

People's Interaction with the Environment



By virtue of its location, history, and exhibits, the John Heinz National Wildlife Refuge at Tinicum offers a particularly rich setting to study people's interaction with their environment.

Located within one of the nation's largest urban population centers, the refuge contains several oil pipelines and the now -closed Folcroft Landfill, an EPA Superfund site. Neighbors include an international airport, highways, residences, and industry. These mostly negative effects of humans on the surroundings are everywhere, and yet, "Tinicum" remains an island of natural beauty that attracts birders, sportsmen, joggers, and wildlife lovers who daily frequent its trails. As such, the refuge is a perfect place to focus on man's interactions with his environment.



The rich history of the refuge is another reason why we should study the human - environmental interactions here. Native American Lenape once lived here mostly in harmony with their natural surroundings. The name Tinicum is of Lenape origin, meaning "islands of the marsh".

When the early Dutch and Swedish settlers arrived in the 1600s, they began changing the landscape to suit their own needs, building a dike along the creek bank and draining some of the marsh for farming. Today visitors walk along this "dike trail", not realizing that it, like the artificial pond (impoundment), are part of the built environment.

During the 19th & 20th centuries, increased industrialization reduced the approximately 6,000 acres of original freshwater marsh to the 250 acres we preserve today.

Much of this history is detailed and displayed in the exhibits in the Cusano Environmental Education Center (CEEC). Visitors will also be impressed by the environmentally friendly construction that demonstrates the 21st century's new found respect for the environment. Thus, in many ways, the refuge is an ideal location to study human interaction with the environment.

Sincerely,

The Refuge Environmental Education Development (REED) Team

"I went to the woods because I wanted to live deliberately, to front only the essential facts of life, and see if I could learn what it had to teach, and not, when I came to die, discover that I had not lived."

Henry David Thoreau

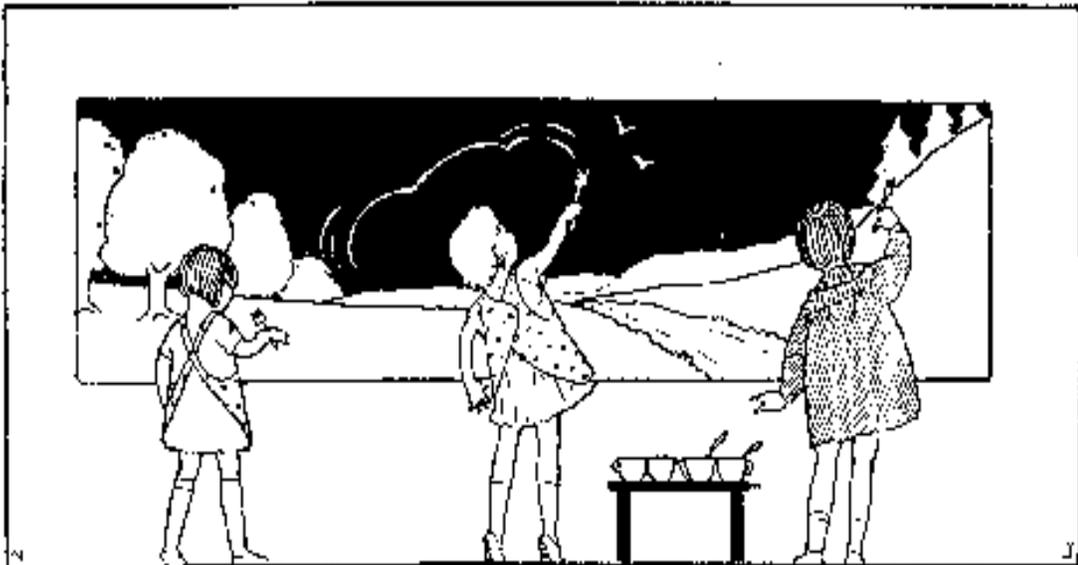
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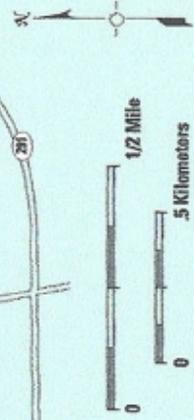
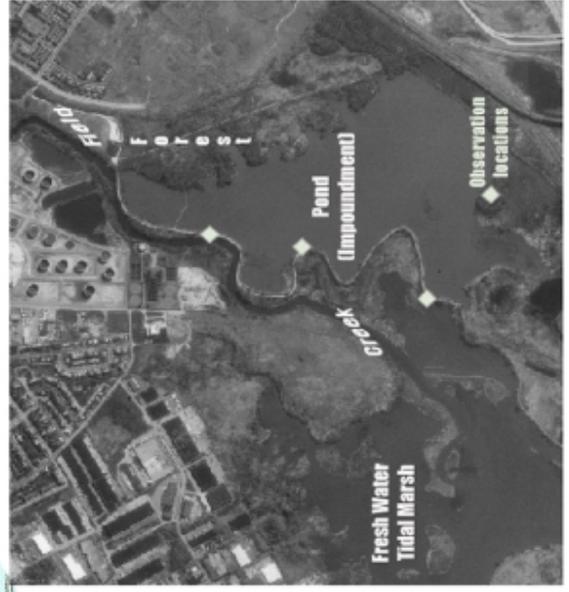
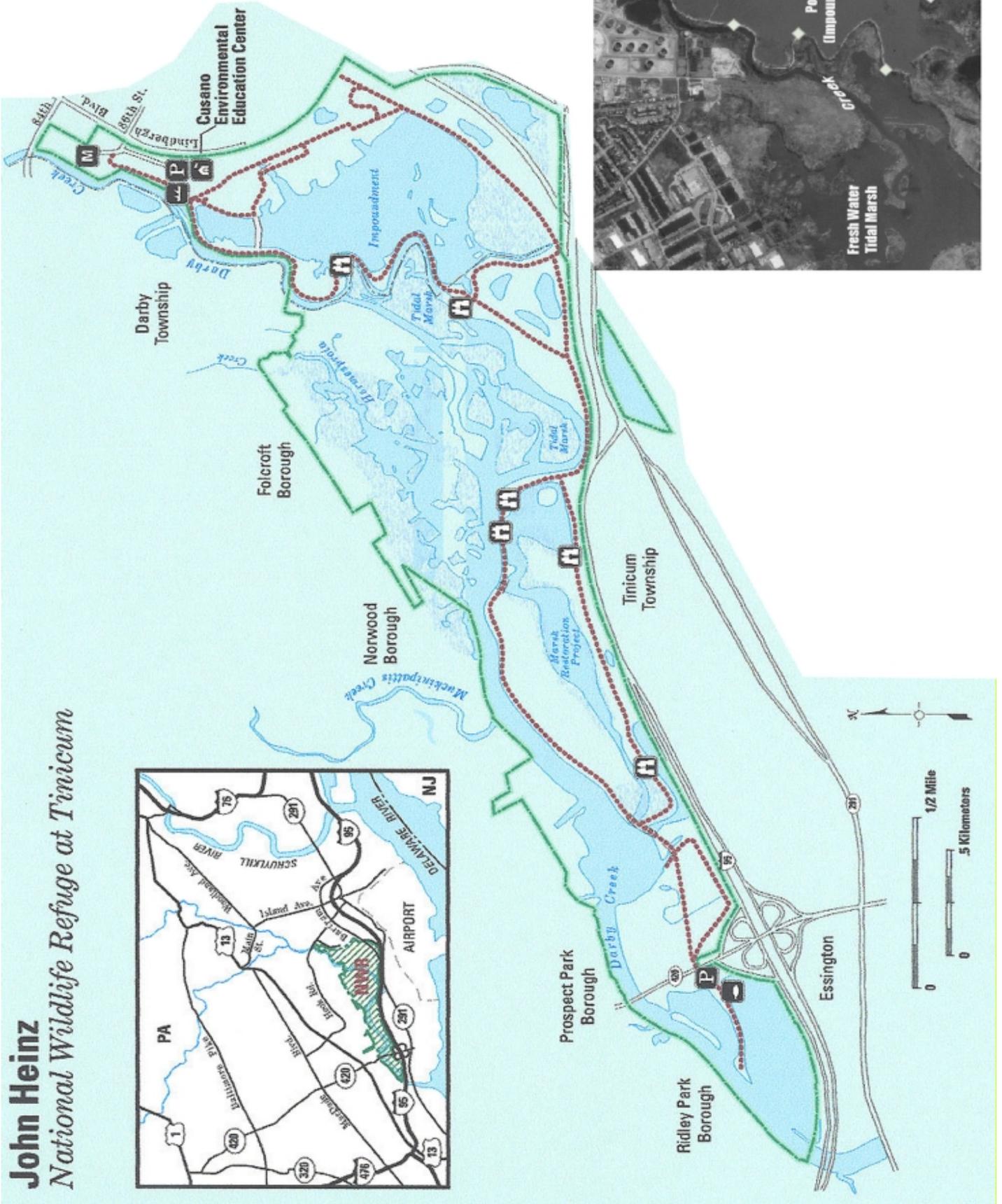
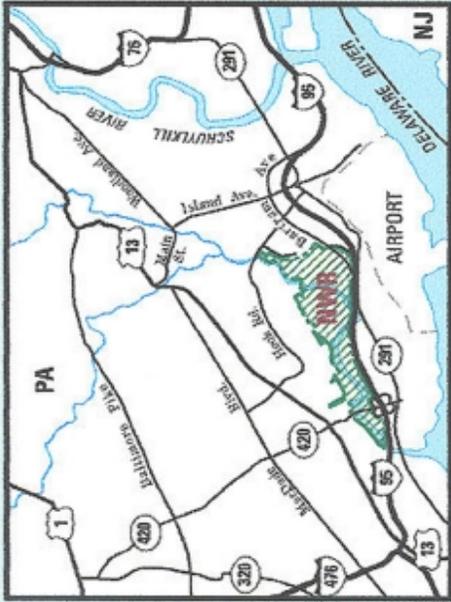
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John Heinz National Wildlife Refuge at Tinicum





