

## **CONQUERING NATURE & SAVING NATURE? HUMANS & URBAN ECOLOGY IN CHICAGOLAND HISTORY**

**WHEN TO USE THIS LESSON:**

High School Biology..... unit on Ecosystems and Biodiversity  
High School Environmental Science.....unit on Ecological Succession and Human Populations

**LESSON DURATION:** 4 days

**SUITABLE FOR:** Grades 9-12

<b>NGSS STANDARDS:</b>	<b>LIFE SCIENCES</b>	<b>EARTH SCIENCES</b>
<p><u>DISCIPLINARY CORE IDEAS:</u> LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.D: Biodiversity and Humans</p> <p><u>EVIDENCE STATEMENTS:</u> HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.  HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p>	<p><u>DISCIPLINARY CORE IDEAS:</u> ESS3.A: Natural Resources ESS3.B: Natural Hazards</p> <p><u>EVIDENCE STATEMENTS:</u> HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.  HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</p>	<p><u>DISCIPLINARY CORE IDEAS:</u> ESS3.C: Human Impacts on Earth Systems</p>

**LESSON SEQUENCE:**

Day 1: What's the Anthropocene? What's Stewardship?  
Day 2: Mapping and Time-lining Chicagoland's Ecology

Day 3: Case Studies: Chicagoans Reclaim Nature  
Day 4: Assessing Success, Planning for the Future

**ESSENTIAL QUESTIONS:**

- How have different eras of human activity (social, agricultural, commercial, industrial, infrastructural, residential) shaped the landscape and biome of a region?
- How has human culture attempted to manage, redirect, or reduce its own impacts on the environment and local ecosystem?
- How do we evaluate the success of our attempts at environmental stewardship in an urban/metropolitan setting?

**LESSON PLAN OVERVIEW AND LEARNING GOALS:**

In this 4-day lesson, students will explore primary documents that introduce them to an important dynamic in environmental history and earth and life sciences: that humans play a role in ecological succession, both as reckless disrupters of existing biophysical environments, and sometimes as careful stewards of new ecosystems. By way of the environmental history of Chicagoland, students will be able to explain how these two opposing tendencies—anthropogenic degradation and environmental stewardship—are historically interrelated. Students begin by placing Chicago's history within the geologic timescale epoch of the "Anthropocene," when industrialization amplified human impact on ecosystems. Students carry on by plotting dual timelines of Chicago's history, marking major industrial events on the one hand, and the evolution of a movement for environmental stewardship on the other. Then, in teams, students take a deeper dive into one or another historical episode of environmental stewardship, and report back to the class about the special ecological problems that Chicagoans were concerned with, the special historical conditions that shaped their moment, and an evaluation of the legacy of the episode. Finally, student teams propose their own project of environmental stewardship, with a focus on current ecological conditions in the city. By the end of this lesson, students will be able to:

- Define the concept of the anthropocene—the current era of Earth's history (dating back to the Industrial Revolution, but accelerating globally after 1950) during which humans have a decisive influence on the dynamics of the biophysical environment on a planetary scale.<sup>1</sup>
- Define the concept of environmental stewardship—the cultural, civic, and scientific movement in human societies (dating back to the mid-nineteenth century) to study the impacts of human activity on the natural world, and to conserve, protect, and curate the sustainability of some aspect of the biophysical environment, whether at the scale of entire ecosystems, a specific habitat, or a particular species of flora or fauna.
- Periodize the major eras of urban and metropolitan development in Chicagoland and name the environmental impacts associated with each.
- Name and sequence the stages and types of movements for environmental stewardship in Chicagoland.
- Develop criteria for assessing the success and legacy of an environmental stewardship project.
- Develop criteria for assessing contemporary environmental and ecological impacts and how a proposed stewardship intervention might address them.

<sup>1</sup> The Anthropocene, despite being used by many historians and environmental scientists, has not been officially adopted as a part of the International Commission on Stratigraphy's International Chronostratigraphic Chart. A proposal to formalize its inclusion into the chart has been approved by the working group of geologists within the ICS as of 2019.

