Formative Assessment Exemplar - 8.3.3

Introduction:

The following formative assessment exemplar was created by a team of Utah educators to be used as a resource in the classroom. It was reviewed for appropriateness by a Bias and Sensitivity/Special Education team and by state science leaders. While no assessment is perfect, it is intended to be used as a formative tool that enables teachers to obtain evidence of student learning, identify gaps in that learning, and adjust instruction for all three dimensions (i.e., Science and Engineering Practices, Crosscutting Concepts, Disciplinary Core Ideas) included in a specific Science and Engineering Education (SEEd) Standard.

In order to fully assess students' understanding of all three dimensions of a SEEd standard, the assessment is written in a format called a cluster. Each cluster starts with a phenomenon, provides a task statement, necessary supporting information, and a sequenced list of questions using the gather, reason, and communicate model (Moulding et al., 2021) as a way to scaffold student sensemaking. The phenomenon used in an assessment exemplar is an analogous phenomenon (one that should not have been taught during instruction) to assess how well students can transfer and apply their learning in a novel situation. The cluster provides an example of the expected rigor of student learning for all three dimensions of a specific standard. In order to serve this purpose, this assessment is NOT INTENDED TO BE USED AS A LESSON FOR STUDENTS.

Because this assessment exemplar is a resource, teachers can choose to use it however they want for formative assessment purposes. It can be adjusted and formatted to fit a teacher's instructional needs. For example, teachers can choose to delete questions, add questions, edit questions, or break the tasks into smaller segments to be given to students over multiple days.

General Format:

Each formative assessment exemplar contains the following components:

1. Teacher Facing Information: This provides teachers with the full cluster as well as additional information including the question types, alignment to three dimensions, and answer key. Additionally, an example of a proficient student answer and a proficiency scale for all three dimensions are included to support the evaluation of the last item of the assessment.
2. Students Facing Assessment: This is what the student may see. It is in a form that can be printed or uploaded to a learning platform. (Exception: Questions including simulations will need technology to utilize during assessment.)

Accommodation Considerations:

Teachers should consider possible common ways to provide accommodations for students with disabilities, English language learners, students with diverse needs or students from different cultural backgrounds. For example, these accommodations may include: Providing academic language supports, presenting sentence stems, or reading aloud to students. All students should be allowed access to a dictionary.

References:

Moulding, B., Huff, K., & Van der Veen, W. (2021). *Engaging Students in Science Investigation Using GRC*. Ogden, UT: ELM Tree Publishing.

Teacher Facing Information

Standard: 8.3.3

Assessment Format: Online Only (Requires students to have online access), Printable or Online Format (Does not require students to have online access)

Phenomenon	
A person with asthma is walking along a Gulf Coast beach in Florida. They begin to notice that they have difficulty breathing. They look out into the water and see that the water is red. Figure 1: A beach in Florida  An image of a red tide in a Florida Beach(Flickr User AJC1)	Proficient Student Explanation of Phenomenon: Student Task: Using data from the provided information, write a CER (claim, evidence, reasoning) arguing a significant cause of the red tide in Florida and its impact (effect) on the ecosystem's food web which includes humans. Use qualitative evidence from the provided information to describe the cause and effect to back up your claim. You should also support each piece of evidence with reasoning of why that evidence supports your claim. Possible causes could include: Fertilizer, agriculture, pollution from factories, house-hold pollution, flooding, hurricanes, storms, upwelling, Possible effects could include: Killing sea life, affecting human health (respiratory, toxic seafood ingestion), reducing recreation area availability, certain beaches might need to be closed, food web disruption, energy flow disruption. photosynthesis and cellular respiration disruption.
Cluster Task Statement	
(Represents the ultimate way the phenomenon will be explained or the design problem will be addressed) In this task you will use text, diagrams, and information to answer questions and write a claim, evidence, and reasoning statement about what the person is experiencing as they walk along the beach in Florida.	
Supporting Information	
The coast of Florida experienced an event of the stench of thousands of dead, bloated fish hungover in 2018. The fish were casualties of an uncontrolled growth of algae called *Karenia brevis* (Kaa-REN-ee-uh BREV-iss). Such blooms hit the Gulf of Mexico's coastlines almost every year but in	

2018, it was particularly intense — and toxic. It causes breathing problems for people — and kills sea creatures. Dolphins and endangered sea turtles may turn up among the dead. It is called red tide because the algae that turn the water a murky reddish tint.

When algae cells die or become damaged by waves, they release poisons. These are called brevetoxins (BREV-eh-tox-ins). During a bloom, the algae's poisons can enter the air. People walking along an affected beach might cough or sneeze or have itchy eyes. A red tide's effects can be worse for people already struggling with lung issues, such as asthma.

