last of the right whales

Curriculum Guide
U.S. Edition

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Introduction

The *Last of the Right Whales* education guide contains six lessons designed to help educators use the documentary film *Last of the Right Whales* as a classroom teaching and learning resource. Each lesson can be used as a stand-alone, multi-day unit, with a variety of pre-viewing, viewing, and post-viewing activities, discussion prompts, a final culminating activity, and a full rubric. Depending upon your learning objectives the duration of each lesson can range from two days to two weeks or more.

One central principle guiding these materials is quite basic — whales do not recognize national borders. As such, the cooperative work needed between Canada and the United States is reflected throughout the lessons.

For high school, the curriculum includes:

- Lesson objectives that reflect current issues in North Atlantic right whale conservation, scientific research, and stakeholder involvement, with topics aligned to Common Core and NGSS standards.
- Pre-viewing, viewing, and post-viewing activities crafted to appeal to different learning styles, integrated across disciplines. There are multiple suggestions for post-viewing activities that strengthen content and skill development. Choose one or more of the activities to best meet your learning objectives.
- Resources for student research and educator background including links to video shorts and video featurettes accessible on the production company's YouTube channel.
- A culminating activity and rubric designed to easily photocopy and distribute to students.

For higher education you will find

- Fact-filled big ideas and external resources for student research, writing and faculty preparation.
- Essential questions to anchor seminar discussions.
- Resources for student research and educator background including links to video shorts and video featurettes accessible on the production company's YouTube channel.

Please go to the *Last of the Right Whales* website to obtain an educational copy of the film. (runtime|92 min)

For additional background on the documentary and on North Atlantic right whales see the *Last of the Right Whales* Discussion Guide here. In each lesson, sections of the guide pertinent to the lesson topic will also be referenced for educators and students to easily access and use throughout their learning journey.

If your students are interested in having their video review posted to the HitPlay YouTube channel, contact HitPlay Productions at info@hitplayproductions.ca. See the Media Literacy and Documentary Filmmaking Approaches lesson for more detail.

We look forward to hearing your voice in this important conversation!

U.S. Curriculum Overview

Last of the Right Whales touches on many diverse and highly relevant scientific, economic, geo-political, ethical, and artistic issues that touch upon these ideas:

ENDURING UNDERSTANDINGS

- Climate varies geographically through both natural and man-made processes.
- Human activities are impacting the climate system.
- Observations and modeling are used to understand the complex relationship between global warming and human activities.
- Earth's climate is influenced by interactions involving the sun, ocean, atmosphere, clouds, ice, land, and life.
- The ocean exerts a major influence on weather and climate.
- The ecosystems within the ocean and land are interdependent and reliant on one another.

DISCIPLINES AND STANDARDS

To allow for the greatest flexibility and creativity each lesson includes standards in the following areas:

Science:
Environmental Science (Regular/AP Level)
Biology (Regular/Honors/AP Levels)
Oceanography

- Aligned with Next Generation Science Standards (NGSS)

Social Sciences/Humanities:
The documentary and lessons are also highly relevant in English classrooms for debate, argument writing and position papers in the English classroom when studying nonfiction, journalism, and scientific accounts of world events.

- Aligned with Common Core - Speaking and Listening

Media/Media Literacy/Film Studies:
Given the use of different technology and the powerful use of visual imagery, the film can also be used as an example of the power of storytelling and how art influence ideas and advance policy changes.

- Aligned with International Society for Technology in Education (ISTE)

Lesson Roadmap:

Big Ideas & Essential Questions

CLIMATE CHANGE AND EFFECTS ON THE FOOD CHAIN

North Atlantic right whales eat zooplankton called copepods. The whales eat by filter feeding, which means they swim through the copepods with their mouths open and strain the animals through their baleen. Swimming like this takes a lot of energy, so the whales need to find very-dense patches of copepods in order to make the process of eating worth the effort. A right whale can eat as much as a billion copepods per day (1-2 tons). Some patches contain more than 300,000 copepods per cubic meter.

With climate change, however, food resources have been shifting in both distribution and quality. As sea surface temperatures warm, copepods are disappearing and/or shifting location, and the nutritive value of copepods are dropping in what used to be rich feeding grounds. Sea surface temperatures in the Gulf of Maine, a key right whale habitat, are warming 99% faster than sea surface temperatures in any other part of the world.[*] As a result, North Atlantic right whales are travelling farther north to feed in the Gulf of St. Lawrence.

North Atlantic right whales play a vital role in the marine ecosystems in which they live. They feed at the bottom and excrete feces at the surface. Whale feces put nutrients such as iron back into the sea. These nutrients are then eaten by smaller ocean creatures like phytoplankton, which help maintain ocean ecosystems and food webs. Research has shown that the decline in right whale populations has resulted in a decline in nutrient recycling.[**] Nutrient recycling is an important part of battling global warming, because phytoplankton consume carbon and release oxygen.

- Does the fact that right whales are baleen whales put them at an evolutionary disadvantage in terms of the effects of global warming on the food chain?
- What does the extinction of right whales mean for the ecosystems of the Atlantic coast?
- What would a resurgence in the right whale population mean for human efforts to reduce global warming?
- Earth's climate is influenced by interactions involving the Sun, ocean, atmosphere, clouds, ice, land, and life.
- The ocean exerts a major influence on weather and climate.
- The ecosystems within the ocean and land are interdependent and reliant on one another.

North Atlantic right whales eat zooplankton called copepods – as much as a billion copepods per day (1-2 tons). As sea surface temperatures warm, copepods are disappearing and shifting location, and the nutritive

* https://climate.nasa.gov/news/2798/watery-heatwave-cooks-the-gulf-of-maine/

** https://www.sciencedaily.com/releases/2015/10/151026172050.htm

HABITAT SHIFT & VESSEL STRIKES

value of copepods are dropping in what used to be rich feeding grounds, forcing right whales to move their feeding grounds north from the Bay of Fundy to the Gulf of St. Lawrence. As a result, right whales are now at greater risk of vessel strikes in a busy international shipping area and protection measures are being implemented to protect right whales in both Canada and the U.S.

- What are the connections and interrelationships between global warming, habitat shift, high rates of right whale mortality, fisheries, shipping-related industries, and individual/local/global employment?
- What are the effects of vessel speed restrictions on various stakeholders?

Although the move to the Gulf of St. Lawrence has placed North Atlantic right whales at greater risk, it's not just large shipping containers that are implicated in vessel strikes. Small vessels are responsible for many injuries and deaths.

- What is the effect of pleasure crafting, fishing, and tourism on North Atlantic right whales?
- What recommendations would you suggest to these sectors to prevent right whale deaths?

Speed restrictions are being used to reduce North Atlantic right whale mortality rates because using location-tagging technology on whales is not an option. First, subcutaneous tags that are embedded into whale blubber/muscle cause local swelling and could lead to infection; second, unintrusive tags that stick on the skin of the whale don't stay on for very long, so they would stop transmitting and wouldn't help notify vessel operators.

- What other kinds of technologies could be used to reduce vessel strikes?
- Is technology the answer to this problem? What other ideas come to mind?

Indigenous peoples across the globe share similar beliefs about the sentience of non-human animals. Animals are a part of creation, and humans are meant to care for creation. In Indigenous societies, animals are not seen as property, as they are in settler-colonial societies.

- What does it mean to co-exist with other species on the planet?
- What does it mean to lose an entire species?

REPRODUCTION & EXTINCTION

Fecal and blow studies have shown that entanglement causes right whales to produce stress hormones, causing long-term damage to the heart and immune system and making the animal more susceptible to disease. Entanglements also lead to problems with reproduction. Entangled juvenile whales lose an average 50% of their blubber and entangled adults lose about 17%, meaning that males aren't fit enough to compete for a mate. Healthy breeding-age females calve every 3-6 years, but research shows that females who survive entanglement can take more than 10 years between calves. 86% of all catalogued right whales have been entangled in fishing gear at least once (and some as many as seven times).*

* https://www.int-res.com/articles/meps_oa/m438p267.pdf

- How can we lessen the stress that right whales experience?
- What are the connections and interrelationships between entanglement, high rates of right whale mortality, fisheries, shipping-related industries, human consumption, market capitalism, and individual/local/global employment?

The American Psychiatric Association describes ecological grief as a growing threat to mental health, especially in younger generations and people who live close to the land.

- What are the intersections among climate change, species extinction, and mental health?
- How are governments and health-care systems responding to (or not responding to) the impacts of ecological grief? What does it mean to co-exist with other species on the planet? What does it mean to lose an entire species?
- Indigenous peoples across the globe share similar beliefs about the sentience of non-human animals. What is the impact of grief and loss on North Atlantic right whales? How might the death of calves and death of their relatives affect their health and ability to reproduce?

A higher calving rate in recent years has not resulted in an increase in the North Atlantic right whale population.

- When young/breeding females die from entanglements, or vessel strikes, or from not having enough food, what is the effect on long-term population numbers?
- What risks do calves, in particular, face?

ROPELESS FISHING GEAR

Entanglements occur throughout the North Atlantic right whale range and have been documented in waters off the southeast U.S. coast, mid-Atlantic, Gulf of Maine, and Gulf of St. Lawrence. Lobster and snow crab gear are the cause of most entanglements for right whales. In traditional crab or lobster fishing, vertical ropes (lines) hundreds of feet long connect traps on the seafloor to buoys at the surface, which allows fishers to locate their gear and haul it back up. Different types of ropeless or pop-up gear that allow fishers to release a line from the sea floor using an acoustic signal are currently in development. Challenges with gear mapping, the cost of transitioning, and questions about fisher safety remain. Ropeless gear is five times more expensive than fixed-line gear, but funding from the Department of Fisheries and Oceans has helped offset the cost to fishers.

- Are government subsidies enough to ensure that fishers embrace this new technology?
- What else is needed?
- What are the connections and interrelationships among ropeless gear, business, fisheries-related industries, whale conservation, and individual/local/global employment?

Some environmental organizations are asking that the snow crab and lobster fisheries be placed on the "red list" because fixed-line gear in those fisheries cause most entanglements.

- What role does human consumption/over-consumption of marine fishery resources play in right whale entanglements and deaths? Would you pay more to buy/eat fish if it would keep whales safe from entanglement?

WOMEN & EQUITY IN STEM

U.S. census data show that only 27% of the total STEM (science, technology, engineering, and math) workforce are women.* Yet, in Last of the Right Whales there are 12 women featured as central to the story—all working in STEM related positions including citizen scientists and as entanglement responders—making them the majority of characters in the documentary.

The STEM workforce is also not as diverse as it should be in some sectors and for some populations.** Women are over-represented in health care but under-represented in computing and engineering and communities. Black and Latino people are under-represented in STEM jobs across sectors and Asian people are over-represented across sectors. And although STEM workers tend to have a higher annual income than workers in other sectors, their findings show that pay gaps exist by gender, race, and ethnicity.***

U.S. College Board data show that students who study the arts have higher scores on standardized testing.**** Employers say they value employees with creativity, social skills, and versatile problem-solving skills, which an arts education helps develop. As a result, many educators are now discussing whether STEM should be changed to STEAM (science, technology, engineering, arts, and math).

- What are the systemic barriers that women, Black, Indigenous, and other communities of color experience that can be obstacles to entering STEM careers?
- What are the benefits of diversity in STEM?
- What changes can help increase equity within institutions so that structural and cultural barriers are removed?
- How might having a background in and appreciation for art and culture, the outdoors, or philosophy relate to having a successful career in STEM?

MEDIA LITERACY & DOCUMENTARY FILMMAKING APPROACHES

An "impact film" is a short or long film that aims to encourage the viewer to get involved and take action on a social issue. Unlike shorter films/videos in news media or online feature documentary films such as *Last of the Right Whales* are grounded in long-form storytelling and take the time to build empathy in the viewer.

- Why is building empathy key to inspiring people to engage and act?
- It is often said that societal change begins with the individual. How do the images and sounds in *Last of the Right Whales* connect to viewer emotions?

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* https://www.census.gov/library/stories/2021/01/women-making-gains-in-stem-occupations-but-still-underrepresented.html

** https://bluecharter.thecommonwealth.org/wp-content/uploads/2020/12/GenderEquityOceanSci_2020_10_24_CAB_DFO.pdf

*** https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

**** The Journal of Aesthetic Education, Vol. 34, No. 3/4, Special Issue: The Arts and Academic Achievement: What the Evidence Shows (Autumn - Winter, 2000), pp. 77-89.

