrel, red-winged blackbird, leaves, and pigeon feathers

Being a naturalist requires observing carefully and closely. Although your students, like all children, are probably good observers, their skills for observing nature can be developed further and focused. You can help them by practicing a few simple exercises based on their senses. Some of them can be done in the classroom and some can be done outdoors. Some also provide practice in another skill that naturalists need—describing what their senses tell them.

Eyes/Looking:

- Have students close their eyes. Ask them to describe a part of the classroom, for example, what is on the bulletin board, or what you are wearing, or what the front of the school looks like.
- Pass out the hand lenses in the case and have students used them to look closely at the specimens in the case. This is an opportunity for them to master using the magnifying lenses before going on a field trip.

Ears/Listening:

- Have your students close their eyes and listen to the sounds they hear for one or two minutes (you can time them). Ask them to extend a finger for every sound they hear during that period, or just count silently.
- Demonstrate the Bird Song Identifier and have the students, as a group or individually, practice matching the song to an image of the birds in a field guide (such as [Urban Wildlife](#) in the case).

Hands/Touching:

- Assemble a few objects of different textures in a bag or box that students can reach into without seeing into (examples: sandpaper; velvet, a rock, a piece of wood, a Styrofoam cup). You can place several objects in one container and have all the children feel inside in turn; or you can place objects in individual bags around the classroom and have the children circulate to feel each one. Tell them not to say what they felt until everyone has felt every object. Then discuss what they felt. When they identify objects, ask them what tactile qualities suggested the identity. Was the object smooth, rough, furry, bristled, soft? You can use this exercise to build vocabulary as well as to practice skills of touch.
- Pick a tree outdoors and have the children close their eyes and examine it with their hands. Ask them to describe how it feels.

See page 19 for details on how this activity meets New York State Learning Standards.



ART EXTENSION: GRADES K–3

Explain the terms “nature,” “natural,” and “unnatural” (in the sense of synthetic or man-made) to your students. Then from old magazines or pictures they have drawn, have the students create a collage with natural objects on the right side of the paper and unnatural (man-made) objects on the left side. Discuss their choices as a group.

ACTIVITY 2 Set Up a Nature Table

All Grades

Related Specimens: Gray squirrel, red-winged blackbird, praying mantis, dragonfly, cicada, leaves, seeds, and pigeon feathers

Though a cliché, it is also true that children’s ability to wonder is the source of their learning. The following activity is designed to encourage wonder by (1) providing things to wonder about and to share with peers; and (2) providing time in which the wondering can emerge and be extended. It is a common misconception that wonder (or inspiration) happens in an instant, that children’s questions emerge all at once, in first contact with something. In fact, children’s “questions” are often not in the form of questions, but emerge as observations. The Nature Table allows familiarity with natural materials to grow through repeated observation, however casual it seems, and this in turn will lead to comments about the specimens that you, as a teacher, can build on.

The idea of the Nature Table is for students to leave on the table specimens that they pick up or bring from home to share with each other. It is also a place where specimens collected during the class field trip can be deposited. It is essentially a class collection.

Materials:

- The top of a table, desk, bookcase or some other surface in the classroom that can be dedicated to this use.
- A few “starter” specimens—for example, selections from the Urban Naturalist case, some leaves or shells that you bring in. (Note: If you think a specimen might have live insects on it, you can put it in a Ziploc bag or sealed bottle temporarily.)
- A supply of 3” x 5” cards

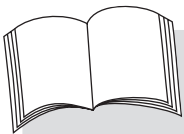
What To Do::

- 1 Place your “starter” specimens in the spot you have designated for the Nature Table, along with the 3” x 5” cards.
- 2 Explain to the students that the Nature Table is a place where they can put natural specimens that they collect or already have at home. Ask students to fill out a 3” x 5” card for each specimen with their name, the name of the specimen, and where they got it. Help pre-writers by taking this information by dictation or asking them to draw the specimen on the card.
- 3 Continue occasionally to encourage students to bring things in, until they begin to do so on their own. Allow students to pass by, look at the table, pick things up, and comment whenever they are able.
- 4 Deposit specimens collected during class field trips on the Nature Table, with their documentation.

