



Cycles of Life in an Urban Habitat: Changes in Biodiversity

Curriculum Unit 05.05.09
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This unit is anchored in the science vision statement of the New Haven Public School curriculum standards and frameworks for the second grade. The list includes standards in the areas of scientific inquiry, life science, earth science, technological science, ecology, and historical perspectives in science (see Appendix – Content Standards). However, because it is an integrated unit, standards in reading, writing, library media, technology, and other curricular area standards are also covered here.

In order to accomplish this, students will participate in a series of activities focused on direct observation and enquiry based learning allowing them to:

- Differentiate between animate and inanimate objects
- Study the differences between primary producers, primary consumers, secondary consumers and a wide variety of food chains
- Study and compare at least two permanent plots located in the schoolyard
- Observe how the seasons affect the life cycle, migration, and habitat of the diverse organisms in those plots
- Create a butterfly garden and compare this habitat to the permanent plots
- Create a database that lists all living and non-living organisms in each of these habitats
- Design simple descriptive experiments and pose questions related to the design, data gathering, and conclusions
- Make observations of the species richness, diversity, and evenness
- Make visual, written and oral presentations of their findings
- Observe the importance that the soil has in maintaining a balance between plants and organisms

Key Concepts

The following is a list of the basic concepts that will be targeted throughout the unit and in the lesson plans.

- Biodiversity is important to the stability of ecosystem functioning
- Interconnections of species plays a significant role in the functioning of ecosystems
- Humans depend on other species as sources of food, shelter, and economic gains
- Life on earth is dependent on food chains, webs and pyramids
- Humans have direct and indirect effects on our environment and habitat
- A society cannot maintain economic growth and subsist without biodiversity
- There are many types of habitats and ecosystems
- There are direct and indirect effects on the loss of biodiversity
- Humans' interdependence on other living species is basic to the subsistence of the web of life
- Once a species becomes extinct, it cannot be brought back
- Each habitat shares similar characteristics in its functioning and interdependence of species

Introduction

It is seriously alarming the news of the number of species that are lost daily or going extinct due to pollution, overpopulation, urban sprawl, over consumption, overexploitation of natural resources, and/or disease. So the question begs to be asked as to the role of educators in helping decrease such a loss, and in what ways educators can make a significant difference in abating the lose of biodiversity in the web of life.

I believe, that as educators we have a very important role to play and thus, the reason I write this curricular unit. Simply put the purpose can be described as that of assisting students to become critical thinkers in developing the necessary skills to grow into educated consumers that understand the daily choices they make affect everything they do.

Most nations have signed and enacted into law major initiatives dealing with the study, preservation and conservation of biological diversity when on December 29, 1993 they undersigned the International Convention on Biodiversity. This fact offers an indication of the importance that biodiversity has in our lives. Also, these conventions underscore the importance of immediate action at the local, regional, and national levels of understanding biodiversity.

There are some reasons for hope in that many organisms are resilient and evolve and adapt to ever changing circumstances. There is also hope in the labor of both governmental and non-governmental agencies and organizations that have raised the alarm, begun to study the situation, and taken some significant steps in raising people's awareness and in the conservation of endangered species and habitats.

Purpose

Through the implementation of this unit, designed to complement an already existing science curriculum on butterflies and moths that was designed by Science and Technology for Children, students will take a close look at several urban habitats and in this process begin to acquire an understanding of the biological diversity on which we depend. We will start by answering some preliminary questions in a general way and depicting examples directly related to the topic of life on earth in order to understand some of the intricacies related to the multiple components of the web of life.

These preliminary questions are the foundation to the content and concept specific objectives that the hands on activities will lead us into. Some general questions that will frame this unit are:

- Why is ecology and biodiversity conservation something that affects our lives directly?
- What are the basic principles and relationships between ecology and biodiversity that any citizen should be aware of?
- What are the direct and indirect impacts of loss of biodiversity in our lives?

The introduction of the unit is one of the principal components because it will set up the foundation of the scope and sequence of the unit. In the process of activating the students prior knowledge, the teacher assess what is the students' level of understanding and creates the scaffolds and necessary schemas and foundations that will allow all students to experiment with the concepts and content in order to create meaning from these interactions.

The teacher begins to create a word and picture vocabulary bank that later in the field studies section, or right there in the highlighted habitat, will allow the students to describe their observations and data collection. Without this vocabulary the students won't be able to meet the unit's objectives.

Objectives

Every year as part of the New Haven Public Schools Science curriculum, teachers in the second grade implement a unit on the lifecycle of the Painted Lady butterfly (*Vanessa cardui*). However, the resources that accompany the Science and Technology for Children's kit, limits its scope to observing the changes that occur from the egg to the full grown butterfly without covering in any depth its habitat, communities, environment, ecosystem, food chain, and food web. Thus, this unit attempts to enrich the kit by expanding on the concepts related to the importance that the habitat has to the living organisms and the dependence on maintaining in equilibrium the web of life of that given ecosystem.

Few are the students who at the sight of a butterfly, a bird, or a furry animal, do not show interest in learning more about them. At the same time, it does not cease to amaze me how, at the sight of a spider, the first instinct is to step on it and kill it. It is my hope that through their participation in the activities in this unit, students will be able to explain the reasons why that spider, worm, or other insect has the right to continue to be alive after their encounter.

I have chosen to focus this unit on cycles of life in an urban habitat as a way to make the concepts and important ideas of ecology and biodiversity concrete to the students' everyday living and as a complement to the unit on the butterfly life cycle. Thus, the concepts of habitats, communities, and environment, the connections among them, ecosystems, food chains, webs and pyramids, are introduced based on those organisms that live in local urban habitats. Late during the spring semester we will contextualize the previous concepts to the butterfly life cycle.

