

## Empty Waters: How Climate Change is Creating Chaos



A lonely fishing boats hauls in its catch for the day off Casco Bay, Portland, ME  
Image courtesy of Gettyimages

### QUESTIONS

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1. How is climate change affecting our waters?
2. What is water scarcity?
3. How does rising ocean temperatures create a perfect storm for waterways such as the Gulf of Maine?

## Empty Waters: How Climate Change is Creating Chaos

<b>C3 Framework:</b>	D2.Geo.3.9-12. Use geographic data to analyze variations in the spatial patterns of cultural and environmental characteristics at multiple scales D2.Geo.9.9-12. Evaluate the influence of long-term climate variability on human migration and settlement patterns, resource use, and land uses at local-to-global scales.
<b>Staging the Question</b>	<p>“The ocean is not just a victim of climate change, it is also a powerful source of solutions” Jane Lubchenco, former administrator of NOAA</p> <p>As a class, discuss the quote from Lubchenco, identifying how the ocean has been a victim of climate change and the factors that may impact the value of our oceans</p>

Supporting Question 1	Supporting Question 2	Supporting Question 3
What is water scarcity?	How is climate change affecting different waters?	How does rising ocean temperatures create a perfect storm for waterways such as the Gulf of Maine?
Performance Task	Performance Task	Performance Task
<ol style="list-style-type: none"> <li>1. Read article (Death of the Nile)</li> <li>2. Have students complete the graphic organizer about the article while they read</li> <li>3. Read article (River Delta changes)</li> <li>4. Read and Draw as a class</li> <li>5. Discuss water scarcity</li> </ol>	<ol style="list-style-type: none"> <li>1. Examine a map of the Arctic Ocean, Gulf of Maine, and the Nile River</li> <li>2. Brainstorm geographical features and economic dependencies</li> <li>3. Discuss what is causing climate change</li> <li>4. Read article (Heatwave)</li> <li>5. Watch Gulf of Maine video</li> <li>6. Introduce and complete NASA Climate Change inquiry lab</li> <li>7. Read “Sea Ice” article and discuss</li> </ol>	<ol style="list-style-type: none"> <li>1. Read article (Gulf of Maine warming)</li> <li>2. Make comparisons to Delta Nile</li> <li>3. Introduce and complete Empty Water Student Lab</li> <li>4. Make a claim using evidence about why the Gulf of Maine is rising faster than any other ocean</li> </ol>
Sources	Sources	Sources
<p><a href="#">Death of the Nile article</a>  <a href="#">Death of the Nile graphic organizer</a>  <a href="#">River Delta changes</a></p>	<p><a href="#">Arctic Ocean map</a>  <a href="#">Gulf of Maine map</a>  <a href="#">Nile Delta map</a>  <a href="#">Watery Heatwave cooks the Gulf of Maine</a>  <a href="#">NASA climate change lab</a>  <a href="#">Sea Ice article</a></p>	<p><a href="#">Why is the Gulf of Maine warming faster article</a>  <a href="#">Empty Water: Student lab</a></p>

<p>Summative Performance Task</p>	<p>ARGUMENT: How is climate change creating chaos? Construct an argument outline that discusses the compelling question using specific claims and relevant evidence</p> <hr/> <p>EXTENSION: Create an infographic that illustrates the current relationship between climate change and rising sea temperatures. You need to focus on either the Gulf of Maine or the Delta Nile region</p>
<p>Taking Informed Action</p>	<p>UNDERSTAND: Research your local water issues and the impact of climate change. ASSESS: Determine the most pressing water-related issue affecting your community. ACT: Create an informational system to inform others</p>

## **OVERVIEW**

### **Description**

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This unit plan is designed to examine how climate change is creating chaos. It focuses primarily on the Gulf of Maine but the current situation in the Delta Nile region has been dovetailed in. Students will examine evidence that supports the sea surface temperature is increasing along the New England coastline. That although temperatures are different in different regions of New England, the Gulf of Maine is rising 99% faster than any other ocean on earth. Students will learn that Earth's temperature is changing. They will use data to describe the shape of change globally and locally in order to predict the future.

### **Structure**

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In addressing the compelling question, "How is climate change creating chaos?" students work through a series of supporting questions, formative performance tasks, and sources in order to create summative assessment that is supported by evidence.

### **Staging the compelling question**

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In staging the compelling question, "How is climate change creating chaos?" teachers can prompt students with the quote, "The ocean is not just a victim of climate change, it is also a powerful source of solutions" by Jane Lubchenco, former administrator of NOAA. Have students identify how the ocean has been a victim of climate change and the factors that may impact the value of our oceans. Discussions should include what climate change is, how it impacts the oceans, and what the current threats are.

### **Supporting Question 1:**

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The first supporting question, "What is water scarcity?" helps students understand the global importance of water to any region. The formative performance task has students reading articles to understand the changes that are occurring in the Nile Delta region. The graphic organizer helps students create outline notes about the contributing factors. The read and draw checks for understanding. Students will use it as an opportunity to draw what they read from the article.

### **Supporting Question 2:**

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The second supporting question, "How is climate change affecting different waters?" helps students understand the impact that climate change is having on varying ocean systems. The formative performance task has students become familiar with the Arctic Ocean, Gulf of Maine and the Nile River. Students will look at varying features of each system and determine the

reliance that humans would have on them. Students will continue the task of reading articles and learning more about how the Gulf of Maine is warming faster than any other ocean on earth. Students will then use their knowledge to create a sea ice lab. The lab should act as an inquiry opportunity for students to learn more about the impact of sea ice on rising sea temperatures.

### **Supporting Question 3:**

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The third supporting question, “How does rising ocean temperatures create a perfect storm for waterways such as the Gulf of Maine?” helps students understand the current situation in the Gulf of Maine and why it has historians, scientists, and fishermen concerned. The formative performance task has students continuing to examine the research and supporting evidence. Students will use an inquiry lab from the Gulf of Maine Research Institute (GMRI) to learn more about how the Gulf of Maine’s waters are changing. Students will examine both the lobster and black sea bass populations and how the two species are changing Maine’s waters.

### **Summative Performance Task:**

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At the end of this inquiry process, students have examined the ways in which climate change has impacted both the Delta Nile region and the Gulf of Maine. Students are expected to use their extensive knowledge about the topics to create an infographic. They will need to use evidence from multiple sources to support their claim. Students will construct an infographic that is both informative and interactive. They need to answer the compelling question, “How is climate change creating chaos.?”