

The Ecology and History of Onondaga Lake: Exploring Haudenosaunee and Scientific Perspectives

High School Curriculum

This curriculum was developed by Catherine Landis, with input from ESF and SU faculty. It is intended to be used in conjunction with at least one field trip to the Skä·noñh -- Great Law of Peace Center. Teachers may elect to cover one lesson or multiple lessons, depending on time and interest.

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Lesson 1: Before All Else – The Thanksgiving Address

This lesson introduces the Thanksgiving Address in the context of learning about ecosystems and the environment in general. It also introduces students to the notion of different worldviews that underlie different ways of relating to the natural world (traditional and scientific ecological knowledge, or TEK and SEK). The lesson has no specific field trip component, but aims rather to provide a foundation for the lessons that follow.

SEK topic: Ecosystem components, functions, relationships

TEK topic: Ecosystem relationships based on gratitude as well as factual/empirical knowledge. Importance of language for relationships with people and the natural world.

Length: 50 minutes

Location: Indoors

Objectives: Following this lesson, students will be able to:

1. Describe the Thanksgiving Address and its significance to the Haudenosaunee people;
2. Compare elements of the Thanksgiving Address to those in an ecosystem model (Thanksgiving Address as an ecological inventory);
3. Recognize gratitude on a personal level to various elements of the Address;
4. Explain the concept of worldview, and how worldviews express themselves in different ways of relating to the environment.

Materials:

1. copies of the Thanksgiving Address
2. 11 x 14" sheets of blank paper with section for each TA element (e.g. people, mother earth, water) written at the top; tape
3. markers and/or crayons, colored pencils

Before this class:

- Have students fill out the Questionnaire (see Appendix 1), or ask students to take out a piece of paper, and write down 10 things for which they are grateful. Teacher collects; this exercise stimulates thinking about gratitude, and as a pre-assessment tool for the lessons that follow.
- After taking the Questionnaire, students should also read the “Thanksgiving Address: Greetings to the Natural World,” either in class or as a take-home assignment.
- If read aloud in class, different students could read different parts (e.g. Mother Earth, food plants, etc.) aloud so all listen and participate.

Procedure:

1. Introduce the Thanksgiving Address and its role in Haudenosaunee culture, using the introduction by John Stokes and the write-up by Freida Jacques (Appendix 2?). (10 minutes).

Salient points:

- It’s not a prayer, it’s an address to these elements;
- In native languages, it is referred to as the “words that come before all else” – why begin with gratitude?
- “greetings” and “thanks” have same root in Haudenosaunee languages
- correct pronunciation of Haudenosaunee; why not Iroquois

2. Divide students into pairs, and assign each pair one component of the Thanksgiving Address (or lump components, if few students)

3. Pass out sheets of 11 x 14” paper, one sheet/pair. In the center of the paper, ask students to draw or write the name of their element (e.g. sun, or trees). Then ask them to answer two questions about that element, writing responses on the paper (10 – 15 minutes):

1. How is it important to the ecosystem? What is its function or gift? (list 10 things)
2. How is it important to you, personally? (5 ways) Why might you be grateful for the sun, e.g.?

Note: The responses to these two questions can overlap.

4. Arrange the pictures on whiteboard so the class can see how the components fit together. Teacher briefly reviews relationships from an ecosystem function perspective. The result should be a concept map of ecosystem relationships.

5. Editing—Give students a chance to add what they think might be missing from the lists/drawings (i.e., they can add to any of the TA elements, not just the ones they worked on in pairs). (5 minutes)

6. Review the role of people: What is our gift to the ecosystem? The Haudenosaunee remind us that the Earth could do quite well without us, and our duty is to give thanks and acknowledge what we receive while recognizing this dependence.

7. The Thanksgiving Address reflects a particular **worldview** with respect to human beings and our place in nature. A worldview is a cultural lens through which we view the world—ourselves, other people, and nature, including the places we live. Think of a worldview as an “organizing concept” for our relationships with the land and with each other.

- How would you describe the worldview implicit in the Thanksgiving Address?
- List some characteristics of your own worldview, thinking again of the Address components. How would you describe the worldview of the dominant culture in the US today?

8. Tell them that these different worldviews generate different ways of knowing about the ecosystem, sometimes called **traditional** and **scientific ecological knowledge**, or SEK and TEK.

To clarify these different ways of knowing, think of your neighborhood. Do you know it through maps and latitude/longitude measurements, or from the personal experience of living there?

SEK: measurements (height, weight, temperature, blood test; dimensions of buildings and places, population size, etc.)

TEK: knowledge gleaned through personal experience, and through the sharing of collective experience (such as knowing your parents or friends in a personal way). This knowledge extends to knowing plants, birds, fish—other elements in the Thanksgiving Address (not just humans).

9. The point is not to elevate one knowledge system and denigrate another, but to suggest the strengths and weaknesses of both. Both provide important sources of knowledge for humans and their communities.

In the lessons that follow, we will learn about species and landscapes native to the Onondaga Lake watershed from TEK and SEK perspectives

10. A final and critical point on the importance of native languages as the conveyance for the Address: Our translation, however laudable, is an “Americanized” version whose English words fail to represent the meaning of the original.

To demonstrate what is lost, project a selection of text from linguist Wallace Chafe’s translation of the Address [Appendix 3] so students can see the original words, and Chafe’s 5 line translation. The English translation reflects only a fraction of the significance and cultural depth of the TA in the original tongue.

For reflection - or Post field trip activities

1. Find a news story about the environment. What is the relationship of people to the resource (water, air, deer, etc.)? Is it based on gratitude, greed, fear, or something else?

2. Find a news story specifically about Onondaga Lake, and answer the same question. That is, how would you characterize people's relationship to the lake based on their actions, decisions, or words?

Recent example: "Toxic waste found in back yards of homes along Ley Creek in Salina," syracuse.com, April 26, 2016 (Appendix 4).

The previous exercises could be used for student assessment, perhaps scored at 20 points (total):

Summarize news story: 5 points

Describe human relationship: 5 points

Identify TA elements, as discussed in class, as part of your discussion: 5 points

Spelling, grammar, clarity: 5 points

3. Pick one element of the Thanksgiving Address (e.g. water). From the moment you get up in the morning, notice every time that element supports you (brushing your teeth, washing your hands, drinking a cup of tea, etc.) and offer thanks silently or otherwise. At the end of the day, write a paragraph about your experience.

- This exercise could be extended to a "gratitude journal" that includes all the elements of the Address, perhaps focusing on a different one each day for a week or 10 days.
- To add a quantitative (SEK) component to this activity, have students calculate their daily water "footprint," using the guidelines for the "Water Audit" activity in *Project Wet*. [Footprint calculator included as Appendix 5; also provide specific lesson]
- You could scale up this activity by having students conduct a water audit for their entire school, providing a chance for students to engage in positive action to reduce the school's water footprint. Again, details for conducting this exercise can be found in *Project Wet*, lesson XX.

4. Take the "Gratitude Quiz" from the Greater Good Science Center (at http://greatergood.berkeley.edu/quizzes/take_quiz/6). How many of the questions reflect the life-supporting elements acknowledged in the Thanksgiving Address?

- Now ask students to submit questions for a "gratitude quiz" based on these entities-- water, earth, air, plants—as well as people, etc.
- Post the quiz online so anyone can take it; results could provide a kind of "ecological gratitude" quotient. [I'm not sure how they would post it online—maybe through Survey Monkey?—students might be able to figure that out]

5. Have students create their own "Words that Come Before All Else" accordion poster, patterned after the one sold by the Syracuse Cultural Workers (you can see it at <https://www.syracuseculturalworkers.com/products/poster-greetings-and-thanks-to-the-natural-world>) From the website:

Both a visual and spiritual reminder, the message from the Haudenosaunee can be used by all people all over the world. I have used it many times for gifts, and to spread the word of thankfulness and appreciation to all Creation.