Through these activities, students will make direct observations on how the seasons affect the life cycle, the migration, and habitat of the diverse organisms. Through the students' active participation in the accompanying lessons, by the time they complete this unit, the students will have explored and compared urban and other local habitats to learn about biodiversity, made direct observations and created their own experiments to describe some basic factors that contribute to biodiversity, modeled some of the factors that decrease biodiversity, enhanced their understanding of why biodiversity is important to us, and expressed through stories, artwork, and presentations, why we should care about biodiversity.

Life is a garden

It never ceases to surprise me the resiliency that life on earth has to renew itself, day after day, season after season. As a gardener, I rejoice at each shade of green the grass turns after a March and April rain followed by the rays of sunshine. I see the grass grow faster than I wish in the summer months telling me that it is time to cut it back, just so that it can grow even thicker than before. The blistering sun of August slows the growth and makes it turn brown; the grass will no longer have the force that previously had and will, as the nights get colder and the days shorter, begin to weaken until it goes dormant once the first frost of October arrives.

As I nip the leading stem of the black-eyed Susan (*Rudbeckia hirta*), the new growth generated from each of the nodes will reward me at a later time with that many more blooms. Simultaneously, the root system is strengthened, making the growth horizontal instead of vertical. Thus, the plant shows its resilience, and

instead of dying back, it comes back with that much more strength and development.

Backyard habitat

These last few years, I have been working in naturalizing the lawn that surrounds my gardens and the house. I have begun introducing other plant species into the lawn, mainly for aesthetic reasons, with the awareness in mind, that as I mow the lawn, I decrease the amount of biological diversity.

So now the lawn has these patches or islands where these new plant species that I introduced, or that for the first time, I am allowing to grow so that they might have a chance to complete their life cycle, depict a very much more diverse ecosystem. At the same time I am fascinated by the way that the garden's colors have increased, the amount of bees, butterflies, and other visible life is also on the increase; I cringe at the idea of the destruction I bring to all these environments with the lawn mower in hand, I shave off all the life three inches above ground level. Bormann et al. (2001) would label this the Freedom Lawn in juxtaposition to the Industrial Lawn.

The Freedom lawn seeks to create a healthier and more diverse environment, while the Industrial Lawn, seeks uniformity at any cost to the environment. Therefore, through the use of many chemicals and pesticides, overuse of limited water resources, and the side effects of washed out pesticides into drinking wells, rivers and oceans, the Industrial Lawn has serious direct and indirect consequences to the environmental problems we face nowadays.

The metaphor of the lawn as the earth, the lawnmower as progress and unchecked over-exploitation of natural resources, and myself as the human component, will depict some of the fundamental ecological, and biodiversity concepts that I would like for my students to begin to understand. I find it unlikely that my students will be able to study a savanna, a prairie, a coastal or any other type of habitat and understand the relationships, factors, characteristics of the interdependence of the web of life unless they can see very simple and concrete examples that demonstrate the intricacies and importance of all forms of life. As a means of discovering how nature works, the students will gather clues by becoming active participants with the habitats that surround their lives. This will be accomplished through the study and year-round direct observation of two or three permanent plot samples located in the school backyard and a community garden.

Factors affecting the environment

Given that the major threat to biological diversity is in the loss of habitats, this unit attempts to instill on students the importance of habitat preservation. Thus, I begin from the premise that students must understand what a habitat is, and that they must begin to look at the world as a biologist and naturalist, as a way of becoming ecologists.

Some of the other important factors affecting the deterioration of healthy environments that threatens biological diversity are:

- Over-exploitation
- Pollution

- Habit degradation and loss
- Competition/predation from alien species
- Disease

Although it is important that students are aware that deforestation and destruction of tropical rain forest, which occupy 7% of the Earth's total surface, is responsible for the loss of many species that depend on that habitat, it is also imperative, that they closely relate to what this means. Such an abstract and far away reality is meaningless to a seven or eight year old child, and this unit attempts to make these sad and preoccupying facts real to their lives in order to become meaningful. This is accomplished by studying the above listed factors affecting the environment on those permanent plot samples where we will be conducting our observations.

As a society we cannot be demanding that others take care of the habitats near them, when excessive consumption of resources is our daily mantra.

The web of life

Biodiversity

Made up of two separate words: biology, the study of living organisms, and diversity that refers to the variety of living organisms. As we can see from the above living organism classification, there are millions of different species, all of which are important for the balance.

Life's Cycles

Ruth Heller (1983) in *The reason for a flower* clearly describes, through beautiful colored plates, the amazing process that takes place from flower to seed. It is through this process that children can begin to understand the definition of a wider spectrum of living organism, as well as the resiliency to regenerate itself from a simple seed into a flower, a fruit, and back to a seed. And thus, another life cycle begins at the same time that another continues, like the spiral on a snail's shell or yet another ring in a tree trunk.

The seasons as a cyclical clock

In order to understand the idea of ecosystems, habitats, communities, and biomes, students need to be able to understand the fundamental concept of the seasons as one of the most important life generating and recursive cycles of maintenance, development, and growth.

It is important to note the influence that the change of seasons has on all living organisms marking life on earth into very clear beginnings and endings of life cycles. It is through close observation of these yearly

cycles, that we begin to understand issues of life and death, issues of rebirthing and regeneration, of destinies and foretold outcomes and endings.

Living organisms

Because the cycle of life has a very clear beginning and end, from birth to death, all living organisms exhibit very similar behaviors, that although very different according to the species, reflect the same needs to seek shelter, food and drink, and reproduce.