Trapped at Tinicum!

Concept

Students will imagine they are “Trapped at Tinicum” for several days and must survive on the resources available. The students will identify the natural resources they can use to survive. Then they will project how their use of the resources will affect the environment.

Objectives

By the end of the activity, the students will:

1. list the basic necessities of all living things.
2. determine how humans use natural products and how that use affects the environment.
3. discover ways to limit human consumption of the environment.
4. demonstrate knowledge of an historical perspective of the ways Native Americans and early American settlers used this area.

Pennsylvania Educational Standards

(Environment and Ecology)

- | | |
|-------------|-------------|
| 4.1.4 C & D | 4.1.7 C & D |
| 4.2.4 A & C | 4.2.7 C |
| 4.3.4 C | 4.4.10 A |
| 4.6.4 A | 4.7.4 A |
| 4.7.7 A | 4.8.4 A |
| 4.8.7 A & B | 4.8.10 C |

Pre-Trip Lesson

1. Explain and discuss the basic necessities of life: food, water, shelter (including clothing), and space. How do we obtain these necessities?
2. Practice mapping. Have students draw a map of the school, pointing out where they find the basic necessities at school. Then have the students map their neighborhoods (habitat) and mark where they find their basic needs there.

Trip Lesson

1. Divide the class into 5 or 6 groups. Each group should have an adult leader who is familiar with the lesson and the refuge prior to the field trip.
2. Explain the simulation (see worksheet). “You are stranded at the refuge. There is no way to leave. Your groups have 25 minutes to scout the area and locate and list those things on the refuge that will supply you with what you need to survive.” Review food, water, shelter, and space.

Hand out worksheet, map, and natural resources list. Students need to identify a plan of survival (i.e., which group will find food, transport water, build the shelter, etc.), and identify and mark on the map which areas and those animals and plants they will use to accomplish their various tasks.

Remember, develop a plan only. Do not build, pull plants, try to capture animals, or drink from the creek.

3. When students return, discuss what they found. Did the students take into consideration a balanced diet of protein and vegetables? Were there items on the refuge that they would use every day (wood, water, etc.)?

Compile the information from all the groups on a large map. Did the groups plan on using materials from the same area? What quantity of the materials will be needed for each person? for each day?

4. Have the students consider and discuss how using those “resources” for a class of this size will affect the area. How long do you think the area would be able to support your group?
5. Use Post trip lesson #2

Post-trip lesson

1. Have students read or tell stories of people who lived off the land. These might be people who had been stranded like Robinson Crusoe, or Native Americans and early settlers who forged a life out of the wilderness.

Students might refer to “Gilligan’s Island” or “Survivor”. Have the students write a report comparing their experience at Tinicum with the experiences of others. How would the students change their survival plans when “stranded at Tinicum” after reading about how others survived?

2. Have students research the peoples who have populated the Tinicum area over the years, using background information provided and additional resources. This would include Native Americans, Swedish, Dutch, and English settlers. How did they use the area? How did they make sure the materials they needed would be there year after year?