Jeanne Shenandoah (Eel Clan, Onondaga)

These posters could have more or less rigorous art/science content depending on the learning objective for the class.

6. Read “Allegiance to Gratitude” chapter in *Braiding Sweetgrass* by Robin Kimmerer, and answer the questions on the worksheet provided [Appendix 6?].
7. In reflecting on the worldviews held by different people, consider these questions:
- What was the worldview of your ancestors 100 years ago? 500 years ago?
 - What worldview makes it possible to care for land and water sustainably? and what worldviews are problematic to land and water?
 - What is the worldview that allowed for the damage to Onondaga Lake?

Resources

Stokes, John; Benedict, David; Rokwaho; Swamp, Jake; Ka-Hon-Hes. 1993.
Thanksgiving address: greetings to the natural world, or Ohén:ton Karihwatéhkwen: words before all else. The Tracking Project, Six Nations Indian Museum, Corrales, N.M; Onchiota, N.Y.

Frieda Jacques - Introduction to Thanksgiving Address

“Allegiance to Gratitude” chapter in *Braiding Sweetgrass* by Robin Kimmerer.

Lesson 2: Meet the Plants

Now we turn toward the vast fields of Plant life. As far as the eye can see, the Plants grow, working many wonders. They sustain many life forms. With our minds gathered together, we give thanks and look forward to seeing Plant life for many generations to come.

-- *Haudenosaunee Thanksgiving Address*

Plants know how to make food and medicine from light and water, and then they give it away.
-- *Braiding Sweetgrass*, Robin Kimmerer

This lesson builds on Lesson 1 (Thanksgiving Address) for a specific group of organisms, the plants. We start with plants since they are easy to find and observe. They drive ecosystem processes and provide food, medicine, and much more for human societies. From a TEK perspective, plants are our elders and teachers. This lesson provides a chance for students to consider plants in general from SEK/TEK views, and to get to know a particular plant currently growing at the Skä•noñh Center.

Pre-field trip lesson

40 minute lesson to review the roles of plants and to conduct the research in class. If class time is limited, this lesson could be completed as a homework assignment.

Readings: “Skywoman Falling,” pp. 3-10 in *Braiding Sweetgrass*; “The Honorable Harvest,” from *Yes* magazine, November 26, 2015 (Appendix 7). Both pieces by Robin Kimmerer.

Objectives: Following this lesson, students will be able to:

1. List 5 characteristics of plants, and what makes them unique as organisms and “teachers”/neighbors;
2. Describe human relationship with plants from TEK and SEK perspectives;
3. Prepare to introduce a plant that they will see at the Skä•noñh Center in terms of its biological, cultural, and historical values.
4. Explain the honorable harvest as it applies to plants and other “resources.”

Procedure:

1. Start basic: What is a plant?

You could even start with a concept map on a whiteboard, with a circle for plants in the center. Give each student a sticky note, and invite them to write something about plants and post it on the board.

You might also ask students to describe their *relationship* to plants. This could range from watering house plants to sitting under a favorite tree. Not all students may fully appreciate the photosynthetic origins of their breakfast cereal or Doritos, let alone fossil fuels like coal and oil.

2. Remind students of the Thanksgiving Address, the notions of worldview, as well as TEK and SEK (from Lesson 1). How are these teachings reflected in the “honorable harvest” guidelines for taking plants, or plant parts?

3. Starting with plants: From an SEK and TEK perspective, review the roles of plants in the ecosystem. How do plants “sustain many life forms”?

Using scientific (**SEK**) language, students might say:

- energy foundation for ecosystems (photosynthesis); plants are autotrophs (make their own food), while animals (like us) are heterotrophs, having to depend on the autotrophs to get food
- Other functions of plants: providing habitat structure & food, reducing urban heat island effect, storing carbon, reducing air pollution; providing beauty; screening the view or providing a sound barrier
- Functions in water cycling: intercepting, storing rainfall; protecting soil from erosion; evapotranspiration (think of rain gardens reducing storm water runoff; refer to watershed lesson)

From **TEK** perspective,

- From *Braiding Sweetgrass*: Sky Woman (source of seeds), plants as elders, teachers. How would you “learn” from a plant?
- Note the categories of plants in TA: plants, food plants, medicine herbs, trees
- Also maybe passage from Hewitt about the medicine plants, food plants and the power plants possess; 5 line translation showing world view around plants
- Also, Herrick (p. 18) and how plants are named by the Haudenosaunee: according to structure and functional features; by ecological relationships (false solomon’s seal as “fox eats its berries”); use (black ash “people pound the wood”); metaphor (lady’s slipper orchid as “whippoorwill’s shoe”); etc.

3. How do we know the plants: refer to TEK/SEK lesson:

- SEK: observations (life cycle, dispersal mechanisms, niche, measurements such as dbh, height, phenology, leaf chemistry, cell structure, genetics)
- TEK: experience—taste, sound, smell, memories, sight; shade; also observations—phenology, life cycle, etc.

3. Assign students to work in pairs or small groups to research the following plants present at the Skä•noñ Center. Obviously, teacher or students could select from plants on the list rather than cover every species. (See Appendix 8 for details on these plants)

sycamore	wild strawberries (uncertain if present)
ash (white or green)	black raspberry
northern white-cedar	hawthorne
eastern white pine	dogbane
red oak	red/Austrian pine
sugar maple (uncertain if present)	boxelder
staghorn sumac	European buckthorn
red osier dogwood	common reed (<i>Phragmites australis</i>)
black raspberry	

Here are sample questions the students could answer about their plants.

Remember that they are responding to the question, “Who is it?” as well as “What is it?”

- Plant common name
- Scientific name
- Is it native to New York? To North America?
- Is it considered invasive?
- In what habitat would you find it in a natural setting? (forest, wetland, meadow, etc.)
- Describe the plant's life cycle over time. How long does it live?
- Describe its relationship with wildlife (birds, mammals, insects). Does it provide nuts, seeds, pollen, for example?
- What value/gifts does it share with people? Is it a medicine herb or food plant?
- Draw or find a photo of the plant. Include close up pictures of its leaves, fruit/seed, and bark.
- How would you identify it? What features distinguish this plant from other plants?

Note that the last two species on the list (*Phragmites australis* [common reed] and European buckthorn) are not native to North America,¹ and are both considered highly invasive in NYS and other states. A teacher could choose therefore to cover them separately from the other species on the list. Both plants are very common at the Skä•noñh Center, defining the longitudinal boundaries of the property (common reed along the Parkway, buckthorn along the railroad tracks). They should elicit some discussion about invasive species: Why are they here? What makes a plant “invasive”? Do they provide any “gifts” or services at this site?

Meet the Plants Field trip - Skä•noñh Center

1. Students can find “their” plant on the property, using what they have learned about its appearance and growth habit. Give them 10 minutes to do this, and help them if necessary.
2. Students introduce their plant to the group as one at a time we tour the grounds going from plant to plant.
3. Along the way, review the Honorable Harvest principles. They are listed in Robin Kimmerer’s short article as well as other sources.

Ask permission of the ones whose lives you seek. Abide by the answer.

Never take the first. Never take the last.

Harvest in a way that minimizes harm.

Take only what you need and leave some for others.

Use everything that you take.

Take only that which is given to you.

Share it, as the Earth has shared with you.

Be grateful.

Reciprocate the gift.

