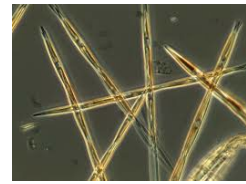




## Task: Harmful Algae Blooms



### Part 1: Student Directions

Did you know that our environment can be harmed by something called a Harmful Algae Bloom? (HAB). These blooms can contaminate our shellfish, making them poisonous to eat. We rely on seafood such as clams, mussels, oysters, and crabs for both food and income. You will learn what HAB's are, why they are a problem, and what we can do to stay safe. Then you will write an essay to teach other students about the danger of HAB's.

### Steps you will follow:

To plan and compose your essay, you will do the following:

1. View two short videos and read two articles taking notes on the sources.
2. Answer three research questions about the sources.
3. Participate in an optional field investigation to learn more about plankton and the types that are harmful. You will share your findings with the Olympic Region Harmful Algal Blooms (ORHSB)
4. Write your essay.

### Directions for beginning:

You will now watch two videos and read two articles, taking notes with the template provided. You may refer back to the sources and your notes when writing your essay.

### Sources Information:

#### Video #1: Keeping TABS on HABS: Single Celled Rebels:

[http://link.brightcove.com/services/player/bcpid660572735001?bckey=AQ~~,AAAAMzfSubE~,RCh\\_vKEgcc\\_JMzkxcOiauevcIDBmMO9s&bctid=2144712276001](http://link.brightcove.com/services/player/bcpid660572735001?bckey=AQ~~,AAAAMzfSubE~,RCh_vKEgcc_JMzkxcOiauevcIDBmMO9s&bctid=2144712276001) (2 min. 7 sec.)

#### Video #2: Keeping TABS on HABS: Sampling Techniques:

<https://videos.fisheries.noaa.gov/detail/video/2144668526001/1.2-tabs-on-habs-sampling-techniques-2013?autoStart=true&q=tabs%20on%20habs> (2 min. 39 sec.)

Article #1: Salish Sea Snapshots: Detecting Harmful Algae Blooms *EPA 2106 Salish Sea Ecosystem Conference*: <https://www.eopugetsound.org/articles/salish-sea-snapshots-detecting-harmful-algal-blooms>

Article #2: Harmful Algae Blooms: Adapted from Harmful Algae Blooms article *Center for Disease Control and Prevention*: <https://www.cdc.gov/habs/environment.html>

Except where otherwise noted, *FieldSTEM* copyright [Pacific Education Institute](#) (PEI), is available under a [Creative Commons Attribution-NonCommercial 4.0 License](#). All logos and trademarks are the property of their respective owners.



## Task: Harmful Algae Blooms



### Notetaking Tool: Video Resources

Video Resource	What is a Harmful Algae Bloom and how might we recognize one?	In what ways are these blooms harmful?	What can we do to keep ourselves safe?
<b>Video Resource # 1:</b>  <b>Keeping TABS on HABS: Single Celled Rebels</b>			
<b>Video Resource #2:</b> <b>Sampling Techniques</b>			



## Task: Harmful Algae Blooms



### Notetaking Tool: Print Resources

Print Resources	What is a Harmful Algae Bloom and how might we recognize one?	How are these blooms harmful?	What can we do to keep ourselves safe?
<b>Print Resource: #1:</b>  <b>Salish Sea Snapshots: Detecting harmful algal blooms</b>			
<b>Print Resource #2:</b>  <b>Harmful Algae Blooms: Causes and Ecosystem Impacts</b>			

# Harmful Algae Blooms: Causes and Ecosystem Impacts

(Adapted from “Harmful Algae Blooms: Causes and Ecosystems Impacts” by the *Center for Disease Control and Prevention*. Original article can be found here: <https://www.cdc.gov/habs/environment.html>)

Learn what harmful algal blooms are, why they are a concern, and what causes them to form.

