

American Eels



Department of
Environmental
Conservation

Topics: Life cycle, migration, community science, adaptations, research

GRADE LEVEL: High School

Big Ideas:

- Animals adapt over time.
- Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.
- American eels are an important part of the ecosystem.
- American eels have multiple habitat requirements throughout their life cycle.

Learning Objectives: *students will be able to...*

- Analyze and interpret data to plot the migratory path of American eels.
- Explain and map phenomena such as the American eel migration patterns.
- Discuss the niche and habitat of the eels.
- Identify the behaviors and adaptations that allow animals to survive in their environment.
- Analyze and construct scientific explanations that changes to physical or biological components of an ecosystem affect populations.
- Model how eels use resources in their environment for every part of their life cycle.
- Identify the Hudson River as a hotspot for migratory eels, and what that does for the entire system.
- Explain abiotic and biotic factors influencing the carrying capacity of a population.

New York State Science Learning Standards:

HS-LS2-1. Use mathematical and/or computational representations to support explanations of biotic and abiotic factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Key Understandings:

- Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- Ecosystems have carrying capacities, which limits the numbers of organisms and populations they can support.

Essential Questions:

- How do animals adapt to their environment to survive?
- How can disruptions to an ecosystem lead to shifts in populations?
- How can populations change over time?
- What are the limiting factors that influence eel population size?

- Resources are finite and this affects the abundance (number of individuals) of species in any given ecosystem.
- Data provides evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.
- Organisms engage in characteristic behaviors that increase the odds of reproduction.
- Organisms can change their physical structures and their behaviors over their life cycle to better adapt to their environment and to meet their basic needs.
- Eels travel long distances through many habitats in their life.
- What characteristics of eels' influence survival at different stages in their life cycle?

Students will know...

- What a life cycle is, and the sequential life stages of the American eel.
- Key vocabulary terms.
- Eels rely on many different habitats during their life.
- The migration patterns of the American eel.
- Different habitats that an American eel uses during its life.
- How to read graphs and analyze trends over time.
- How to analyze and interpret data about eels.
- Scientists, including students and their teachers, contribute valuable data that helps scientists study changing eel populations

Vocabulary:

- **Adaptation:** a feature that allows an organism to deal with environmental conditions.
- **Behavioral adaptation:** an adaptation involving the way an animal acts.
- **Physical adaptation:** an adaptation involving the form of an organism.
- **Estuary:** a body of water in which fresh and salt water meet.
- **Habitat:** the place where a given plant or animal lives,
- **Life cycle:** the stages of form and activity through which a living thing passes as it develops from a beginning stage to an adult able to reproduce and restart the cycle.
- **Migration:** the movement from one place to another.

Learning Plan: We recommend doing these lessons in sequential order; however, they can be done as individual lessons. Lessons have multiple links (videos, songs, diagrams, activities) that can be used at the teacher's discretion depending on class time.

Pre-assess: How do eels know where to migrate? How are their needs met in their various habitats? How does their migration influence the food web? Use informational surveys/questionnaires/inventories to assess students' prior knowledge, have students write or draw in response to the essential questions.

Use [the eel poster](#) to show students the migration and life stages of the American eel. Have students discuss and make a T-chart about which challenges eels might have in their migration and hypothesize what structures/behaviors could help with that migration.

Progress Monitoring: Formative assessment and teacher feedback should be ongoing throughout the lessons. Teachers should develop assessments based on their individual class needs. Think-pair share, exit tickets, interactive discussions, questions and listening, informal observations, quizzes and student work samples can all be used.

Lesson 1: Community Science in Action- Students watch a video and PowerPoint presentation about the Eel Project, then complete a worksheet on eel biology.

- [Hudson River Eel Project](#)
 - Migration of the American [Eel Presentation](#) & [Student Worksheet](#)
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Lesson 2: Mapping the Migration of American Eels- Students follow the life cycle of the American eel by mapping their migration routes. Using graphs and videos students pose questions about eels and their reliance on many aquatic habitats.

- Eel Life Cycle [Video](#)
 - American Eel Mapping [Video](#) & [Poster](#)
 - Mapping the Migration of American Eels [Activity](#), [Student Worksheet](#) & [Map](#)
 - Extra: Meet the Fish Video: [American Eel](#)
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Lesson 3: American Eel Research & Data Trends Over Time- Students analyze and interpret eel data trends over time at various tributaries along the Hudson River.

- Mystery of eels [Video](#)
 - Hudson River Eel Project Data Analysis [Student Activity](#) & [Student Spreadsheet](#)
 - Extra: [Eel Migration in the Hudson Estuary](#)
 - Extra: [Article on Eel Poaching](#)
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Lesson 4: Let's Talk about Science- Students interpret scientific articles about eel migration.

- [Direct observation of American eels migrating across the continental shelf to the Sargasso Sea](#) & [Student Worksheet](#)
 - [Guided document](#) to work with scientific papers
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Teachers: Would you like to visit us at Norrie Point environmental education center, or have an educator visit your classroom in-person or virtually? Contact us to schedule a program: hrteach@dec.ny.gov

Resources:

Websites:

- [The Hudson River Eel Project](#) (NYSDEC)
 - [U.S Fish & Wildlife Service Eel Page](#)
 - [All about American Eels](#) Infographic (PBS Nature)
 - [Video: The Mystery of Eels & Eel Project](#) (PBS Nature)
 - [Chesapeake Bay Program American Eel](#)
 - [Atlantic States Marine Fisheries Commission \(ASMFC\)](#)
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Books:

- The Hudson: An Illustrated Guide to the Living River by Stephen Stanne, Roger Panetta, Brian Forist & Majja Niemisto
- Eels: An Exploration, from New Zealand to the Saragasso, of the World's Most Mysterious Fish by James Prosek
- The Book of Eels: Our Enduring Fascination with the Most Mysterious Creature in the World by Patrik Svensson