Sustain the ones who sustain you, and the Earth will last forever.

¹ There is a species of common reed (*Phragmites americanus*) that is native to the US and to NYS, but it is much less common than its non-native counterpart, and does not grow in the dense robust monocultures of the non-native *Phragmites australis*.

How do these practices affect our relationship with the plants we see at Skä•noñh, and in general?

Optional activities:

1. In TEK, we know plants and animals not only through facts, but through direct experience such as tasting or touch contact, weaving or cordage production. There are a couple of ways these experiences could be incorporated into the lesson:

- Have students prepare pine needle tea or sumac “lemonade” with maple sweetener. They could also eat raspberries if they are at Skä•noñh Center in July. What are the medicinal or health benefits of these foods/beverages? (30 minutes to prepare and drink tea)
- Make cordage from dogbane, cattail, or nettles. This would require advance preparation so the cordage-making materials were available (45 minutes to make cordage, assuming the materials are ready).

2. Based on everything you learned, design a display/poster on this plant that could go at the Skä•noñh Center. Combining all students’ work, we should have materials to introduce visitors to plants of the site (40 minutes or longer for design and text).

3. So far, this lesson focuses on individual plants. Collectively, plants appear in recurring patterns in the landscape, and we refer to these assemblages as *plant communities*. For a more quantitative exercise, conduct a simple point intercept survey to assess the vegetation (plant communities) of the Skä•noñh Center grounds (see Appendix 9 a and b for instructions and data form) (1 hour to organize students, provide instruction and conduct activity; data analysis would add extra 15 minutes; plant identification would add extra 15-30 minutes).

- What was the most common vegetation? (lawn, successional woodland, *Phragmites* wetland would likely rank among the most common habitats)
- What are the gifts of these particular plant communities? (e.g., what are the gifts of a lawn, or the linear woodland along the railroad tracks?)

Post field trip activities

1. Restoration: If you were to enlist the help of plants to heal this site on the shore of Onondaga Lake, what plants would you choose and why? That is, how would you enhance the Skä•noñh Center grounds for plants, but also for birds, pollinating insects, people, and other life.

- Sketch a property design that shows your ideas for this property. Refer to GoogleMaps/GoogleEarth for a model.
- Write a page of text explaining your plans, and justifying the changes you make. Be sure to include a list of the species you chose and why they are appropriate for the site.
- Students might consider rain gardens, forest gardens, pollinator corridors, vernal pools, bird habitat, etc. For a historical perspective on plant communities on this site, refer to old maps such as the one posted on <http://onondagalakehistoricalecology.weebly.com>. This site also gives descriptions of the kinds of habitats that once occurred around the lake.

2. Return to “The Honorable Harvest” article by Robin Kimmerer. Respond to the questions posed by the author towards the end of the article; that is:
 - What if the Honorable Harvest were the law of the land? And humans—not just plants and animals—fulfilled the purpose of supporting the lives of others?
 - What would the world look like if a developer poised to convert a meadow to a shopping mall had first to ask permission of the meadowlarks and the goldenrod? And abide by their answer?
 - What if we fill our shopping baskets with only that which is needed and give something back in return?
 - How can we reciprocate the gifts of the Earth?

3. Conduct a plant survey on your school grounds. Identify plants or habitats that seem uniquely valuable, such as a meadow or trees along a stream.

4. Learn about the concept of “cultural keystone species.” What are the characteristics of these species? Invite students to reflect on some cultural keystone plants from their culture(s). See ecologyandsociety.org/vol9/iss3/art1/main.html for more information.

Lesson 3: The Waters: Onondaga Lake Watershed

We give thanks to all the Waters of the world for quenching our thirst and providing us with strength. Water is life. We know its power in many forms—waterfalls and rain, mists and streams, rivers and oceans. With one mind, we send greetings and thanks to the spirit of water.
-Haudenosaunee Thanksgiving Address

We have learned about Thanksgiving Address, worldview and TEK in reference to Onondaga Lake. Here we explore the watershed concept from a TEK perspective, considering what it means to be indigenous to a place, and a place shaped by water (think of the glaciers as well as current drainage patterns). Salt- as well as fresh-water influence the human and biological history of Onondaga Lake. The goal is to instill in students a sense of belonging to a larger system, the Onondaga Lake watershed.

Objectives: Following this lesson, students will be able to:

1. Locate themselves within a particular place, the Onondaga Lake watershed;
2. Access tools/information to learn about the OL watershed from TEK and SEK perspectives;
3. Contrast the Haudenosaunee and American history of relations to Onondaga Lake watershed;
4. List 3 ways students can act as agents of watershed recovery or healing (responsibility).

SEK topics: Watersheds as unified wholes (connected hydrology of valley and stream); watershed features and dimensions; water quality metrics; water pollution.

TEK topics: Water as veins of mother, rivers and lakes as sentient beings; experiences in a watershed, cultural history, gifts of water & our responsibility to water in turn.

Pre-field trip lesson

Length: 40 minutes

Location: Indoors

Reading: “The Waters” chapter in *Words that Come Before All Else*, first 5 pages (25-29).

“The Sacred and the Superfund” pp. 310-340 in *Braiding Sweetgrass* by Robin Kimmerer

Materials:

1. Maps of Onondaga Lake watershed showing tributaries and their watersheds (subwatersheds), and land use or cover type in the watershed.
[<http://www.oei2.org/olp/ppdf/watershed%20map.pdf>]
2. Laptops/computers with internet access. If this technology not available, provide students with hardcopy data.
3. Optional: large sheets of paper, colored markers or colored pencils for Onondaga Lake watershed model/map/poster.

Procedure:

1. Ask students to each trace the path of a drop of water from their homes (or from the school, or from their favorite place) to the ocean. They can sketch a map, or they can list places that water drop would go. (10 minutes)
2. Review student responses, and the likely path such a drop of water would take from Syracuse area to the sea.
 - Review/introduce the concept of **watershed** as the land area across and/or through which water flows to a particular stream, lake or river. Patterns of water flow in a landscape provide a convenient way for us to think about the boundaries of particular places.
 - Using the local example, highlight the idea of nested watersheds, from local to global. For example, your school might belong to the Furnace Brook, Onondaga Creek, Onondaga Lake, Seneca River, and Great Lakes watersheds simultaneously.
 - A drop of water could theoretically flow through all of these watersheds, unless it is captured or evaporated along the way (see opening pages of “The Sacred and the Superfund” chapter for description of a raindrop’s journey to Onondaga Lake).
 - Note that water can flow both over the land surface (surface flow) or under the earth as groundwater. Flow paths are often similar, reflecting topography in both cases.
 - Everything in a watershed is connected by water – rocks, soil, and all the living things including ourselves
3. Divide students into groups and ask them to draw the Onondaga Lake watershed. Include:
 - location of their school, house, and other familiar places
 - watershed boundaries (approximate)
 - streams, rivers, lakes
 - elements of the water cycle including precipitation, surface flow, groundwater flow, infiltration, evapotranspiration
 - arrows that show direction of water flow
 - location of other Thanksgiving Address elements (birds, trees, fish); what species live in your watershed?
4. To your drawings/maps, add the watershed of your **drinking water**. Is it the same as the watershed where you live? For most schools in the Syracuse area, the source is Skaneateles Lake. Why don’t we drink the water of our own watershed?
5. Now think of the water flowing out of your drain, or that you flush down the toilet. Is your **“sewershed”** the same as your watershed? How would you find out where the pipes go and where the waste water ultimately flows? Why might there be differences between a sewershed and watershed? (For example, one watershed might have a state of the art treatment facility to which waste water outside of the watershed gets delivered by pipes.)
6. In the reading (in *Words Before All Else*) by James Ransom, rivers and lakes are not “just an H₂O, but . . . a living entity.” The author refers to the rivers and lakes as “the blood veins of our mother.” How does this perspective affect our relationship with water? If we were to see Onondaga Lake as a living entity, for example, how might we treat it? What might it say to us? Share your responses

with your group and jot them down on a separate sheet of paper. Turn in along with the watershed maps you have drawn.