Discussion Questions:

- As appropriate, refer to specimens on the table during discussions related to the case or to other activities such as reading.
- Establish a “Featured Specimen”: Once each day or each week, have your class vote on an specimen they think is the most interesting, unusual, or beautiful.

See page 19 for details on how this activity meets New York State Learning Standards.



ART AND ENGLISH LANGUAGE ARTS EXTENSION

After living with the Nature Table for a while, have the students draw and write about the specimens in their Nature Journals. Have students take an specimen to their desk or table to draw. Tell them to imagine they are nature illustrators, or show them examples of nature illustrations, and ask them to pay attention to the shape and details of the specimen in their drawing. Have them finish by writing about what they have drawn.

ACTIVITY 3 Make A Nature Journal

All Grades

Related Specimens: All

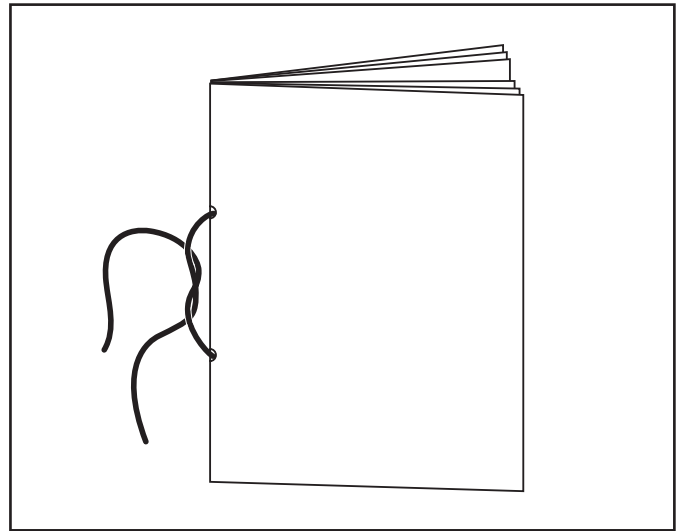
Journals are an essential tool of any naturalist. In their journals, naturalists keep track of their observations and reflect on what they have seen. The Nature Journal can serve the same function for your student naturalists throughout the year.

Materials:

- Unlined 8 1/2" x 11" paper
- Staples or yarn and scissors for binding
- Drawing materials such as markers, crayons, and pencils

What To Do:

- 1 Give each student as many sheets of paper as you think their journals should have. Have the students align the sheets, fold them in half together, and attach them along the fold with staples or with yarn threaded through holes in the fold and tied together (see illustration).
- 2 Have students decorate the cover with a scene from nature (for example, a tree, from memory) or with a leaf print (see leaf print extension activity on page 16).
- 3 Have a discussion with your class about what they know about the specimens in the case and what they would like to know about the specimens on the Nature Table. Have them write their questions in their Journals.
- 4 Introduce students to the documentation procedures and questions outlined below.
- 5 Set aside five to ten minutes each day for students to do quiet reflection and journal writing about their observations outdoors or of the specimens that have appeared on the Nature Table.
- 6 When you take Neighborhood Nature Field Trips (see next activity), have students use their Journals to document their trips in writing (see discussion questions below) and/or by drawing plants, trees, insects, birds, or other creatures they see on the field trip.



See page 19 for details on how this activity meets New York State Learning Standards.

Documentation Procedures and Questions for Students:

- Start each entry with the date and what time of day it is. For outdoor observations, mention the weather and where you were (the park, street, yard, or other place). Note any changes in the season. Has it just rained and is the ground wet? Is it cold, with frost on the ground?
- What natural phenomena did you see, hear, smell? Did you see any insects flying around? Did you see squirrels? What did they do? Are there buds on the trees or have the leaves begun to change? Can you hear any birds? Did you see any animals eating?
- Make notes of everything you see. You may also include things you find like feathers or interesting leaves.
- Look at a leaf, its shape, the pattern of its veins. Describe or draw it. Does it have holes in it?
- Let your eyes and your mind wander and write down questions that pop into your head. Did you see anything you have never seen before?
- You may use words or drawings to record observations. You may write in sentences, write a poem, or simply make a list.