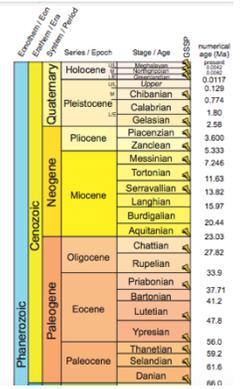
**DAY 1: WHAT'S THE ANTHROPOCENE? WHAT'S STEWARDSHIP?**

**Materials needed:** LCD projector, blackboard

**Objectives:** Students will access prior knowledge about the geologic timescale and human history to consider the interrelation of human action and the biophysical environment. Students will combine these elements with new data to construct a definition of the "Anthropocene" as an era shaped by the advent of industrialization. Students will access prior knowledge about the presence of parks, preserves, and greenspaces in their neighborhoods to consider them as man-made artifacts of the local history of environmental stewardship.

**ENGAGE:**

In **whole-group discussion**, announce to students that this week you'll be exploring the concept of the *Anthropocene* and the concept of *environmental stewardship*. Tell students that you'll start with the Anthropocene and write or project it on the board. Ask students if they've ever heard this word. (Most likely they will not). Ask students to use their knowledge of root words to infer the meaning. Some may recognize the prefix "anthro" as reminiscent of anthropology—the study of human culture. Some may (upon prompting) recognize the suffix "cene" as shared among a bunch of terms they learned in earth science as part of the the *geologic time scale*. [project the first visual aid]. Note that the various time epochs of the Cenozoic era and their names (Paleocene, Eocene, Oligocene, Miocene, etc.). Explain that the "cene" suffix is the same root as the word "recent" and is used for the more recent (Cenozoic) era on the timescale. Explain that Anthropocene is a term that some scientists want to add to the timescale. Ask students to complete the inference: if -cene refers to a recent time-period in the fossil record, and anthro- means human, then what might Anthropocene mean? Possible guesses might be the era when humans originated, or when they migrated, or when they invented tools. Nudge students forward by suggesting that this new era would be marked off *way* more recently than those events, toward the top of the chart. [project the second visual aid].

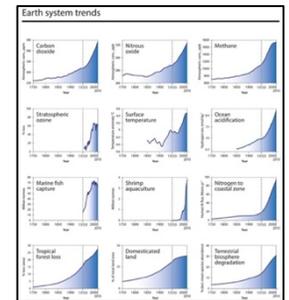


**EXPLAIN:**

Help students arrive at the insight that around the time that this image was produced (1869), humans were in the midst of an intensive wave of *industrialization* and *urbanization*, in which steam, petroleum, and coal power allowed and induced people to more aggressively shape land and waterways to their uses, and produced mass amounts of pollutant waste into the air, water, and soil. This is what scientists mean by the Anthropocene [write or project the definition]—*the current era of Earth's history, dating back to the Industrial Revolution, but accelerating globally since 1950, during which humans have a decisive influence on the dynamics of the biophysical environment on a planetary scale.*

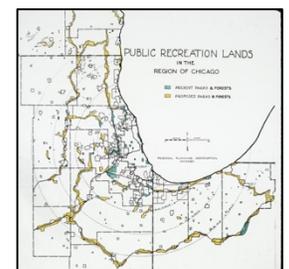
**EXPLORE AND ELABORATE:**

In a quick **think-pair-share**, ask students to pair up and come up with three present-day examples of human activity that shape the land, soil, water, air, or plant and animal life on earth. Back in **whole-group discussion**, track a short list of some of the students' contributions highlighting the fact that the era of human activity shaping the biophysical environments is far from over. [project the third visual aid]. Discuss how each of these indicators are evidence that scientists use to support their claim that the planet's various systems have been under a sustained degradation by human industrial and commercial activity.