## Bloom Basics

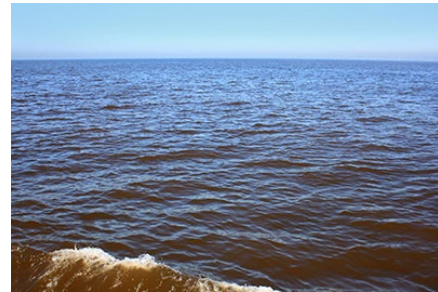
### Algae

Algae are a group of plant-like organisms that are usually found in water. Like plants, algae have a pigment called chlorophyll that they use to turn sunlight into food. Algae can be found in all types of aquatic ecosystems, including salt water, fresh water, and brackish water (a mix of salt and fresh water).

Algae that live in the water can be grouped into two categories, seaweed, and phytoplankton. Seaweed are large algae made up of many cells and phytoplankton are small, single-celled algae.



Seaweed



Phytoplankton

Phytoplankton sometimes reproduce quickly, which is referred to as a “bloom.” Some blooms can harm people, animals, or the environment by:

- Producing toxins
- Becoming too dense and blocking light
- Using up the oxygen in the water

These harmful blooms can be caused by many types of **phytoplankton**. However, the two types that cause most harmful algal blooms off the Washington Coast are dinoflagellates and diatoms. **Dinoflagellates** and **diatoms** can make the water different colors, including red, brown, or golden. They are most often found in salt water or brackish water, including estuaries.

### Are algae good or bad?

On their own, algae are not good or bad. They are important organisms that produce most of the oxygen needed to sustain life. However, if too many algae grow at once, or if they produce toxins, they can harm people, animals, and the environment.

### Not all blooms are harmful.

Some algae blooms can discolor water, smell bad, and cause the water or fish to taste bad, but are not toxic. **You cannot tell if a bloom is harmful just by looking at it. Testing a sample of water from the bloom is the only way to know for sure that the bloom is harmful.**

## Ecosystem Impacts

### Phytoplankton and their toxins can harm people, animals, and local environments

Ecosystems are made up of living organisms and the physical environment. People, animals, and local environments are all part of an ecosystem. Harmful algae are a health issue and can affect ecosystems in many ways. For example, some **Dinoflagellates** and **diatoms** can cause harm to people and animals by making toxins or growing too dense.

### Toxins

Toxins can be in the cells of the **phytoplankton** or released into the water. Shellfish take in the toxins and pass these onto humans who eat the animals.

### Common toxins made by dinoflagellates

- Brevetoxin
- Azaspiracid
- Ciguatoxins
- Okadic acid
- Saxitoxin
- Dinophysistoxin
- Yessotoxins

### Common toxin made by diatoms

- Domoic acid

### Dense blooms

If a bloom becomes so dense that sunlight cannot go through, it can block plants and animals in the water from getting the sunlight they need to survive. Dense blooms can also clog the gills of fish and shellfish, preventing them from breathing.

When a bloom dies off, the decay process may use up all the oxygen in the water, causing other organisms in the water to suffocate (not be able to breathe).

### Keeping Yourself and Your Animals Safe

Algae blooms can create toxins that are harmful to people and animals. How do we get poisoned? By eating seafood that has been infected by the toxins from an algae bloom. Shellfish absorb the toxins, which are stored in their bodies for weeks, months, or sometimes even more than a year, after the bloom dissipates.

Researchers test shellfish to determine when they are safe to eat.

Always check with the Department of Health before harvesting shellfish. You can view the [Washington Shellfish Safety Map](#) or call the Biotoxin Hotline (1-800-562-5632) to get the most up-to-date shellfish closure information before you harvest. Neither cooking nor freezing will destroy the biotoxins present in shellfish. It is not safe to eat shellfish that are harvested from areas that are closed due to biotoxins.