- What film techniquesdoes director Nadine Pequeneza use to enhance audience engagement, reach our emotions, and stimulate our intellectual curiousity?
- What influence do you think documentary film can have on anindividual, community, and society?
- *Last of the Right Whales* uses ethical approaches to documentary filmmaking. Before starting her work, director Nadine Pequeneza obtained the necessary permits under the Species at Risk Act and the Endangered Species Act. Everyone involved with the film, from fishers to ocean scientists, were careful about maintaining distance and not harassing the whales. Director Nadine Pequeneza also made sure to work with research scientists and accredited ocean science organizations, so that all the information in the film is backed by their data and expertise.
    - Why are ethics and standards important in documentary filmmaking?
    - What influence does documentary film have on the individual, community, and society?

Last of the Right Whales Lesson Plan:

Climate Change and Effects on the Food Chain

OBJECTIVES

After this lesson, students will be able to:

- Identify the volume of copepods and zooplankton that right whales eat every day.
- Examine changes in right whale feeding patterns.
- Analyze differences between the weight and length of North Atlantic right whales and Southern right whales.
- Describe the function of baleen and the difference between baleen whales and toothed whales.
- Examine how changes in ocean acidity and temperature affect the food chain.

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film
- Equipment to view video content
- Handout: Film Quotations to Explore

VIDEO RESOURCES

- Meet Dr. Charles "Stormy" Mayo short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=S_WmOxTwQhc
- Meet Dr. Kimberley Davies short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=MalkEPD_YkE

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. Have students watch the Meet Dr. Charles "Stormy" Mayo short on the production company's YouTube channel: https://www.youtube.com/watch?v=S_WmOxTwQhc

   After they view the short, have students work individually to make predictions about the film (what they think the main themes, ideas, or story will be). Tell students to keep their list of predictions so they can use it in a Post-Viewing Activity.

2. Tell students that North Atlantic right whales weigh 25% less than Southern right whales, and that they are, on average, one meter shorter than Southern right whales. Have a large-group brainstorm session using the following prompt: Why do you think North Atlantic right whales are smaller and skinnier than Southern right whales? Assign a student as a note-taker on a flip chart, dry-erase white board, or chalkboard. Check the brainstormed ideas after watching the film as a Post-Viewing Activity, using information presented in the film.

3. Project the "Tracking Change in the Atlantic" infographic from the Fisheries and Oceans Canada website on a large screen or have students go to it on desktop devices. Ask students to examine it for 3–5 minutes, then have a large-group discussion using the following prompts:

   - What information stands out for you?
   - How do you think these changes contribute to the North Atlantic right whale being an endangered species?
   - What is the connection between higher acidity, habitat impacts, higher water temperatures, and shifting communities?
   - What are the connections and interrelationships between global warming, resource extraction industries, conservation, and individual/local/global employment?

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these three steps for students to complete:

1. Have students create a mind map to take notes on as they watch the film. The mind map should contain the following key words: issues, solutions, perspectives. Tell students to keep their mind maps to use in a Post-Viewing Activity. To get students started, use the following prompts:

   - What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?
   - How do the people in the film try to solve the problem/issue? Are they successful? Why or why not?
   - Whose perspectives are included in this film, and for what purpose? How would this story be different if told from the perspective of another character in the film?

PREPARING TO VIEW (cont'd)

2. The mind map should also include a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.

3. Immediately after the film concludes, have students jot down three questions for discussion that the film raises in their minds.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Ask students if the predictions they made in the Pre-Viewing Activities were correct. Have them give specific evidence from the film (facts revealed in images, text, dialogue, or voiceover) that supports or disproves their predictions.

2. Conduct a large-group discussion guided first by student questions written during the Viewing Activity. After fielding student questions, consider these discussion prompts to deepen understanding:

    - How does this film help you understand societal values and attitudes toward an issue at a particular point in time?
    - Before viewing this film, did whale conservation or oceans play a large part in your life? If yes, why? If no, why not? Will this change now that you have seen this film? In what way?
    - What changes do the characters in the film experience? What causes those changes? What are the consequences of those changes for the characters in the documentary?
    - What is the role of everyday citizens in right whale conservation?
    - What is the role of ethics and morals in everyday life? What are some of the ethical issues presented in this film?
    - What is the most interesting, surprising, or heartbreaking thing you learned while watching this film? How did the filmmaker show this?
    - How does this film encourage you to see the world differently?

3. Have students do some research and use information presented in the film to create an infographic or multimedia presentation focusing on the following questions:

    - What is baleen? How do baleen whales feed?
    - What are the differences between baleen whales and toothed whales?
    - What changes have occurred in the feeding patterns of right whales?

POST-VIEWING ACTIVITES (cont'd)

4. In small groups, have students plan a national and/or international campaign to persuade the governments of Canada and the U.S. to protect North Atlantic right whales in the face of climate change. Each group needs to show:

    - A timeline: campaign start/end, events, meetings, media, and other activities.
    - A plan for public education: what the group will do to help the public learn about the connections between right whales, climate change, and effects on the food chain.
    - A plan for meetings with politicians: who will the group meet with? How much emphasis should be placed on issues of sovereignty, relationships, and international law?
    - Some consideration of other stakeholders: who else will need to learn about the issues, and why? What effect will the campaign have on them?
    - A media plan: how will the group publicize the issue and promote meetings and event(s)?
    - Fundraising: Does the group need funds to accomplish certain tasks? How should funds be raised?
    - An end plan: What will the group's next steps be if the campaign does, or doesn't, succeed in creating change? Will the group monitor or get involved in the issues going forward?

CULMINATING ACTIVITY: Food, Feces, and the Ecosystem

Right whales eat zooplankton called copepods. The whales eat by filter feeding, which means they swim through the copepods with their mouths open and strain the animals through their baleen. Swimming like this takes a lot of energy, so the whales need to find super-dense patches of copepods in order to make the process of eating worth the effort. A right whale can eat as much as a billion copepods per day (1-2 tonnes). Some patches contain more than 300,000 copepods per cubic meter. With climate change, however, food resources have been shifting in both distribution and quality. As sea surface temperatures warm, copepods are disappearing and/or shifting location, and the nutritive value of copepods are dropping in what used to be rich feeding grounds. Sea surface temperatures in the Gulf of Maine, a key right whale habitat, are warming 99% faster than sea surface temperatures in any other part of the world. As a result, North Atlantic right whales are travelling farther north to feed in the Gulf of St. Lawrence. (Kim Davies, Associate Professor of Biological Oceanography at the University of New Brunswick and lead at the Davies Lab, explains this shift in habitat in a short video on HitPlay Productions' YouTube channel.

Right whales play a vital role in the marine ecosystems in which they live. They feed at the bottom and then poop at the surface. Scientists who have seen and smelled whale poop say it's really strong and smells like fish! When whales poop, they put nutrients such as iron back into the sea. These nutrients are then eaten by smaller ocean creatures like phytoplankton, which helps maintain ocean ecosystems and food webs. Research has shown that the decline in right whales has resulted in a decline in nutrient recycling. Nutrient recycling is an important part of battling global warming, because phytoplankton consume carbon and release oxygen.

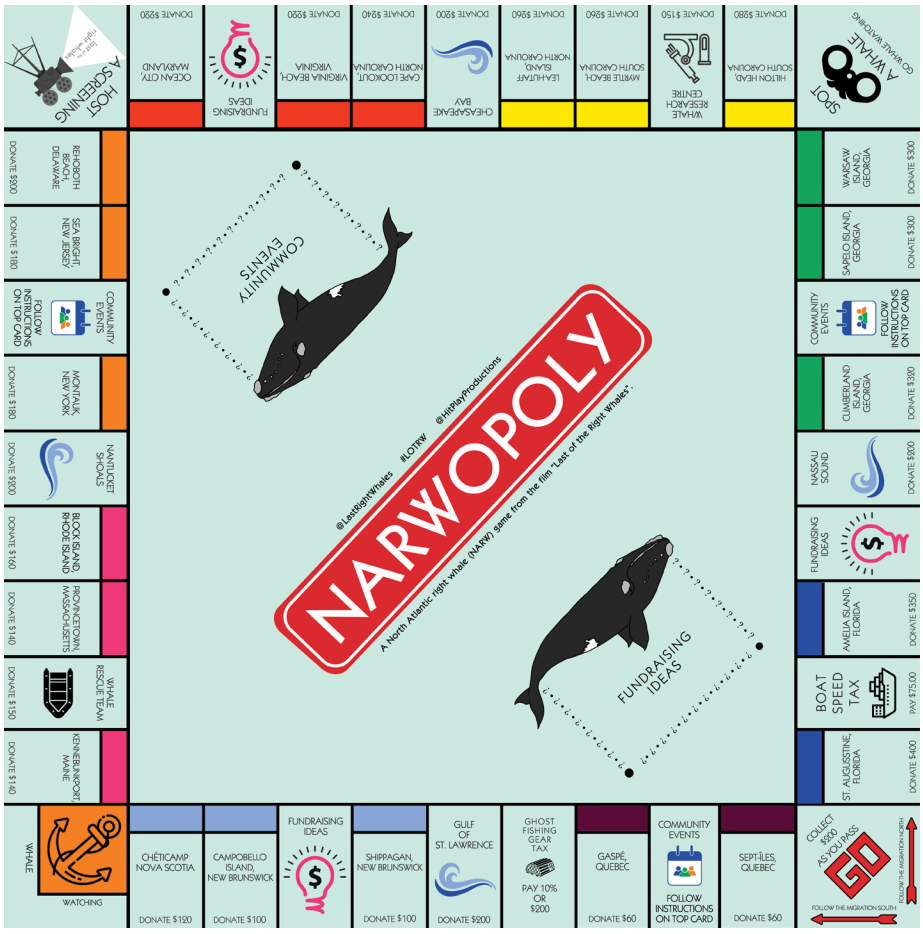
CULMINATING ACTIVITY (cont'd)

For your assignment, you will create a board game showing the following:

- The effects of climate change on Atlantic ocean ecosystems from the Gulf of St. Lawrence to the Gulf of Mexico
- Changes to North Atlantic right whale feeding grounds
- Changes to various regional ecosystems in the right whale range
- The effect on ocean ecosystems when right whales are present
- The effect on ocean ecosystems if right whales go extinct
- The effect on right whales and ocean ecosystems if global warming is halted

Your board game can take any format that makes sense to you (e.g., snakes and ladders style, Monopoly-style cards…), but it must include characters, information, and scenarios presented in the film. You can also do some outside research. Be as creative as possible! Your game moves/questions/scenarios should show connections, relationships, what happens when right whales are present or missing, and what will happen if people change their lifestyles to reduce greenhouse gas emissions.

An example from HitPlay Productions:



HANDOUT: FILM QUOTATIONS TO EXPLORE

"We've got to understand these animals in context. These whales are not floating in space. They're living in an ecosystem. The baseline of this system is changing. It's always changed. It's never been static, but now it's changing with such rapidity that things like evolution can't catch up. If the whales lose the plankton, they're not going to evolve with different baleen that allows them to feed on fish. They're dead."
— Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

"I've seen a lot of very skinny North Atlantic right whales."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"The reason why North Atlantic right whales have a body condition deficit is twofold. The basis of it, for sure, is they need more food to eat, and with climate change, there's been a wholesale change in the availability of the food, but the second side of it is the energetic costs of entanglement."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"Give nature a chance, and it will come right back."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"This system has changed. The richness has declined. Who speaks for the clams, who now are many fewer than they once were? Or the terns? The whales speak for them."
— Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

"The story of the North Atlantic right whale, it's symbolic of the human crisis with nature as a whole, right now. We are pushing, our activities are pushing, this species to the brink of extinction. But we know exactly what we need to do to stop it. It's in our power to stop it. We know what needs to be done. And that is, at the same time, the story of global warming and resource degradation."
— Tom Cheney, Conservation Writer

RUBRIC: Grades 9-12
Food, Feces, and the Ecosystem

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge and skills to new contexts with limited effectiveness	Transfers knowledge and skills to new contexts with some effectiveness	Transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12

Grades 9-12 NGSS

HS-Weather and Climate

HS-LS2: Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-6, HS-LS2-7, HS-LS2-8

HS-LS4: Biological Evolution: Unity and Diversity

HS-LS4-2, LS4-3, HS-LS4-5

HE-ESS3: Earth and Human Activity

Last of the Right Whales Lesson Plan:

Habitat Shift and Vessel Strikes

OBJECTIVES

After this lesson, students will be able to:

- Explain why global warming has forced North Atlantic right whales to move their feeding grounds from the Bay of Fundy to the Gulf of St. Lawrence.
- Analyze the impacts of habitat shift on the right whale population.
- Examine the types of vessels that injure/kill right whales.
- Describe the protection measures being implemented to protect right whales.
- Identify and interpret the effect of vessel speed restrictions on various stakeholders.