ACTIVITY 4

Take a Neighborhood Nature Walk

All Grades

Related Specimens: All

Learning about nature is best done directly, through contact with nature itself. Students may be unaware of the natural environment all around them. Nature walks are an important way to focus students on nature in the city.

There are many ways to do a nature walk. How you choose to do it will depend somewhat on the age and interests of your class and the environment around your school. Does the school have plantings around it? Is there a park? Street trees? A community garden? A vacant lot? Is there a place where you can dig up some dirt and bring it back to the classroom to look for insects? Even cracks in the sidewalk can be a place to investigate for signs of nature. The steps enumerated below are simply ideas for a field trip.

It is important to take as many nature walks as you can organize, so that your students can observe changes in nature over time and so that they can deepen their observations. The walks can be 30 minutes, as frequently as two or three times a week.

Materials:

- A place to walk
- Enough adults to accompany you, and parental permission, (if necessary)
- A Nature Journal
- Hand lenses, binoculars, and bird song identifier, from the case
- Camera (optional)
- Paper (or reused plastic) bags, enough for each child
- Other useful tools: tongue depressors, a trowel, penlights, additional hand lenses

What To Do:

- 1** Plan your walks. Before you take children out, decide the route of your walk by walking around the neighborhood yourself, picking interesting and safe spots to see along the way.
- 2** Prepare the adult volunteers: Talk to them about the route, the tools the children will have, and what you hope the children will find. Emphasize the importance of giving children opportunities to observe and form questions, rather than receive answers right away. Encourage them to respond to students' questions with phrases like "What do you think?" or "How could we find out?"

3 Prepare students.

- Explain that the purpose of the walk is to look for and collect evidence of nature. Use the specimens in the case to offer examples of what they might see and have the children think of other plants, animals, or evidence of nature that they might see. (Spider webs, half-eaten nuts, animal tracks, noises, nests, and bird droppings count, too!)
- Introduce the tools they will be using—hand lenses, binoculars, tongue depressors, bird song identifier, camera—and give them a chance to experiment with them, using the specimens in the case as appropriate.
- Talk about the importance of looking before touching and discuss basic cautions like don't touch broken glass. If you plan to go to wooded areas, familiarize yourself and the other adults with the appearance of poison ivy and take precautions against ticks.

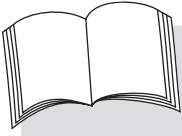
4 Start your walks! As you walk along encourage the students to talk about what they see and hear in nature. Allow them time to observe and to ask questions. See below for more ideas.

5 When you return, you can do any of several things: Have students share with the class what they collected. Emphasize to your students the great variety of natural specimens they collected. You might want to do some simple classification with them (such as with plants, animals, insects, or geological specimens). Display the collections on the Nature Table, with their labels (see the Nature Table activity). Alternatively, ask students to sketch or write about what they saw in their Nature Journals. What questions do they have?

See page 19 for details on how this activity meets New York State Learning Standards.

ACTIVITY 4

Going Further: Take a Neighborhood Nature Walk (continued)



NATURE WALK ALTERNATIVES AND EXTENSIONS:

- Do a collecting trip: Allow the children to pick up specimens from nature such as rocks, bark, grass, leaves, flowers, nuts etc., and put them into their bags to take back to the class. Have them keep track of where they collected the specimens. If they are old enough, students can take their Nature Journals and record their collections directly in the Journal.
- Take several trips, each one focused on a different type of nature: plants, animals, insects—or even just trees or birds. Or take the whole class, but divide the students into sub-groups, each of which focuses on a different type of nature.
- Make a list of things to notice about the nature they are seeing. You can do this as a handout or as a class discussion or both. For example, you may want students to look at animal behavior (How does the squirrel move? Where does it go? Does it make noise? Does it eat, and what?) or the structure and environment of plants (What parts does the plant have? Do all the plants you see have the same parts? What leaf shapes do you see? Are the leaves arranged on the stems or branches in pairs, in triplets, in a spiral around the branch, or some other arrangement?)
- Do a drawing trip, or incorporate drawing into one of the other trips: If there is an appropriate place to do this, take drawing materials and have the children sit and draw from nature, focusing on individual plants or animals rather than on the scene.
- Back in the classroom: Have students use materials collected on the trip, along with markers and other art materials, to make collages.
- Back in the classroom: Have students use books and the internet to look up the leaves, nuts, rocks, and other things they collected to learn more about them and to share with each other either in class discussion or on the Nature Table.
- A nature walk in your school neighborhood is a good first experience, but if you're feeling adventurous, plan some field trips to more distant places in the city to study nature (see page 21 for some suggestions).

ACTIVITY 5 Observe Growth

Grades: 1–5

Related Specimens: Cicada and cicada molt, seeds, earthworm lifecycle block

Perhaps the most fundamental characteristic of living things is that they grow and change in the course of their lives, so growth is something naturalists watch carefully. Many organisms go through visibly different stages between birth and death. The earthworm life cycle block and the cicada and its molt show several stages and every specimen in the case is at some point in the life cycle of its organism (the squirrel is an adult, the butterfly has metamorphosed several times, and so forth). However, animal life cycles are harder to demonstrate in the classroom than plant growth. The following plant growth activities will provide your students with a classroom experience of growth in nature, apart from their own.

GRADES 1–3: BEAN GROWING

Materials:

- Styrofoam cups or yogurt containers, with 2–3 small holes in the bottom for drainage
- Stick-on labels and markers
- Potting soil
- Dried beans from the supermarket (such as kidney, pinto, black-eyed peas, or lima beans)

What To Do:

- 1 Give each student a Styrofoam cup and 2–3 beans.
- 2 Demonstrate how to fill the cup to about 1 inch below the top with potting soil and plant a bean (a fingernail's length down in the soil). Cover it with the soil.
- 3 Have students write their name and the date the seeds were planted on a stick-on label for the cup.
- 4 Have students water their beans lightly until the soil is evenly moist but not soaked and set the planted cups in a sunny spot in the classroom (or under a grow light). Do not over water them.
- 5 Have students start a page in their Nature Journals for their plant, on which to make observations of its growth. Every few days, they should check to see what has happened to their plant and record it in their Journals. When sprouts begin to appear, they can begin to measure and record growth.
- 6 To make this exercise more complex, once sprouts appear, students can experiment with how environmental conditions affect the plants. For example, take two plants of the same height and put one in a dark place and leave one in the light. What happens to the plants after two days? After a week? Or vary the

amount of water, making sure to record how much water each plant gets. Discuss with students how environmental conditions affect plants on the street and in the parks.

GRADES 4–5: POND IN A JAR

This activity introduces the idea that changing environments support different varieties of plant life in a process called “succession.”

Materials:

- A good-sized jar, one for each student
- Potting soil
- Aquatic plants, obtainable in the fish section of a pet store
- Seeds—birdseed, sunflower seed

What To Do:

- 1 Have students place two inches of soil and three inches of water in a jar. Place the jar in the window, without a lid, and allow it to settle overnight.
- 2 Next, students plant an aquatic plant in the jar, label the jar with their name and the date of planting, and put it on a windowsill or under a grow light. Do not replace the water that evaporates from the jar. The idea is to watch the “pond” gradually die. Have students record daily changes.
- 3 Once or twice a week, have the students add three or four birdseeds to the jar. While there is water in the jar, the seeds should germinate and then rot. Continue adding seeds even after the water evaporates. As the water evaporates down to the soil, the aquatic plant will die. The birdseeds will now find the environment suitable for growth.
- 4 Sunflower seeds, which grow large, can be added to represent forest trees. You will now need to add water, as a substitute for rainfall, to keep the soil damp to keep things growing.
- 5 Have each student make a poster, drawing, or other visual representation of what they saw happen to their “pond.” Ask them to talk about what they have learned about how environments can change. Introduce the term **succession**.