Onondaga Lake Watershed Resources

- *US EPA Surf Your Watershed site.* <https://cfpub.epa.gov/surf/locate/map2.cfm> You can type in your zip code and find your watershed, learn about the condition of your watershed, etc.
- *CNY Izaak Walton League's Project Watershed* <http://www.projectwatershed.org/> What does it mean to "monitor" water, and how is water monitoring conducted? (chemical and biological surveys)
- *Onondaga Lake Watershed Partnership (OLWP)* <http://www.olwp.org/>. An excellent source for information specific to the Onondaga Lake watershed. For example, see this presentation on the watershed at http://www.olwp.org/uploads/2/5/4/0/25403925/dar_presentation_12-5-15.pdf
- *Onondaga County Ambient Monitoring Report for Onondaga Lake*
- http://static.ongov.net/WEP/AMP/2013_AMP_ANNUAL_REPORT_03-03-15/AMP_2013_Final_030315.pdf. Chock full of SEK information on the current state of Onondaga Lake.
- *Onondaga Environmental Institute* <http://www.oei2.org>. Fact sheets, educational materials, maps and info on the watershed.
- *Historical Ecology of Onondaga Lake* <http://onondagalakehistoricalecology.weebly.com>. What was Onondaga Lake like in the not-so-distant past? Learn about the plants, animals, and other features of lake ecology at this site (still under construction).
- *Onondaga Lake Superfund Repository* (Atlantic States Legal Foundation) <http://www.onondagalake.org>. Superfund information by subsite. Good pictures and data on contaminant history.
- From City of Syracuse Dept of Water, about our drinking water source:
The primary water supply for the city of Syracuse is Skaneateles Lake, one of the Finger Lakes located approximately 20 miles southwest of the city. Skaneateles Lake is one of the cleanest lakes in the world. The high quality of the water makes it possible to utilize the lake's water without filtration. Skaneateles Lake is one of the few large system surface water supplies in the country that is approved as an unfiltered water supply. The lake water passes through coarse screening and receives chlorine for disinfection and fluoride for dental hygiene. At the Reservoirs, the water is re-chlorinated and phosphate is added for corrosion control.
See http://www.syracuse.ny.us/Pdfs/Water/wshed_official_w_boundary_note.pdf for a map of Skaneateles Lake watershed boundaries.

The Waters - Field Trip, Skä•noñh Center

At the Skä•noñh Center, students will observe indoor displays, but the field trip will also capitalize on the sweeping view of the lake and watershed features.

Length: About 60 minutes

Procedure:

1. From the parking lot, have students orient themselves to the view of the lake and surrounding lands.

- Note watershed features visible from the sweeping view at the site: southern highlands (hilly), northern Lake Ontario Plain (high and low elevations, water flows downhill).
- Ask students also to identify the man-made features such as waste beds, amphitheater, smokestacks belonging to current industry in the Solvay area (paperboard company, gas power plant).
- These sites are visible on the opposite shore of the lake. How do these industries or industrial artifacts affect Onondaga Lake today? Is the era of pollution entirely gone?

2. Bring students to the bluffs over the parking near the outdoor oven; this vantage point provides a panoramic view of the lake and its surrounding landscape.

- Note site topography as it rises above the Lake. The Onondaga Lake Parkway runs on flat shoreline close to the water.
- Historically, this area was often saturated, and periodically flooded by the lake. It would have supported transitional habitats or **wetlands** such as swamps, fresh- and salt-water marshes.
- Wetlands support an abundance of plants and animals, and are often the most biodiverse sites on the landscape.
- People too visited these resource-rich areas to hunt, trap, fish, and gather plant foods and medicines. Shellfish (mussels), frogs, fish, muskrat, bird eggs, plant tubers (roots) could be harvested here.

Onondaga Lake was lowered in 1822 by clearing and straightening the outflow channel to the Seneca River. These changes increased the flow of water out of the lake and reduced the area of lakeshore wetlands.

- In the early 1800s, American settlers saw the swamps as gloomy, intractable places that harbored disease. What disease was prevalent in Onondaga Lake swamps? How was it transmitted and where did it come from originally?
- Are there any wetlands left at the Skä•noñh Center or along the Parkway? Describe them and what grows there now. (*Phragmites* or common reed grass is the dominant species.)

Inside the Skä•noñh Center

Ask students to answer the following questions, perhaps on a separate worksheet.

1. Why is Onondaga Lake important to the Haudenosaunee people? Based on the displays as well as the readings, describe the Haudenosaunee relationship to the watershed.
2. How would you contrast the indigenous relationship to Onondaga Lake with the Euro-American one? Based on the pre-field trip lesson, and stories students have heard about Onondaga Lake, students should have some idea of the way the lake was used as a waste dump in the past. Pollution began with salt, sewage, and municipal waste, and later expanded to chemical and material byproducts ranging from PCBs to broken china.
3. The following discussion could take place inside the Skä•noñh Center, but might better happen outside on a nice day on the bluffs where you can see the Lake. You could also ask students to write responses individually in their notebooks. Given the decades of dumping, how do you think we can heal our relationship to Onondaga Lake? There is a major clean-up going on right now that students can follow on the websites provided above, but even without detailed knowledge of that effort they can brainstorm ideas.

For assessment, students could jot answers to all or some of the above questions and turn in as a short assignment.

Post field trip/For reflection.

1. Aquatic invertebrates are used as indicators of watershed health; they are the “backbone” of programs like Project Watershed. Can you think of other “indicators” of watershed health? What makes a healthy watershed? (Think about TEK as well as SEK “metrics.”)
2. A land use map is often used to assess a watershed’s contribution to water quality. Note typical land use categories such as Agricultural, Commercial, Mining, Residential.
 1. Where are the Thanksgiving Address elements? Could you design an alternative “land use” map that more explicitly includes non-human lives and priorities?
 2. Role of plants: Plants play critical role related to water quality and quantity in a watershed. Ask students to list watershed functions of plants. They can further research the importance of forested watersheds, rain gardens, wetlands, and urban forests. Here is a fantastic resource for all manner of material on urban watershed forestry: <http://forestsforwatersheds.org>
 3. Historically, the forests around Onondaga Lake were stripped for wood (fuel & building materials) for the salt industry. How did such deforestation affect the Lake?
 4. Caring for our watersheds (responsibility): Ask students to brainstorm ways they can benefit a stream near their school. Possibilities: pick up trash, add native plants, monitor water quality, plan guided walks or use other means to teach the school community about their connection to the stream, contact local political leaders to express concerns.
 5. Explore the Onondaga Lake watershed history based on rocks (see lesson plan for “Mother Earth: Rocks, Minerals, and Onondaga Lake”). In this lesson, students learn about 3 key rocks/minerals central to the Onondaga Lake story: salt (halite), limestone, coal, chert. For simplicity, teachers could select a lesser number of rocks for this lesson (e.g., just salt and limestone). This lesson is suitable for Earth Science class, where students learn about rocks and minerals. [could make available online]
 6. Delve further into the history of the Onondaga Lake watershed. Here students gain a historical perspective on Onondaga Lake by studying 4 maps ranging in date from 1800 to the present day. The lesson reveals the dramatic changes in the land, essential to understanding the current condition of the Lake and its watershed. The changing human relationship to this place/ecosystem is an important part of the story. [Again, this lesson could be made available on a site that stored supplemental readings, activities and resources to support the curriculum.]
 7. Invite students to write a play based on what they learned in Activity #6 above. Characters can come from any period of the lake’s history, and can be trees, birds, fish or any of the Thanksgiving Address components, as well as people.