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film.
- Equipment to view video shorts and featurettes
- Handout: Film Quotations to Explore

RESOURCES

- Meet Dr. Moira Brown short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=4Ky_JxwqIrI
- Delivering Antibiotics to North Atlantic Right Whales short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=jTH9OTwsOro
- The Canary Calf short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=8u3u8nXE4kQ
- "Compliance Guide for Right Whale Ship Strike Reduction Rule" infographic, National Oceanic and Atmospheric Administration
- "North Atlantic Right Whales – 2021 Vessel Traffic Management Measures," Transport Canada
- "Reducing Vessel Strikes to North Atlantic Right Whales," National Oceanic and Atmospheric Administration

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. Have students watch the Meet Dr. Moira Brown short on the production company's YouTube channel.

   After they view the short, have students work individually to write down 2-3 questions they have about the film, about Dr. Moira Brown's work, or about habitat shift and global warming.

   Have students to keep their list of questions so they can use it in a Viewing Activity

2. Display the "Compliance Guide for Right Whale Ship Strike Reduction Rule" infographic from the National Oceanic and Atmospheric Administration website and/or the "Speed Restriction Measures in the Gulf of St. Lawrence" infographic from the Transport Canada website on a large screen or have students go to it/them on desktop devices.

   Ask students to examine and analyze the infographic(s) to prepare for a large-group discussion using the following prompts:

   - What information stands out for you?
   - How might these speed restrictions prevent vessel strikes in North Atlantic right whale habitat?
   - What are the challenges posed by adopting speed restrictions? What are the benefits?
   - What are the connections and interrelationships between global warming, habitat shift, high rates of right whale mortality, speed restrictions, fisheries and shipping-related industries, and individual/local/global employment?

3. Have students watch the Delivering Antibiotics to North Atlantic Right Whales featurette on the production company's YouTube channel. After viewing, ask students to write a one-paragraph response to one of the following prompts, then engage a large-group discussion or a Think-Pair-Share:

   - Should recreational boating be banned from right whale habitats?
   - What is the connection between consumer culture, global trade, and right whale mortality?

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these four steps for students to complete:

1. As they watch the film, ask students to jot down notes that answer their list of questions (from the Pre-Viewing Activity) about global warming, habitat shift, and Dr. Moira Brown's work.

2. Ask students to create a mind map as they watch the film. The mind map should contain the following key words: issues, solutions, perspectives.

PREPARING TO VIEW (cont'd)

Tell students to keep their mind maps to use in the Culminating Activity. To get students started, use the following prompts:

- What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?
- How do the people in the film try to solve the problem/issue? Are they successful? Why or why not?
- Whose perspectives are included in this film, and for what purpose? How would this story be different if told from the perspective of another character in the film?

2. Ask students to create a mind map as they watch the film. It should contain the following key words: issues, solutions, perspectives. Tell students to keep their mind maps to use in a Post-Viewing Activity.

3. Ask students to jot down a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.

4. Immediately after the film concludes, have students jot down three questions for discussion that the film raises in their minds.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Conduct a large-group discussion guided by student questions written during the Viewing Activity. After fielding student questions, consider these discussion prompts to deepen understanding:
   - Before viewing this film, did whale conservation or oceans play a large part in your life? If yes, why? If no, why not? Will this change now that you have seen this film? In what way?
   - What changes do the characters in the film experience? What causes those changes? What are the consequences of those changes for the characters in the documentary?
   - What is the role of everyday citizens in right whale conservation?
   - When people learn about North Atlantic right whales and vessel strikes, they often ask why conservation organizations don't just tag the whales, so fishers, recreational boaters, and container ships know where the whales are and can avoid them. Why do you think that speed restrictions are used to reduce right whale mortality rates, instead of tagging the whales in an effort to avoid vessel strikes? (Answers could include: because subcutaneous tags that are embedded into whale blubber/muscle cause local swelling and could lead to infection; and unintrusive tags that stick on the skin of the whale don't stay on for very long, so would stop transmitting/wouldn't help notify vessel operators)
   - How does this film help you understand societal values and attitudes toward an issue at a particular point in time?

POST-VIEWING ACTIVITES (cont'd)

- The American Psychiatric Association says that ecological grief is a growing threat to mental health globally. What does it mean to co-exist with other species on the planet? What does it mean to lose an entire species?
- What is the most interesting, surprising, or heartbreaking thing you learned while watching this film? How did the filmmaker show this?

2. Have students do some research and use information presented in the film to create an infographic or slide presentation focusing on the following questions:
    - How does global warming connect to habitat shift?
    - What kind of vessels cause injury or death of North Atlantic right whales?
    - Why does reducing the speed of vessels reduce the frequency/severity of vessel strikes?
    - What other dangers do right whales encounter in their feeding areas, calving grounds, and along their migratory route?

3. Have students watch The Canary Calf featurette on the HitPlays's YouTube channel. After viewing, have a large-group discussion using the following prompt:
    - Is the Canary Calf lost? An orphan? Or adapting to climate change by shifting its habitat?
    - What information or evidence from the film are you using to back up your thinking?

4. Distribute the ***Handout: Film Quotations to Explore***. Have students work in pairs to discuss the ideas in the quotations and share their conclusions with the large group. As they discuss the quotations, ask students to think about the following
    - Whose story is told in this film? Whose story is not told? How does this story, and the way it is told, help you understand your own role in North Atlantic right whale conservation?
    - What changes do the subjects of the film experience? What causes those changes? What are the consequences of those changes?

5. Tell students that research conducted by the Intergovernmental Panel on Climate Change (IPCC) shows that ecosystems are moving in response to climate change. Many species of plants and animals are also shifting their range, but migration into new territory is often difficult or impossible due to human activity. Have students read the article "2017–2022 North Atlantic Right Whale Unusual Mortality Event" on the National Oceanic and Atmospheric Administration website and visit the map that shows the locations where dead right whales have appeared.

    Ask students to conduct research and complete a mapping exercise:
    - Plot the movement of North Atlantic plankton communities
    - Plot the movement of North Atlantic right whales
    - Overlay/compare the above to the NOAA's map of dead right whales

    After completing this exercise, have students reflect on their process by writing a one-page response to their maps that includes the following:
    - A prediction as to what the data will show in another decade if (a) vessel strikes and global warming continues, and (b) speed restrictions and seasonal fishery closures

POST-VIEWING ACTIVITES (cont'd)

(cont'd) reduce strikes and the global community reduces greenhouse gas emissions and keeps global warming below 1.5-2 degrees.

CULMINATING ACTIVITY: TRI-PARTITE MEETING AGENDA

Collisions with fast-moving large ships are almost always lethal to right whales, but small vessels can also seriously injure or kill. This is one of the reasons that federal law prohibits approaching whales closer than 500 yards in U.S waters (100 metres in Canada). In April 2022, Fisheries and Oceans Canada announced temporary fishing area closures in the Gulf of St. Lawrence, the Bay of Fundy, and other critical habitat areas for North Atlantic right whales. These seasonal closures aim to protect right whales as the endangered animals migrate into Canadian waters. Transport Canada also says it will enforce speed restrictions for vessels over 13 metres long throughout much of the Gulf of St. Lawrence.

For your assignment, you will create a tri-partite meeting agenda between Canada, the United States, and Indigenous peoples living in what is now called Canada and the U.S. Your meeting agenda will focus on temporary, seasonal, and permanent measures to prevent North Atlantic right whale mortality in both U.S. and Canadian waters. Alongside the agenda, include a short writeup explaining why you made the choices that appear on your agenda. Your agenda and/or writeup should include:

- Title/theme of the meeting: What is the focus, and what will you discuss? (Use the mind map you created in the Viewing Activity to help with this part.)
- Stakeholders: Who will attend? What are their roles and/or interest in these matters?
- Meeting location: Where will the meeting be held? Who will host? Why does this matter?
- Types of measures: What measures are being proposed for implementation? Which ones are temporary? Which are seasonal? Which are permanent?
- Length: How many minutes/hours/days will you need for each agenda item?
- Facilitation: Who will facilitate the discussion and play timekeeper?
- Dates and locations: When will the measures start and end? Where will they be applied? (Take a look at the NOAA document "Reducing Vessel Strikes to North Atlantic Right Whales" and the Transport Canada document "Speed Restriction Measures in the Gulf of St. Lawrence" to see how they use dates and locations.)
- Agreement: How will you come to an agreement? Will you use majority vote, consensus, or an other type of agreement?
- Renegotiation: What provisions will you discuss to decide how the agreement might be amended, updated, or replaced?
- Cross-border issues: What is the role of environmental law, international law, and Indigenous/treaty law in the measures to protect North Atlantic right whales? Will you discuss how to take these measures and make them legally binding regulations?

Be creative! Imagine yourself as an attendee at the meeting, and ask yourself what you would need to know, learn, and discuss in order to make the best prevention/conservation decisions. Use what you've learned from the film and conduct some independent research to help you compose your tri-partite agenda.

HANDOUT: FILM QUOTATIONS TO EXPLORE

"If such animals were dying a slow death in an urban setting, the consumers that were at the basis of the demand that led to that happening would not tolerate it. None of us would tolerate what's going on out there if we knew enough about it."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"When I was maybe eight, my parents and my grandparents brought me to an island in the Bay of Fundy called Grand Manan, and we were surrounded by, like, 40 right whales, you know, surface-active groups, and at the time, I was just like... Then when I started working as a whale-watching guide in my early 20s, it was at that kind of initial stages of those first years where they weren't showing up anymore. They were instead bypassing the Bay of Fundy, and they were going to the Gulf of St. Lawrence."
— Nick Hawkins, Wildlife Photographer and Cinematographer

"Our impact as humans on the world is totally… wrong. They travel the world, they see things we don't see. I think that's something that we as people need to get more in contact with."
— Blake Hall, Recreational Fisher

"Unfortunately, a lot of the necropsies I've done have been really young animals, two years or less... and all of those animals have been human-impact deaths, but I think that 3560's calf was the youngest of those that I had necropsied, about five or six months, at that point."
— Sarah Sharp, Veterinarian, IFAW

RUBRIC: Grades 9-12
Tri-Partite Meeting Agenda

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge and skills to new contexts with limited effectiveness	Transfers knowledge and skills to new contexts with some effectiveness	Transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.1
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.2
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.8

Grades 9-12 NGSS

HS: Weather and Climate

HS: Interdependent Relationships in Ecosystems

HS-LS2-6, HS-LS2-8

HE-ESS3: Earth and Human Activity

Last of the Right Whales Lesson Plan:
Reproduction and Extinction

OBJECTIVES

After this lesson, students will be able to:

- identify the reasons behind elevated mortality in the North Atlantic right whale population.
- explain the effects of climate change, entanglement, and vessel strikes on right whale reproduction.
- analyze the reasons why a higher calving rate has not resulted in an increase in right whale population.
- describe "regime shift" and analyze its effect on right whale population and calving rates.
- examine the effects of extinction on the human world and the natural world.

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film.
- Equipment to view video shorts and featurettes
- Handout: KWL Chart
- Handout: Film Quotations to Explore

RESOURCES

- Meet Dr. Kimberley Davies short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=MalkEPD_YkE
- Meet Gina Lonati, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=m15xfMD_Lsc
- Meet North Atlantic Right Whale 4615, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=CddjGHAJNrk
- Historical Calving Rates, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=T-tdqjkXSvM

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. Have students watch the Meet North Atlantic Right Whale 4615 short on HitPlay's YouTube channel.