Use the worksheets included in this lesson to assist students in determining what resources were available in Tinicum at the time of the Lenape and early settlers.

Discuss students’ research and findings on the refuge. Can they compare how people might have utilized the area in the past to how people might utilize the area today? What if it wasn’t a wildlife refuge? What might have happened to this area?



Survivors,

The bus broke down and we are stranded at the refuge. We called for help but for some extraordinary reasons, we cannot be picked up for several days. We cannot walk home, and we are not allowed to leave the refuge. We have no access to food. We are trapped at Tinicum!

Your task: Each group needs to develop a survival plan.

Divide your group into teams. Each team will be responsible for either food, water, or shelter. As we explore the refuge, the job of each group will be to discover things that can be used to aid survival. Findings will be recorded on the attached chart.

Food Team

Discover things that we can eat.

How will we find or catch them?

How could we cook or prepare them?



Shelter Team

Help us find a place that is safe, dry, and comfortable.

We need a place to sleep, rest, and be protected from the weather.

What would be the best location for our shelter?

What could we use to build it?

Why was this location chosen?



Water Team

Make sure we have water to use and drink.

Where is the best place to get it?

How can we make sure it is safe to drink?

Could we make it safe to drink?

How can we transport it?



Good Luck. It's going to be very cold and dark tonight.

Team: _____

Group Leader : _____

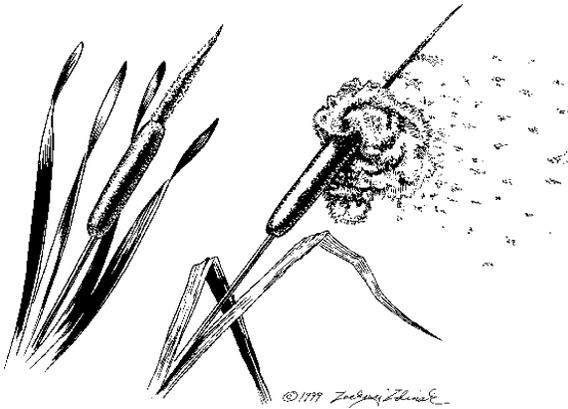
Partners: _____

As you walk through the refuge, make a list of things that you could use to accomplish your task. **DO NOT COLLECT THEM.** In the margins of this page, write down how you plan to accomplish your task. Include in your writing answers to questions like: How will you know what you have chosen is edible? How will you transport the water? How will you make the shelter secure in a storm? Make a sketch if you can.

| | |
|------------------------------|--|
| Creek | |
| Forest | |
| Pond (Impoundment) | |
| Field | |
| Freshwater Tidal Marsh | |

Tinicum Natural Resources List

Many of the plants and animals found in the area have been used, by humans, and continue to be used. On National Wildlife Refuges, all plants and animals are federally protected and can not be collected without written permission from refuge management.



Cattails, Common and Narrow-leaved

(*Typha latifolia* and *T. angustifolia*)

Cattails are marsh plants with long, slender leaves and a brown spike that is actually the flower. The roots and sprouts can be eaten like a potato, while the pollen can be used like flour. Native Americans wove the leaves of the cattails to make mats which were used to sit on or were tied to the frame of a shelter to make walls. Found in wet areas, cattails are typically in bloom from May until July.

Dandelion, Common and Fall

(*Taraxacum officinale* and *Leontodon autumnalis*)

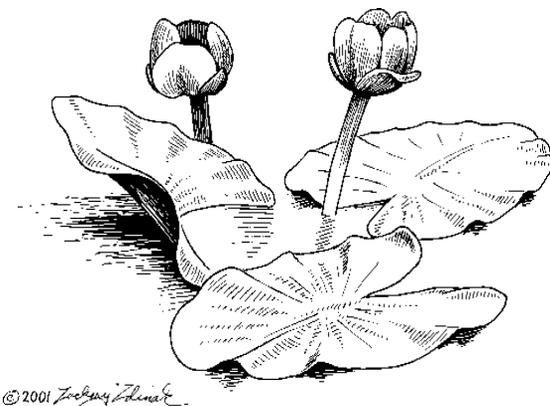
The dandelion is identified by a yellow flower-head and lobed, basal leaves around the base of the stem. All parts of this flower can provide a food source if selected at the right time of year. Early European settlers brought the plants over to the "New Americas" because of its value as food and also for its medicinal purposes.



Spatterdock or Yellow Water Lilly

(*Nuphar advena*)

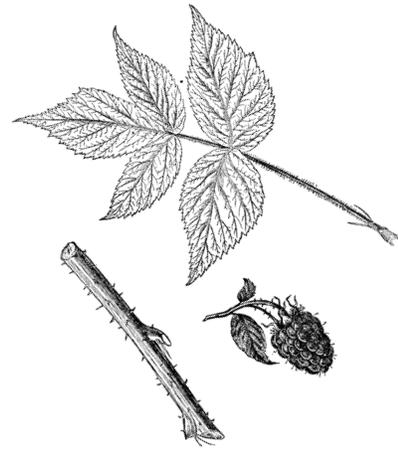
Spatterdock is a large-leaved plant found in the impoundment. It is often mistaken for the fragrant water lily (*Nymphaea odorata*) which has a white flower. The root of the spatterdock can provide a food source similar to potatoes, and the seeds can be roasted.



Blackberries, Common

(*Rubus allegheniensis*)

Blackberry bushes are found throughout the refuge along the edges of the trails. The blackberry plant is thorny and has a small, compound leaf with 3 - 5 toothed leaflets. Blackberry leaves can be used to make tea; while the berries provide a sweet fruit in July and August.

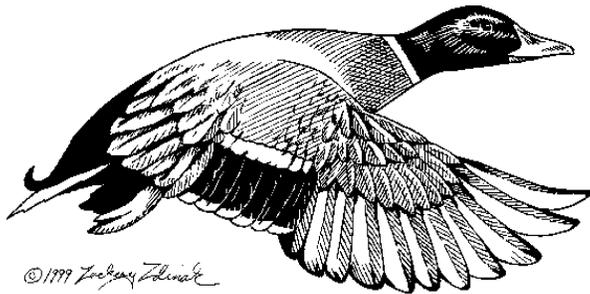
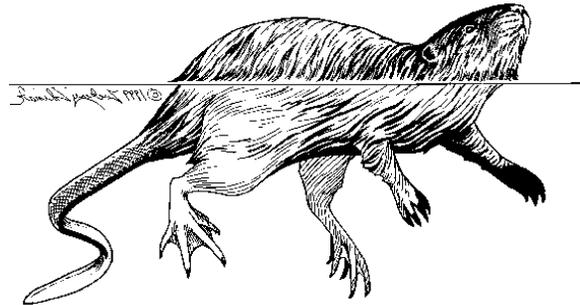


Trees

There are a variety of trees on the refuge. While some may provide a source of food, like the mulberry trees, others may provide materials for shelter and tools.