As the days grow longer and the sun warms the Northern Hemisphere, the sleepy and slow life, begins to awake from a very much needed regeneration period. The blood begins to thin out and some of the dormant instincts begin another cycle in the life of the organism.

Organism Taxonomy and Classification

There are millions of living organisms that are classified according to five kingdoms or groups of living things. The kingdoms all have in common that the organisms are made up of one or more cells, take in food, grow and reproduce or split to make new cells.

- Kingdom monera
- Kingdom protista
- Kingdom fungi
- Kingdom of plants
- Animal kingdom

The greatest variety of organisms belongs to the family of arthropods. Arthropods have a hard skeleton called exoskeleton that covers their entire outside body. Insects are arthropods with the special characteristic of having six legs with a body composed of three distinct parts: head, thorax, and abdomen. The butterfly is an arthropod.

Sun = life

All forms of life need energy in order to grow. For this reason, all living organisms depend on some basic necessities such as the search for food. In every habitat there are food producers and food consumers. Plants and trees are the basic food producers through the conversion of the sun's energy into sugar with the help of water and carbon dioxide in the atmosphere. This process of photosynthesis, and the oxygen that the plants give off in the exchange from solar energy to nutrients, is the basic tenant of life on earth.

Small herbivores feed on the plants and fruits. They are considered first consumers because they feed on food made by food-producing plants. These, in turn are the food consumers and producers to animals who depend on meat (carnivores) for energy. This dependence and interdependence of animals and plants as sources of energy creates a food chain. There can be food chains that are very simple such as a rabbit eating a plant or very complex ones that have many different levels and that depend on all of those levels being present. Humans, play a very important role in these chains.

Lesson plans and strategies in a Dual Language Program

The following lessons represent a sample of the different elements that are part of this unit and with the main goal of having second language students understand and interact with the content regarding biodiversity and the web of life through a second language in a cross cultural environment. The main goal of these lessons is to develop second language and science content academic proficiency. For such a purpose, close attention is placed upon key concepts, outcomes, assessments, appropriateness of language, lessons developed with the L2 learner in mind, and selected vocabulary. For an expanded description of the Dual Language model offered, please read Mendia-Landa (2004)

As part of the concept development strategy, three types of lessons are demonstrated: 1) concept comprehension (presented in L1), 2) integrated group lesson, and 3) second language development.

Introduction

In order to activate students' prior knowledge of what biodiversity is and the importance that it has in our lives, the unit will begin with a shared reading of the *El autobus mágico: Mariposa y el monstruo del pantano* by Joanna Cole. This *Magic School Bus* book will be revisited throughout the unit as a means to center our discussion on the experiences and discoveries that the students make about butterflies and the other animals in the swamp and relate it to those animals and discoveries we are making in our permanent plot samples. The key concepts will be written as they are introduced and will anchor the activities that follow. The students will be able to explain in their own words these statements.

In order to activate prior knowledge and find out how much the students know, as the story is being read will pose some guiding questions. The following might be some possible questions.

What would happen to a plant/animal/ human if there were no sun? What do plants and animals need in order to live? What happens when we don't have food, shelter? Could you find a in a swamp/park/garden, etc.

As children freely respond, the teacher writes down the comments and makes a list of what the children know, and talk about. This will be repeated at the completion of the unit to evaluate how much information the students have gathered.

Next, the teacher will show the students two of the key concepts that will direct the discussion prior to a hands-on activity that will follow the whole class mini-lesson on food and food sources:

- Humans depend on other species as sources of food, shelter, and economic gains

- Life on earth is dependent on food chains, webs and pyramids

The food magnifying glass

Some classic books, such as *Little Red Hen*, a favorite of mine, can be read through a "food magnifying glass", focusing on the different types of food that are either used by the characters, the different seasons when the story takes place, and how food is used throughout the story. This focus on specific elements can serve as an additional way of bringing key concepts to life through story telling.

This story will allow the teacher and students to begin looking at the importance that the sun plays in the growth cycle, the seasons. How the wheat converts the sunlight into food allowing it to germinate, grow, and produce seeds, which will be the crop that once milled will allow the Little Red Hen to make the bread needed to feed herself so she can do her work. Here, the children will begin to understand food chains, primary sources, and primary consumers, and the importance of food to life. Thus, this story is used as the springboard to bring the children's attention to the different types of food sources and producers and how important they are in our lives.

The biodiversity magnifying glass

Next, the same story will be read through a "biodiversity magnifying glass" where we will focus our attention on the fauna and flora. The students will make two lists; one list with all the animals and a second list with all the plants and trees.

Through this whole group exercise, we can revisit almost any book, and begin to create a word bank that gives us the names of the most common plants and animals we will observe in the habitat that we will focus our study on: the urban habitat characterized by the school lawn and the butterfly garden. Thus, this is a way of presenting some of the vocabulary so when observing the permanent plot; the children can use it in context. When we do field work and find animals or plants that are discovered for the first time and not part of our list, we will add them to our list.

There will be much more fauna and flora that neither the children, nor the teacher, will be able to name. For such a purpose it is important to introduce the use of a field guide to the students. There are many field guides specific to almost any region in North America. I suggest that prior to the introduction on how to use the field guide the teacher emphasizes and teaches a lesson on the importance of gathering data. That is, the students need to be able to describe the shape, size, color, pattern and sounds in order to seek help from an adult or to look it up in the field guide.

Permanent Plots

Prior to this event, the teacher will have familiarized himself or herself with the fauna and flora present in the permanent plot to be studied, so as to introduce the needed vocabulary and pick a spot that has a wider representation of species. In this plot is where the first and most critical lessons will take place. It is here that we want to ensure that students understand what senses to use, how to gather data through observing a specific element on the plot, and what are the necessary procedures to follow in order for us to later be able to observe other plots.