   After they view the short, have students work individually to make predictions about the film (what they think the main themes, ideas, or story will be). Tell students to keep their list of predictions so they can use it in a Post-Viewing Activity.

2. Distribute the ***Handout: KWL Chart***. Ask students to fill in the K and W columns of the chart before they view the film. They can also add to the chart as they watch the film. Tell students to keep their KWL chart so they can fill in the L column as a Post-Viewing Activity.

3. Display the "Ocean Regime Shift is Driving Collapse of the North Atlantic Right Whale Population" infographic from Research Gate on a large screen or have students go to it on desktop devices. Ask students examine and analyze the infographic to prepare for a large-group discussion using the following prompts:

   - What information stands out for you?
   - What are the differences between the 2009 and the 2019 data?
   - What are the connections among mortality rates, calving rates, climate change, habitat (Gulf of St. Lawrence and Gulf of Mexico), and feeding patterns? How do they connect?
   - What is the graph on the bottom of the infographic telling you about the mortality rate, the calving rate, and survival of the species?

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these three steps for students to complete:

1. Ask students to create a mind map as they watch the film. The mind map should contain the following key words: issues, solutions, perspectives. Tell students to keep their mind maps to use in the Culminating Activity. To get students started, use the following prompts:

   - What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?
   - How do the people in the film try to solve the problem/issue? Are they successful? Why or why not?
   - Whose perspectives are included in this film, and for what purpose? How would this story be different if told from the perspective of another character in the film?

2. Ask students to jot down a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.

PREPARING TO VIEW (cont'd)

3. Have students jot down three questions for discussion that the film raises in their minds.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Have students watch the Historical Calving Rates featurette and the Meet Dr. Kimberley Davies short on the production company's YouTube channel.

   After viewing, ask students to work individually to research and write an essay OR create a multimedia presentation focusing on the following questions:

   - What changes have occurred in right whale distribution in the southeastern U.S. and the Gulf of St. Lawrence in Canada?
   - How does regime shift affect mortality rates and calving rates?
   - How do different types of law – such as international law, environmental law, and Indigenous/treaty law – factor into creating cross-border solutions to these issues?

2. Copy-paste and print several of the quotations from the ***Handout: Film Quotations to Explore*** section on individual sheets of paper. Have students work in pairs to discuss the ideas in the quotations. Then ask each pair to share their conclusions with the large group. As they discuss the quotations, ask students to think about the following:

   - Whose story is told in this film? Whose story is not told?
   - How does this story, and the way it is told, help you think differently about your own community/life?
   - What changes do the subjects of the film experience? What causes those changes? What are the consequences of those changes?

3. Have students watch the Meet Gina Lonati short on HitPlay Productions' YouTube channel. After they view the short, conduct a large-group discussion using the following prompts:

   - Why do you think the filmmaker decided not to use this clip in the film? What decisions does a documentary film director need to make in order to balance factual information and storytelling?
   - How does this short help you understand the impact of technology on conservation and research occupations?
   - How does this short give you deeper insight into the effects of entanglement and other stressors on the right whale population? What does temperature indicate about mammalian health?

4. Conduct a large-group discussion guided by student questions written during the Viewing Activity.

   After fielding student questions, consider these discussion prompts to deepen understanding:

POST-VIEWING ACTIVITES (cont'd)

- When young/breeding females die from entanglements or vessel strikes, what is the effect on long-term population numbers?
- How does this film help you understand societal values and attitudes toward an issue at a particular point in time?
- Before viewing this film, did whale conservation or oceans play a large part in your life? If yes, why? If no, why not? Will this change now that you have seen this film? In what way?
- What is the role of everyday citizens in right whale conservation?
- What changes do the characters in the film experience? What causes those changes? What are the consequences of those changes for the characters in the documentary?
- What is the most interesting, surprising, or heartbreaking thing you learned while watching this film? How did the filmmaker show this?

5. Ask students if the predictions they made in the Meet North Atlantic Right Whale 4615 Pre-Viewing Activity were correct. Have them give specific evidence from the film (facts revealed in images, text, dialogue, or voiceover) that supports or disproves their prediction.

CULMINATING ACTIVITY: Ecological Grief and the Future

Entanglements, vessel strikes, and global warming are the biggest threats to North Atlantic right whales. The population is in decline due to a reduction in food sources and an increase in toxic stress. But scientists agree that population numbers can recover if right whales get immediate relief from these pressures. Right whales are long-lived and have prolonged reproductive capabilities.

A powerful and effective way to communicate a story alongside a feature documentary is through creating a podcast. There are many fantastic podcast apps and websites to help students curate their story, compile data, organize a storytelling arch, and communicate their message. For your assignment, you will use outside research and the information presented in the film to create a podcast about ecological grief as it relates to North Atlantic right whale reproduction and extinction.

The American Psychiatric Association describes ecological grief as a growing threat to mental health, especially in younger generations and people who live close to the land. Start with (but don't limit yourself to) the following articles:

- "Generation Climate Change: Growing Up With Ecological Grief and Anxiety," from the American Psychiatric Association website
- "Ecological Grief and Anxiety: The Start of a Healthy Response to Climate Change?" from the Lancet
- "Ecological Grief: The Mental Toll of the Climate Emergency," from the Canadian Climate Institute website

Make sure your podcast covers the following points and/or includes:

- the intersections among climate change, species extinction, and mental health

CULMINATING ACTIVITY (cont'd)

- the impact of ecological grief on human mental and physical health
- the impact of grief and loss on North Atlantic right whales (per volunteer sighter Lily Pinkham's comment about the effect that calf deaths might have on the mother whale)
- how governments and health-care systems are responding to (or not responding to) the impacts of ecological grief
- the impacts of ecological grief on your life, your family's life, or the life of your community: will your grief spur you to action or prevent you from taking action?
- information on the measures being taken to halt the extinction of the North Atlantic right whale
- an interview with a guest and/or an audio clip and/or a text excerpt you can play/read during your podcast
- information on the measures being taken to halt the extinction of the North Atlantic right whale
- source information for any research, quotes, clips, or excerpts
- how ecological grief might affect future generations

ADDITIONAL LEARNING

"Ocean Regime Shift is Driving Collapse of the North Atlantic Right Whale Population" infographic, Research Gate: https://www.researchgate.net/figure/Infographic-reviewing-the-impacts-of-changing-ocean-conditions-on-the-right-whale_fig2_354289168

"Generation Climate Change: Growing Up With Ecological Grief and Anxiety," American Psychiatric Association: https://psychnews.psychiatryonline.org/doi/full/10.1176/appi.pn.2021.6.20

"Ecological Grief and Anxiety: The Start of a Healthy Response to Climate Change?", The Lancet: https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30144-3/fulltext

"Ecological Grief: The Mental Toll of the Climate Emergency," Canadian Climate Institute: https://climateinstitute.ca/ecological-grief/

HANDOUT: KWL Chart

	KNOW	***WANT TO KNOW***	***LEARNED***
WHALES			
CALVES/ REPRODUCTION			
DEATHS/ EXTINCTION			

HANDOUT: FILM QUOTATIONS TO EXPLORE

"We should leave no trace, and the traces that we do leave should be good ones, and we're certainly not doing that with this species."
— Barb Zoodsma, NOAA Right Whale Recovery

"The right whales are very much a metaphor, really, for the sea, and their decline tells us what is happening to this ocean."
— Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

"This is actually one of the top five females in the whole population, so she's had eight calves in the last 30 years or so."
— Nick Hawkins, Wildlife Photographer and Cinematographer

"Not only do you have to stop killing them, you also have to give them a chance to reproduce and successfully rear calves."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

RUBRIC: Grades 9-12
Ecological Grief and the Future

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge/ skills to new contexts with limited effectiveness	Transfers knowledge/ skills to new contexts with some effectiveness	Transfers knowledge/ skills to new contexts with considerable effectiveness	Transfers knowledge/ skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.1
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.2
- English Language Arts Standards » Writing » CCSS.ELA-LITERACY.W.9-10.8

Grades 9-12 NGSS

HS - Weather and Climate

HS - Interdependent Relationships in Ecosystems

HS-LS2-6, HS-LS2-8

HS-LS1-2 From Molecules to Organisms: Structures and Processes

HS-LS2-8 Interdependent Relationships in Ecosystems

HS-LS4-5 Biological Evolution: Unity and Diversity

ISTE Standards For Educators

- 5a-Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.
- 5b-Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.
- 6c-Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.

ISTE Standards For Education Leaders

- 1c- Model digital citizenship by critically evaluating online resources, engaging in civil discourse online and using digital tools to contribute to positive social change.
- 1d-Cultivate responsible online behavior, including the safe, ethical and legal use of technology.
- 3e-Develop learning assessments that provide a personalized, actionable view of student progress in real time.

Last of the Right Whales Lesson Plan:
Ropeless Fishing Gear

OBJECTIVES

After this lesson, students will be able to:

- Describe how/why fixed-gear fisheries equipment leads to whale entanglements
- Explain how ropeless gear would reduce entanglements
- Identify different types of ropeless gear currently in development
- Analyze gear location technology
- Examine whether the snow crab and lobster fisheries should be placed on the "red list"
- Identify and interpret the impacts of ropeless gear for various stakeholders

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film.
- Equipment to view video shorts and featurettes
- Handout: KWL Chart
- Handout: Film Quotations to Explore

RESOURCES

- Meet Martin Noël, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=QXaE_jSVWWU
- "On Demand Fishing Gear" infographic, Ropeless Consortium: https://ropeless.org/
- "Pop-Up Pots and the Search for 'Whale-Safe' Gear," National Fisherman: https://www.nationalfisherman.com/boats-gear/pop-up-pots-and-the-search-for-whale-safe-gear
- "Lobsters and Right Whales are on a Climate-Driven Collision Course," Sustainable Fisheries: https://sustainablefisheries-uw.org/right-whales-lobster-climate-change/
- "NRDC Supports Seafood Watch Move to 'Red List' American Lobster and Snow Crab," Natural Resources Defense Council: https://www.nrdc.org/experts/francine-kershaw/nrdc-supports-seafood-watch-move-red-list

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. Have students watch the Meet Martin Noël short on HitPlay Productions' YouTube channel. After they view the short, have students work individually to write down 2–3 questions they have about the film or about the fisheries technology Martin Noël is testing. Tell students to keep their list of questions so they can use it in a Viewing Activity.

2. Distribute the ***Handout: KWL Chart***. Have students to fill in the K and W columns of the chart before the film. They can also add to the chart as they watch the film. Tell students to keep their KWL chart so they can fill in the L column as a Post-Viewing Activity.

3. Next, project the Ropeless Consortium website on a large screen or have students go to it on desktop devices and then connect to the link for the On Demand Fishing Gear Information Graphic. Have students examine the infographic and prepare for a large group discussion using these prompts:
    - What information stands out for you?
    - How will ropeless gear contribute to the conservation and sustainable use of ocean resources?
    - What are the challenges posed by adopting ropeless gear? What are the benefits?
    - What are the connections and interrelationships between ropeless gear, business, fisheries-related industries, environmental concerns, and individual/local/global employment?

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these five steps for students to complete:

1. As they watch the film, ask students to jot down notes that answer or are related to their list of questions (from the Pre-Viewing Activity) regarding fixed gear, ropeless gear, and Martin Noël's experiences testing ropeless gear.

2. Ask students to create a mind map as they watch the film. The mind map should contain the following key words: issues, solutions, perspectives. Tell students to keep their mind maps to use in a Post-Viewing Activity.
    - What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?
    - How do the people in the film try to solve the problem/issue? Are they successful? Why or why not?
    - Whose perspectives are included in this film, and for what purpose? How would this story be different if told from the perspective of another character in the film?

PREPARING TO VIEW (cont'd)

3. Ask students to jot down a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.

4. Ask students to create a list of stakeholders as they watch the film (examples could include fishers, local communities, research scientists, conservation groups, government and other regulators, underwater technology companies, North Atlantic right whales, and humankind). Tell them to keep their list so they can use it in a Post-Viewing Activity.

5. Immediately after the film concludes, have students jot down three questions for discussion that the film raises in their minds.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Copy-paste and print several of the quotations from the ***Handout: Film Quotations to Explore*** on individual sheets of paper. Have students work in pairs to discuss the ideas in the quotations. Then ask each pair to share their conclusions with the large group. As they discuss the quotations, ask students to think about the following:

    - Whose story is told in this film? Whose story is not told? How does this story, and the way it is told, help you understand your own community/life?
    - What changes do the subjects of the film experience? What causes those changes? What are the consequences of those changes?