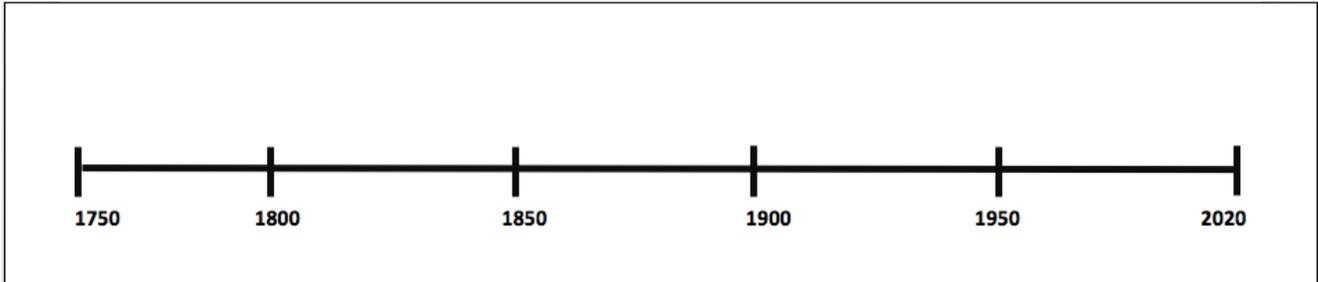


**RE-ENGAGE:**

In **whole-group discussion**, ask students to think of their neighborhood. Ask what their nearest park is. Ask if they've been to any of the large parks and forest preserves in Chicagoland. Make a list on the board of parks and forest preserves that students have visited. (show fourth visual aid). Ask students to look at the map of public recreation lands from the early 20<sup>th</sup> century. Ask students to clarify what the green areas indicate. The two shades show existing and "proposed" greenspaces. Underscore the central insight: that these places where we enjoy "nature" are not exactly "natural." In fact, they were proposed, designed, and built by people who were worried about all that industry and smoke and pollution that we saw in the second slide. Write or project the term *environmental stewardship* on the board. Explain that this was a movement that grew up right alongside the expansion of the Anthropocene, and give the definition: *the cultural, civic, and scientific movement to study the impacts of human activity on the natural world, and to conserve and protect some aspect of the biophysical environment.*



For **homework**, hand out the *Timeline Worksheet* and ask students to mark off tick marks every ten years between 1750 and 2020; this should be 27 evenly spaced tick marks across the page. Then visit the Chicago Public Library's Chicago History Timeline to mark four events (one before 1850; one between 1850 and 1899; one between 1900 and 1949; and one from 1950 to today) that they've either heard of or are curious about. Explain that this assignment will get them ready to think in terms of big eras of time, and to give themselves "signposts" to help them locate events in sequence.



## DAY 2: MAPPING AND TIMELINING CHICAGO'S ECOLOGY

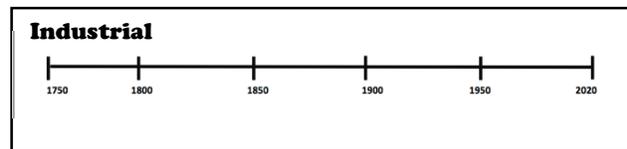
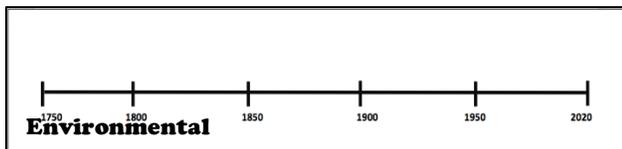
**Materials needed:** LCD projector, blackboard, laptops or computer lab, large poster-sized post-its.

**Objectives:** Students will be able to periodize the major eras of urban and metropolitan development in Chicagoland and name the environmental impacts associated with each. Students will be able to name and sequence the stages and types of movements for environmental stewardship in Chicagoland. Students will be able to infer causal connections between these two chronologies.

**ENGAGE:** In **whole-group discussion**, ask students to resurface the who, what, where, and when of what they're studying this week. **Who:** industrialists, environmentalists; **What:** the development of industry and the movement for green space. **Where:** in Chicago; **When:** from the early 1800s to the present. Draw a quick timeline like the one they made for homework on the board. Ask students to share out some of the events and episodes that they marked on their timeline for homework. Track them on the board, marking years and drawing quick doodles to symbolize events.

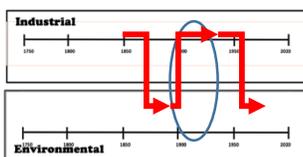
**EXPLAIN & ELABORATE:** In **whole-group discussion**, tell students that they're going to scale up their timelines to the size of a poster, and that they'll be working in groups to create one of two new timelines that will track important events on two different themes. One theme will be the development of industry, transportation, and commerce. The second will be the development of the movement for environmental stewardship.