Figure 2: The order of events that lead to a red tide

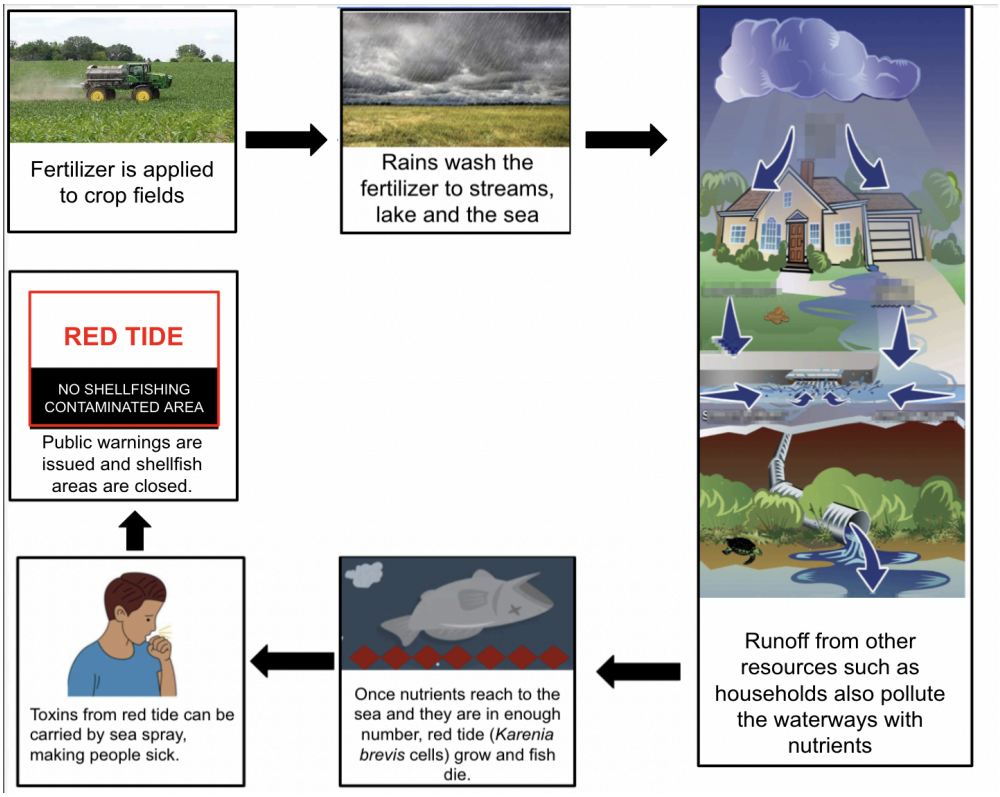
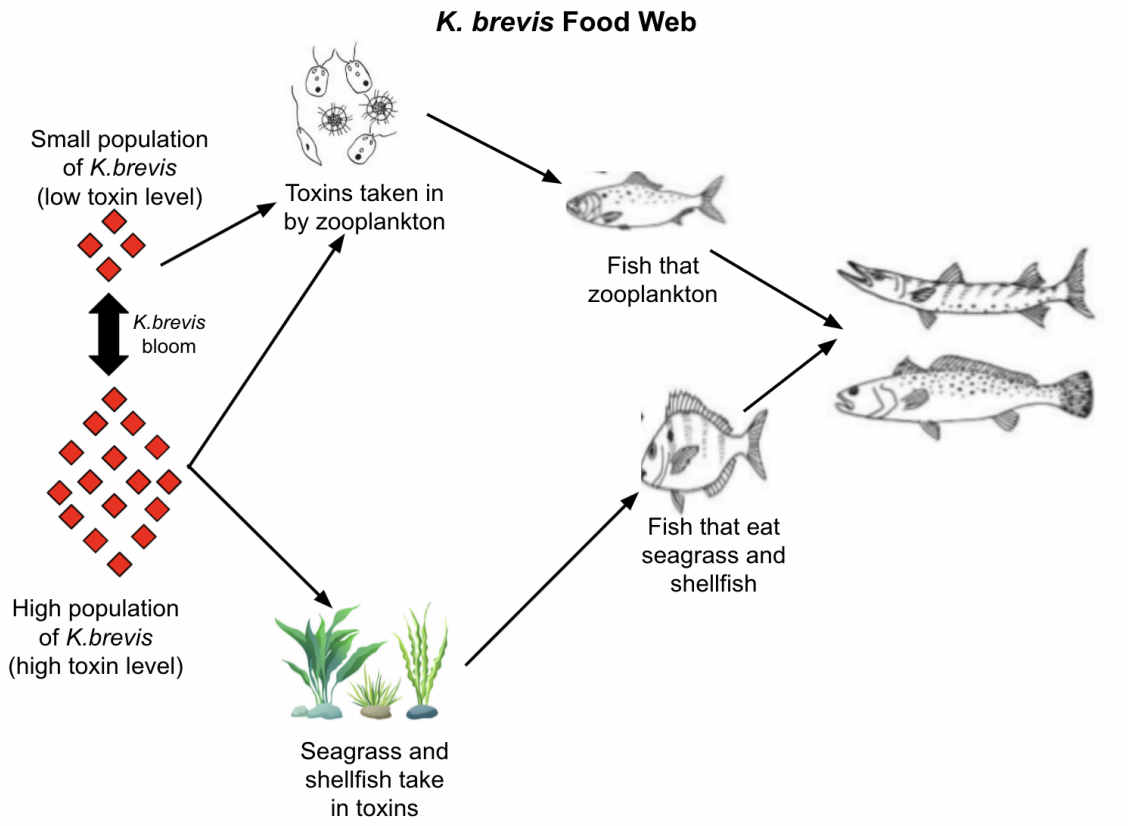