One of the first lessons needs to be on how to make observations and how to gather data using the senses. Children need to be guided step by step through this process so they can later be independent in gathering data and entering it on their naturalist journal.

Schoolyard fieldwork

Due to the importance of fieldwork as a step-by-step process to the success of the unit, I concentrate my sample lessons on how to present it to the class. On the first observation that takes place at one of the permanent plots, the students will be directed to use only the sense of sight and gather the data in a naturalist journal. The purpose is to introduce to the students the importance of using the sense of sight, smell, hearing, and at times touch and taste to identify a plant or an animal. However, this will be done in separate lessons so as to introduce the specific vocabulary related to each of the senses.

The students then will write an entry in their own naturalist journal, which will include the date, season, time of the day, and a drawing of the plant or animal they are seeing. If the child knows the name of the plant or animal he or she will write it down next to the drawing. Back in the classroom the children will self-assess their entries and share with the rest of the students. This lesson will be repeated with the senses of smell, hearing, and touch. Note the importance that these lessons have to vocabulary development and how important, especially in the case of second language learners, to scaffold the vocabulary through the use of word banks, webs, and organizers.

Once the children are able to make simple observations, create a journal entry and use of the basic vocabulary needed to describe some of the living organisms that are represented in the plot, we will take another field trip to the schoolyard where the plot is located. Of course, many other organisms, not on the plot, will grasp the student's attention, such as birds and squirrels. In this case our observation procedure might be to make three lists. One list for plants in the lot, another for the living organisms in the lot, and a third for those plants and organisms not in the plot; but always emphasizing that it is the permanent plot where our attention needs to be focused.

Control and experimental permanent plots

Having delineated the permanent plot for study, previous observations made to ensure some significant diversity, and after doing some fieldwork to talk about the methods of data collection and data gathering, another permanent plot is located in the schoolyard.

This plot will possibly have a combination of grass, annuals, biennials, and perennials. This lot will be the control permanent plot. Here, we will let all plants grow we can compare it with the one that is maintained as a regular lawn.

The butterfly garden

Early in the fall, the teacher, with the help of the students will locate an area in the schoolyard to create a butterfly garden. This will be a controlled area with the main purpose of attracting butterflies and other organisms so the students can observe and compare the previous two permanent plots to this one.

There are many excellent resources on plants and how to create a butterfly garden though local gardening clubs, community gardens and via the Internet. The list of electronic resources at the end of this unit highlights some of the most important ones. Because it takes more than one growing season to grow a

butterfly garden, this will be a long-range project.

Through the planning and implementing process of the butterfly garden, the teacher will highlight, and the children will learn about the differences between annual, biennial, and perennial plants. Students will compare these plants to those of the two other plots, and will observe differences and similarities between them.

Concept Comprehension L1

Title: Animate versus inanimate

Students classify different objects and living organisms according to being either animate or inanimate and later sort them by which of the five kingdoms or groups of living things they think they belong to. At first, they will only have the animal kingdom and the kingdom of plants to draw from. This lesson will be taught in the students' dominant language, as a whole class, followed by an activity where students will work in small groups.

Students will be offered a set of pictures including objects, animals and plants (i.e. tree, giraffe, table, fly, rose) and discuss if they are animate or inanimate. At the completion of this lesson, the students will come up with two categories of cards, one for organisms and another for objects. This lesson will be later repeated by adding different cards. Once the students have a clear understanding of the difference between animate and inanimate, the activity is repeated only with live organisms and begin classifying them according to one or another kingdom (i.e. plant vs. animal)

Performance Task I- Categorizing

The lesson plans have been broken down further into tasks and have been written with the student in mind. The descriptions give the student a clear understanding of what they are expected to do, how they have to do it, and how they are going to be assessed. The students will receive copies of the assessment by which they will evaluate their own work.

I don't assume that the students have had much experience with performance tasks learning. Therefore, it is important to model the first few lessons as a class. This will ensure students' success in completing the different steps expected of them. For such a purpose I suggest the use of an LCD or overhead projector to go over the process.

The performance tasks are to be given to the students prior to the beginning of the task. It is the road map that the student, will use to be able to perform what we are asking them to do. As part of the process the students will also be able to preview the assessment tool by which they will be evaluated. Please look at the Appendix for a sample of the evaluation rubrics.

Background: There are millions of living organisms that are classified according to five kingdoms or groups of living things. The kingdoms all have in common that the organisms are made up of one or more cells, take in food, grow and reproduce or split to make new cells.

Task: You will work with your group in classifying the picture cards between animate and inanimate objects.

Then, you will classify the cards of living (animate) organisms between plants and animals.

Purpose: To differentiate between living (animate) and non-living (inanimate) and to classify living organisms between plants and animals.

Procedure: Begin by cutting two 3 by 5 cards in half. Write one label in each of the cards: animate, inanimate, plant kingdom, animal kingdom.

- Take the two cards labeled animate and inanimate and place them on the table in front of your group.
- Taking turns with your classmates, begin placing a card at a time under each of the labels.
- Before you move on to the next card, the student's whose turn it is will ask to the rest of the group the following question:
Is the animate or inanimate?
- The rest of the group will respond with the following phrase:
The is an animate/inanimate because ...
- When you finish, take some construction paper; individually write the labels animate and inanimate, and write under each column the name of each of the objects in front of the group.
- Repeat the same steps with the labels plant and animal using the following sentence starters:
Is the a plant or an animal?
The is a plant/animal because....
- Finally, write on the other side of the construction paper the labels and the names of each of the animate organisms in front of your group.