2. Have students research and write an essay OR create a multimedia presentation focusing on the following questions:

    - What are the challenges and opportunities involved in making ropeless fishing legal in both the United States and Canada?
    - How do different types of law – such as international law, environmental law, and Indigenous/treaty law – factor into this work?

3. Have students read the following articles/letter on the Sustainable Fisheries website and the Natural Resources Defense Council website:

    - "Lobsters and Right Whales are on a Climate-Driven Collision Course"
    - "NRDC Supports Seafood Watch Move to 'Red List' American Lobster and Snow Crab"
    - NRDC Letter to Seafood Watch

    Ask students to write their own letter to Seafood Watch, stating whether or not they support lobster and snow crab being moved to red list status. Have them detail the reasoning behind their thinking, making sure to reference information presented in the film and the Fisheries and NRDC articles.

POST-VIEWING ACTIVITIES (cont'd)

4. Ask students to read the "Pop-Up Pots and the Search for 'Whale-Safe' Gear" article on the National Fisherman website. Have students engage in a lightning debate on the statement "Ropeless gear should be adopted immediately," using the following steps:

    - Have students work in partners to prepare a pros and cons graphic organizer using specific information from the article and the film (using the mind map they created as a Viewing Activity and/or the list of stakeholders they created as a Viewing Activity). Make sure each student creates their own copy of the organizer.
    - Ask students to work together to choose which one of them will argue the pros and which one of them will argue the cons.
    - Have each partner research ropeless gear and whale conservation using one additional article or scientific paper that they keep secret from their partner. Tell students they will use this independent research to surprise or outdo their partner in debate.
    - Line up desks/chairs in single rows, face to face. Tell students they are free to hold on to the pros and cons graphic organizer, their independent research notes, and a blank piece of paper so they can jot down notes during the debate.
    - Each partnership will have 3 minutes to debate the issue, using the following format:

        Partner 1: 1-minute opening
        Partner 2: 30-second rebuttal
        Partner 2: 1-minute opening
        Partner 1: 30-second rebuttal
        Partner 1: 30-second closing
        Partner 2: 30-second closing

    Before the debate starts, teachers can model a lightning debate by challenging a volunteer student or a co-teaching colleague (no notes or research will be used).

    - After each partnership finishes, have students immediately vote for the winner using hands, poll technology, or colour-coded cards created before the debate.
    - After the debate, ask students to fill out a self-assessment form so they can reflect on their arguments and rebuttals during the debate.

CULMINATING ACTIVITY: Ropeless Gear & Location Technology

Entanglement happens when ropes ("lines"), netting, or other human-made materials wrap around the body of a whale. The lines get caught in a whale's mouth or wrap around their flippers or tail as they move through the water. The ropes then cut into the skin, causing significant injuries, amputations, and infection. Whales can carry heavy gear around for months, and because the gear prevents them from moving and feeding freely, they gradually die of starvation, drowning, or infection. Even if whales manage to disentangle themselves (or are disentangled by human rescuers), fecal and blow studies have shown that the experience causes the whales to produce stress hormones, causing long-term damage to the heart and immune system and making the animal more susceptible to disease. Entanglements also lead to problems with reproduction. Entangled juvenile whales lose an average 50% of their blubber and entangled adults lose about 17%, meaning that males aren't fit enough to compete for a mate. Healthy breeding-age females calve every 3–6 years, but research shows that females who survive entanglement can take more than 10 years between calves. Scientists say that 86% of all catalogued right whales have been entangled in fishing gear at least once (and some as many as seven times). Entanglements occur throughout the right whales' range and have been documented in waters off the southeast U.S. coast, mid-Atlantic, Gulf of Maine, and Gulf of St. Lawrence. Lobster and snow crab gear lead to most entanglements for North Atlantic right whales. In traditional crab or lobster pots, vertical ropes (lines) hundreds of feet long connect traps on the seafloor to buoys at the surface, which allows fishers to locate their gear and haul it back up.

New technologies are now being tested to prevent right whale entanglements. For your assignment, you will conduct in-depth research on how ropeless gear, gear location, and gear mapping technologies work, making sure to research the following engineering and technology companies: EdgeTech, Desert Star Systems, FioMarine, Jasco-Smelts, and Ashored. You must also include research from federal government sources including (but not limited to) the National Oceanic and Atmospheric Administration and Fisheries and Oceans Canada.

You will compile your research to create a written essay OR slide presentation, using the thesis, anti-thesis, and synthesis format. Your essay/presentation must include:

- information about buoy and line alternatives
- information on the differing gear location and gear mapping technologies and how they work
- visuals (images or drawings)
- citations/sources for images, quotes, and research information
- government regulations/requirements for snow crab and lobster fisheries, and how ropeless technology fits into or addresses these regulations/requirements
- challenges and benefits of ropeless technology for fishers, the fisheries industry, whales, government departments, and the environment
- a concluding paragraph or statement that identifies the best ropeless technology, based on evidence you have included in your essay/presentation

Bonus Points: If you can invent another form of ropeless gear, gear location, and/or gear mapping technology, include it in your report for bonus points.

HANDOUT: KWL Chart

	KNOW	WANT TO KNOW	LEARNED
WHALES			
FISHERIES			
RESEARCH			
HOW TO HELP			

HANDOUT: FILM QUOTATIONS TO EXPLORE

"This is one of the greatest animal ethical issues of our time. The fact that there's these, you know, highly intelligent animals out there, that have a high capacity to feel pain, suffering for months, years."
— Nick Hawkins, Wildlife Photographer and Cinematographer

"We haven't found a way yet to co-exist."
— Nick Hawkins, Wildlife Photographer and Cinematographer

"Once that rope tightens, their movements can work that polypropylene rope like a steel wire saw, and it cuts into flesh. Amputations are not uncommon. Flippers, pectoral fins, flukes… If it does lose the entire tail, the animal will die."
— Nick Hawkins, Wildlife Photographer and Cinematographer

"There's not a lot of places left to fish. Everybody is going there. June 30th is the last day. We won't have another chance."
— Martin Noël, Crab Fisher (translated from French)

"Yeah, we need to protect the whales, but a lot of people are working at shore, and are depending on this industry."
— Martin Noël, Crab Fisher

"We are the first ones that are touched by those closures, so we have to be part of the solution."
— Martin Noël, Crab Fisher

"If we demand that these products are caught in an ethical way, i.e., no rope in the water column, then the problem's going to go away. We'll be paying more, for sure, but at the same time, the animals will recover and thrive, and we can all live happily ever after in the coastal ocean."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

RUBRIC: Grades 9-12
Ropeless Gear & Location Technology

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge and skills to new contexts with limited effectiveness	Transfers knowledge and skills to new contexts with some effectiveness	Transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12

Grades 9-12 NGSS

HS - Interdependent Relationships in Ecosystems

HS-LS2-6, HS-LS2-8

HE-ESS3: Earth and Human Activity

HS-ESS3-4 - Human Sustainability

ISTE Standards For Educators

- 5a-Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.
- 5b-Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.
- 6c-Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.

ISTE Standards For Education Leaders

- 1c- Model digital citizenship by critically evaluating online resources, engaging in civil discourse online and using digital tools to contribute to positive social change.
- 1d-Cultivate responsible online behavior, including the safe, ethical and legal use of technology.
- 3e-Develop learning assessments that provide a personalized, actionable view of student progress in real time.

Last of the Right Whales Lesson Plan:
Careers in STEM

OBJECTIVES

After this lesson, students will be able to:

- Identify STEM career opportunities in the environmental, fisheries, and conservation sectors
- Recognize the need for both critical and creative thinking in STEM occupations
- Assess the changes that new technologies bring to fisheries and ocean careers
- Describe challenges and opportunities for women in STEM careers
- Examine issues of equity and diversity in STEM occupations

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film.
- Equipment to view video shorts and featurettes
- Handout: KWL Chart
- Handout: Film Quotations to Explore

RESOURCES

- Meet NOAA's Barb Zoodsma, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=59v1dDuwT1I
- Meet Gina Lonati, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=m15xfMD_Lsc
- Meet the NARW Citizen Scientists, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=NT7m5hmnt4E

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. Have students watch the Meet NOAA's Barb Zoodsma short on HitPlay Productions' YouTube channel. After they view the short, have students work in small groups to write down 2–3 questions they have about women in STEM careers. Tell students to keep their list of questions so they can use it in a Post-Viewing Activity.

2. Have students watch the Meet the NARW Citizen Scientists short on HitPlay Productions' YouTube channel. After they view the short, ask students to work in small groups to brainstorm a list of local/regional issues that they could get involved with as citizen scientists.

   Have each small group pick one issue from the list to share with the large group.

   Have a large-group discussion about the issue, and use a laptop and screen to display relevant websites or news articles as the discussion takes shape. (You can also ask students to research local/regional issues in their small groups, if you prefer.)

3. Distribute the ***Handout: KWL Chart***.

   Have students to fill in the K and W columns of the chart before the film.

   They can also add to the chart as they watch the film. Tell students to keep their KWL chart so they can fill in the L column as a Post-Viewing Activity.

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these three steps for students to complete:

1. Have students create a mind map to take notes on as they watch the film. The mind map should contain the following key words: issues, solutions, perspectives. To get students started, use the following prompts:

   - What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?
   - How do the people in the film try to solve the problem/issue? Are they successful? Why or why not?
   - What is the role of STEM in the problems and issues discussed in this film?
   - Whose perspectives are included in this film, and for what purpose? How would this story be different if told from the perspective of another character in the film?

2. Students should also watch for and write down the different jobs and roles they see being performed in the film and brief descriptions of images in the film that they feel are especially interesting, surprising, or that raises questions. After they finish watching the documentary, students will be about share their thoughts on why this image stood out for them as a Post-Viewing Activity.

PREPARING TO VIEW (cont'd)

3. Ask students to jot down a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Copy-paste and print several of the quotations from the ***Handout: Film Quotations to Explore*** section on individual sheets of paper. Have students work in pairs to discuss the ideas in the quotations. Then ask each pair to share their conclusions with the large group. As they discuss the quotations, ask students to think about the following:
    - Whose story is told in this film? Whose story is not told? How does this story, and the way it is told, help you understand your own community/life?
    - What changes do the subjects of the film experience? What causes those changes? What are the consequences of those changes?
2. Have students return to the list of 2–3 questions they had about women in STEM careers (which they created in small groups as a Pre-Viewing Activity).

    Have a large-group discussion using the following prompt:
    - What information did you learn from the film that helped answer your questions about women in STEM careers?
    - What questions are still outstanding?
3. Ask students to return to the list of jobs and roles they wrote down as a Viewing Activity. Have them write a one-paragraph response to the following prompt, then engage a large-group discussion or a Think-Pair-Share: ***What is the role of critical and creative thinking in STEM careers?***

    Use specific examples from the film that showed people engaging in risk assessment or finding creative answers to issues and problems (examples could include Nick Hawkins building a subsurface ROV, or Moira Brown deciding how to handle the whale entanglement rescue).
4. Have students return to the list of jobs and roles they wrote down as a Viewing Activity. Ask them to do a Think-Pair-Share and identify the number of times that new technologies are involved in the jobs/roles they identified.
5. Have students watch the Meet Gina Lonati short on HitPlay Productions' YouTube channel. After they view the short, conduct a large-group discussion using the following prompt:
    - What are the main issues we encounter in this film? Were the issues resolved at the end of the film? Why or why not?

CULMINATING ACTIVITY: Diversity and Inclusion in STEM

The STEM workforce is not as diverse as it should be in some sectors and for some populations. Women are over-represented in health care but under-represented in computing and engineering. Black and Latino people are under-represented in STEM jobs across sectors. Asian people are over-represented across sectors. And although STEM workers tend to make more annual income than workers in other sectors, the Pew Research Center says there are pay gaps by gender, race, and ethnicity.

As a class discuss the following questions:

- What are the systemic barriers that women, Black, Indigenous, and other communities of color experience that can be obstacles to entering STEM careers?
- What are the benefits of diversity in STEM?
- What changes can help increase equity within institutions so that structural and cultural barriers are removed?