See page 19 for details on how this activity meets New York State Learning Standards.

ACTIVITY 6

Going Further: Additional Activities and Curricular Connections

Starting with this case and your class' observations during the Neighborhood Nature Walk, you can take the study of natural science in your classroom in many different directions. This is a perfect area in which to follow your students' interests and the serendipitous discoveries they make or the circumstances around your school. For example, if your school has a mulberry tree nearby and has just been studying China, you might want to use the earthworm lifecycle block and introduce the lifecycle of silk worms and the study of silk. Or, the bird nest in the case may inspire conversation about animal homes that you want to help them investigate further. Some of these directions, and also links to other curricular areas, are suggested below.

English Language Arts: Describing Game Grades 3–6

Have students write a description of a natural object in the classroom, without naming it. Have other students guess from the description (displayed on the walls or read to the class) what the object is. (You may want to model this for the class before having students try it.) Emphasize to your students that they want others to be able to guess their specimens, and help them understand that for others to identify the object, they must write a detailed description. After the specimens are revealed, discuss what it is about the descriptions that made it easier to identify the specimens.

English Language Arts: Story Writing Grades 1–3

Have students choose two of the specimens and write a story about them. What happens when the squirrel finds a bird nest? What happens when the earthworm crawls under a leaf?

Science: Observing Trees Grades 2–4

Have students draw a tree from memory in their Nature Journal. Next, take students to a park and have each student or pair of students locate a tree that will become "their special tree." (If finding a place with enough trees is not possible, have children select a class tree from the ones that are available.) Have students draw their tree in their Journals, next to the remembered tree. Revisit the tree throughout the year and have students write and draw about how it changes seasonally.

Science: Classifying Leaves Grades 2–4

Have students look closely at their hands. Point out the veins in their hands and explain that they carry blood with nutrients and oxygen to all parts of their hand. Explain that leaves have veins, too. These carry nutrients, water, and other important substances to the leaves. Make a chart showing the 3 leaf types, based on their vein formation. (See page 4 in [The Urban Tree and Leaf Handbook](#) in the case.)

- 1 Parallel (many straight lines running in the same direction)
- 2 Palmate (branching, like our hands)
- 3 Pinnate (like a feather)

Have students sort the leaves they have collected and the leaves in the case according to the type of veins they have.

Leaves may also be sorted by what kind of edges they have, such as:

- 1 Smooth
- 2 Toothed
- 3 Lobed

Use the Leaf Morphology block in the case to identify these different edge types.

Science: Life Cycles Grades K–4

Mealworms, tadpoles, even butterflies can be raised in the classroom to allow students to follow the lifecycle and to experience metamorphosis first hand. For example: For each student or study group, place two or three mealworms in a capped jar. Provide the mealworms with bran and a slice of raw potato or apple. The mealworm is the larval stage of a beetle. Before reaching the final step in the metamorphosis, the mealworm goes through a pupa stage that resembles neither the "worm" or "beetle" developmental periods.

ACTIVITY 6

Going Further: Additional Activities and Curricular Connections (continued)

Science and Social Studies: Guest Speaker **All Grades**

Invite a guest to your classroom. This might be someone from the Audubon Society or a parent who is a gardener or a bird-watcher. Talk with students ahead of time about what the person does and write down their questions to ask when the guest arrives. Invite the guest not only to talk about what he or she does, but also to share tools, books, and stories. Let the students ask questions. Don't forget to let them tell the guest about their own inquiries into nature and to share their drawings and journals!

Geography, Science, and Math: Mapping **Grades 2–5**

After several days of bird walks, take a special mapping walk. Help students draw a map of the area by providing them with a handout on which blocks around the school are outlined. As you walk, have students draw in landmarks and use symbols to show the locations of any nests that you have found in the area. Keep this map up to date by adding newly discovered nests and by recording the activity in and around the nests on a separate sheet. Develop a map key to use on this record sheet.