Lesson 4: The Food Plants

With one mind, we turn to honor and thank all the Food Plants we harvest from the garden. Since the beginning of time, the grains, vegetables, beans and berries have helped the people survive. Many other living things draw strength from them too. We gather all the Plant Foods together as one and send them a greetings and thanks.

-Haudenosaunee Thanksgiving Address

In previous lessons, we learned about plants in general and the gifts they provide. Here we focus specifically on the food plants around Onondaga Lake, using the “foodshed” concept. We look at the indigenous food system, which included both wild and cultivated plants and was sustainable here over thousands of years. We compare aspects of the indigenous system to the way we eat today, including plant growing, harvest, processing and delivery.

Objectives: Following this lesson, students will be able to:

1. Explain the idea of a *foodshed* and describe their own foodshed;
2. List 3 cultivated and 3 wild food plants important to the Haudenosaunee;
3. Compare the indigenous foodshed to today’s food production system in terms of seasonal cycles, food miles, and other characteristics.

Pre-field trip lesson

Reading: “The Berries” and “The Three Sisters” in *Words that Come Before All Else*.
Optional reading: “Council of the Pecans” in *Braiding Sweetgrass* by Robin Kimmerer.

Materials:

1. Large sheets of paper and colored markers or pencils for drawing foodsheds
2. Maps of the world are useful for locating countries of origin for various foods (foodshed drawing activity).
3. *Optional:* Sample plant foods in the local, regional, and global foodsheds for discussion and consumption. If possible, provide foods collected from right around the school such as lamb’s quarters or mallow.

Procedure

1. Ask students: What is your relationship to food, and to food plants? You could ask them to list food they have eaten in the past week.
2. Divide students into small groups or pairs. Give each group a large piece of paper and ask them to draw their *foodshed*. A foodshed is the area of land from which food “flows” to your table, or “the geographic area from which a population derives its food supply” (Peters et al. 2008).
 - If they eat grapes from Chile, or peanut butter from Georgia, they will recognize that they belong to a foodshed that is truly global. Use the global maps to locate countries

of origin for various foods, if needed. The diagram should show different foods and where they come from.

- Note the distance food must travel to reach your table or lunch bag.
- How do your foodshed boundaries compare to your watershed boundaries (drawn in Lesson 3)? That is, this exercise is best done after students have drawn their watershed, or at least are aware of its boundaries.

3. Onondaga Lake as Foodshed

Ask students to imagine acquiring all their calories from within their watershed, or local region generally. This was the case historically, before cheap fuel allowed us to ship foods long distances. How would you eat, in other words, if foodshed boundaries more closely matched watershed ones?

- List all the foods you can think of that are actually gathered/grown/produced today in the Onondaga Lake watershed.
- How does this list compare to your actual diet (see earlier list)?
- Optional activity (see below, and worksheet): Calculate food miles costs of long-distance transport of food that you eat.

For reflection

One of the big differences between the historical/local and current food systems is that the historical one was largely controlled by the seasons. In considering alternatives to this long-distance food system, we need to address issue of seasonality. We'll do this in depth during the field trip

- What factor or factors drive today's food system?
- Why might we want to be less dependent on a global food system? That is, what are benefits of a smaller and more local foodshed?

Optional activities

1. Food web. Ask students to draw a model of the food web to which they belong. It should show the origins of the various snack and meal components they listed in Step 1 of this lesson. The key concept is the idea of energy flowing through living organisms by way of consumption. That is, food is not simply a matter of getting some "Cheez-its" out of a vending machine, but comes from plant and animal sources modified, processed, and packaged to attract purchase and consumption. Note the plant and animal sources of the foods you list. Where were they grown and processed?

2. Food miles. This exercise allows you to quantify the impact of a long-distance food system in terms of just one aspect of sustainability-- carbon emissions from fossil fuel use. See Worksheet that accompanies this lesson for instructions, information and follow-up questions.

Field trip - Skä•noñh Center

Reading: Before the field trip, students should read the article accompanying this lesson, "Food Plants of the Onondaga Lake Watershed."

Invite students to explore the Center and observe the displays. In particular, ask them to find examples of Haudenosaunee food plant use, such as Three Sisters agriculture, and describe them in their notebooks.

Exploring the seasonal foodshed

In the pre-lesson, we asked students to consider their diet from the perspective of the foodshed concept. Here, we will explore Onondaga Lake and its watershed as our local foodshed. Much of the consideration will be historical, due to the contamination issues that constrain consumption of foods from the lake and areas immediately around it today. We will take into account the limiting factor of seasonality and how it affects food availability.

Materials:

1. Several large pieces of paper—at least 4, for students to draw their section of the year.
2. Colored pencils, pens, or markers.
3. Copy of reading, “Food Plants of Onondaga Lake Watershed” that accompanies this lesson.
4. *Optional:* Cards featuring the variety of food plants found in the Onondaga Lake watershed.

Procedure

1. Begin with food seasons that we experience today. For example, you might ask students about foods they eat at certain holidays throughout the year, such as Thanksgiving, Christmas, Hannukah, New Year’s, Easter, Passover, Memorial Day, Labor Day, Ramadan, etc.

2. Next divide students into 4 groups, one for each season—Spring, Summer, Fall, Winter. Each group gets one large sheet of paper and a selection of colored pens/pencils.

We will be creating a model for the annual cycle of gathering food for the Onondaga Lake watershed; each group of students will be responsible for one season of the year. These ways are largely historical, but people do continue to gather such foods today.

3. Using the table in the reading, and the foods it lists, place the plant food in the season when it is gathered [these food plants could be prepared as pictures that are printed on cards].

For example, you would put berries in summer, wild rice in early fall, and maple sap in late winter.

4. In adding the plant food to the season that it becomes available, you’ve covered one part of the food system—the harvest.

Are there any plant foods harvested in winter?

If not, what did people eat in the winter? That is, how did they cope with the seasonality of the food resource?

5. Let's now examine ways people faced the issue of seasonal availability of foods, without trucks and the interstate highway system. Add to each section of the seasonal "pie," how you think the foods might have been planted, preserved and stored. Then add the season of consumption. What foods could you store in the summer and fall, for example, and eat in January?

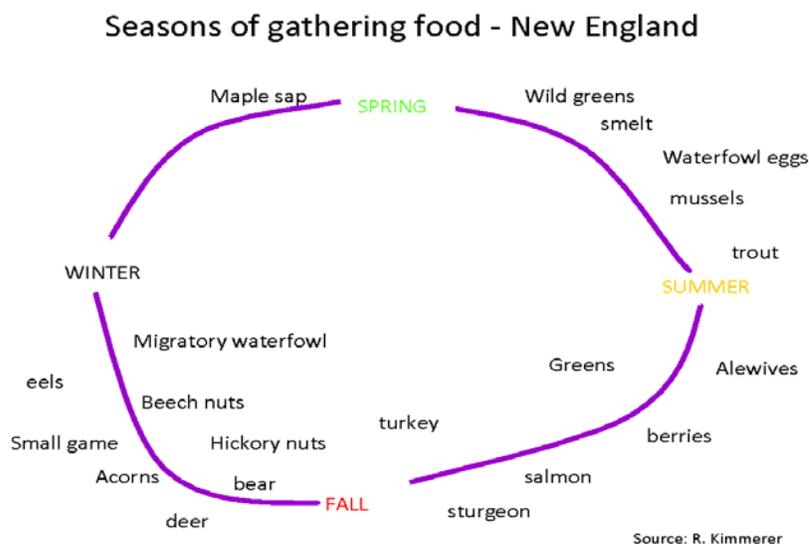
Students could use concentric circles for each aspect of the food production system: planting, harvest, processing (if any), storage, and consumption

Optional: Add to calendar other foods besides plants that would have been available from Onondaga Lake or its watershed. Examples: venison, bear, rabbit, beaver, turkey, fish (salmon, eel, sturgeon), ducks, geese, mussels. Add each one to the season they would be hunted, trapped, fished or collected.