Mammals

Mammals, such as muskrats, deer, rabbits, and squirrels, can satisfy a variety of needs such as food, shelter, and tools.



Waterfowl

Waterfowl, such as ducks and geese, are a source of both meat, feathers, and eggs.

Wild Rice (*Zizania aquatica*)

Wild Rice is a tall grass that grows in wetland areas. Wild Rice is native to the wetlands of Tinicum Marsh and is utilized as a food source by many animals including waterfowl, deer, muskrats, and insects.

Phragmites or Giant Reed (*Phragmites australis*)

Phragmites is a tall reed with a feather-like flower. It grows densely along the creek and in the marsh. Though it provides no food value to people, some use it for thatching and weaving mats. Phragmites are a non-native and invasive plant on the refuge.



We are all in this Together

Pre-trip lesson

Concept

Students will search for ways people and wildlife interact with the refuge environment today, examining how those interactions help or hurt the environment.

Objectives

Students will be able to:

1. describe examples of people's interaction with the environment.
2. compare their daily environment to the refuge environment.
3. discover and possibly change their behaviors which hurt the natural environment.
4. discover how people hurt or help themselves through their interactions with the environment.

Pennsylvania Educational Standards

(Environment & Ecology)

- 4.1.4 C, D & E
- 4.2.4 D
- 4.3.4 A, B & C
- 4.3.7 C
- 4.6.4 A
- 4.7.4 A

1. Use the orientation packet, refuge website, or brochures to find lists of plants and animals commonly found/seen at the refuge. Have the students choose one organism and investigate its **interactions** with the environment. Pose questions like: Does it clean the air/water? Does it create habitat for others? Have the students put the information they find on one side of an index card and a picture of their plant or animal on the other side.
2. Have the students explore their own local environment. Is there pollution? How is the pollution being controlled? Without stores and services providing food and trash removal, would this be a healthy environment? Consider noise pollution. As a homework assignment, have students sit quietly outside their homes or in their rooms and list the things they hear.
3. Show the video, "Americas Wetlands" (available from the refuge library). Discuss the importance of wetlands to people and what people can do to preserve them. Discuss the various functions of wetlands.
4. Introduce the concepts of **dikes** and **levees** as built alterations to the natural landscape. Using stories like the *Little Dutch Boy*, discuss with the students what dikes and levees are and if or how they benefit people.

Trip lesson

Using the included worksheets and trail map, do the following activities.

1. From the trail entrance to the boardwalk

Walk the Darby Creek Dike Trail. Remind students of the class discussion of dikes and levees. Explain that this dike is built. Ask the students why this dike might be here. Explain how it separates the impoundment from the creek and channels the creek. Keep in mind that all of this area was marsh at one time.

2. At or near the water control structure

Have the students record trash floating past in the creek for 1.5 minutes. Have them calculate the percentage of trash which is created by people. Discuss where that trash will end up, such as in the marsh, along the creek banks, or elsewhere.

3. At the observation platform

Have students listen and record the sounds they hear. Compare their answers to the homework assignment from Pre-trip #2.

4. At the observation blind

Continue walking to the first observation blind. Have students record the trash items in the marsh. Discuss what kinds of trash are out there, how each kind got there, and what we can do to prevent more trash from accumulating.

5. Return trip

Have a student lead the walk back using the research on plants and animals studied in the pre-trip activity. As a student sees his/her plant or animal, or the area in which it might be found, that student can stop the group, point out the plant or animal and explain what he/she found out about it.

Wrap up at the Cusano Environmental Education Center (CEEC) by having the students describe one way they are going to improve their interaction with the environment.

Post trip lesson

1. On a map, have the students locate the watershed in which they live. Discuss the run-off they see on the street and where it goes. Remind them of the trash they saw in the creek at the refuge and ask where that trash might have originated. Have them watch "Stormy Weather", a video available at the refuge library.
2. Visit a waste-water treatment plant or invite an employee of a facility to come and talk about what is being done to keep trash out of our waterways and environment clean.
3. Watch the video, "There's Some Good News Out There", available from the refuge library. Discuss with the students how young people can make a difference.
4. Have the students plan and implement a neighborhood or school clean-up project or participate in an annual local clean-up.

Name _____

1) As you walk from the CEEC to the boardwalk, look for evidence of people's interaction with the environment. List your findings below, marking whether they are good interactions or bad interactions.

| Interaction | Good | Bad |
|-------------|------|-----|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

2. At the water control structure, count the debris floating past you in the creek for 1.5 minutes. One person in your group can be the timekeeper. Calculate the percentage of counted trash that is created by people. Use the formula below to calculate the percentage.

$$\frac{\text{Man-made trash}}{\text{Total Trash}} \times 100 = \% \text{man-made trash}$$

3. At the observation tower, create a "sound map" below. Place an X to identify your location and then mark the sounds you hear in relation to your location (i.e. behind you, to your left, in front of you, etc.).

4. At the observation blind, list the man-made trash you see in the marsh. How do you think it got there? How can we stop this from happening?

| Kind of trash | How did it get here? |
|---------------|----------------------|
| | |
| | |
| | |
| | |
| | |
| | |



Exploring Attitudes, Feelings, and Values about People's Interaction with the Environment

Pre-trip lesson

Concept

Students will investigate their own and other's attitudes, feelings, and values regarding the environment and how they affect the ways the environment is utilized or appreciated.

Objectives

Students will:

1. examine and explore their own attitudes, feelings, and values about nature and the environment.
2. compare their views to those of others.
3. analyze the ways in which people view the environment from other perspectives, such as where they live.

1. Discuss with students their **attitudes** and **feelings** about nature. Ask them to fill out the attached Survey of Attitudes. Encourage small or large group discussions about their responses.
2. Discuss the concept of **values** with students. How do attitudes and feelings affect values? Have the students search print media and TV for articles, editorials, programs, discussions, etc., that deal with various views of how to approach, use, and value our natural environment. Have the students share these and look for the sets of attitudes and values that affect thoughts and actions.
3. Conduct an observational experience in the classroom. Block off or cover up a part of the classroom the students see every day. Ask them to describe what they usually see there. Once the area is again revealed, have the students compare their recollections to what is actually there.
4. Introduce the students to the great body of American literature that deals with our interaction with nature and the environment. Through poets, writers, artists, scientists, and naturalists of the 19th and 20th centuries, they may see the ways that the growing knowledge, understanding, ways of using, and appreciating the natural world have been explored and celebrated.