Math: Measuring trees **Grades 3–4**

Take string with you on a Nature Walk. Have students pull the string around the tree and cut or knot it at its circumference. Back in the classroom, have students place the string on a smooth surface and measure it using a tape measure (or for younger students, unifix cubes). Have them write the measurement in their Journal. Arrange the class strings according to length, from shortest to longest. What could this mean about the differences between the trees? Have kids hug a tree and see how many kids it takes to go around the tree. Discuss how we use measurement in observations.

Art and Science: Pressing Leaves **All Grades**

Collect leaves while on a nature walk, keeping them as flat as possible. When you return to the classroom, have students sandwich their leaves between two sheets of white paper, write their names on one of the papers, and place the sandwich in a heavy book. Place more heavy books on top and leave them for two to three days. After the leaf has been pressed, it can be laminated or encased in clear Contact paper, and made into a bookmark or saved as a leaf identification card (a label can be encased with the leaf).

Art: Making a Leaf Print **All Grades**

Have students place a leaf on a piece of newspaper underside (bumpy side) up on, so that they can feel the veins with their fingers. Using a sponge, paper towel, or their fingers, have them cover the leaf with paint. Then they should pick it up by the stem, carefully turn it over, and place it face down on a clean piece of paper. Cover with another sheet of newspaper and press down lightly and evenly. Make sure they press all parts of the leaf, especially the edges. Remove the newspaper and gently peel off the leaf. Have the children label their leaf prints with the name of the tree from which the leaf came. The leaf prints can become part of a class Field Guide or a classroom exhibit.

See page 19 for details on how these activities meet New York State Learning Standards.

Vocabulary Words

coniferous:

a tree or shrub, usually an evergreen, that bears cones.

deciduous:

a tree whose annual lifecycle includes shedding its leaves.

ecology:

a branch of science that studies the links between living things and their environment.

evidence:

objects collected systematically that indicate what has happened (or not happened).

exoskeleton:

an outer skeleton, characteristic of insects.

field trip/fieldwork:

in natural science, the field is the place where a naturalist goes to make observations of natural phenomena outside of a laboratory or office. A field trip or fieldwork refers to the process of going out and working “in the field.”

gall:

a growth on a plant’s leaves or other parts caused by injury, insects, or fungi.

habitat:

the place where a plant or animal normally lives and grows.

larva (pl. larvae):

the first stage of an insect’s life, after it is born but before it becomes a pupa; a larva is an immature, wingless insect that spends most of its time feeding and may molt several times as it grows but before it becomes a pupa.

lifecycle:

the different stages and forms that a living thing goes through from birth to death.

metamorphosis:

periods of developmental change from egg to adult: complete when pupal stage is inactive, incomplete when pupa is active and feeding or when there is no pupa stage.

molt:

to shed the outer covering or shell; also the name of the covering or shell once it is shed.

naturalist:

a scientist who studies living things such as plants and animals, usually by observing them in their natural habitats, and by collecting, preserving, and classifying them.

natural history:

the scientific study of living things and their history, and also the body of knowledge that has resulted from this study. Sometimes used interchangeably with the term “natural science,” which can also more broadly include the physical sciences such as chemistry or geology.

nymph:

young or immature form of insect with incomplete metamorphosis.

organism:

an individual living thing, including plants, animals, insects, human beings, and also microscopic organisms.

nut:

a hard-shelled seed pod.

photosynthesis:

the process by which a plant uses the energy of the light to turn carbon dioxide from the air and water from the earth into food (carbohydrates); oxygen is a byproduct of photosynthesis.

pod:

the casing in which a seed is protected until it finds a habitat in which to root and grow.

pupa (pl. pupae):

the stage of insect development between the larval and adult states, in which the insect encloses itself in a cocoon; while in the cocoon, the insect’s body goes through many internal changes as the insect metamorphoses into an adult.

scat:

the fecal matter eliminated by an animal.

specimen:

a natural object that is collected in the field and documented as to where, when, and by whom it was collected.

succession:

the process of change by which one ecosystem replaces another until a state of stability is reached.