Audience: Classmates and teacher

Assessment: Please see Appendix - Performance Task Listing/Classifying

Extension: This lesson can be repeated as an integrated lesson, making sure that the names of each of the objects and organisms are listed on the card. Additionally, other cards can be added that include organisms from the kingdom monera, protista, or fungi.

Home-School Connection: Students will observe their backyard or closest plot to their homes, create a data table that depicts the number, and draw some of the most common ones according to whether they are a

plant or an animal.

Integrated Lesson

Title: Food chains

All living organisms are important whether they are in the bottom or the top of the food chain. The interdependence among organisms creates a balance that when disturbed at any level affects everyone else.

Students in groups will create simple food webs and chains with cutout pictures to demonstrate the interdependence of human on other plants, animals, and organisms for our growth, development, and wellbeing. They will proceed by labeling each of the pictures and the relationships among them.

First, we will begin reading any of the poems of *Abecedario De Los Animales* by Alma Flor Ada (1990). We will discuss the poem and talk about how the animal is alike and different to us. What do they need to live? How often do we eat? Where does our food come from?, etc. Next, we will read the following key concepts and look for examples in our lives.

- Humans depend on other species as sources of food, shelter, and economic gains
- Life on earth is dependent on food chains, webs and pyramids
- Humans have direct and indirect effects on our environment and habitat
- There are many types of habitats and ecosystems

This will be followed by a shared reading activity of *Ecosystems and food chains* (Sabin, 1985). As the different food webs, chains, and pyramids the teacher will depict on a chart how the different organisms are related and dependent on each other.

This will be followed by an activity where each group of students glues a series of pictures that include the sun, plants, rabbits, trees, owl, children, and a cow. The children glue the sun in the middle of the page and the rest of the pictures around it. Then, the connections between each of the pictures will be made by drawing a line to reflect the dependence on each other for food. Each picture will be labeled with its name and whether it is a primary producer, primary consumer, or secondary consumer.

Second language development

Title: Naturalist Journal Fieldwork

Students in groups will observe periodically one square yard permanent plot of land and look for evidence of life. Students will pose questions, conduct simple experiments, gather data in the form of species richness, diversity, and evenness; and communicate their findings orally and in writing as they compare two permanent plots through the seasons.

First, we will begin with a choral reading (all students read at the same time) of one of Alma Flor Ada's poems introduced in the previous lesson. Next we will do a shared reading activity of *One Small Square: Backyard* (Silver, 1993) and create an experiential chart about the school lawn or the backyard. We will create a list of those plants and animals they have observed around the school or backyard. At the completion, we will be reading the key concepts of the unit.

- Interconnections of species plays a significant role in the functioning of ecosystems
- Humans have direct and indirect effects on our environment and habitat
- There are many types of habitats and ecosystems

Next, we will talk about how we can gather data by making observations using our senses. Also, the importance of not disturbing a habitat will be highlighted and as a result the introduction of only working on a permanent plot will be presented as an alternative.

As described earlier in the introduction, this will be one of the most important lessons in as much as it will lay down the process and procedures to follow when doing fieldwork. The emphasis will be on gathering data using the senses, how to enter a journal entry, and on presenting the findings to the group and the class.

Performance Task II-Gathering data from permanent plot

Background: The Earth is made up of huge natural areas called biomes. Some examples of biomes are forest, deserts, and oceans. Within each biome there can be thousands of ecosystems. An ecosystem is a group of organisms and the place where they live including the factors that make life possible. A habitat is a geographical location where animals live. Urban habitats share many characteristics with other habitats in so much as there is interdependence among the different organisms that live there.

Task: You will create an entry in your naturalist log of everything you observe in the permanent plot.

Purpose: To gather systematic data of everything you observe in the backyard permanent plot and to begin discovering the interconnections between soil, plants and animals in an urban habitat.

Procedure: Take your naturalist journal.

- Write today's date.
- In the next line write the season (spring, summer, fall, winter.)
- Next, write the time of the day that you are making the observation.
- After, visit the permanent plot and draw all the organisms and plants you can observe without disturbing the plot or area you are observing.
- Label all the plants and organisms that you can name.
- Use the rubric to assess your work.

Audience: Classmates and teacher

Assessment: See Appendix - Performance Task Gathering Fieldwork Data

Extension: The same activity will be repeated with the sense of hearing, and smell. The students then can gather data by using all the senses at once to create a chart or data table that is labeled species richness (how many of each different species there are), species diversity (how many different species there are in all), and evenness (are all the species represented in the same numbers or not?).

Home-School Connection: Students observe their backyard or other lot and make a list of those plants and animals they observe.

Related L2 vocabulary: observe (observar), draw (dibuja), write (escribe), name (nombra), list (lista)

Core vocabulary: species (especie), senses (sentidos), sight (vista), hearing (oido), smell (olfato), touch (tacto), diversity (diversidad), environment (medio ambiente), soil (tierra), journal (cuaderno), permanent plot (recuadro permanente), plant (planta), Animal (animal).

Extended vocabulary: species richness (riqueza de especies), species diversity (diversidad de especies), species evenness (equilibrio de especies)

Specific language structures addressed (scaffold oral expression): ¿Cuáles son algunos de los animales que has visto/oido/olido/observado en el recuadro permanente? Los animales que he visto/oido/olido/observado en el recuadro permanente son...

¿Cuáles son algunas de las plantas que has visto/oido/olido/observado en el recuadro permanente? Los animales que he visto/oido/olido/observado en el recuadro permanente son...

And then there were more

The following lessons will share the same structure as the previous ones and are here listed as extensions. All of them will begin with a poem or a book from the teacher or student's bibliography, followed by some of the key concepts above listed. Then, we will discuss what we learnt in the previous lessons and will relate what we are about to learn to our lives. Consequently, the other standards listed on this unit will be targeted during the implementation of these activities.