Transition from discussion to explaining their final assignment.

Final Assignment

Sample script:

You are part of a national leadership team advocating on behalf of greater diversity and inclusion in STEM fields. To prepare for an upcoming national conference on this topic you have been tasked to present your research on diversity and inclusion in STEM in ONE of the following ways:

- as a website using Google Sites
- as an infographic
- as a children's book
- as a rap song or poem
- as a comic or graphic novel

Your final product must include the following information/components:

- the benefits of diversity in STEM
- the barriers women, Black people, Indigenous people, and people of colour experience, which prevent them from entering STEM careers
- why women are over-represented in ocean science and technology
- specific approaches for increasing diversity in STEM

All information and quotations must be cited accurately.

Here are two resources that may be a place to start:

Gender Equity in Ocean Science:
https://bluecharter.thecommonwealth.org/wp-content/uploads/2020/12/GenderEquityOceanSci_2020_10_24_CAB_DFO.pdf

U.S. census data on women and the STEM workforce:
https://www.census.gov/library/stories/2021/01/women-making-gains-in-stem-occupations-but-still-underrepresented.html

HANDOUT: KWL Chart

	KNOW	***WANT TO KNOW***	***LEARNED***
STEM CAREERS			
CONSERVATION			
FISHERIES			

HANDOUT: FILM QUOTATIONS TO EXPLORE

"We're no longer enchanted by nature. That's what Nick and I are trying to do. We're trying to restore that sense of wonder. Because nature is incredible. There's so much beauty. There's so much complexity, and our lives can be so much richer when we let that in."
— Tom Cheney, Conservation Writer

"You know, when I first got in this, I thought, 'I'm going to be part of all of the answers, you know, and I'm going to work with government agencies, and we're going to get this done...' and I guess I'm a slow learner, but after 30 years, it's dawned on me that governments can't do this on their own. It's going to take everybody."
— Barb Zoodsma, NOAA Right Whale Recovery

"We're collecting information from an electronic gadget that is recording salinity, temperature, light penetration, density of chlorophyll in the water. We're trying to figure out what these whales need out of this really critical ecosystem."
— Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

RUBRIC: Grades 9-12
Diversity and Inclusion in STEM

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge and skills to new contexts with limited effectiveness	Transfers knowledge and skills to new contexts with some effectiveness	Transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12

ISTE Standards For Educators

- 5a-Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.
- 5b-Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.
- 6c-Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.

ISTE Standards For Education Leaders

- 1c- Model digital citizenship by critically evaluating online resources, engaging in civil discourse online and using digital tools to contribute to positive social change.
- 1d-Cultivate responsible online behavior, including the safe, ethical and legal use of technology.
- 3e-Develop learning assessments that provide a personalized, actionable view of student progress in real time.

Last of the Right Whales Lesson Plan:

Media Literacy and Documentary Filmmaking Approaches

OBJECTIVES

After this lesson, students will be able to:

- Identify how images and sounds connect to emotions.
- Analyze how emotions and facts relate to audience engagement.
- Recognize the importance of ethics and standards in documentary filmmaking.
- Compare and contrast camera shots and audio production and how these design principles communicate mood, atmosphere, and tone.
- Recognize the challenges of field recording in documentary films.
- Assess the influence of documentary film on the individual, community, and society.

GRADE LEVELS

9-12
Higher Education

SUBJECTS

English Language Arts; Health; Science (Earth, Environmental, Biology); Social Studies (Psychology, Sociology, World History); Environmental and Outdoor Education; Ethics

MATERIALS

- Last of the Right Whales: Go to the film's website to obtain an educational copy of the film.
- Equipment to view video shorts and featurettes
- Handout: KWL Chart
- Handout: Film Quotations to Explore

RESOURCES

- Behind the Scenes: Music, from the HitPlay YouTube channel:: https://www.youtube.com/watch?v=kQfLGy5Q9mA
- The Making of Last of the Right Whales, from the HitPlay YouTube channel: https://www.youtube.com/watch?v=nQ98tkob0-I

See the *Last of the Right Whales* Discussion Guide for background information and additional resources on climate change and the effects on the food chain of the North Atlantic right whales.

PRE-VIEWING: OPENING ACTIVITY

1. View the promotional trailer for *Last of the Right Whales* on HitPlay Productions' YouTube channel. After they view the trailer, have students work in small groups to make predictions about the film. Ask each group to choose a note-taker, and tell each group to keep their list of predictions so they can use it in a Post-Viewing Activity:
    - Who do you think the intended audience is for this film? How can you tell?
    - What specific approaches does the film use to appeal to its intended audience? Do these approaches appeal to you?
    - What is the subject of this film? What evidence is there in the trailer?
    - Whose stories are told in this film?
    - What emotions will this film draw out of the viewer?
    - Can you determine the filmmakers' perspective on this subject? What evidence can you find in the trailer to support your view?
2. Play the first minute of the film (the opening sequence starting with the text on the black screen and ending with the whale surfacing to breathe). Have students consider the methods and techniques the filmmaker uses to bring the viewer into the film and create an emotional connection:
    - What does the establishing long shot establish in/for the viewer?
    - How does the juxtaposition of images of the natural world and the sound of a human voice convey the theme of the film?
    - What effect does the music have on the viewer?
    - What effect do the whale sounds have on the viewer?
3. Distribute the ***Handout: KWL Chart***. Ask students to fill in the K and W columns of the chart before they view the film. They can also add to the chart as they watch the film. Tell students to keep their KWL chart so they can fill in the L column as a Post-Viewing Activity.
4. Have students watch the Behind the Scenes: Music short on HitPlay Productions' YouTube channel. After they view the trailer, have students do a Think-Pair-Share using the following prompts:
    - How does film sound strengthen and support the visuals in a film?
    - How does sound enhance the mood, atmosphere, and tone of a film?
    - What effect does music have on the viewer during a film?

PREPARING TO VIEW

Teacher Note: To encourage active viewing of *Last of the Right Whales*, students will be completing several exercises as the they watch the story. Prior to showing the film, take some time to go over these four steps for students to complete:

VIEWING ACTIVITIES (cont'd)

1. Have students create a mind map to take notes on as they watch the film and explain that they will use the mind map in the Culminating Activity. The mind map should contain the following key words: conflicts, techniques, purpose, and perspective. To get students started, use the following prompts:
    - What are the main conflicts we encounter in this film? Were the conflicts resolved at the end of the film? Why or why not?
    - How was the film made? What conventions or production techniques are used? How do these techniques attract/engage the viewer?
    - Whose perspectives are included in this film, and for what purpose? Who benefits if the message is accepted? Who may be disadvantaged?
    - How would this story be different if told from the perspective of another character in the film?
2. Have students jot down a brief description of any image in the film that they feel is especially interesting, surprising, or that raises questions. Have students share their thoughts on why this image stood out for them as a Post-Viewing Activity.
3. Review the PBS Viewing Guide for documentaries and have them complete it after the film is over. Students can use their completed documents in the Culminating Activity.
4. Immediately after the film concludes, have students jot down three questions for discussion that the film raises in their minds.

WATCH LAST OF THE RIGHT WHALES

POST-VIEWING ACTIVITES

Teacher Note: Consider one of more of these activities to best meet your learning objectives.

1. Copy-paste and print several of the quotations from the ***Handout: Film Quotations to Explore*** section on individual sheets of paper. Have students work in pairs to discuss the ideas in the quotations. Then ask each pair to share their conclusions with the large group. As they discuss the quotations, ask students to think about the following:
    - Does the film foster respect for a diversity of ideas about the main subject? If so, how?
    - From whose perspective is this story told? How do you know this?
    - What values are being promoted? How do you know this?
    - Whose story is told in this documentary? Whose story is not told? How does this story, and the way it is told, help you understand your own community/life?
    - What changes do the subjects of the film experience? What causes those changes? What are the consequences of those changes?
2. An "impact film" is a short or long film that aims to encourage the viewer to get involved and take action on a social cause. Have a large-group discussion using the following prompt:

POST-VIEWING ACTIVITIES (cont'd)

- Unlike shorter films/videos in news media or online, long-form documentary films take the time to build empathy in the viewer. Why is building empathy key to inspiring people to engage and act?

3. Ask students if the predictions they made in the trailer Pre-Viewing Activity were correct. Have them give specific evidence from the film (facts revealed in images, text, dialogue, or voiceover) that supports or disproves their prediction.

4. Conduct a large-group discussion guided by student questions written during the Viewing Activity.

   After fielding student questions, consider these discussion prompts to deepen understanding:

   - What is the most interesting, surprising, or heartbreaking thing you learned while watching this film? How did the filmmaker show this?
   - How does this film help you understand societal values and attitudes toward an issue at a particular point in time?
   - Before viewing this film, did whale conservation or oceans play a large part in your life? If yes, why? If no, why not? Will this change now that you have seen this film? In what way?
   - What changes do the people in the film experience? What causes those changes? What are the consequences of those changes for the people in the documentary?
   - What global issues are addressed in this film? What is the filmmakers' point of view on the opportunities and challenges of those issues?
   - How does this film encourage you to see the world differently?

5. Have students watch the Meet Gina Lonati short on HitPlay Productions' YouTube channel. After they view the short, conduct a large-group discussion using the following prompt:

   - Why do you think the filmmaker decided not to use this clip in the film?
   - What decisions does a documentary film director need to make in order to balance factual information and storytelling?

6. Have students watch The Making of Last of the Right Whales short on HitPlay Productions' YouTube. After they view the short, ask students to write a paragraph using the following prompt: In the short, Director Nadine Pequeneza says that being on small boats during a global pandemic created challenges in field recording. How did she collaborate with sound recorders/engineers to solve this problem? What does this say about the importance of collaboration in filmmaking?

   - How did she collaborate with sound recorders/engineers to solve this problem?
   - What does this say about the importance of collaboration in filmmaking?

CULMINATING ACTIVITY: Evaluating Ethics, Standards, and Artistic Expression in Documentary Film

Last of the Right Whales uses ethical approaches to documentary filmmaking. Before starting her work, Director Nadine Pequeneza obtained the necessary permits under the Species at Risk Act and the Endangered Species Act. Wildlife Photographer and Cinematographer Nick Hawkins obtained permission to use his subsurface ROV (remote-operated vehicle). Everyone involved with the film, including ocean scientists, were careful about maintaining distance and not harassing the whales. Director Nadine Pequeneza made sure to work with research scientists and accredited ocean science organizations, so that all the information in the film is backed by their data and expertise.

For your assignment, you will write a magazine- or newspaper-style review of the film *Last of the Right Whales* OR create a YouTube-style video review. Your review needs to include the following:

- A title for the review, plus hashtags for when you post your written/video review
- The title of the film and what type of film it is
- A brief summary of the content or story of the film, including the main issue/conflict, the setting, and the subjects of the film (if you created a mind map or filled in the PBS Viewing Guide as a Viewing Activity, you can use them in this step)
- Some analysis of the director's artistic expression. For example: Does the film seem to flow well from scene to scene and from sequence to sequence, or is it hard to follow? Do viewers know why the subjects in the film are doing what they're doing? Is the film visually pleasing? Is the pace appropriate? How does the soundtrack and music add to the film? Does the director get the intended reaction from the audience?
- Comments on the camera work, editing, lighting, sound, or other visual impacts of the film
- An overall assessment of the film, employing analysis and original commentary on the central theme/ideas/lesson of the film and whether they will inspire people to get involved or create change (and why)

Have students read and use the following articles as reference points in their review:

1. "The Public Trust in Documentary: Is It Earned?";
2. "Documentary Standards and Practices are Missing";
3. "When Wildlife Documentaries Harass: Ethics Required in Environmental Filmmaking Too"; and,
4. Specific information on the director's artistic choices and approach, as presented in The Making of *Last of the Right Whales* short on HitPlay Productions' YouTube channel.

Instruct students that after they have a first draft of their review, they will meet with the teacher for feedback and to make revisions. After the final draft of the review is completed, explain that they will present it to their classmates, a school audience by publishing it in the classroom/school newsletter, posting it to social media, reading/showing it at a public event, or displaying it in a public space.

The film production company, HitPlay Productions, is happy to host reviews on its YouTube channel – so let your teacher know if you're interested in sending the company your video review.