**Divide the class** into teams of four or five students (enough to have six teams in all). Assign three teams to work on an Industrial Timeline; assign the other three teams to work on an Environmental Stewardship Timeline. **Distribute** poster-sized post-its to each team. Ask them to post two together at the sticky end to create one long, horizontal sheet. Instruct students to re-draw the 1750-2020 timeline on the poster. If they have the Industrial timeline, they should draw it near the top of their poster. If they have the Environmental timeline, they should draw it near the bottom of their poster.



**EXPLORE:** Give students laptops and instruct them to work through sections 2 through 6 of Essay 3, "[A Day in the Park](#)" on the ECC digital exhibit, "Wild in the City." Those groups working on the Industrial timeline will be tracking, dating and plotting events of industrial and infrastructural development (like the building of canals, railroads, factories, skyscrapers and so on) but also any information they can find about the growth of the city's population. The groups working on the Environmental timeline should be tracking, dating and plotting any events in which people tried to protect or preserve parts of the local environment. For each event, ask students to mark the year and to draw a small cartoon or symbol to illustrate the item.

**EVALUATE:** Once students have completed their timelines, have the teams link up in three pairs—each pair would have one Industrial team and one Environmental team. Have the paired teams paste their timelines up in a stacked formation on the wall so that the events can line up. Tell students that each team will have 5 minutes to introduce their timeline to their peer team, and then the team will have 10 minutes to come up with an answer to a bigger question that you'll give once the introductions are complete. Circulate and assess each team as you would in an informal **fishbowl** observation. Once 5 minutes have passed, announce that each pair of teams need to come up with an answer to a big question, which you'll project or write on the board: *Do you see clear moments when the industrial history of the city affected the movement for environmental stewardship? Circle those moments across the two timelines and be ready to explain why you chose them.* Conduct another **fishbowl** observation of the teams as they deliberate. Then in **whole-class discussion**, call on a representative from each group to explain why they highlighted the events they did. Facilitate a discussion to get students around to the fundamental insight: that history is like a dynamic feedback loop: humans create industry, which spurs pollution, which spurs people to be concerned about the environment, which spurs them to protect and manage certain parts of the environment, which spurs industry to seek out different areas for development, which provokes the cycle again.



**DAY 3: CASE STUDIES: CHICAGOANS RECLAIM NATURE**

**Materials needed:** LCD projector, blackboard, laptops or computer lab.

**Objectives:** Students will be able to name, sequence, and geo-locate the stages and types of movements for environmental stewardship in Chicagoland. Students will develop criteria for assessing the success and legacy of an environmental stewardship project.

**ENGAGE & EXPLAIN:** In **whole-group**, remind students of yesterday's insight: that the industrial history of the city, also produced a movement for environmental stewardship. Explain that today, students will become experts on four specific cases of environmental stewardship from the twentieth century and assessing their successes. Project or draw the chart below to explain how students will track the features of each case. You can also make a handout, but have students use notebook paper or a digital document to allow room for full answers.

Name of Stewardship Project	Date(s) and Location For many, there are multiple dates for different parts of the project. Put them in chronological order.	Who (persons or organizations) designed, paid for, and implemented the project?	What ecological/environmental problem did they seek to solve?	What innovations (things they built or land they protected or research they conducted) did they make?	What were the long-term benefits and legacies of the project for the environment? What ecosystems were preserved? What species of plant or animal life were protected?	What were the long-term benefits and legacies of the project for humans? What research, education, recreation, or employment did people get?	Any challenges, conflicts, or negative side effects of the project?
Illinois Prairie Path (Growing a Path from the Grass Roots)							
Chicago Botanic Garden (Seeds of Change)							
Lincoln Park (A Century of Citizen Science in Lincoln Park)							
Chicago Academy of Sciences (Documenting Urban Nature)							

**EXPLORE:** In **independent work**, have students explore essays [4](#), [5](#), [6](#), & [7](#) on their computers or tablets to discover the story of each of these Chicagoland stories of environmental stewardship. Remind students that answers to these questions may not be "right there" and that they will need to read closely and patiently to come up with full answers to each question. The chart they create must have full sentences for each prompt.