Trip lesson

1. At the refuge, begin with an observation activity. For example, have the students count how many sounds they hear while sitting quietly near the CEEC.
2. Take an observation hike. Hand out cards with various "roles" on them. Ask the students to assume the role indicated and look for aspects of what they see in the refuge that would assist them in their "role". For example, a fashion photographer might be looking for a special background for a model, while an **ornithologist** might be looking for any signs of birds. Other possibilities might include wildlife biologist, fisherman, airport planner, artist, writer, or highway planner, etc.

3. After the observation hike, have the students spread out along a trail. Place them far enough apart so that they will not be able to distract each other. Prepare them for this by telling them ahead of time that while each of them is sitting alone, he or she should observe the sights, sounds, and the surroundings and think about their feelings about nature. Each should try to use all of his or her senses while observing the surroundings.

Post trip lesson

1. Have the students retake the attitude survey. Have any of their responses changed? Why or why not? Do they think their responses are typical? Do they differ based on gender, motivation, where a person grew up, other factors? Would such things affect the responses of others? What about age and occupation?
2. As a homework assignment, ask the students to give the survey to two or three adults or children. The responses could be compiled and analyzed with regard to the criteria established in Suggestion #1.
3. Search the media for items about environmental issues. Conduct discussions in large or small groups about these issues. What values drive the various positions taken on these issues? (Interesting place to note that the establishment of the National Wildlife Refuge systems arose as a response to the unrestricted slaying of wildlife for food, fashion, and commerce.) What values were involved? Do students know about Hawk Mountain? Do they know about proposed changes to their environment?
4. Students will use their refuge experiences and observations and their readings about the environment in one or more of the following ways:

Write poems or essays, keep a journal, or respond in other creative ways such as drawing or painting.

Participate in a poetry, essay, or creative expression contest.

Write a position paper on an environmental issue.

Create a literary magazine to be published at school.

Make a study of a person whose contributions to thinking and writing about environmental issues have made an impact on society or on themselves.

Make a comparison of an area of the John Heinz National Wildlife Refuge at Tinicum to areas described in "Walden" by Thoreau (Appendix B)

Volunteer for "Thoreau" clean-ups at the refuge.

Survey of Attitudes

Very True Sort of true Not very true Not true at all

- 1) I think each person in the community should do what he or she can to protect the environment.
- 2) I believe that what I do every day can have an impact on the environment.
- 3) I know where to find information on environmental issues.
- 4) I believe that I can make a difference in my school or community.
- 5) I believe that working together can solve community problems.
- 6) I think it is important to look for ways to help the environment.
- 7) I discuss environmental issues with my family.
- 8) I am aware of local, national, and global environmental issues.
- 9) I am aware of the following local, national, and global issues:



Land Management and Green Architecture

Concept

Students will examine land management techniques and green architecture at the refuge and learn how they benefit wildlife and people.

Objectives

Students will be able to:

- 1) describe two methods of resource management used by the refuge.
- 2) understand why it is important to manage the ways wildlife and people use the land.

Pennsylvania Educational Standards

(Environment & Ecology)

- | | |
|---------|---------|
| 4.2.7 C | 4.3.4 A |
| 4.5.4 B | 4.5.7 A |
| 4.6.4 A | 4.7.7 C |
| 4.8.4 D | |

Pre-trip Lesson

1. Work with the students on understanding the practice of land management. Invite someone involved in city or community planning to your classroom to discuss what land management practices are being used in the city or the town where the students live. Find out how these practices affect the environment. Learn about “green architecture”.
2. Students could use any of several simulated computer games based on city design. One of the more popular of these is the “Sim City” series. Obstacles such as zoning regulations and growing energy requirements are considered throughout the game as the city evolves. These games are designed to be both fun and educational.

Alternatives to the computer simulations are available in Project WILD or Project Learning Tree. Ask refuge education staff for more information about these lesson plans.

Trip Lesson

1. When your field trip reservation is made, request an introduction that focuses on refuge land management practices. Refuge staff will discuss with students the ways the refuge is managed for a variety of wildlife, using the field near the building or the impoundment as examples.
2. Using the maps and information provided, visit the various “management” areas and have the students assess what management practices are being used and the wildlife affected by them.
3. Have the students search for evidence of the wildlife they expect to find in those areas. Depending on the time of year, certain habitats may need to be “searched” with the eyes only, so as not to disturb nesting birds, etc. Check with staff before the field trip regarding possible closed areas of the refuge.
4. Conduct the “Recycled Material!” exercise in the building.
5. Complete the “Reduce, Reuse, & Recycle” exercise in the building.

Management Techniques on the refuge

Mowing

Mowing is used to maintain areas as field habitats. Mowing is conducted every 1 - 3 years depending upon the location and its needs. Sections are considered for mowing based on the amount of woody plants found in the area and what wildlife the refuge staff is trying to encourage to use the area. Primary reasons for keeping an area in a field-like state on the refuge are encouraging ground-nesting birds and the need for staff to access an area that will require study, such as the old Folcroft landfill - a designated EPA Superfund site. Refuge biologists use bird surveys to determine if ground-nesting birds are present. They look for evidence of bird droppings, feathers, sounds of birds calling, matted vegetation with feathers or broken eggshells, or actually sighting the birds.

Mammals such as foxes, rabbits, deer, and rodents also benefit from field habitats. For the **herbivores**, the field provides a food source that may not be found in other habitats such as forests which have few herbaceous plants in comparison to fields. For small mammals, it also provides some protection or "cover" to hide from predators. For the white-tailed deer, the field provides a place to "bed down" for the evening. **Carnivores** such as foxes find their prey in the fields and raise their young there. They feed on mice, voles, insects, and rabbits. Evidence that these mammals are using a field include: animal **scat**, small paths through the vegetation, matted or flattened vegetation, and animal remains.

Birds of prey, such as hawks and owls, also benefit from field habitats. They find food such as mice and voles in the fields. Evidence that these birds are using the area include: animal remains, visual sightings of raptors, and **owl pellets**.