6. Now bring the four groups' work together to unite the four quarters of the seasonal cycle. You have created a "seasonal foodshed calendar" for Onondaga Lake that includes planting (if any), harvest, processing and storage of foods for a cyclical year of plant foods.

- Now that you see the whole year, add any plants or processes you think might be missing. Could you survive on this food system?
- What foods would make up a typical meal or snack in each of the four seasons?
- How does this system compare to the way most of us eat today?
- What are some advantages and disadvantages of eating locally and seasonally?
- What are advantages and disadvantages of reliance on wild foods (foraging) as well as cultivated?

We will explore the last two questions in the post-field trip lesson. Here's a seasonal foodshed model from New England, for comparison:



Optional activities:

1. If available, provide samples of local food plants. These could be items currently grown in the watershed (such as apples, carrots, peas), or historical foods such as wild rice. Similarly, they could be either wild or cultivated foods.

-Introducing students to the many different corn varieties grown by the Haudenosaunee also expands their understanding of indigenous diets.

2. In the long term, we hope to have a greater sampling of wild and cultivated food plants growing at the Skä•noñh Center. We could even enlist student involvement in planning, planting and maintaining these areas; stay tuned.

3. Using a large historic map showing Onondaga Lake habitats, match the food plant to the habitat where you would find it. You could also do this activity with a current map, but the habitat selection would be relatively limited due to habitat loss and landscape contamination around Onondaga Lake.

Post-field trip activities

1. *Then and now.* Compare today’s food system (with its foodshed that you explored in the pre-field trip lesson) to the historical indigenous one described in the reading and field trip activity. Here are some suggestions you can use to make the comparison (can select from this list):

Characteristic	Today’s food production system (from pre-field trip lesson)	Indigenous food system (see reading)
Production (what inputs are used to grow the plants?)		
Processing (what goes into preparing the actual food from the plant material?)		
Packaging (what materials and energy go into dividing up the food for retail?)		
Transportation costs (includes environmental impacts, etc.)		
Impacts to soil		
Protection of natural ecosystems (wetlands, forests, meadows)		
Variety of fresh foods available year round		
Health and nutritional value		
Connection to place (emotional and otherwise)		

Food security (vulnerability to mishaps, etc.)		
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For reflection

Based on your responses, which food system seems most in line with the values of reciprocity and gratitude implicit in the Thanksgiving Address? Give reasons for your choice.

- Suggest ways we can incorporate elements of the local food system into our own.
- In general, can you think of ways to reciprocate the gifts of the food plants, soils, sunlight and other parts of our food production system?

2. *Food or lawn?* In this activity, we measure the amount of land devoted to lawn around our schools, churches, homes, and consider the re-purposing of some of this land to grow food.

- Use GoogleEarth or a similar program to measure the area of lawn around your school or home. Don't count ballfields where the lawn is needed for the sports activity. Focus instead on areas where the lawn serves no function besides ornament.
- What if we replaced lawns with fruit trees or other food-producing plants in these spaces? For a quantitative response, calculate how much food those lawns could support. This information can be found online and in the scientific literature, and is specific to food type and soil.
- Design a garden or even a "food forest" to replace the lawn on some part of the school grounds.

3. *Amazing maize: Corn as a native crop.*

Ask the students to recall the last time they ate corn. Then show the video documentary, "King Corn," about the "subsidized crop that drives our fast food diet."

- Based on what you learn in the film, is this a relationship based on Thanksgiving?
- Based on the film and the chapter reading in WTCBAE, compare the native relationship with corn as a food, to the current one in the US today.
- Show copy of poster that displays many varieties of Haudenosaunee corn.

4. *Questions specific to the reading that accompanies this lesson*

- What might be some advantages to a food system that relies on a wide range of plants, cultivated and wild? Example: Gives you a broad range of potential edibles; gives incentive to conserve biodiversity; etc.
- From the reading, the Haudenosaunee women farmers did not plough the soil. What are some reasons for practicing a no-till system?
- The reading mentions food forests. Learn about food forests, and design one for your school. Be sure to include pollinator plants as well as edibles.

Vocabulary used in the reading and in this lesson:

foodshed – geographic area from which a population derives its food supply	
food forest	perennial
polyculture	foraging
monoculture	mast tree
annual	

Resources

John Mohawk, YouTube video, "Survive and Thrive." Keynote presentation on plant breeding by indigenous people. About 20 minutes long.

John Hart, "Evolving the Three Sisters" in *Paleoethnobotany of the Northeast*, Vol II, Chapter 7. Chapter on early agronomy of developing Three Sisters as crops.

Eames-Sheavly, Marcia., Cornell Cooperative Extension., United States., Department of Agriculture.,. 1993. The three sisters : exploring an Iroquois garden. Cornell Cooperative Extension, [Ithaca, N.Y.].

Hart, J. P. 2008. Separating the three sisters. *Legacy: the Magazine of the New York State Museum* 4:10-12.

Kimmerer, R.W. 2013. Braiding sweetgrass. "Council of the Pecans" is the chapter most relevant to this lesson.

Peters, C. J., Bills, N. L., Wilkins, J. L., & Fick, G. W. 2009. Foodshed analysis and its relevance to sustainability. *Renewable Agriculture and Food Systems*, 24(1), 1-7. Good introduction to foodshed concept.

Pleasant, J. M. 2011. The Paradox of Plows and Productivity: An Agronomic Comparison of Cereal Grain Production under Iroquois Hoe Culture and European Plow Culture in the Seventeenth and Eighteenth Centuries. *Agricultural History* 85:460-492.

Pleasant, J. M. 2015. A New Paradigm for Pre-Columbian Agriculture in North America. *Early American Studies: An Interdisciplinary Journal* 13:374-412.

King Corn documentary. See <http://www.kingcorn.net/> for more information.

Lesson 5: The Birds

We put our minds together as one and thank all the Birds who move and fly about over our heads. The Creator gave them beautiful songs. Each day they remind us to enjoy and appreciate life. The Eagle was chosen to be their leader. To all the Birds—from the smallest to the largest—we send our joyful greetings and thanks.

-Haudenosaunee Thanksgiving Address

Onondaga Lake has long been attractive to birds, due to its productive waters (primary production by plants feeds plankton and fish and so on up the food chain); and due to the diversity of habitats along its shoreline (swamp, marsh, upland, urban and suburban). Ducks, herons, gulls, and terns are commonly seen, along with fish-eating raptors such as osprey and bald eagle. In this lesson, we learn about the birds of Onondaga Lake, their adaptations to particular habitats, and how they might be affected by centuries of human-modifications of the lake shore and waters. Finally, we look at ways to reciprocate the gift of birds—to “send our joyful greetings and thanks” to these feathered creatures.

Objectives: Following this lesson, students will be able to:

1. Name 5 birds that use at least 3 different habitats at Onondaga Lake;
2. Explain how these birds are adapted to live in their respective habitats;
3. Name 2 bird species important to the cultural and ecological history of Onondaga Lake and recount their stories;
4. List 3 ways we could reciprocate the gifts of birds, at Onondaga Lake or anywhere in the watershed.