Figure 2 shows the events that causes a red tide in Florida

Figure 3: *K.brevis* Food Web



K.brevis is a photosynthetic algae that causes a red tide. The figure shows that it is eaten by zooplankton and that it passes the toxins to fishes. Seagrass and shellfish also take in the toxins and they are eaten by fishes.

Cluster Questions

Gather:
Cluster Question #__1__
Question Type: Table Match
Addresses:
__x__ DCI (LS2.B, LS2.C)
__x__ SEP Asking Questions, Obtain, Evaluate, and Communicate.
__x__ CCC Change and Stability, Cycling of matter and Flow of energy.
Answer:
Information/Sentence #

A matches up with #2.
B matches up with #6.
C matches up with #5.
D matches up with #3.

Question 1:
Match up the sentence number with where you would find the information provided about toxic algae blooms.

1. The stench of thousands of dead, bloated fish hung over the beaches of western Florida for months in 2018.
2. The fish were casualties of an algae bloom — an uncontrolled growth of small organisms.
3. Such blooms hit the Gulf of Mexico's coastlines almost every year.
4. Called a red tide, this year's bloom has been particularly intense — and toxic.
5. The algae that turn the water a murky reddish tint also emit a poison.
6. It can cause breathing problems for people — and kill sea creatures.
7. Dolphins and endangered sea turtles may turn up among

<table>
<tr>
<td>E matches up with #4.</td>
<td>the dead.

<table><tr><th>Information</th><th>Sentence #</th></tr><tr><td>A. Definition of an algae bloom.</td><td>2</td></tr><tr><td>B.How it affects humans.</td><td>6</td></tr><tr><td>C.The reason for the red color.</td><td>5</td></tr><tr><td>D.The part of the world where they occur most.</td><td>3</td></tr><tr><td>E.The name of these toxic algae blooms.</td><td>4</td></tr></table></td>
</tr>
<tr>
<td>Gather:
Cluster Question #__2__
Question Type: Table match
Addresses:
__x__ DCI (LS2.B, LS2.C)
__x__ SEP Asking Questions, Obtain, Evaluate, and Communicate.
__x__ CCC Change and Stability, Cycling of matter and Flow of energy.
Answer:

Information/Sentence #

A matches up with #1 and 2.
B matches up with #7.
C matches up with #3.
D matches up with #6.
E matches up with #5.</td>
<td>Question 2:

Match up the sentence number with where you would find the information provided about toxic algae blooms.

1. The best known toxic tides are caused by Karenia brevis (Kaa-REN-ee-uh BREV-iss).
2. These fragile, single-celled algae create red tides.
3. When their cells die or become damaged by waves, they release poisons.
4. These are called brevetoxins (BREV-eh-tox-ins).
5. During a bloom, the algae’s poisons can enter the air.
6. People walking along an affected beach might cough or sneeze or have itchy eyes.
7. A red tide’s effects can be worse for people already struggling with lung issues, such as asthma

Information Sentence #</td>
</tr>
</table>

	A. What causes the red tide. 1 and 2 B.Who is affected most by red tides. 7 C.What causes the release of the toxin or poison. 3 D.Symptoms a person might experience. 6 E.How the algae can affect human breathing. 5
Gather: Cluster Question #__3__ Question Type: Table Match Addresses: __x__ DCI (LS2.B, LS2.C) __x__ SEP Asking Questions, Obtain, Evaluate, and Communicate. __x__ CCC Change and Stability, Cycling of matter and Flow of energy. Answer: **Information/Sentence #** **A matches up with #8-11.** **B matches up with #3.** **C matches up with #4.** **D matches up with #7.** .	Question 3: Match up the sentence number with where you would find the information provided about toxic algae blooms. 1. There are natural sources of nutrients in the sea, but nutrient pollution can occur when nutrients from the land run off into local waters. 2. Nutrient pollution can be thought of as the rocket fuel that can make algae grow rapidly. 3. It gives them a buffet of nutritious substances to live on. 4. The term for the enrichment of waters with excess nutrients, leading to algal blooms and the problems they cause, is eutrophication 5. There are many sources of nutrients that make their way from the land to the sea. 6. We apply lots of nutrients (fertilizers) on land to make lawns and golf courses look green. 7. The biggest source of nutrients comes from agriculture,

and Florida has lots of farmland.