■ RESOURCES AND REFERENCE MATERIALS ■

Correlations with New York State Learning Standards

The activities included in this guide meet the following New York State Learning Standard Performance Indicators for elementary students (K-5):

New York State Learning Standard Performance Indicators (Elementary Level)					Activity					
Standard Area	Standard #	Subject	Letter	Students will	1	2	3	4	5	6
Arts	1	Visual Arts	a	Experiment and create art works, in a variety of mediums (drawing, painting, sculpture, ceramics, printmaking, video, and computer graphics), based on a range of individual and collective experiences	•	•	•	•		•
English Language Arts	1	Listening & Reading	b	Gather and interpret information from children's reference books, magazines, textbooks, electronic bulletin boards, audio and media presentations, oral interviews, and from such forms as charts, graphs, maps, and diagrams				•		•
ELA	1	Listening & Reading		Ask specific questions to clarify and extend meaning	•	•	•	•	•	•
ELA	1	Speaking & Writing		Present information clearly in a variety of oral and written forms such as summaries, paraphrases, brief reports, stories, posters, and charts		•	•	•	•	•
ELA	1	Speaking & Writing		Select a focus, organization, and point of view for oral and written presentations		•	•	•	•	•
ELA	1	Speaking & Writing		Use details, examples, anecdotes, or personal experiences to explain or clarify information	•	•	•	•	•	•
ELA	1	Speaking & Writing		Observe basic writing conventions, such as correct spelling, punctuation, and capitalization, as well as sentence and paragraph structures appropriate to written forms		•	•	•	•	•
ELA	2	Speaking & Writing		Create their own stories, poems, and songs using the elements of the literature they have read and appropriate vocabulary						•
ELA	2	Speaking & Writing		Observe the conventions of grammar and usage, spelling, and punctuation		•	•	•	•	•
ELA	4	Speaking & Writing		Listen attentively and recognize when it is appropriate for them to speak	•	•	•	•	•	•
ELA	4	Speaking & Writing		Take turns speaking and respond to other's ideas in conversations on familiar topics	•	•	•	•	•	•
Social Studies	3			Draw maps and diagrams that serve as representations of places, physical features, and objects						•
Math, Science, & Technology	1	Scientific Inquiry		Ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about	•	•	•	•	•	•
MST	1	Scientific Inquiry		Question the explanations they hear from others and read about, seeking clarification and comparing them with their own observations and understandings		•	•	•	•	•
MST	1	Scientific Inquiry		Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed		•	•	•	•	•

■ RESOURCES AND REFERENCE MATERIALS ■

Correlations with New York State Learning Standards

The activities included in this guide meet the following New York State Learning Standard Performance Indicators for elementary students (K-5):

New York State Learning Standard Performance Indicators (Elementary Level)					Activity					
Standard Area	Standard #	Subject	Letter	Students will	1	2	3	4	5	6
MST	1	Scientific Inquiry		Carry out their plans for exploring phenomena through direct observation and through the use of simple instruments that permit measurements of quantities (e.g., length, mass, volume, temperature, and time)		•		•	•	•
MST	1	Scientific Inquiry		Organize observations and measurements of objects and events through classification and the preparation of simple charts and tables					•	•
MST	1	Scientific Inquiry		Interpret organized observations and measurements, recognizing simple patterns, sequences, and relationships					•	•
MST	1	Scientific Inquiry		Share their findings with others and actively seek their interpretations and ideas		•		•	•	•
MST	1	Scientific Inquiry		Adjust their explanations and understandings of objects and events based on their findings and new ideas		•	•	•	•	•
MST	1	Measurement		Select appropriate standard and nonstandard measurement tools in measurement activities					•	•
MST	1	Physical Setting		Observe and describe properties of materials using appropriate tools		•	•	•	•	•
MST	1	The Living Environment		Describe the characteristics of and variations between living and nonliving things		•	•	•		•
MST	1	The Living Environment		Describe the life processes common to all living things		•	•	•	•	•
MST	1	The Living Environment		Describe how the structures of plants and animals complement the environment of the plant or animal		•	•	•	•	•
MST	2	The Living Environment		Describe the major stages in the life cycles of selected plants and animals		•	•	•	•	•
MST	2	The Living Environment		Describe basic life functions of common living specimens				•	•	•
MST	4	The Living Environment		Describe how plants and animals, including humans, depend upon each other and the nonliving environment		•	•	•	•	•
MST	4	The Living Environment		Identify ways in which humans have changed their environment and the effects of those changes					•	

Corresponding Field Trips

The following organizations offer programs related to wildlife and nature. Check with each for details.