Impoundment water level management

The water level in the impoundment can be lowered or raised, depending on wildlife needs. Lowering the water level provides mudflat areas for wetland animals like wading birds and migrating shorebirds and for plants like cattails, duck potato, and arrow arum. Raising the water level at certain times of the year provides increased area for waterfowl to land and feed on underwater vegetation.

Diking areas in wetlands

Dikes are used to aid in draining marshes and protect areas from flooding. Back then diking was a way to drain an area a farmer wanted for fields and pasture. Dikes can also be used to separate freshwater areas from saltwater areas or to regulate the water level in an area to make it more beneficial to wildlife. They can affect a variety of animals based on the purpose of the dike. On the refuge, dikes constitute much of the trail system and are similar in appearance and construction to those built by the early European settlers in the area.

Paths

On the refuge, as in other parks or nature preserves, paths provide a means of showing people interesting natural areas. Paths also keep people from creating their own trails and trampling vegetation in the area. They keep people safer since paths and trails are kept clear of most hazards like poison ivy and stinging nettle. Paths keep people from infringing upon areas set aside for the growth of certain plants that provide food and cover for animals.

Biological control of invasive plants

Purple loosestrife

(*Lythrum salicaria*)

Leaf-eating beetles and root weevils have been introduced into the area known as “Hoy’s Pond” in an attempt to control the purple loosestrife plant. This European plant was introduced into the United States and began to overrun areas where cattails and other native marsh plants are found. It is of little value to wildlife and it takes over the habitat where native plants normally grow. The introduced insects have been studied extensively and have been found to eat only the loosestrife plants. It is believed that the loosestrife and the insects will control each other so that neither will proliferate.



Restoring marshes

Wetland restoration on the refuge began in 1991 when the Pennsylvania Department of Transportation needed to replace wetlands disturbed during the construction of the Blue Route, I - 476. At that time, 18 acres of marsh were restored in an area that had been filled by dredged materials from the Delaware River. Years later, the expansion of the Philadelphia International Airport required adding acres to the marsh. Both restoration sites can be seen past the first bird blind, about two miles down the main Darby Creek Dike Trail. These restoration projects were required by federal law.



Bird boxes and Osprey Nesting Platforms

Nesting boxes and platforms assist birds that might otherwise be unable to find good nesting areas due to loss of old rotten tree snags or other suitable nesting habitat. The smaller boxes over the impoundment are used by Tree Swallows, while the large nest boxes are for Wood Ducks. The nesting platforms located along Darby Creek, near the marsh restoration sites are for the Osprey, which the refuge is trying to encourage to nest here.

Post trip lesson

1. Obtain a natural features map or **topographic map**. Divide the students into the following groups: parks and wildlife, transportation and shipping, housing, commercial garbage and waste disposal. Have each group think about and identify its top land use priorities and the locations for them, using the maps. Then have the class come together to “plan” their city. Talk to them about working together to make their city the cleanest and most environmentally friendly (including to wildlife) city it can be.
2. Use the “Build Lightly” exercise.
3. Have students research, discuss, or write about other elements that may require management or response. Examples could be **invasive species**, oil spill, feral cats, landfills, and floods.

Historical Adventures in the Wetlands

We know from looking at old maps and reading local histories that this area was once a vast marshland of over 6,000 acres. We also know that Native Americans and early European settlers lived in our area. This activity is designed to get you to experience a wetland like Tinicum from the perspective of the Lenape and the early Dutch, Swedish, and English settlers. Later you will compare their use and impact on the wetlands area with that of modern man. Think about the necessities of all life - food, water, and shelter. How did each of these groups find what they needed in areas like Tinicum.



The Lenape

The first known people to live in this area were the Unami (turtle) tribe of the Lenape nation (later called the Delaware by the Europeans). They lived on both sides of the Delaware River, from the Lehigh River down to Delaware Bay. In our immediate area, the word Passyunk (meaning 'in the valley') survives from their language. The Unami were an agricultural people. They grew corn, squash, and beans, fertilizing their fields with fish scraps. They did not practice crop rotation, but rather moved whole villages when the soil was exhausted. The Lenape also hunted, fished, and gathered wild rice, nuts, berries, and fruits in the area. Much of their clothing was made from animal skins, and they lived in lodges of birch bark. Today we think of the Lenape as living close to nature. They impacted their environment, but not nearly to the extent we do today.

The Early European Settlers

The first European to discover the Delaware River was Henry Hudson, in 1609. The river got its name in 1610 from the English in honor of the Governor of Jamestown, Lord De La Warr.

In 1623 the Dutch arrived and immediately built forts along the river in New Jersey and Delaware. Dutch sailor David DeVries caught a few whales on the river a few years later, but complained about the small yield of whale oil. In 1633, the Dutch built another fort along the Schuylkill river near today's Platt Bridge. The early Swedish settlers also built log cabins and forts as well as crude shelters for the immigrants. In 1643, Swedish Governor John Printz built himself a brick house. Printz developed a brisk trade in animal furs and tobacco, and made plans for building mills and more forts.

The Dutch and Swedes also brought to the new world their flood control and wetlands drainage system of dikes. Basically, a dike is a levee or ridge constructed to hold back water. The Swedes and Dutch settlers continued this practice in their new settlements, draining the wetlands to farm the rich soil beneath. Forty years later, the English colonized what is now center city Philadelphia. William Penn made note of the region's numerous brooks, good springs, and mineral waters.



Students,

It is 1678 and you have just sailed across the Atlantic in the English ship "Shield". The ship enters a conical shaped bay with marshes on either side teeming with wildlife. The Captain has instructed you and your crew mates to venture ashore and determine whether this is a good spot to settle. Using what you have already read about other colonists' needs, see how you could use wetlands like Tunicum to support settlement.

Food: From your readings, determine what your community members typically ate. Search for food sources for them. Record your findings below.

Food source?

How will you obtain?

How will you prepare?

Water: Like all of us, your community members used water for hygiene, transportation, and most importantly, for drinking. Search the area for water sources.

Where are the water sources at the refuge?

Is it a drinkable source? If not, can you make it drinkable/

How will you obtain/store the water?

Have you found water for hygiene purposes?

Is there a water source you could use for transportation?

Shelter: What kind of shelter can you build/find for your community? What should it be near? What materials must you have to build it?

Clothing: What materials are available in this environment for appropriate clothing?

Reduce, Reuse, Recycle

According to the Refuge's, *It's Easy Being Green...and Better for the Environment* brochure, the Cusano Environmental Education Center (CEEC) was designed to conserve energy and water, prevent waste, make careful use of the natural resources that went into the building, and to treat its site sensitively.