## Contributing Factors

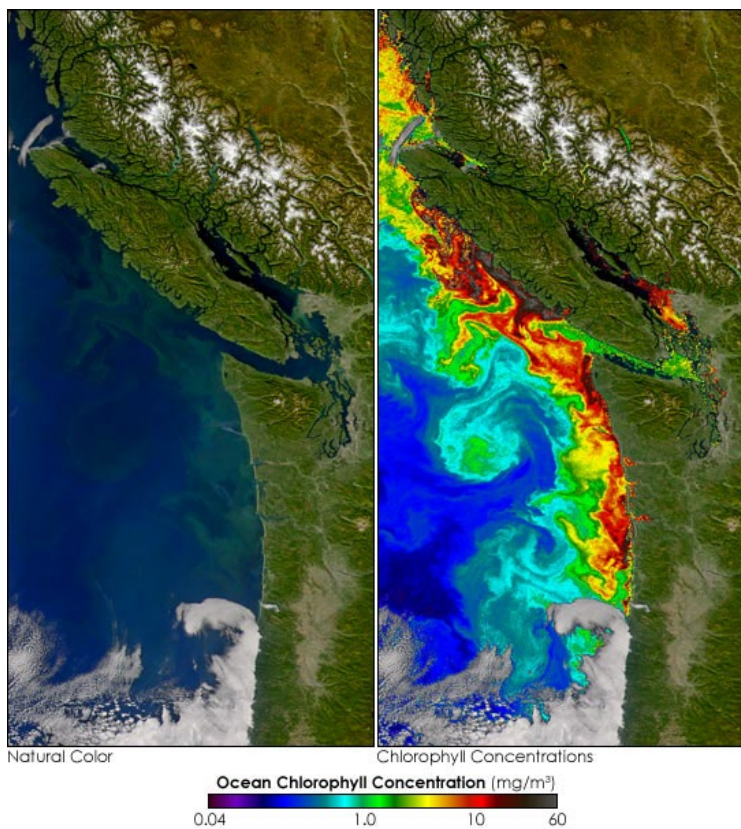
Many factors can encourage **phytoplankton** to reproduce quickly, or bloom:

- **Levels of nutrients** such as phosphorus and nitrogen increase in water. Contributing factors include:
  - Fertilizer (for example, from home lawns and agricultural land)
  - Sewage from people and animals
  - Run-off from cities and industrial buildings
- **Deep ocean water rises** towards the surface and increases nutrient levels. This rising of the water is called upwelling. It can happen along the western U.S. coastline when there are changes in temperature between the ocean and the atmosphere above the eastern Pacific Ocean.
- **Water temperature** increases. Blooms are more likely to happen in summer or fall but can occur any time of year.

**Climate change** can increase the growth of harmful algae. It can make blooms occur more often and be more severe. For example, warming temperatures (global warming) have contributed to extensive blooms that can last into the early winter months. In the past several years, such blooms have been found more often and in more places across the United States.

**Let's Review!** What have you learned about harmful algae blooms?

- What are they?
- How are they harmful?
- What causes blooms to grow quickly?
- How can you and your family stay safe?



### Toxic Algal Bloom off Washington

The image on the left is a “true color” satellite photo of algae blooms off the coast of Washington and Vancouver Island.

The image on the right has been computer-enhanced to show the density of chlorophyll. Algae produce chlorophyll, so the higher concentration of chlorophyll, the more algae are in that area.

NASA images courtesy the [SeaWiFS Project](#), NASA/Goddard Space Flight Center, and [ORBIMAGE](#).



# Task: Harmful Algae Blooms



## Part 1 Research Questions:

Answer the research questions using information from the sources. Cite your sources.

1. Explain what harmful algae bloom (HAB) are and what causes them. Use information from two of your sources. Cite your sources. (*Locating Information*)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

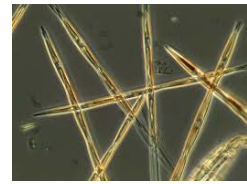
---

---



## Task: Harmful Algae Blooms

---



2. Which sources were most helpful to you in learning about harmful algae blooms, the videos, or the articles? Give evidence to support your choice. (*Selecting the best information*).