ADDITIONAL LEARNING

PBS Viewing Guide for Documentaries: https://pov-tc.pbs.org/pov/downloads/2010/pov-behindthelens-introducing-documentaries-viewing-guide.pdf

"The Public Trust in Documentary: Is It Earned?", Centre for Media and Social Impact: https://cmsimpact.org/report/the-state-of-journalism-on-the-documentary-filmmaking-scene/p/the-public-trust-in-documentary-is-it-earned/

"Documentary Standards and Practices are Missing," Centre for Media and Social Impact: https://cmsimpact.org/report/the-state-of-journalism-on-the-documentary-filmmaking-scene/p/documentary-standards-and-practices-are-missing/

"When Wildlife Documentaries Harass: Ethics Required in Environmental Filmmaking Too," International Documentary Association: https://www.documentary.org/feature/when-wildlife-documentaries-harass-ethics-required-environmental-filmmaking-too

HANDOUT: KWL Chart

	KNOW	WANT TO KNOW	LEARNED
WHALES			
FISHERIES			
RESEARCH			
HOW TO HELP			

HANDOUT: FILM QUOTATIONS TO EXPLORE

"Photogrammetry has been around for a long time, the science and the physics of it is very clearly worked out. A flat image, the camera's at a horizontal level, and you have an accurate measurement of the altitude, and with that, you do the math... That gives you a good chance of estimating the volume of the animal, and hence, its body condition."
— Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"I don't want to, like, anthropomorphize animals, but think of what this does to the mother too. We know other whales, orcas, have this connection with their family. We see how close they are to their calves here... and so we're causing all this... and that whale suffered for two weeks. So we have to do something. If this happened to a human, what would we do?"
— Lily Pinkham, Volunteer Sighter

"If these animals are present in our lives through media, through storytelling, when we talk about regulation changes, when we talk about changes in fisheries, in shipping, those changes are going to be more acceptable to a knowledgeable public, to a knowledgeable industry sector."
— Nick Hawkins, Wildlife Photographer and Cinematographer

RUBRIC: Grades 9-12
Evaluating Ethics, Standards, and Artistic Expression in Documentary Film

Categories	50–59% (Level 1)	60–69% (Level 2)	70–79% (Level 3)	80–100% (Level 4)
Knowledge of content	Demonstrates limited knowledge of content	Demonstrates some knowledge of content	Demonstrates considerable knowledge of content	Demonstrates thorough knowledge of content
Understanding of content	Demonstrates limited understanding of content	Demonstrates some understanding of content	Demonstrates considerable understanding of content	Demonstrates thorough understanding of content
Use of planning skills	Uses planning skills with limited effectiveness	Uses planning skills with some effectiveness	Uses planning skills with considerable effectiveness	Uses planning skills with considerable effectiveness
Use of processing skills	Uses processing skills with limited effectiveness	Uses processing skills with some effectiveness	Uses processing skills with considerable effectiveness	Uses processing skills with a high degree of effectiveness
Use of critical and creative thinking processes	Uses critical and creative thinking processes with limited effectiveness	Uses critical and creative thinking processes with some effectiveness	Uses critical and creative thinking processes with considerable effectiveness	Uses critical and creative thinking processes with a high degree of effectiveness
Organization and expression of ideas, information, and understandings in oral, visual, and/or written forms	Organizes and expresses ideas, information, and understandings with limited effectiveness	Organizes and expresses ideas, information, and understandings with some effectiveness	Organizes and expresses ideas, information, and understandings with considerable effectiveness	Organizes and expresses ideas, information, and understandings with a high degree of effectiveness
Use of vocabulary and terminology of the discipline in oral, visual, and/or written forms	Uses conventions, vocabulary, and terminology with limited effectiveness	Uses conventions, vocabulary, and terminology with some effectiveness	Uses conventions, vocabulary, and terminology with considerable effectiveness	Uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application of knowledge and skills	Applies knowledge and skills in familiar contexts with limited effectiveness	Applies knowledge and skills in familiar contexts with some effectiveness	Applies knowledge and skills in familiar contexts with considerable effectiveness	Applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	Transfers knowledge and skills to new contexts with limited effectiveness	Transfers knowledge and skills to new contexts with some effectiveness	Transfers knowledge and skills to new contexts with considerable effectiveness	Transfers knowledge and skills to new contexts with a high degree of effectiveness
Make connections within and between various contexts	Makes connections within and between various contexts with limited effectiveness	Makes connections within and between various contexts with some effectiveness	Makes connections within and between various contexts with considerable effectiveness	Makes connections within and between various contexts with a high degree of effectiveness

STANDARD ALIGNMENT FOR HIGH SCHOOL

Common Core standards for ELA-Speaking and Listening (Grades 9-12) and NGSS Standards for Grades 9-12 are covered in this film. Since there is also a technology component that could be integrated, ISTE Standards for Educators are provided.

Common Core: Speaking and Listening

- English Language Arts Standards » Speaking & Listening » Grade 9-10
- English Language Arts Standards » Speaking & Listening » Grade 11-12
- English Language Arts Standards » Anchor Standards » College and Career Readiness Anchor Standards for Speaking and Listening

Refer to Media Literacy Education & The Common Core State Standards document as a helpful reference.

ISTE Standards For Educators

- 5a-Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs.
- 5b-Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.
- 6c-Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems.

ISTE Standards For Education Leaders

- 1c- Model digital citizenship by critically evaluating online resources, engaging in civil discourse online and using digital tools to contribute to positive social change.
- 1d-Cultivate responsible online behavior, including the safe, ethical and legal use of technology.
- 3e-Develop learning assessments that provide a personalized, actionable view of student progress in real time.

Post-Secondary Curriculum

NOTE TO EDUCATORS

The Big Ideas and Essential Questions listed below reflect current issues in North Atlantic right whale conservation, scientific research, and stakeholder involvement as presented in the film. These ideas can be used to anchor the discussion. The external resources, quotations from the feature film, and shorts and featurettes from the production company's YouTube channel provide further context and connections, and can also be used as in-class activities.

TOPIC #1: CLIMATE CHANGE & EFFECTS ON THE FOOD CHAIN

Big Ideas & Essential Questions

- North Atlantic right whales eat zooplankton called copepods. The whales eat by filter feeding, which means they swim through the copepods with their mouths open and strain the animals through their baleen. Swimming like this takes a lot of energy, so the whales need to find super-dense patches of copepods in order to make the process of eating worth the effort. A right whale can eat as much as a billion copepods per day (1-2 tonnes). Some patches contain more than 300,000 copepods per cubic meter. With climate change, however, food resources have been shifting in both distribution and quality. As sea surface temperatures warm, copepods are disappearing and/or shifting location, and the nutritive value of copepods are dropping in what used to be rich feeding grounds. Sea surface temperatures in the Gulf of Maine, a key right whale habitat, are warming 99% faster than sea surface temperatures in any other part of the world. As a result, North Atlantic right whales are travelling farther north to feed in the Gulf of St. Lawrence. Does the fact that right whales are baleen whales put them at an evolutionary disadvantage in terms of the effects of global warming on the food chain?
- North Atlantic right whales play a vital role in the marine ecosystems in which they live. They feed at the bottom and excrete feces at the surface. Whale feces put nutrients such as iron back into the sea. These nutrients are then eaten by smaller ocean creatures like phytoplankton, which helps maintain ocean ecosystems and food webs. Research has shown that the decline in right whale populations has resulted in a decline in nutrient recycling. Nutrient recycling is an important part of battling global warming, because phytoplankton consume carbon and release oxygen. What does the extinction of right whales mean for the ecosystems of the Atlantic coast? What would a resurgence in the right whale population mean for human efforts to reduce global warming?

Resources

Meet Dr. Charles "Stormy" Mayo, from the HitPlay YouTube channel

Resources (cont'd)

Meet Dr. Kimberley Davies, from the HitPlay YouTube channel

"Tracking Change in the Atlantic" infographic, Fisheries and Oceans Canada

Film Quotations to Explore

"We've got to understand these animals in context. These whales are not floating in space. They're living in an ecosystem. The baseline of this system is changing. It's always changed. It's never been static, but now it's changing with such rapidity that things like evolution can't catch up. If the whales lose the plankton, they're not going to evolve with different baleen that allows them to feed on fish. They're dead." Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

"The reason why North Atlantic right whales have a body condition deficit is twofold. The basis of it, for sure, is they need more food to eat, and with climate change, there's been a wholesale change in the availability of the food, but the second side of it is the energetic costs of entanglement." Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"The story of the North Atlantic right whale, it's symbolic of the human crisis with nature as a whole, right now. We are pushing, our activities are pushing, this species to the brink of extinction. But we know exactly what we need to do to stop it. It's in our power to stop it. We know what needs to be done. And that is, at the same time, the story of global warming and resource degradation." Tom Cheney, Conservation Writer

TOPIC #2: REPRODUCTION AND EXTINCTION

Big Ideas & Essential Questions

- A higher calving rate in recent years has not resulted in an increase in the North Atlantic right whale population. When young/breeding females die from entanglements, or vessel strikes, or from not having enough food, what is the effect on long-term population numbers? What risks do calves, in particular, face?
- Fecal and blow studies have shown that entanglement causes right whales to produce stress hormones, causing long-term damage to the heart and immune system and making the animal more susceptible to disease. Entanglements also lead to problems with reproduction. Entangled juvenile whales lose an average 50% of their blubber and entangled adults lose about 17%, meaning that males aren't fit enough to compete for a mate. Healthy breeding-age females calve every 3-6 years, but research shows that females who survive entanglement can take more than 10 years between calves. 86% of all catalogued right whales have been entangled in fishing gear at least once (and some as many as seven times). How can we lessen the stress that right whales experience? What are the connections and interrelationships between entanglement, high rates of right whale mortality, fisheries- and shipping-related industries, human consumption, market capitalism, and individual/local/global employment?

- The American Psychiatric Association describes ecological grief as a growing threat to mental health, especially in younger generations and people who live close to the land. What are the intersections among climate change, species extinction, and mental health? How are governments and health-care systems responding to (or not responding to) the impacts of ecological grief? What does it mean to co-exist with other species on the planet? What does it mean to lose an entire species?
- Indigenous peoples across the globe share similar beliefs about the sentience of non-human animals. What is the impact of grief and loss on North Atlantic right whales? How might the death of calves and death of their relatives affect their health and ability to reproduce?

Resources

Meet North Atlantic Right Whale 4615, from the HitPlay YouTube channel

Historical Calving Rates, from the HitPlay YouTube channel

Meet Dr. Kimberley Davies, from the HitPlay YouTube channel

Meet Gina Lonati, from the HitPlay YouTube channel

"Ocean Regime Shift is Driving Collapse of the North Atlantic Right Whale Population" infographic, Research Gate

"Generation Climate Change: Growing Up With Ecological Grief and Anxiety," American Psychiatric Association

"Ecological Grief and Anxiety: The Start of a Healthy Response to Climate Change?", The Lancet

"Ecological Grief: The Mental Toll of the Climate Emergency," Canadian Climate Institute

Film Quotations to Explore

"We should leave no trace, and the traces that we do leave should be good ones, and we're certainly not doing that with this species. The right whales are very much a metaphor, really, for the sea, and their decline tells us what is happening to this ocean." Charles "Stormy" Mayo, Director, Right Whale Ecology Program, Center for Coastal Studies

"They're dying at a rate that's greater than the entire species' reproduction. If we don't do something right now, we're going to see the extinction of a great whale species." Nick Hawkins, Wildlife Photographer and Cinematographer

"Not only do you have to stop killing them, you also have to give them a chance to reproduce and successfully rear calves." Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

TOPIC #3: HABITAT SHIFT AND VESSEL STRIKES

Big Ideas & Essential Questions

- North Atlantic right whales eat zooplankton called copepods – as much as a billion copepods per day (1-2 tonnes). With climate change, however, food resources have been shifting in both

Big Ideas & Essential Questions (cont'd)

- (cont'd) distribution and quality. As sea surface temperatures warm, copepods are disappearing and/or shifting location, and the nutritive value of copepods are dropping in what used to be rich feeding grounds, forcing right whales to move their feeding grounds north from the Bay of Fundy to the Gulf of St. Lawrence. As a result, right whales are now at greater risk of vessel strikes in a busy international shipping area. Protection measures are being implemented to protect right whales in both Canada and the U.S. What are the effects of vessel speed restrictions on various stakeholders? What are the connections and interrelationships between global warming, habitat shift, high rates of right whale mortality, fisheries- and hipping-related industries, and individual/local/global employment?
- Although the move to the Gulf of St. Lawrence has placed right whales at greater risk, it's not just large shipping containers that are implicated in vessel strikes. Small vessels are responsible for many North Atlantic right whale injuries and deaths. What is the effect of pleasure crafting, fishing, and tourism on North Atlantic right whales? How should these sectors be managed to prevent right whale deaths?
- Speed restrictions are being used to reduce North Atlantic right whale mortality rates because using location-tagging technology on whales is not an option. First, subcutaneous tags that are embedded into whale blubber/muscle cause local swelling and could lead to infection; second, unintrusive tags that stick on the skin of the whale don't stay on for very long, so they would stop transmitting and wouldn't help notify vessel operators. What other kinds of technologies could be used to reduce vessel strikes? Is technology the answer to this problem?
- Indigenous peoples across the globe share similar beliefs about the sentience of non-human animals. Animals are a part of creation, and humans are meant to care for creation. In Indigenous societies, animals are not seen as property, as they are in settler-colonial societies. What does it mean to co-exist with other species on the planet? What does it mean to lose an entire species?