Bronx Zoo

2300 Southern Blvd., Bronx
(718) 220-5131
www.nyzoosandaquarium.com

Prospect Park Audubon Center

Prospect Park, Brooklyn
(718) 287-3400
www.prospectpark.org/dest/main.cfm?target=audu#Audubon

New York City Urban Park Rangers Program

Various New York City Parks
Dial 311 for all Parks & Recreation information
www.nycgovparks.org/sub_about/parks_divisions/urban_park_rangers/pd_ur.html

Clay Pits Pond State Park Preserve

83 Nielsen Avenue, Staten Island
(718) 967-1976
www.nysparks.state.ny.us/parks/info.asp?parkID=32

Staten Island Greenbelt Environmental Center

700 Rockland Avenue, Staten Island
(718) 667-7475
www.sigreenbelt.org/About/Edcenter/edcenter.htm

Gateway National Recreation Area (National Park Service)

210 New York Avenue, Staten Island
(718) 354-4606
www.nps.gov/gate/pphtml/planyourvisit.html

The Brooklyn Children's Museum also offers programs on a variety of natural history topics. For a listing of programs currently available, please see our website at www.brooklynkids.org, or contact the Scheduling Assistant at 718-735-4400, extension 118, to request a School Adventure Brochure.

Bibliography and Web Resources

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Jordan, Helen J. How A Seed Grows. New York: Harper Collins, 1992.

Silver, Donald M. One Small Square: Backyard. New York: Learning Triangle Press, 1993.

Gibbons, Gail. Tell Me, Tree: All About Trees For Kids. New York: Little Brown, 2002.

Burns, Diane L. Trees, Leaves and Bark, A Take-Along Guide. Chanhassen, Minnesota: NorthWord Press, 1995.

These websites were operating in 2006. If they don't work when you try them, organizations such as the National Science Teachers Association (www.nsta.org/elementaryschool) can refer you to equally useful sites.

Brooklyn Children's Museum: Visit our website with your students to look up specimens in our collections and find out more about them.
www.brooklynkids.org/emuseum

Acorn Naturalists offers many resources in the natural sciences for teachers and parents.
www.acornnaturalists.com/store/index.asp&ID=OV

Columbia Education Center offers individual lessons in different areas of natural science, organized by grade level.
www.col-ed.org/cur/science.html#sci1

The National Arbor Day Foundation website has fun and education games and an animated online Field Guide to Trees for children.
www.arborday.org

EcoKids offers children some fun online natural science activities with an ecological slant.
www.ecokids.ca/pub/index.cfm

The Electronic Naturalist is a site for teachers and kids containing lots of good information about many natural science subjects.
www.enaturalist.org

Web Resources

Note about websites: The websites listed were operating in 2006. If they don't work when you try them, be aware that organizations such as the National Science Teachers Association (www.nsta.org/elementaryschool) will often be able to refer you to equally useful sites.

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The National Arbor Day Foundation website has fun and education games and an animated online Field Guide to Trees for children.
www.arborday.org

EcoKids is a Canadian website for children, offering fun online natural science activities with an ecological slant.
www.ecokids.ca/pub/index.cfm

The Electronic Naturalist is a site for teachers and kids containing lots of good information about many natural science subjects. It is maintained by the Roger Tory Peterson Institute of Natural Science, named for the founder of Peterson Field Guides.
www.enaturalist.org

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www.brooklynkids.org

For information about renting this or other Portable Collections Program cases, please contact the Scheduling Assistant at 718-735-4400 ext. 118.