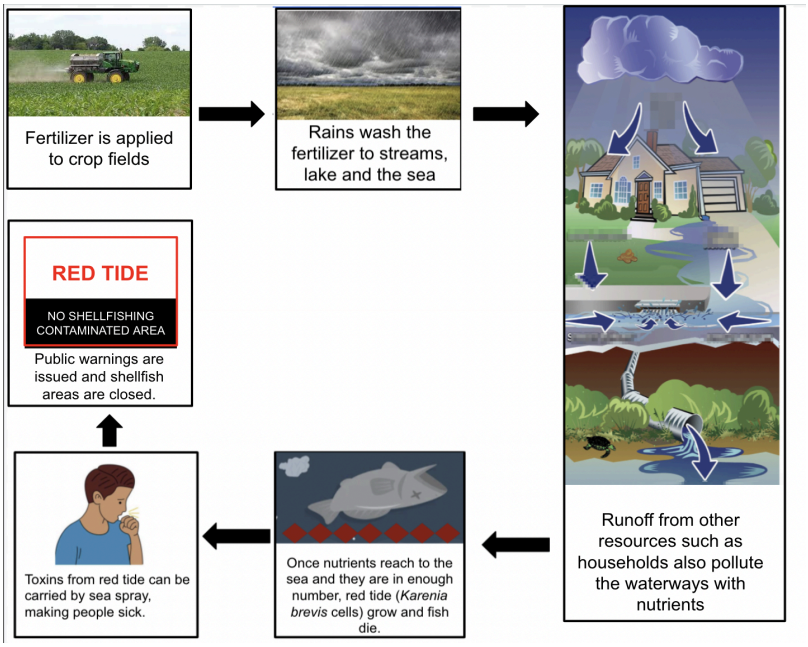
8. Most nutrients used in agriculture stay on land and support the growth of crops.
9. But some can run into rivers and streams when it rains, and can also seep into groundwater.
10. Even more nutrients runoff into rivers and streams when it rains hard (Figure 2).
11. Nutrients also make their way into waterways when we flush the toilet.
12. Without enough nutrients, red tide blooms do not occur and this is what happens most summers.
13. *Karenia brevis* cells may start to grow, but they die out because there are not a lot of natural nutrients in the Gulf of Mexico

Information	**Sentence #**
A.Describes where nutrients that humans use can go.	8-11
B.Describes how nutrient pollution helps algal blooms.	3
C.Gives the scientific term for nutrient pollution.	4
D.Gives the biggest source of nutrient pollution.	7

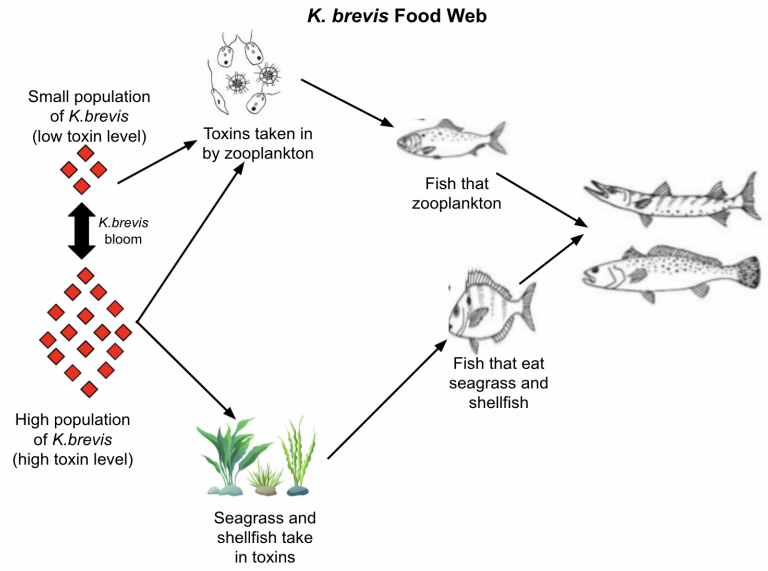
*list all 13 sentences as possible distractors.

Gather:
Cluster Question #__4__
Question Type: Ordering
Addresses:
__x__ DCI (LS2.B, LS2.C)
__x__ SEP Asking Questions, Obtain, Evaluate, and

Question 4:
Study Figure 2 below and then place the steps in order to show how nutrient pollution from humans can end up causing red tides, a disruption in the food web, and health problems for humans.