Pre-field trip lesson

Location: Indoors

Length: 40 minutes

Materials:

- Onondaga Lake bird list from Onondaga Audubon Society
- Access to internet or other resources about birds

Reading: “The Birds” in *Words that Come Before All Else*

Procedure

1. Review the Thanksgiving Address from Lesson 1, and tell students that we will focus on Birds. As the Address points out, birds have the gift of flight, and are also accomplished vocalists. Birds “remind us to enjoy and appreciate life.”

Ask students about their **relationship** with birds. They may have a bird feeder, or they may observe pigeons roosting near their house. Some students may know about the eagles visible from Carousel Mall at Onondaga Lake during the winter. What relationship with birds is implied in the Thanksgiving Address?

3. During the field trip, we will be observing birds at Onondaga Lake. We will prepare by learning about species students might see and/or hear at the Skä•noñh Center or at Onondaga Lake Park.

Show students the red-winged blackbird video from <http://musicofnature.com/videos/> , as an example of a species they are likely to see or hear at Onondaga Lake (for a field trip in May or June).

This website has numerous outstanding, short videos of bird behavior, including birds singing, calling, feeding, etc.

4. Divide students into small groups or pairs. Each group will select 2 species—a water bird and a terrestrial species, if possible-- from this list of birds that live at Onondaga Lake for all or part of the year.

robin, red-winged blackbird, black-capped chickadee, ring-billed gull, mallard, bald eagle, osprey, Canada goose, bank swallow, song sparrow, downy woodpecker, northern cardinal, common merganser, hooded merganser, fish crow, yellow warbler, double-crested cormorant, Caspian tern

5. Students will gather information on the biology of these birds in anticipation of their visit to Onondaga Lake. Their investigations could cover some or all of these topics:

- *Habitat* – aquatic, wetland, mudflat, lawn, swamp, forest, meadow, or a blend of these habitats. Where would you expect to see this bird at Onondaga Lake?
- *Diet* – plant, insect, vertebrate (fish, e.g.), mollusk
- *Foraging method* – How does it get its food? Gleaning, pecking, diving, dabbling, etc.
- *Human relationship*— are there stories about this species? do people eat it? do people appreciate its song?

5. An *adaptation* is a trait that allows an organism to survive in its environment. How is your species adapted to its habitat and diet?

Examples: long, slender legs help herons wade in shallow water; long, thin bill with flexible tip helps snipe probe for & grasp food in mud.

6. Unlike plants, birds are highly mobile. Some species on the list are year-round residents, while others visit Onondaga Lake only at specific times of year. What is the date of your class field trip? Would you expect to see your species on this date?

7. If time, ask students to present their bird(s) to the class so everyone is prepared to find it during the field trip. They should be sure to tell the class where to look—Will the bird be soaring over the water, hiding in the brush, or dabbling in the shallows seeking plant food?

Extensions/Optional activities

1. Ask students to write up their responses to the lesson questions as if they were the bird in question. That is, they take on the persona of the bird and tell about their experience as that bird in terms of diet, habitat, etc. Sometimes such a leap of imagination can help lessen the gulf between ourselves and other species.
2. Remind students that we are literally related to birds. Ask them to list the ways we are related biologically. For examples: similar brain wiring, similar skeletal anatomy, same singing genes, same basic cellular structure and biochemical pathways, etc.

3. Like humans, birds communicate using sounds, especially vocal ones, as well as various behaviors. Songbirds in particular (family Passiformes) represent many beautiful singers. By listening to birds and learning to recognize their unique sounds, we can in some manner “learn the language of the birds.” That is, songs, calls, and other sounds have specific functions that allow birds to “speak to” one another (see reading in WTCBAE, p. 114). Behavior and sound together can reveal much about the community of birds and their ways and allow us access to this language (see *What the Robin Knows* by Jon Young). During the field trip, we will practice recognizing birds by their behavior and songs.
4. In the WTCBAE chapter, the author reflects on birds as *teachers* (p. 115-116). According to him, what can we learn from birds? Can you think of any other ways birds teach or inspire us?

Bird Field trip: Skä•noñh Center and possibly Onondaga Lake Park, Honeywell Visitor Center (for waterfowl, gulls, and wading birds).

Note: Onondaga Lake is listed as an IBA, Important Bird Area, by Audubon New York. IBAs provide important habitat for birds during various times of the year. The designation of Onondaga Lake as an IBA reflects the Lake’s importance for wintering waterfowl, seeking open water and food at a time many lakes and streams freeze over further north. During winter months, you can see an amazing array of such birds on Onondaga Lake—mergansers, redhead, scaup, bufflehead, ring-necked ducks, goldeneye, swans, etc. Winter field trips to see birds on Onondaga Lake are therefore possible, at least until/unless the lake freezes over. The best places to see winter waterfowl are probably the Honeywell Visitor Center (also warm!), and the lake side trail along the wastebeds.

Materials

- Pencil/pen and paper or worksheet to respond to Scavenger Hunt questions
- Bird field guides
- Binoculars
- *Optional:* Measuring tape (at least 20 m), clipboards, data forms, timer or watch for conducting point counts
- *Optional:* Spotting scope for birds on the lake, especially useful if field trip extends to Onondaga Lake Park or the Honeywell Visitors Center

Indoors - Skä•noñh Center

1. *Scavenger hunt:* Find the following birds that are part of Skä•noñh Center exhibits: passenger pigeon, bald eagle, Canada goose.

In each case, say something about the exhibit where you found the bird, the cultural context or story of which it is a part, and the species’ role in the ecology of Onondaga Lake. We will also elaborate on these topics as a class, once the scavenger “hunt” is over. Give students 20 minutes?

A. . *Canada goose*—Haudenosaunee creation story: geese put their wings together to carry Skywoman safely to Earth when she falls through the hole in the Skyworld.

Canada geese, like bald eagles discussed below, were once on the brink of extinction (~1900) and uncommon around Onondaga Lake. Since the 1960s their populations have exploded, due partly to the release in the 1930s of resident “giant” geese by the US government, for the purported benefit of hunters. These resident geese thrive on the expanses of lawn humans have created in parks, yards, golf courses, farm fields, airports (geese are one of the few birds that can digest grass). Canada geese are long-lived-- some individuals live for >30 years.

Migratory Canada geese still exist, but they are fewer in number than the resident populations. Resident and migratory Canada geese do not typically interbreed. Biologists believe now there are far too many resident geese. For more on Canada geese, see <https://www.allaboutbirds.org/canada-goose-resident-vs-migratory/>

B. *Bald eagle*—Perched on top of the tree of peace (eastern white pine) at the center of the building, where the staircase wraps up.

“In the Haudenosaunee world view, the eagle hovers over the Great Tree of Peace, attentive to threats to the confederacy.” “The eagle was humanity’s lookout against enemies who would disturb the peace, a symbol since . . . adopted in a similar way . . . on the Great Seal of the United States.” (Dictionary of Haudenosaunee Culture – get correct name)

Some of the students may know about the bald eagles visiting Onondaga Lake during the winter. See this and other articles and images in syr.com for more information: http://www.syracuse.com/kirst/index.ssf/2015/01/return_of_regal_visitors_bald_eagles_again_in_syracuse_at_onondaga_lake.html

- Why do eagles congregate at Onondaga Lake?
- What time of year is the best to see multiple eagles?
- What threats continue to the birds in terms of contaminants and habitat loss at Onondaga Lake?