How many examples of reduced, reused, and recycled materials can you find in the CEEC?

Reduce

Reuse

Recycle

Recycled and Renewable!

Match these recycled and or renewable materials with their use in the CEEC.

| What it is made from - | Where it is in the building - |
|-------------------------------------|-------------------------------|
| Recycled plastic mixed with sawdust | Education wing floor |
| Renewable aspen trees | Bathroom floor tiles |
| Recycled newspaper | Countertops |
| Renewable cork oak bark | Outdoor decks |
| Farm waste and recycled newspapers | Classroom wallboards |
| Truck tires | Sound absorption panels |
| Recycled glass | Exhibit wing floor tiles |

Cusano Environmental Education Center Scavenger Hunt

Find something that begins with the letters of Mr. Cusano's name:

C _____

U _____

S _____

A _____

N _____

O _____

The CEEC was designed to mirror the refuge itself, to bring a piece of the refuge indoors.

See if you can find

Something old _____

Something new _____

A quiet place _____

Something big _____

Something small _____

Something alive _____

Something beautiful _____

Something wet _____

Something natural _____

Something man-made _____

Something recycled _____

Something moving _____

Something still _____

For comparison of “Heinz” to Walden using Thoreau’s description in Walden

Sounds:

As I sit at my window this summer afternoon, hawks are circling about my clearing; the tantivy of wild pigeons, flying by two and threes athwart my view, or perching restless on the white pine boughs behind my house, gives a voices to the air; a fish hawk dimples the glassy surface of the pond and brings up a fish; a mink steals out of the marsh before my door and seizes a frog by the shore; the sedge is bending under the weight of the reed birds flitting hither and thither; and for the last half-hour I have heard the rattle of railroad cars, now dying away and then reviving like the beat of a partidge, conveying travellers from Boston to the country. For I did not live so out of the world as that boy who, as I hear, was put out to a farmer in the east part of the town, but ere long ran away and came home again, quite down at the heel and homesick. He had never seen such a dull and out-of-the-way place; the folks were all gone off; why, you couldn't even hear the whistle! I doubt if there is such a place in Massachusetts now: --

The Ponds:

Standing on the smooth sandy beach at the east end of the pond, in a calm September afternoon, when a slight haze makes the opposite shore-line indistinct, I have seen whence came the expression, “The glassy surface of the lake.” When you invert your head, it looks like a thread of finest gossamer stretched across the valley, and gleaming against the distant pine woods, separating one stratum of the atmosphere from another. You would think that you could walk dry under it to the opposite hills, and that the swallows which skim over might perch on it. Indeed, they sometimes dive below this line, as it were by mistake, and are undeceived. As you look over the pond westward you are obliged to employ both your hands to defend your eyes against the reflected as well as the true sun, for they are equally bright; and if, between the two, you survey its surface critically, it is literally as smooth as glass, except where the skater insects, at equal intervals scattered over its whole extent, by their motions in the sun produce the finest imaginable sparkle on it, or perchance, a duck plumes itself, or, as I have said, a swallow skims so low as to touch it. It may be that in the distance a fish describes an arc of three or four feet in the air, and there is one bright flash where it emerges, and another where it strikes the water' sometimes the whole silvery arc is revealed' or here and there, perhaps, is a thistle-down floating on its surface, which the fishes dart at and so dimple it again. It is like molten glass cooled but not congealed, and the few motes in it are pure and beautiful like the imperfections in glass. You may often detect a yet smoother and darker water, separated from the rest as if by an invisible cobweb, boom of the water nymphs, resting on it. From a hilltop you can see a fish leap in almost any part; for not a pickerel or shiner picks an insect from this smooth surface but it manifestly disturbs the equilibrium of the whole lake. It is wonderful with what elaborateness this simple fact is advertised -- this piscine murder will out --and from my distant perch I distinguish the circling undulation when they are half a dozen rods in diameter. You can even detect a water-bud (Gyrinus) ceaselessly progressing over the smooth surface a quarter mile off; for they furrow the water slightly, making a conspicuous ripple bounded by two diverging lines, but the skaters glide over it without rippling it perceptibly. When the surface is considerably agitated there are no skaters nor water-bugs on it, but apparently, in calm days, they leave their havens and adventurously glide forth from the shore by short impulses till they completely cover it. It is a soothing employment, on one of those fine days in the fall when all the warmth of the sun is fully appreciated, to sit on a stump on such a height as this, over looking the pond, and study the dimpling circles which are incessantly inscribed on its otherwise invisible surface amid the reflected skies and trees. Over this great expanse there is no disturbance but is thus at once gently smoothed away and assuaged, as, when a vase of water is jarred, the trembling circles seek the shore and all is smooth again. Not a fish can leap or an insect fall on the pond but it is thus reported in circling dimples, in lines of beauty, as it were the constant welling up on its fountain, the gentle pulsing of its life, the heaving of its breast. The thrills of joy and thrills of pain are undistinguishable. How peaceful the phenomena of the lake! Again the works of man shine as in the spring. Ay, every leaf and twig and stone and

cobweb now at mid-afternoon as when covered with dew in a spring morning. Every motion of an oar or an insect produces a flash of light; and if an oar fall, how sweet the echo!

Spring

The change from storm and winter to serene and mild weather, from dark and sluggish hours to bright elastic ones, is a memorable crisis which all things proclaim. It is seemingly instantaneous at last. Suddenly an influx of light filled my house, though the evening was at hand, and the clouds of winter still overhung it, and the eaves were dripping with sleety rain. I looked out the window, and lo! where yesterday was cold and gray ice there lay the transparent pond already calm and full of hope as in a summer evening, reflecting a summer evening sky in its bosom, though none was visible overhead, as if it had intelligence with some remote horizon. I heard a robin in the distance, the first I had heard for many a thousand years, methought, whose note I shall not forget for many a thousand more -- the same sweet and powerful song as of yore. O the evening robin, at the end of a New England summer day! If I could ever find the twig he sits upon! I mean he; I mean the twig. This at least is not the *Turdus migratorius*. The pitch pines and shrub oaks about my house, which had so long drooped, suddenly resumed their several characters, looked brighter, greener, and more erect and alive, as if effectually cleansed and restored by the rain. I knew that it would not rain anymore. You may tell by looking at any twig of the forest, ay, at your very wood-pile, whether its winter is past or not. As it grew darker, I was startled by the honking geese flying low over the woods, like weary travelers getting in late from Southern lakes, in indulging at last in unrestrained complaint and mutual consolation. Standing at my door, I could hear the rush of their wings; when, driving toward my house, they suddenly spied my light, and with hushed clamor wheeled and settled in the pond. So I came in, and shut the door, and passed my first spring night in the woods.