Communicate. __x__ CCC Change and Stability, Cycling of matter and Flow of energy. Answer: **4,2,5,3,1,6**	 1- Toxins can get into the air and make people sick. 2- Storms wash nutrients into water sources. 3- Nutrients cause a red tide which can kill off organisms living in the ocean. 4- Fertilizer (often too much of it) is used in agriculture. 5- Households also provide runoff of nutrients that can cause pollution. 6- Leads to disruption in the food web, temporarily closes beaches to fishing and recreation. **Steps: _____ , _____ , _____ , _____ , _____ , _____ ,**
Reason: Cluster Question # __5__ Question Type: Table Sort __x__ DCI (LS2.B, LS2.C) __x__ SEP Asking Questions, Obtain, Evaluate, and Communicate. __x__ CCC Change and Stability, Cycling of matter and Flow of energy. Answer:	Question 5: Using Figure 3, sort the organisms by the role they play in the ecosystem. Figure 3. *K. brevis* Food Web

Producers	Primary Consumers (Herbivores)	Secondary Consumers (Carnivores)
seagrass	zooplankton	fish that eat other fish
algae	fish that eat seagrass	



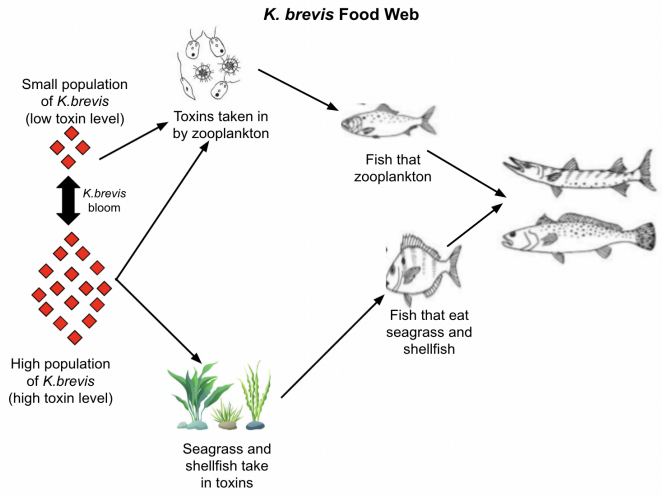
Organisms to sort: seagrass, K.brevis Algae, Fish that eat other fish, zooplankton, fish that eat seagrass

Producers	Primary Consumers (Herbivores)	Secondary Consumer (Carnivores)

Reason:
Cluster Question # __6__
Question Type: Multiple Select
__x__ DCI (LS2.B, LS2.C)
__x__ SEP Asking Questions, Obtain, Evaluate, and Communicate.
__x__ CCC Change and Stability, Cycling of matter and Flow of energy.
Answers: b,e

Question 6:

Figure 3. *K. brevis* Food Web



Using Figure 3, **select 2** choices that best explain the death of

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<td>carnivorous fish during a red tide.

A. The toxins move from the zooplankton to the seagrass and when the carnivorous fish eat the seagrass they die.
B. The shellfish absorb the toxins when eaten by the fish the toxins are passed along. Carnivorous fish then get the toxin as they eat other fish.
C. Carnivorous fish eat the algae and then are killed by the toxins.
D. The seagrass produces the toxins and kills the shellfish and carnivorous fish.
E. The zooplankton absorb the toxins as they eat the algae. When a fish eats the plankton the toxins are passed on. Carnivorous fish absorb the toxins as they eat the smaller fish.</td>
</tr>
<tr>
<td>Reason:
Cluster Question #__7__
Question Type: Table Sort
Addressing
__x__ DCI (LS2.B, LS2.C)
__x__ SEP Asking Questions
__x__ CCC Change and Stability, Cycling of matter and Flow of energy.
Answer: (this is a check box question where the students will have the question and will check either scientific question or non-scientific question).

1. Why do people like to study red tides? NON-Scientific
2. Are fish afraid of red tides? NON-Scientific
3. What are the levels of oxygen in a red tide? Scientific
4. How is light transfer through the water affected by red tides? Scientific
5. What are some respiratory diseases that</td>
<td>Question 7:
Evaluate the following questions that could be asked about red tides. Classify each question as a scientific/non-scientific question. Remember, a scientific question means that you could perform experiments and/or measure data. A non-scientific question is opinion based and/or cannot be tested on the specified topic.

1. Why do people like to study red tides?
2. Are fish afraid of red tides?
3. What are the levels of oxygen in a red tide?
4. How is light transfer through the water affected by red tides?
5. What are some respiratory diseases that affect humans?
6. How does the amount of certain chemicals affect the ability of red tide growth?