Language arts: Creating a field guide that describes each of the species represented in the schoolyard by shape, color, size, color, pattern and sounds. As a written prompt, consider making an adaptation of a folk story such as Little Red Riding Hood, or the Three Little Pigs with food webs and chains in mind.

Art: Illustrate a field guide to the school backyard. Create a collage or mural with all the colors present in each of the permanent plots through the seasons. How would they be different?

Science: Comparing the school species richness, diversity, and evenness permanent plot to the nearest community garden, marshland, or shoreline. Make a science board describing the differences between two urban habitats throughout the fall and winter seasons. Where do organisms go in the winter months (migration and local habitats). Creating a moth trap with an ultraviolet lamp.

Social Studies: Color a map of North America, or other continent, with the most important biomes represented

in it (i.e. forests, grasslands, shrub and scrublands, deserts, mountains, tundra)

From the backyard to the Mill and Quinnipiac rivers

Once the students have made multiple observations of the permanent plot at different times of the day, the control plot (that which will not be disturbed throughout the year) can begin to be observed and comparisons made in relation to the above mentioned criteria. Additionally, the children will begin building the butterfly garden as another habitat that they will observe and gather data about its species richness, diversity, and evenness as they closely look at the food chains, webs and pyramids.

The Fair Haven community in New Haven is lucky to have the affluence of the Mill and Quinnipiac rivers that can be used as comparisons sites when observing different habitats. Because they are within walking distance to our school, the children will be able to practice the data gathering and observation skills learned throughout the unit to compare and analyze the differences on species richness, diversity, and evenness to these or other sites around the city.

Additionally, a comparison of soil samples will be taken from each of the plots after, we looked at the gathered data and will be sent to the Connecticut Agricultural Station for analysis. These results will be added to the collected data and then compare the soils' results to the types of plants that grow on those plots.

Once the students have made multiple observations of the permanent plot at different times of the day, the control plot (that which will not be disturbed throughout the year) can begin to be observed and comparisons made in relation to the above mentioned criteria. Additionally, the children will begin building the butterfly garden as another habitat that they will observe and gather data about its species richness, diversity, and evenness as they closely look at the food chains, webs and pyramids.

Last Word

Teaching in a Dual Language Program at the same time that you write curricular units is always a double challenge because the number of children and responsibilities associated to their academic, social, emotional and linguistic development. However, in the last few years, with the growth in this type of programs, there are more and more resources available.

The Internet provides a wide range of current and authentic resources that can be added to the teacher's toolbox. However, there is still much need more resources and here is where teacher's ingenuity, creativity, and originality come into place. I suggest the teacher make tapes of non-fiction books in order to provide the student with many opportunities to listen to the principles involved related to more technical topics such as the one on this unit. These books, would allow the second language learners to hear a native speaker, reading aloud books concentrated on the area of study. These could be used at the listening center after they have been introduced to the class.

Teacher's Bibliography

(1998). *Scientists on Biodiversity*. New York, American Museum of Natural History.

Given the dire straits of biomes and ecosystems, it is refreshing, yet concerning, to read scientists' perceptions and concerns of the importance of biodiversity to human kind. A must read for all those who are concerned on ecology and biodiversity.

Bormann, F. H., D. Balmori, et al. (2001). *Redesigning the American lawn : a search for environmental harmony*. New Haven, Yale University Press.

Why are we so fascinated with the lawn? What effects do this have on local and regional habitats? This book explains it all in detail. A wake up call to anyone who is a gardener or need to take care of a lawn.

Camazine, S. (1987). *The naturalist's year : 24 outdoor explorations*. New York, Wiley.

This book is an excellent resource for the teacher that needs extensions to those activities related to ecology and conservation. Great resource for the middle and high school teacher.

Carr, S., A. Lane, et al. (1993). *Practical conservation : urban habitats*. [Milton Keynes, England] London, Open University in association with the Nature Conservancy Council ;

Hodder & Stoughton.

What is the relationship between conservation and urban habitats? Why should we care? This is a must read book for those interested on urban ecology.

Gilbert, O. L. (1989). *The ecology of urban habitats*. London ; New York, Chapman and Hall.

A must for the reader on the ecology of urban habitats. Excellent reading material that describes the components and make up of urban habitats. It includes a list of bibliographic references.

Mendia-Landa, P. (2004). *Energy All Around: Energy in Our Lives. Energy, Engines, and the Environment*. New Haven, Connecticut, Yale-New Haven Teachers Institute. **IV** .

A curricular unit with elementary students enrolled in a Dual Language Program in mind. It includes a list of student, teacher, and electronic resources.

Patent, D. H. and W. Mu-oz (1996). *Biodiversity*. New York, Clarion Books.

Provides a global perspective on environmental issues while demonstrating the concept, which encompasses the many forms of life on earth and their interdependence on one another for survival.

Wheater, C. P. (1999). *Urban habitats*. London ; New York, Routledge.

All you needed to know about urban habitats and more. This book includes graphs and tables describing fauna, and flora of urban habitats.

Student's Bibliography

Ada, A. F. and V. Escrivá (1990). *Abecedario de los animales*. Madrid, Spain, Espasa Calpe, S.A.

Each letter of the Spanish alphabet is represented by a colorful illustration including two poems in Spanish highlighting a different animal for each letter.

Carter, K. (1995). *Animales viajeros*. Vero Beach, Fla., Rourke.

This is a good emergent reader book on animal migration in Spanish. Great photographs. Includes a table of contents, and a glossary.

Davis, W. (1997). *City park*. New York, Children's Press.

An excellent resource on urban habitats for emergent readers. A city park is shown to be home to many different forms of animal life, from insects to birds and mammals.