Resources

Meet Dr. Moira Brown, from the HitPlay YouTube channel

Delivering Antibiotics to North Atlantic Right Whales, from the HitPlay YouTube channel

The Canary Calf, from the HitPlay YouTube channel

"Compliance Guide for Right Whale Ship Strike Reduction Rule" infographic, National Oceanic and Atmospheric Administration

"North Atlantic Right Whales – 2021 Vessel Traffic Management Measures," Transport Canada

"Reducing Vessel Strikes to North Atlantic Right Whales," National Oceanic and Atmospheric Administration

Film Quotations to Explore

"Our impact as humans on the world is totally… wrong. They travel the world, they see things we don't see. I think that's something that we as people need to get more in contact with." Blake Hall, Recreational Fisher

"If such animals were dying a slow death in an urban setting, the consumers that were at the basis of the demand that led to that happening would not tolerate it. None of us would tolerate what's going on out there if we knew enough about it." Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

TOPIC #4: ROPELESS FISHING GEAR

Big Ideas & Essential Questions

- Entanglements occur throughout the North Atlantic right whale range and have been documented in waters off the southeast U.S. coast, mid-Atlantic, Gulf of Maine, and Gulf of St. Lawrence. Lobster and snow crab gear are the cause of most entanglements for right whales. In traditional crab or lobster fishing, vertical ropes (lines) hundreds of feet long connect traps on the seafloor to buoys at the surface, which allows fishers to locate their gear and haul it back up. Different types of ropeless or pop-up gear that allow fishers to release a line from the sea floor using an acoustic signal are currently in development. Challenges with gear mapping, the cost of transitioning, and questions about fisher safety remain. Ropeless gear is five times more expensive than fixed-line gear, but funding from the Department of Fisheries and Oceans has helped offset the cost to fishers. Are government subsidies enough to ensure that fishers embrace this new technology? What else is needed? What are the connections and interrelationships among ropeless gear, business, fisheries-related industries, whale conservation, and individual/local/global employment?
- Some environmental organizations are asking that the snow crab and lobster fisheries be placed on the "red list" because fixed-line gear in those fisheries cause most entanglements. What role does human consumption/over-consumption of marine fishery resources play in right whale entanglements and deaths? Would you pay more to buy/eat fish if it would keep whales safe from entanglement?
- Fecal and blow studies have shown that entanglement causes North Atlantic right whales to produce stress hormones, causing long-term damage to the heart and immune system and making the animal more susceptible to disease. Entanglements also lead to problems with reproduction. Entangled juvenile whales lose on average 50% of their blubber and entangled adults lose about 17%, meaning that males aren't fit enough to compete for a mate. Healthy breeding-age females calve every 3–6 years, but research shows that females who survive entanglement can take more than 10 years between calves. 86% of all catalogued right whales have been entangled in fishing gear at least once (and some as many as seven times). How important of a factor is ropeless gear in right whale conservation and survival?

Resources

Meet Martin Noël, from the HitPlay YouTube channel

"On Demand Fishing Gear" infographic, Ropeless Consortium

"Pop-Up Pots and the Search for 'Whale-Safe' Gear," National Fisherman

"Lobsters and Right Whales are on a Climate-Driven Collision Course," Sustainable Fisheries

"NRDC Supports Seafood Watch Move to 'Red List' American Lobster and Snow Crab," Natural Resources Defense Council

Film Quotations to Explore

"This is one of the greatest animal ethical issues of our time. The fact that there's these, you know, highly intelligent animals out there, that have a high capacity to feel pain, suffering for months, years." Nick Hawkins, Wildlife Photographer and Cinematographer

"Yeah, we need to protect the whales, but a lot of people are working at shore, and are depending on this industry." Martin Noël, Crab Fisher

"We are the first ones that are touched by those closures, so we have to be part of the solution." Martin Noël, Crab Fisher

"If we demand that these products are caught in an ethical way, i.e., no rope in the water column, then the problem's going to go away. We'll be paying more, for sure, but at the same time, the animals will recover and thrive, and we can all live happily ever after in the coastal ocean." Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

TOPIC #5: WOMEN & EQUITY IN STEM

Big Ideas & Essential Questions

- U.S. census data show that only 27% of the total STEM workforce is women. Yet there are 12 women featured in Last of the Right Whales, working in STEM positions or as citizen scientists and entanglement responders, making them the clear majority in this film. What are the individual and societal factors that make a STEM job in oceans and conservation more possible, or more desirable, than in other areas? Why do fewer women work in STEM across sectors?
- The STEM workforce is not as diverse as it should be in some sectors and for some populations. Women are over-represented in health care but under-represented in computing and engineering. Black and Latino people are under-represented in STEM jobs across sectors. Asian people are over-represented across sectors. And although STEM workers tend to make more annual income than workers in other sectors, the Pew Research Center says there are pay gaps by gender, race, and ethnicity. What are the benefits of diversity in STEM? What are the barriers that women, Black people, Indigenous people, and people of colour experience that prevent them from entering STEM careers? How can we change the systems and institutions of society so that these barriers are removed?

Big Ideas & Essential Questions (cont'd)

- U.S. College Board data show that students who study the arts have higher scores on standardized testing. Employers say they value employees with creativity, social skills, and versatile problem-solving skills, which an arts education helps develop. As a result, many educators are now discussing whether STEM (science, technology, engineering, and math) should be changed to STEAM (science, technology, engineering, arts, and math). How might having a background in and appreciation for art and culture, the outdoors, or philosophy relate to having a successful career in STEM?

Resources

Meet NOAA's Barb Zoodsma, from the HitPlay YouTube channel

Meet Gina Lonati, from the HitPlay YouTube channel

Meet the NARW Citizen Scientists, from the HitPlay YouTube channel

"STEM Jobs See Uneven Progress in Increasing Gender, Racial, and Ethnic Diversity," Pew Research Centre

Film Quotations to Explore

"You know, when I first got in this, I thought, 'I'm going to be part of all of the answers, you know, and I'm going to work with government agencies, and we're going to get this done...' and I guess I'm a slow learner, but after 30 years, it's dawned on me that governments can't do this on their own. It's going to take everybody." Barb Zoodsma, NOAA Right Whale Recovery

TOPIC #6: MEDIA LITERACY & DOCUMENTARY FILMMAKING APPROACHES

Big Ideas & Essential Questions

- An "impact film" is a short or long film that aims to encourage the viewer to get involved and take action on a social issue. Unlike shorter films/videos in news media or online, long-form documentary films like *Last of the Right Whales* take the time to build empathy in the viewer. Why is building empathy key to inspiring people to engage and act?
- It is often said that societal change begins with the individual. How do the images and sounds in *Last of the Right Whales* connect to viewer emotions? How does Director Nadine Pequeneza use an emotional and intellectual palette to enhance audience engagement? What influence does documentary film have on the individual, community, and society?
- *Last of the Right Whales* uses ethical approaches to documentary filmmaking. Before starting her work, Director Nadine Pequeneza obtained the necessary permits under the Species at Risk Act and the Endangered Species Act. Everyone involved with the film, from fishers to ocean scientists, were careful about maintaining distance and not harassing the whales. Director Nadine

Big Ideas & Essential Questions (cont'd)

- (cont'd) Pequeneza also made sure to work with research scientists and accredited ocean science organizations, so that all the information in the film is backed by their data and expertise. Why are ethics and standards important in documentary filmmaking? What influence does documentary film have on the individual, community, and society?

Resources

Behind the Scenes: Music, from the HitPlay YouTube channel

The Making of Last of the Right Whales, from the HitPlay YouTube channel

PBS Viewing Guide for Documentaries

"The Public Trust in Documentary: Is It Earned?", Centre for Media and Social Impact

"Documentary Standards and Practices are Missing," Centre for Media and Social Impact

"When Wildlife Documentaries Harass: Ethics Required in Environmental Filmmaking Too," International Documentary Association

Film Quotation to Explore

"Photogrammetry has been around for a long time, the science and the physics of it is very clearly worked out. A flat image, the camera's at a horizontal level, and you have an accurate measurement of the altitude, and with that, you do the math... That gives you a good chance of estimating the volume of the animal, and hence, its body condition." Michael Moore, Veterinarian, Woods Hole Oceanographic Institution

"I don't want to, like, anthropomorphize animals, but think of what this does to the mother too. We know other whales, orcas, have this connection with their family. We see how close they are to their calves here... and so we're causing all this... and that whale suffered for two weeks. So we have to do something. If this happened to a human, what would we do?" Lily Pinkham, Volunteer Sighter

"If these animals are present in our lives through media, through storytelling, when we talk about regulation changes, when we talk about changes in fisheries, in shipping, those changes are going to be more acceptable to a knowledgeable public, to a knowledgeable industry sector." Nick Hawkins, Wildlife Photographer and Cinematographer

Resource Links

VIDEO

- The Last of the Right Whales film trailer: https://www.youtube.com/watch?v=uxFcNF1Wj5Q
- Meet Dr. Charles "Stormy" Mayo short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=S_WmOxTwQhc
- Meet Dr. Kimberley Davies short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=MalkEPD_YkE
- Meet Dr. Moira Brown short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=4Ky_JxwqIrI
- Meet NOAA's Barb Zoodsma short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=59v1dDuwT1I
- Meet Gina Lonati short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=m15xfMD_Lsc
- Meet Martin Noël short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=QXaE_jSVWWU
- Meet the NARW Citizen Scientists short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=NT7m5hmnt4E
- Delivering Antibiotics to North Atlantic Right Whales short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=jTH9OTwsOro
- The Canary Calf short, from HitPlay's YouTube Channel: https://www.youtube.com/watch?v=8u3u8nXE4kQ
- Behind the Scenes: Music featurette, from HitPlay's YouTube channel: https://www.youtube.com/watch?v=kQfLGy5Q9mA
- The Making of Last of the Right Whales featurette, from HitPlay's YouTube channel: https://www.youtube.com/watch?v=nQ98tkob0-I
- Meet North Atlantic Right Whale 4615 short, from HitPlay's YouTube channel: https://www.youtube.com/watch?v=CddjGHAJNrk
- Historical Calving Rates short, from HitPlay's YouTube channel: https://www.youtube.com/watch?v=T-tdqjkXSvM

ARTICLES & INFOGRAPHICS

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ADDITIONAL FILM INFORMATION

- The *Last of the Right Whales* official website: https://lastoftherightwhales.com/
- The *Last of the Right Whales* Discussion Guide: https://lastoftherightwhales.com/wp-content/uploads/sites/9/2022/03/LOTRW-Discussion-Guide.pdf
- The *Last of the Right Whales* YouTube Channel: https://www.youtube.com/c/HitPlayProductions
- Other *Last of the Right Whale* social accounts:
    - Twitter: https://twitter.com/LastRightWhales
    - Instagram: https://www.instagram.com/lastrightwhales/
    - Facebook: https://www.facebook.com/HitPlayProductions
    - TikTok: https://www.tiktok.com/@lastrightwhales

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