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

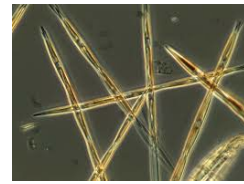
---





## Task: Harmful Algae Blooms

---



3. Explain the effect of HAB's on people, sea life, and local businesses. Use at least two of your sources. Cite your sources. (Having enough information to explain)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

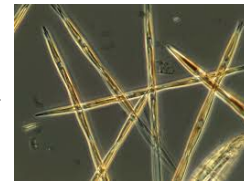
---

---



## Task: Harmful Algae Blooms

---



### PART 2

#### Student Directions:

Review your note and sources. Plan, draft, and revise your essay. Now read your assignment and the information about how your essay will be scored, and then begin your work.

#### Your assignment:

You have been asked to help educate other students on the dangers of Harmful Algae Blooms. Write an essay where you explain what HABs are, how we might recognize them, and why they are a problem. Also, share with your audience what they can do to stay safe. Be sure to cite sources.

#### How your informational/explanatory essay will be scored:

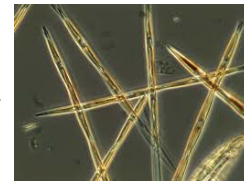
1. **Statement of Purpose/Focus-** how well you clearly state and maintain your controlling idea or main idea.
2. **Organization-** how well the ideas progress from the introduction to the conclusion using effective transitions and how well you stay on topic throughout the essay.
3. **Elaboration of Evidence-** How well you provide evidence from sources about your topic and elaborate with specific information.
4. **Language and Vocabulary-** how well you effectively express ideas using precise language that is appropriate for your audience and purpose.
5. **Conventions-** how well you follow the rules of usage, punctuation, capitalization, and spelling.

#### Now begin work on your essay:

- Review your notes.
- Plan your essay using the template provided.
- Write your essay.
- Revise and edit for a final draft.



## Task: Harmful Algae Blooms



### Planning My Essay: Harmful Algae Blooms

#### Essay Components

Introduction: Capture the reader's attention about HAB's

Purpose of your essay: Tell the readers that you will educate them about HAB's including what they are, how we might recognize them, and why they are a problem.

Support #1: What HAB's are and how to recognize them.