Thinking and Expressing Thoughts - A Little Bit of Thoreau

Why did Thoreau live in the woods? Thoreau was very clear in telling us why. He said, "I went to the woods because I wanted to live deliberately, to front only the essential facts of life, and see if I could learn what it had to teach, and not, when I came to die, discover that I had not lived."

Thoreau lived in his tiny cabin near Walden Pond for more than two years. He lived as simply as he could, reducing his material needs to a minimum. He wanted to understand what he really needed and cared about. Thus, his story at Walden was similar to the kind of retreat people of many religions experience today in order to learn about themselves.

Activity

Prepare the students for this activity by telling them they will each select a spot at the refuge to sit quietly for about 10 minutes. Remembering that they have been considering people's interactions with the environment, ask the students to think about one or more of the following while they are reflecting quietly:

What is essential to you in life?

Could you reduce your material needs?

What is really important in your life?

Can we learn from nature?

If possible, students could take journals to this spot. If not, they can write about their thoughts when they return to school or home.

Alternatively, a student could paint, draw, write a poem, or respond to the experience in any way that expresses the thoughts or feelings which come to them during the quiet experience.

Resources for Teachers

Field Guides and other Reference Books

Collecting the Natural World: Legal Requirements & Personal Liability for Collecting Plants, Animals, Rocks, Minerals & Fossils. Donald Wolberg & Patsy Reinard, Geoscience Press, Inc., 1997

Faulkner and the Ecology of the South. Joseph Urgo & Ann Abadie, University Press of Mississippi, 2005

Field Guide to Wildlife Habitats of Eastern United States. Glenn Woff & Janine Benyus, Fireside Publishers, 2003

Pond and Brook. Michael J. Caduto, University Press of New England, 1990

Redington Field Guides to Biological Interactions: Plants in Wetlands. Charles B. Redington, Kendall/Hunt Publishing Company, 1994

Additional Readings

A White Heron and Other Stories. Sarah Orne Jewetts, Kressinger Publishing, 2004

Brother Eagle, Sister Sky: A Message from Cheif Seattle. Susan Jeffers & Chief Seattle, Dutton books, 1993

Cloudy with a Chance of Meatballs. Judy & Ron Barret, Aladdin 1982

Dear Children of the Earth: A Letter from Home. and other works. Schim Schimmel, Northword Press. 1994

Desert Solitaire. Edward Abbey, Ballantine Books, 1985

In a Nutshell. Anthony Joseph & Chris Arbo, Dawn Publications, 1999

In the Small, Small, Pond. Denise Fleming, Henry Holt & Co. BYR Paperbacks, 2007

Just a Dream. Chris Van Allsberg, Houghton Mifflin, 1990

My Backyard Garden. Carol Lerner, Harper Collins Publishers, 1998

Owl Moon. Jane Yolen, Philomel, 1987

Oxcart Man. Donald Hall, Live Oak Media, 2004

Pilgrim at Tinker Creek. Annie Dillard, Harper Perennial Modern Classics, 2007

The Dandelion Seed. Joseph Anthony & Chris Arbo, Dawn Publications, 1997

The Gardener. Sarah Stewart & David Small, Square Fish, 2007

The Giving Tree. and other works. Shel Silverstien, Harper Collins, 2005

The Lorax. Dr. Suess, Random House, 1971

The Very Grouchy Ladybug. Eric Carl, Harper Trophy, 1996

Where Butterflies Grow. Joanne Ryder & Lynne Cherry, Puffin, 1996

A Sand County Almanac. Aldo Leopold, Ballantine Books, 1986

Going Wild: Adventures with Birds in the Suburban Wilderness. Robert Winkler, National Geographic, 2003

People and Nature, An Introduction to Human Ecological Relationships. Emilio Moran, Blackwell Publishing, 2006

Silent Spring. Rachel Carson, Fawcett Crest Publishers, 1964

Walden. Henry David Thoreau, Princeton University Press, 2004 (150 Anniversary edition)

Authors, Poets, Artists, and Naturalists

Rachel Carson

author & biologist

John James Audubon

ornithologist, painter, & author

Washington Irving

author & essayist

William Bartram

naturalist & artist

David Allen Sibley

ornithologist, artist, & author

Emily Dickenson

poet

Richard Rhodes

author

Ralph Waldo Emerson

essayist & poet

John Muir

author & essayist

Aldo Leopold

author & ecologist

Loren Eisely

author, poet, & ecologist

Edward Abbey

author

Sarah Fuller

poet

William Wordsworth

poet

Annie Dillard

author

Barbara Kingsolver

author

Marjorie Stoneman Douglas

author

John Bartram

botanist & author

Walt Whitman

poet, essayist, & author

Stephen Jay Gould

author & evolutionary biologist

Websites

www.aldoleopold.org - Aldo Leopold Foundation

www.rachelcarson.org - Rachel Carson organization

www.thoreau.org - The Thoreau Center for Sustainability

www.asle.umn.org - Association for the Study of Literature and the Environment

<http://nationalzoo.si.edu/education/conservationcentral> - Conservation Central, National Zoo Habitat Education program

<http://gogreeninitiative.org> - Go Green Initiative

www.nwf.org/gardenforwildlife - National Wildlife Federation,

www.naaee.org - North American Association for Environmental Education

www.paee.net - Pennsylvania Association of Environmental Educators

www.audubon.org - National Audubon Society

www.dcnr.state.pa.us - Pennsylvania Department of Conservation and Natural Resources

<http://interactive2.usgs.gov/learningweb/explorer/topic-bio.asp> - US Geological Survey website for Teachers and Students

www.fws.gov - US Fish and Wildlife Service

Glossary

Attitude - a position or feeling with regard to a fact or state

Carnivore - an animal that eats meat

Dike - a bank of earth constructed to control water

Feelings - a state of mind

Herbivore - an animals that eats plants

Hygiene - conditions or practices conducive to health

Impoundment - man-made pond

Interaction - mutual or reciprocal action or influence

Invasive species - any plant, insect, animal, etc. that is not native to the area and has taken over

Levee - an embankment to prevent or confine flooding

Ornithologist - scientist that studies birds

Owl Pellet - the regurgitated remains of prey, usually containing bones, feathers, or fur

U.S. Fish & Wildlife Service
<http://www.fws.gov>

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