<table><tr><th>Scientific</th><th>Nonscientific</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td>
</tr>
</table>

affect humans? *NON-Scientific* 6. How does the amount of certain chemicals affect the ability of red tide growth? *Scientific*	
Reason: Cluster Question #__8___ Question Type: Table Sort Addressing _x_ DCI (LS2.B, LS2.C) _x_ SEP Asking Questions, Obtain, Evaluate, and Communicate. ____ CCC Change and Stability, Cycling of matter and Flow of energy. Answer: Statement 1: Reading 2 and 3 are biased because some people do not like those sources. FALSE Statement 2: Reading 2 and 3 are not as biased as 1 because they are backed with data and contain sources. TRUE Statement 3: Reading 3 has qualitative and quantitative data to back up its statements. TRUE Statement 4: Reading 1 has qualitative data to back up its statements. FALSE Statement 5: Reading 2 does not have data to back up its statements so its statements are not correct. FALSE	Question 8: Part of science is knowing if you are using unbiased and factual evidence to support your claims. Read over the following three article excerpts and then mark the following statements as true or false. *Remember that qualitative data is descriptive data and quantitative data is numerical data.* **Reading 1:** "When I was visiting Florida, I saw that the water was red. I went into the water and found that it wasn't really fun to be in it. For a few days afterward, I didn't feel very well, but I got better. Now I know that I don't like it when the water is red. I learned later that the red water is called a red tide. Red tides are the worst." **Reading 2:** "The Effects: Human Health Excess nutrients and harmful algal blooms create toxins and compounds in water that pose danger for human health. There are several ways that people (and pets) can be exposed to these compounds. Drinking, accidentally swallowing or swimming in water affected by a harmful algal bloom can cause serious health problems including: ● Rashes ● Stomach or liver illness ● Respiratory problems ● Neurological effects" Excerpt taken from an article from the Environmental Protection Agency, Nutrient Pollution. https://www.epa.gov/nutrientpollution/effects-human-health **Reading 3:** Nitrogen pollution is a contributor to red tide growth. "Identifying nutrient sources is a complicated task because, at more than 1.2 million square miles, the Mississippi River Basin is the fourth largest basin in the world. It covers close to 40 percent of the lower 48 States. There are 31 States that drain, via the Mississippi River Basin, into the Gulf of Mexico, and nutrient sources are found throughout the basin. Fertilizers used on crops, air pollution, and manure are some of the major sources of nitrogen transported from the Mississippi River Basin to the Gulf of Mexico." Excerpt taken from an article from the USGS, Nitrogen and Water.

	True False Statement 1: Reading 2 and 3 are biased because some people do not like those sources. True False Statement 2: Reading 2 and 3 are not as biased as 1 because they are backed with data and contain sources. True False Statement 3: Reading 3 has qualitative and quantitative data to back up its statements. True False Statement 4: Reading 1 has qualitative data to back up its statements. True False Statement 5: Reading 2 does not have data to back up its statements so its statements are not correct.
Communicate: Cluster Question #___9__ Question Type: Addresses: _x__ DCI (LS2.B, LS2.C) _x___ SEP Asking Questions, Obtain, Evaluate, and Communicate. _x___ CCC Change and Stability, Cycling of matter and Flow of energy. Answer: <u>Possible causes could include</u>: Fertilizer, agriculture, pollution from factories, house-hold pollution, flooding, hurricanes, storms, upwelling, <u>Possible effects could include</u>: Killing sea life, affecting human health (respiratory, toxic seafood ingestion), reducing recreation area availability, certain beaches might need to be closed, food web disruption, energy flow disruption. photosynthesis and cellular respiration disruption.	Question 9: Using data from the provided information, write a CER (claim, evidence, reasoning) arguing a significant cause of the red tide in Florida and its impact (effect) on the ecosystem's food web which includes humans. Use qualitative evidence from the provided information to describe the cause and effect to back up your claim. You should also support each piece of evidence with reasoning of why that evidence supports your claim.
Proficiency Scale	
Proficient Student Explanation: Using data from the provided information, write a CER (claim, evidence, reasoning) arguing a significant cause of the red tide in Florida and its impact (effect) on the ecosystem's food web which includes humans. Use qualitative evidence from the provided information to describe the cause and effect to back up	

your claim. You should also support each piece of evidence with reasoning of why that evidence supports your claim.

Possible causes could include: Fertilizer, agriculture, pollution from factories, house-hold pollution, flooding, hurricanes, storms, upwelling,
Possible effects could include: Killing sea life, affecting human health (respiratory, toxic seafood ingestion), reducing recreation area availability, certain beaches might need to be closed, food web disruption, energy flow disruption. photosynthesis and cellular respiration disruption.

Level 1 - Emerging	Level 2 - Partially Proficient	Level 3 - Proficient	Level 4 - Extending
SEP: Does not meet the minimum standard to receive a 2.	**SEP:** Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.	**SEP:** Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings Gather, read, synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and	**SEP:** Extends beyond proficient in any way.

	Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.	describe how they are supported or not supported by evidence. Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	
CCC: Does not meet the minimum standard to receive a 2.	**CCC:** Understands matter is transported into, out of, and within systems. Identifies energy can be transferred in various ways and between objects.	**CCC:** Can track the transfer of energy drives the motion and/or cycling of matter, within a natural or designed system. Understands that the transfer of energy can be tracked as energy flows through a designed or natural system. Analyzes complex natural and designed systems to determine how they function.	**CCC:** Extends beyond proficient in any way.
DCI: Does not meet the minimum standard to receive a 2.	**DCI:** Matter cycles between the air and soil and among plants, animals,	**DCI:** Food webs are models that demonstrate how matter and energy is	**DCI:** Extends beyond proficient in any way.

	and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.	transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level.. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	

(Student Facing Format on following page)

Name: _____ Date: _____

Stimulus

A person with asthma is walking along a Gulf Coast beach in Florida. They begin to notice that they have difficulty breathing. They look out into the water and see that the water is red.

Figure 1: A beach in Florida

An image of a red tide in a Florida Beach(Flickr User AJC1)

The coast of Florida experienced an event of the stench of thousands of dead, bloated fish hungover in 2018. The fish were casualties of an uncontrolled growth of algae called *Karenia brevis* (Kaa-REN-ee-uh BREV-iss). Such blooms hit the Gulf of Mexico's coastlines almost every year but in 2018, it was particularly intense — and toxic. It causes breathing problems for people — and kills sea creatures. Dolphins and endangered sea turtles may turn up among the dead. It is called red tide because the algae that turn the water a murky reddish tint.
When algae cells die or become damaged by waves, they release poisons. These are called brevetoxins (BREV-eh-tox-ins). During a bloom, the algae's poisons can enter the air. People walking along an affected beach might cough or sneeze or have itchy eyes. A red tide's effects can be worse for people already struggling with lung issues, such as asthma.

Figure 2: The order of events that lead to a red tide

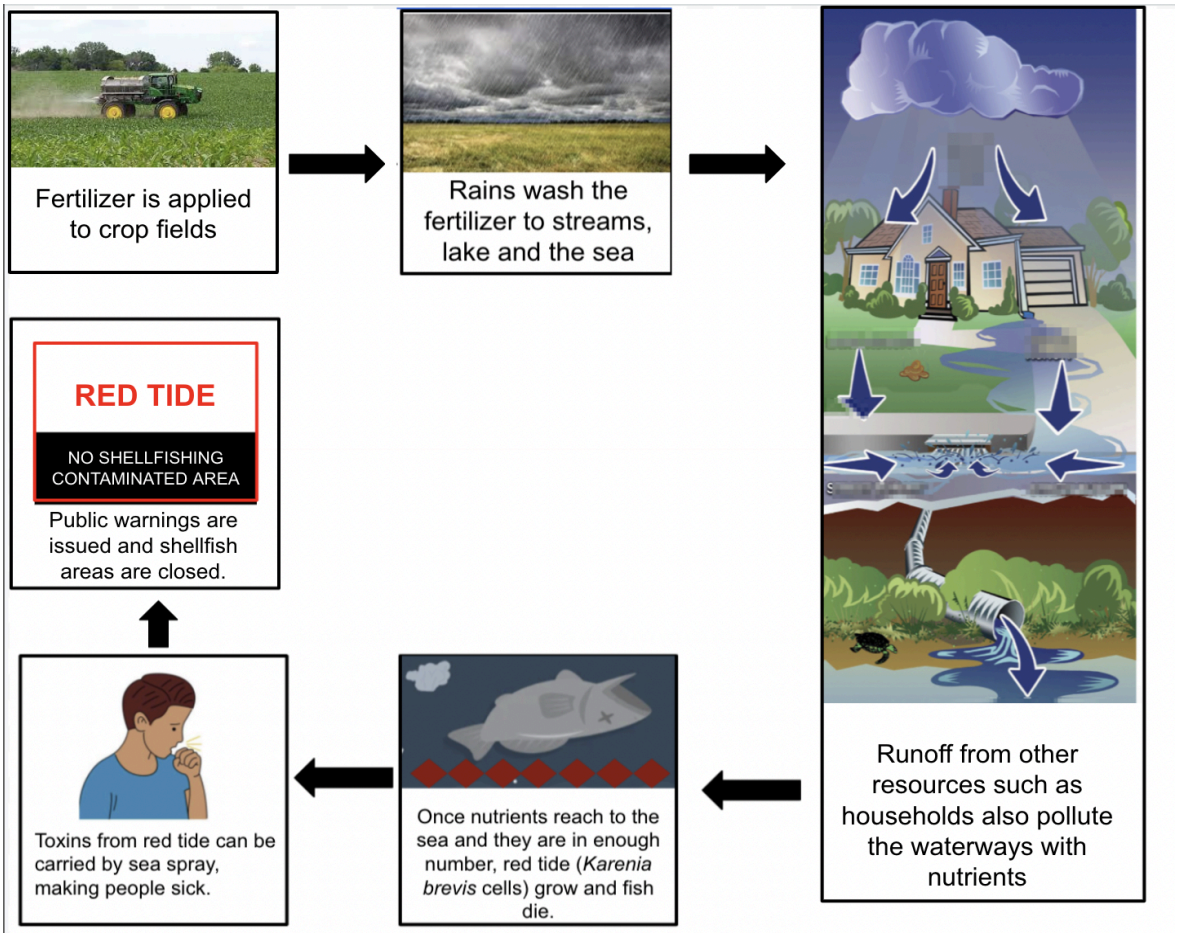
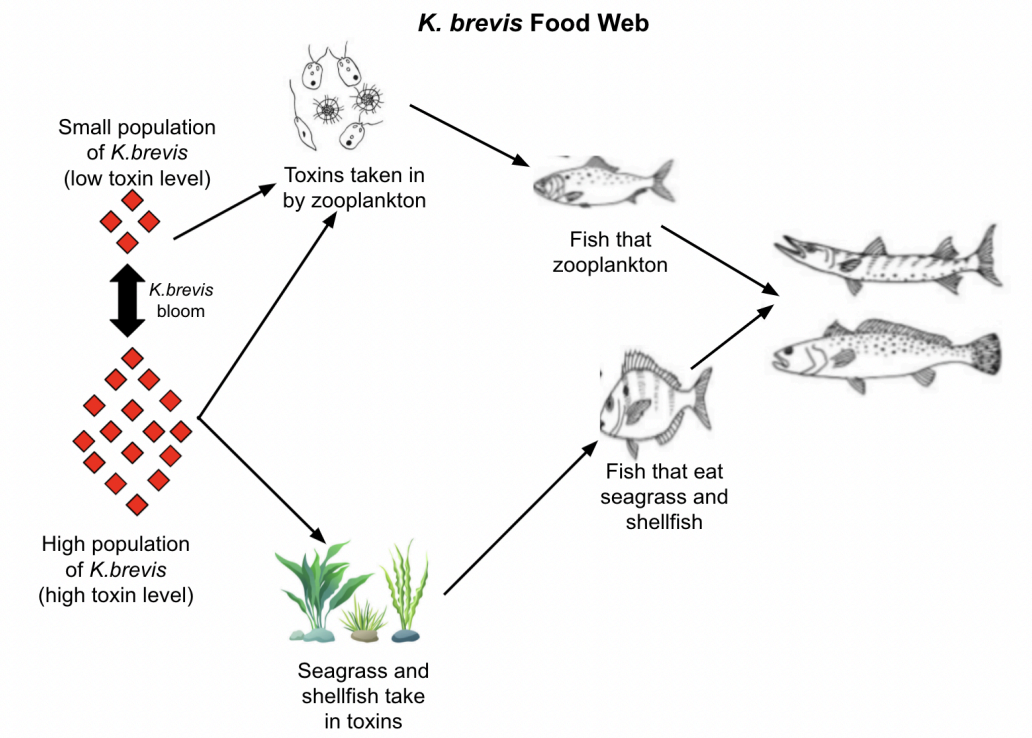