Fleisher, P. (1996). *Life cycles of a dozen diverse creatures*. Brookfield, Conn., Millbrook Press.

Can be used as a research source on the life cycle of the animals listed. This book compares and contrasts the life cycles of twelve animals including the opossum, bullfrog, monarch butterfly, and jellyfish. Recommended for the fluent reader.

Ganeri, A. (1997). *The hunt for food*. Brookfield, CT, The Millbrook Press, Inc.

Why do animals need to eat and how do they go about it? If you want to know, all the answers are here listed with magnificent illustrations and captions. Includes illustrated food webs, a glossary, and an index.

House, M. B. (1986). *The joy of wildflowers : a field book of familiar flowers of rural and urban habitats in the eastern United States*. New York, Prentice-Hall.

An excellent field guide on wildflowers of rural and urban habitats in the United States.

Kalman, B. and G. Nickles (1998). *What is the animal kingdom?* New York, Crabtree Pub. Co.

Recommended as a read aloud or for the emergent or fluent reader. Introduces the animal kingdom, showing and describing the main groups of animals and discussing their anatomy, habitats, reproduction, and classification. Excellent illustrations.

Lasky, K. and C. G. Knight (1993). *Monarchs*. San Diego, Harcourt Brace & Co.

Everything you wanted to know about the monarch butterflies. This book describes the life cycle and winter migrations of the eastern and western monarch butterflies and the two towns that protect their winter habitats. Recommended for the fluent reader.

Lauber, P. and H. Keller (1995). *Who eats what? : food chains and food webs*. New York, NY, HarperCollins.

Recommended for the beginner and emergent reader. This book explains the concept of a food chain and how plants, animals, and humans are ecologically linked. An excellent book to use as a shared or read aloud.

Llamas Ruiz, A. and F. Arredondo (1996). *Metamorphosis*. New York, Sterling Publishing.

Describes the process of metamorphosis in caterpillars, tadpoles, and dragonfly larvae. Recommended for the independent reader. It includes a table of contents and glossary.

Owen, O. S. (1994). *Caterpillar to butterfly*. Edina, Minn., Abdo & Daughters.

Have you ever wondered the stages from egg to butterfly? This book answers this and many other questions. Recommended for the fluent reader.

Sabin, F. and A. Cumings (1985). *Ecosystems and food chains*. Mahwah, N.J., Troll Associates.

Explains the natural patterns by which plants and animals depend upon each other and the environment for food, and emphasizes the dangers of pesticides and other human interference with the ecosystem.

Schaffer, D. (1999). *Silkworms*. Mankato, Minn., Bridgestone Books.

Describes the physical characteristics, habits and stages of development of silkworms, as well as how they are raised to produce silk. Includes a table of comments, a game, glossary, and electronic resources.

Silver, D. M. and P. Wynne (1993). *Backyard*. New York, Scientific American Books for Young Readers.

This book, as one on the series, depicts the way to observe and explore plants, animals, and their interactions found in a backyard. Can be used as a field guide with excellent illustrations and color plates broken down by mammals, reptiles and amphibians, birds, insects, plants, protists, and rocks.

Silver, D. M. and P. Wynne (1994). *Pond*. New York, Scientific American Books for Young Readers.

Excellent illustrations. Can be used as a field guide to the swamp's plants, funguses, invertebrates, mammals, fishes, birds, reptiles and amphibians, protista, and monera

Silver, D. M. and P. Wynne (1997). *Swamp*. New York, Learning Triangle Press.

Explores the richness and variety of life forms that congregate in a swamp, discussing their characteristics and the importance of their survival.

Stone, L. M. (1997). *What makes an insect?* Vero Beach, Fla., Rourke Book Co.

Recommended for the beginner and emergent reader. This book discusses the habits, body parts, and different kinds of insects and their relationships with people. Great photographs accompany the text.

Young, A. M. (1996). *Lives intertwined: relationships between plants and animals*. New York, F. Watts.

Recommended for the fluent reader. Describes the interdependence of plants and animals in a Central American rainforest, focusing on a Morpho butterfly and a Mucuna vine.

Electronic References

Bomba, V. (2001). Connecticut Agricultural Experiment Station. **July 6 , 2005** <http://www.caes.state.ct.us/>.

An excellent site offering a plant pest control handbook, soil testing, plant and insect information, and many publications related to organisms specific to Connecticut.

Culin, J. (1999). Butterfly Gardening. HGIC 1701, The Clemson University Cooperative Extension Service. **July 7 , 2005** <http://hgic.clemson.edu>.

Includes a concise frequent asked questions related to butterfly gardens, the perennial plants, trees and shrubs, annuals and biennials that attract butterflies. Also, includes a list of suggested larval food plants to adult butterfly, field guides, and other references for butterfly gardening.

Lovett, J. (2005). Monarch Watch, University of Kansas Entomology Program. **July 4 , 2005** <http://www.monarchwatch.org/index.html>

Anything and everything about the monarch butterfly, including an extensive reference library related to butterflies and moths. This site has been awarded some of the most notorious web site awards.

Rabuzzi, M. (1997). Cultural Entomology Digest 4. **May 23 , 2005** <http://bugbios.com/ced4/issue4.html>.

This digest includes a wide range on etymological history about butterflies, moths, and caterpillars. Additionally discusses butterflies of Ancient Mexico, and Lepidoptera symbology.

Scott, J. A. (2003). The butterflies of North America CD-ROM: a natural history and field guide. Stanford, Calif., Hopkins Technology.

Originally published in book form, this CD-ROM contains additional photography, video and material. This is not a Macintosh compatible program. Includes over 4,500 full-color pictures that cover 679 species, 24 videos, over 600 field maps of all native species.