**EVALUATE:** After students have completed the work, convene a brief **whole-class discussion** to identify highlights from columns 6 & 7 (the long-term benefits) that some of these environmental stewardship projects brought about for local ecosystems and communities. Ask students: *Did anyone read about an environmental stewardship project that you've actually visited before in real life?* Ask students: *What aspects of these projects sound like something you wish you had in your own community?* Finally, ask students: *What do you think is most important in judging how successful a project is? Is it the scientific knowledge it gives us? Is it the amount of land, water, flora, or fauna protected or preserved? Is it the amount of ordinary people (not scientists or experts) who get to have access to the project? Could these different goals ever be in conflict?* Close the class with a reminder that for **homework**, they must complete any and all parts of the chart that they did not finish in class.

**DAY 4: ASSESSING SUCCESS, PLANNING FOR THE FUTURE**

**Materials needed:** LCD projector, blackboard, laptops or computer lab.

**Objectives:** Students will develop criteria for assessing the success and legacy of an environmental stewardship project. Students will develop criteria for assessing contemporary environmental and ecological impacts and how a proposed stewardship intervention might address them.

**ENGAGE & EXPLAIN:** After collecting the **homework**, in **whole-group**, remind students of the discussion you had yesterday about what's most important about an environmental stewardship project. Jot down the three aspects identified: *scientific knowledge; protection of ecosystems and wildlife; access and education*. Tell students that today, they'll work with a partner to come up with their own proposal for a project of environmental stewardship. They will imagine that they've received a major grant from the Environmental Protection Agency to develop a local project. They will need to begin by thinking about a particular *location* in this community or somewhere nearby where the *problems* of the Anthropocene seem an obvious threat to something in the local ecosystem. Then they will have to devise a particular *solution* and *intervention* that they believe will help solve the problem. Finally, they will have to describe how they would strike a balance between the three benefits identified on the board. Tell students that by the end of class today, they must have identified the location and problem, and that over the next week they will need to work together outside of class to complete the research necessary to complete the proposal.

**EXPLORE:** Allow students to form their own partnerships, and then assign remaining classmates to one another. Demonstrate some online tools—[Google Earth](#), the [Natural Resources Defense Council](#), the [Chicago Metropolitan Agency for Planning Map of Conservation Areas](#), the [Forest Preserve District of Cook County Map](#), [US Fish and Wildlife Service List of Endangered Species in Illinois by County](#) (look for Cook County) and the [Metropolitan Water Reclamation District Fish Count and Water Quality](#) maps. These will allow students to locate and explore parts of local geography and to assess environmental issues. Give students access to laptops or tablets to begin the process of identifying a location and a problem. For examples of proposals, have students visit the [Great Lakes Restoration Initiative Projects Examples](#).

**RE-ENGAGE:** After 30 minutes of exploration and brainstorming by partner teams, call **whole-class** together and have them report out regarding the location and project that they are considering. Give and solicit feedback on each project idea. Invite students having trouble deciding to meet with you to help decide on a location and intervention.

**EVALUATE:** Explain to students that they have one week to complete their projects with their partners. The finished proposal should be arranged as follows:

Page 1-2: **Description of problem and location:** *What's the problem and where is it?* This section must contain a *map* and a *photograph* of the area where the proposed environmental stewardship project would be located, and it must describe the specific issues with pollution or degradation that the project hopes to resolve.

Page 2-3: **Proposed Intervention and Work Plan:** *What are you going to do and how?* This section must describe, in detail, the type of intervention in the local landscape or ecosystem that you propose to make. You should draw a proposal *illustration* of what you hope the site will look like after the project would be completed. There must be a *staged* work plan that identifies how your team will collect information on the current ecosystem, implement your intervention, and care for the area over the long-term.

Page 3-4: **Statement on Conservation:** *How do you know it will work?* This section must explain how your project will be able to be a site of scientific research, genuine protection of ecosystems, and of responsible recreation and appreciation for the general public. You must begin by summarizing the lessons that you learned from the projects you explored in the online exhibits. Then proceed to identify your own standards of what makes a successful stewardship project, and explain how you will meet them.

Page 5-6: **Bibliography:** Your bibliography must be a list of all sources cited and consulted for the project. Use the Chicago Manual of Style to follow the proper formatting requirements.