At one time, bounties (cash) were offered for killing eagles since it was thought the birds were a hazard to farm animals. Later, eagles were exposed to contaminants including heavy metals and the pesticide DDT, widely applied after World War II. Some of these poisons prevented eagle eggshells from developing the proper thickness, so the eggs failed to hatch properly. The bald eagle population plummeted, and eagles were nearly extirpated in New York State. DDT was banned in the US in 1972. Eagles were brought in from Alaska beginning in 1976 to attempt to restore the eagle population in N.Y.S. See the Breeding Bird Survey map at <http://www.dec.ny.gov/animals/74052.html> to appreciate the increase in number of bald eagles in NYS from 1980 to 2000.

C. *Passenger pigeon*—Silhouette of flock appears on wall moving up staircase. The bald eagle was brought back from the brink of extinction and from many decades of persecution; the passenger pigeon was not so fortunate (see WTCBAE p. 111). Passenger pigeons once congregated around the Onondaga Lake salt springs by the thousands. Their flocks, passing over what is now Syracuse, darkened the sky like

clouds, the birds occurred in such abundance. Passenger pigeons historically made an important contribution to Haudenosaunee subsistence cycles. The pigeon dance, a relict of the native relationship that honored this bird, is still observed in many Haudenosaunee communities today.

The passenger pigeon's sharp plunge to extinction stemmed from massive overharvest for commercial markets, and from habitat loss. As the Birds chapter in WTCBAE points out, early colonists saw the natural world not in terms of beings sharing gifts, but rather as "merchantable commodities" (see p. 110).

"The Haudenosaunee knew a different way which was, never take more than you need, and leave some behind to continue their work as bird, plant, tree, or animal. The next time you truly need them, they will be there for your use. Treat them as you would be treated. Have respect for every living thing. We all need to remind ourselves that this is still a good rule to live by" (WTCBAE, p. 111-112).

This statement describes the Honorable Harvest, discussed in greater detail in the "Meet the Plants" lesson. See <http://www.yesmagazine.org/issues/good-health/the-honorable-harvest-lessons-from-an-indigenous-tradition-of-giving-thanks-20151126> for more on the honorable harvest.

Skä•noñh Center – Outdoors - Bird survey

Students will listen and watch the skies and trees to compile a list of birds they see and hear on the property. This activity can be done informally, by walking quietly and pointing out birds as a group; or it can occur more formally by following guidelines for bird point counts, attached to this lesson.

- How many species did you find? Which were the most and least common?
- In what habitats did you encounter the most birds?
- Did you encounter problems in conducting the counts? For example, from noise or other distractions. How might these issues affect the birds themselves?

Post-field trip lessons/Optional activities

1. Look at the habitat and diet of the birds you have researched for the Birds pre-lesson. Now look at maps that show clearly the human footprint around Onondaga Lake, including superfund subsites.

(See http://www.dec.ny.gov/docs/regions_pdf/olconcernmap.pdf, for example.) Where are the areas of contamination and how would these affect birds? Based on habitat and diet, which birds might be most vulnerable to pollution in Onondaga Lake?

In addition to contaminants, the lake is bound by transportation & other infrastructure: the NYS Thruway, Interstate Rte 690, railroads, and Onondaga Lake Parkway, to name just the roads.

Political leaders, citizens and others made decisions about siting these roads and factories, and tolerating pollution of Onondaga Lake's waters. If we were to incorporate sending greetings and thanks to the birds as part of any decision making process, how might the results be affected?

2. Several birds of cultural interest live, or did live, at Onondaga Lake. These include clan birds such as heron, snipe, and hawk (see WTCBAE p. 115), as well as dietary staples (passenger pigeon). For snipe, see short video at <http://musicofnature.com/videos/>

For passenger pigeon, students could read the Appendix that is part of my dissertation.

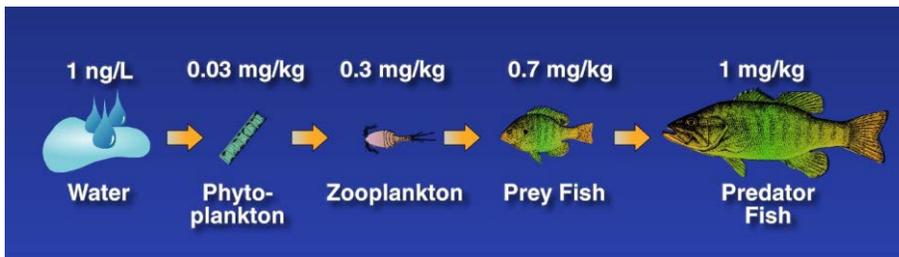
What is the special relationship of these birds to humans? What does it mean that a clan is named after a bird? What are some birds of cultural significance in the US today? (example: chicken, turkey, bald eagle, oriole)

3. Food web dynamics: Birds and Biomagnification

Ask students to read the syr.com article on mercury in birds and bats around Onondaga

Lake: http://www.syracuse.com/news/index.ssf/2014/05/high_levels_of_toxic_mercury_found_in_onondaga_lake_birds_bats_new_studies_revea.html

- Explain biomagnification, and diagram the sequence or pathway for how mercury gets into birds.
- What is the order of magnitude increase in concentration at each level as you move up trophic levels from water to predator? Where do birds belong in this diagram?



Source: Dr. Betsy Henry, 2008.

- How did mercury get into Onondaga Lake in the first place? Where did it come from and how was it used?

You could also ask students to review the actual scientific report from which the newspaper article was taken (available at http://www.fws.gov/northeast/nyfo/ec/files/onondaga/2009_Bird%20Onondaga%20Final-Nov%202013-2012forwebsite.pdf)

The report has graphs and charts that are easy to read and would give students experience with an SEK document.

- Where did songbirds have the highest levels of Hg? (tree swallows and red-winged blackbirds, Harbor Brook). What do these species eat, and how might that diet help explain the high mercury levels?
- Why are shorebirds so vulnerable to Hg contamination? What is their diet, and where do they tend to occur around Onondaga Lake? How does the Hg affect the hatching of eggs?
- Given the history of this contamination, what can we do now that might help restore our relationship with birds? (could be a ceremony or apology as well as cleaning up the toxins)

3. Reciprocity. How can we “send our joyful greetings and thanks” to the birds? As a class, or working in small groups or pairs, invite students to brainstorm ways to return the gift of birds. For example, we could send greetings and thanks via a song or poem; plant bird-friendly trees; protect habitat from further development, etc.

Ask students to pay attention to new construction development in rural and other areas. These could be shopping mall strips, housing tracts, churches, office buildings, etc. Do you think the birds were considered in these land use decisions? Why not? How might birds gain a “voice” in such proceedings?

Resources

Cornell University Laboratory of Ornithology. All About Birds website. <https://www.allaboutbirds.org/guide/search/> Chock full of basic information about birds—see tabs for Identification, Life History, Sound, Video.

The Sacred Song of the Hermit Thrush by Tehanetorens. The Book Publishing Co., Summertown, TN. 1993. See also p. 126 in *Words that Come Before All Else*.

What the Robin Knows by Jon Young. Houghton-Mifflin 2012. This book has aids and suggestions geared at increasing sensitivity to bird language and awareness of birds in general. The book focuses on attention to birds commonly around us, such as robins, jays, and cardinals, that even urban students might recognize and find in their neighborhoods and schools.

Music of Nature. Website by Lang Elliot. The nature video library is especially spectacular <http://musicofnature.com/videos/>

New York State Breeding Bird Atlas. NYS DEC. <http://www.dec.ny.gov/animals/7312.html> Shows breeding status by species for 1988 and 2008. Useful to observe trends in population and distribution of birds over time in NYS.