Sear, D. (1999). Bugbios: Shameless promotion of insect appreciation, IO Vision. **May 23 , 2005** <http://insects.org/>.

A must visit interactive site that promotes insect appreciation. It includes hundreds of photographs with a description of the organism, and the common, scientific, order, and family name.

Appendix

Content Standards

Scientific inquiry

1.1 Students will acquire and practice the ability to do scientific inquiry.

Students in groups will observe periodically one square yard permanent plot of land and look for evidence of life. Students will pose questions, conduct simple experiments, gather data in the form of species richness,

diversity, and evenness; and communicate their findings orally and in writing as they compare two permanent plots through the seasons.

Life science

3.2.a Students will observe that plants and animals have life cycles

3.2.b. Students will identify some of the interrelationships that exist among plants and animals.

3.3 - Students will observe ways in which humans depend on the natural and constructed environment.

Students will study the differences between primary producers, primary consumers, secondary consumers and a wide variety of food chains where humans play an important role. Students will observe the dependence of humans on biodiversity as a means of subsistence and economic growth.

Earth science

4.1.3 Students will gain knowledge of the properties of soil and the dependence of plant life on soil.

Students as they research their plot of land will look at the importance that the soil has in maintaining a balance between plants and organisms. Students will compare three different types of plots and observe differences in the types of soils and the types of plants and living organisms in each of them.

Technological science

5.1.6 Students will work individually and collaboratively to use simple tools, techniques, and quantitative measures.

5.2.1. Students will observe that science presents effective ways to ask and answer questions about the natural world.

Students will create study teams and pose questions related to the plot observations, use simple tools to collect data (i.e. magnifying glass, net), make sense of the data in comparing two different plots, and come up with ways to answer their own questions.

Ecology

6.2.1. Students will learn about populations living in different locations, and they will learn about the concepts of population density and its impact on daily life.

Through comparing two or three different plots (two in the school yard, one in a butterfly garden) the students will make observations of the species richness, diversity and evenness and come up with their own generalizations of the relationships observed in those plots.

Historical perspectives in science

7.1 Students will develop an understanding of science as a human endeavor.

Through the planning of their own simple experiments, the students will develop an understanding that scientists engage in answering questions to simple and not so simple questions, and that they design ways to

come up with answers.

Evaluation Rubrics

CLASSROOM ASSESSMENT LIST

Listing/Categorizing - ELEMENTARY SCHOOL

1. Labels

T: I have written the name of each of the labels on the cards.

O: I have written the name of most of the labels on the cards.

W: I haven't written the names of some of the labels.

2. Classify between animate and inanimate

T: I have placed all the picture cards under each of the labels.

O: I have placed most of the picture cards under each of the labels.

W: I have not placed some of the picture cards under each of the labels.

3. Questions and sentences for animate versus inanimate

T: I have asked and responded with sentences to all the questions.

O: I have asked and responded with sentences to most of the questions.

W: I have asked and responded with sentences to some of the questions.

4. Classify between plant and animal

T: I have placed all the picture cards under each of the labels.

O: I have placed most of the picture cards under each of the labels.

W: I have not placed some of the picture cards under each of the labels.

5. Questions and sentences for plant versus animal

T: I have asked and responded with sentences to all the questions.

O: I have asked and responded with sentences to most of the questions.

W: I have asked and responded with sentences to some of the questions.

6. Writing

T: I have written all of the lists.

O: I have written most of the lists.

W: I have written some of the lists.

Did I do my best work?

Terrific OK Needs Work

CLASSROOM ASSESSMENT LIST

Gathering Fieldwork Data - ELEMENTARY SCHOOL

1. Date

T: I have written today's date at the top of the log entry.

O: I have written the date on my log entry.

W: I have not written today's date on the log entry.

2. Season

T: I have written the current season at the top of the log entry.

O: I have written the season on my log entry.

W: I have not written the season on the log entry.

3. Time of day

T: I have written the time of day at the top of the log entry.

O: I have written the time of day on my log entry.

W: I have not written the time of day on the log entry.

4. Plant drawings

T: I have made many different drawings of plants on the plot.

O: I have made some drawings of plants on the plot.

W: I have not made any drawings of plants on the plot.

5. Animal drawings

T: I have made many different drawings of animals on the plot.

O: I have made some drawings of animals on the plot.

W: I have not made any drawings of animals on the plot.

6. Labels

T: I have written the names of all of the plants and animals in the plot.

O: I have written the names of many of the plants and animals in the plot.

W: I have not written the names of any plants or animals in the plot.

Did I do my best work?

Terrific **O**K Needs **W**ork

Glossary

Food chains: All animals get their food from plants. Animals depend on food for energy. The plant produces its energy from the sun, the rabbit eats the plants, and the fox feeds on the rabbit. This is an example of a food chain. Food is a form of stored energy.

Producers: The plant is a primary producer.

Consumers: the rabbit is a primary consumer; the weasel and the fox can be either secondary or tertiary consumers.

Food web: refers to the combination of food chains that connect all the organisms in an ecosystem.

Ecosystems: A community of organisms and the physical environment where they live including the factors that make life possible.

Habitat: the geographical location where a species lives and that meets all its ecological needs.

Population: The number of different species in a community.

Community: the group of species that live in and share a habitat.

Connections: Relationships in nature.

Cycles in nature: Periodic events that occur time after time.

Disturbing the cycles: Not allowing the events of a cycle to take place as they normally would.

Breaking connections: When two organisms that needed each other cannot come into contact any longer.

Ecological Impact from humans – foresting, agriculture, farming, and urban sprawl are examples of ecological impact of humans.

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