Support #2: Why HAB's are a problem to shellfish and humans

Support #3: What we can do to keep ourselves safe

Conclusion: Summarize the importance of learning about HABs

# Informative / Explanatory Writing Rubric (Grades 6-11)

## Scoring Version



Score	4	3	2	1
Statement of Purpose/Focus	<p>The response is fully sustained and consistently and purposefully focused:</p> <ul style="list-style-type: none"> <li>consistent or main idea of a topic is clearly communicated, and the focus is strongly maintained for the purpose, audience, and task</li> </ul>	<p>The response is adequately sustained and generally focused:</p> <ul style="list-style-type: none"> <li>controlling or main idea of the topic is clear, and the focus is mostly maintained for the purpose, audience, and task</li> </ul>	<p>The response is somewhat sustained and may have a minor drift in focus:</p> <ul style="list-style-type: none"> <li>controlling or main idea of a topic may be somewhat unclear, and the focus may be insufficiently sustained for the purpose, audience, and task</li> </ul>	<p>The response may be related to the topic but may provide little or no focus:</p> <ul style="list-style-type: none"> <li>controlling or main idea of the topic may be somewhat confusing or ambiguous; response may be too brief or the focus may drift from the purpose, audience, and task</li> </ul>
Organization	<p>The response has a clear and effective organizational structure creating unity and completeness:</p> <ul style="list-style-type: none"> <li>consistent use of a variety of transitional strategies to clarify the relationships between and among ideas</li> <li>effective introduction and conclusion</li> <li>logical progression of ideas from beginning to end; strong connections between and among ideas, with some syntactic variety</li> </ul>	<p>The response has an evident organizational structure and a sense of completeness, though there may be minor flaws and some ideas may be loosely connected:</p> <ul style="list-style-type: none"> <li>adequate use of transitional strategies with some variety to clarify the relationships between and among ideas</li> <li>adequate introduction and conclusion</li> <li>adequate progression of ideas from beginning to end; adequate connections between and among ideas</li> </ul>	<p>The response has an inconsistent organizational structure, and flaws are evident:</p> <ul style="list-style-type: none"> <li>inconsistent use of transitional strategies with little variety</li> <li>introduction and conclusion, if present, may be weak</li> <li>uneven progression of ideas from beginning to end; and/or formulaic; inconsistent or unclear connections between and among ideas</li> </ul>	<p>The response has little or no discernible organizational structure:</p> <ul style="list-style-type: none"> <li>few or no transitional strategies are evident</li> <li>introduction and conclusion, if present, may be missing</li> <li>frequent extraneous ideas may be evident; ideas may be randomly ordered or have an unclear progression</li> </ul>
Elaboration of Evidence	<p>The response provides thorough and convincing support/evidence for the controlling idea and supporting idea(s) that includes the effective use of sources, facts, and details.</p> <ul style="list-style-type: none"> <li>comprehensive evidence from sources is integrated; references are relevant and specific</li> <li>effective use of a variety of elaborative techniques*</li> </ul>	<p>The response provides adequate support/evidence for the controlling idea and supporting idea(s) that includes the use of sources, facts, and details:</p> <ul style="list-style-type: none"> <li>adequate evidence from sources is integrated; some references may be general</li> <li>adequate use of some elaborative techniques*</li> </ul>	<p>The response provides uneven, cursory support/evidence for the controlling idea and supporting idea(s) that includes uneven or limited use of sources, facts, and details:</p> <ul style="list-style-type: none"> <li>some evidence from sources is weakly integrated, imprecise, or repetitive; references may be vague</li> <li>weak or uneven use of elaborative techniques*; development may consist primarily of source summary</li> </ul>	<p>The response provides minimal support/evidence for the controlling idea and supporting idea(s) that includes little or no use of sources, facts, and details:</p> <ul style="list-style-type: none"> <li>evidence from the source material is minimal or irrelevant; references may be absent or incorrectly used</li> <li>minimal, if any, use of elaborative techniques*</li> </ul>
Language	<p>The response clearly and effectively elaborates ideas, using precise language:</p> <ul style="list-style-type: none"> <li>vocabulary is clearly appropriate for the audience and purpose</li> <li>effective, appropriate style enhances content</li> </ul>	<p>The response adequately elaborates ideas, employing a mix of precise with more general language:</p> <ul style="list-style-type: none"> <li>vocabulary is generally appropriate for the audience and purpose</li> <li>generally appropriate style is evident</li> </ul>	<p>The response elaborates ideas unevenly, using simplistic language:</p> <ul style="list-style-type: none"> <li>vocabulary is uneven or somewhat ineffective for the audience and purpose</li> <li>inconsistent or weak attempt to create appropriate style</li> </ul>	<p>The response is vague, lacks clarity, or is confusing:</p> <ul style="list-style-type: none"> <li>vocabulary is limited or ineffective for the audience and purpose</li> <li>little or no evidence of appropriate style</li> </ul>

Score	2	1	0
Conventions	<p>The response demonstrates a command of conventions:</p> <ul style="list-style-type: none"> <li>adequate use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling</li> </ul>	<p>The response demonstrates partial command of conventions:</p> <ul style="list-style-type: none"> <li>limited use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling</li> </ul>	<p>The response demonstrates little or no command of conventions:</p> <ul style="list-style-type: none"> <li>infrequent use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling</li> </ul>

NS	Unintelligible, in a language other than English, off-topic, insufficient evidence (incomplete) or copied text. (Off-purpose writing will still receive a score in Conventions.)
----	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

\*Elaborative techniques may include the use of personal experiences that support the controlling idea.