Figure 2 shows the events that causes a red tide in Florida

Figure 3: *K.brevis* Food Web



K.brevis is a photosynthetic algae that causes a red tide. The figure shows that it is eaten by zooplankton and that it passes the toxins to fishes. Seagrass and shellfish also take in the toxins and they are eaten by fishes.

Your Task

In the questions that follow, you will use text, diagrams, and information to answer questions and write a claim, evidence, and reasoning statement about what the person is experiencing as they walk along the beach in Florida.

Question 1

Match up the sentence number with where you would find the information provided about toxic algae blooms.

1. The stench of thousands of dead, bloated fish hung over the beaches of western Florida for months in 2018.
2. The fish were casualties of an algae bloom — an uncontrolled growth of small organisms.
3. Such blooms hit the Gulf of Mexico's coastlines almost every year.
4. Called a red tide, this year's bloom has been particularly intense — and toxic.
5. The algae that turn the water a murky reddish tint also emit a poison.
6. It can cause breathing problems for people — and kill sea creatures.
7. Dolphins and endangered sea turtles may turn up among the dead.

Information	Sentence #
A. Definition of an algae bloom.	2
B.How it affects humans.	6
C.The reason for the red color.	5
D.The part of the world where they occur most.	3
E.The name of these toxic algae blooms.	4

Question 2

Match up the sentence number with where you would find the information provided about toxic algae blooms.

1. The best known toxic tides are caused by *Karenia brevis* (Kaa-REN-ee-uh BREV-iss).
2. These fragile, single-celled algae create red tides.
3. When their cells die or become damaged by waves, they release poisons.
4. These are called brevetoxins (BREV-eh-tox-ins).
5. During a bloom, the algae's poisons can enter the air.
6. People walking along an affected beach might cough or sneeze or have itchy eyes.
7. A red tide's effects can be worse for people already struggling with lung issues, such as asthma

Information	Sentence #
A. What causes the red tide.	1 and 2
B.Who is affected most by red tides.	7
C.What causes the release of the toxin or poison.	3
D.Symptoms a person might experience.	6
E.How the algae can affect human breathing.	5

Question 3

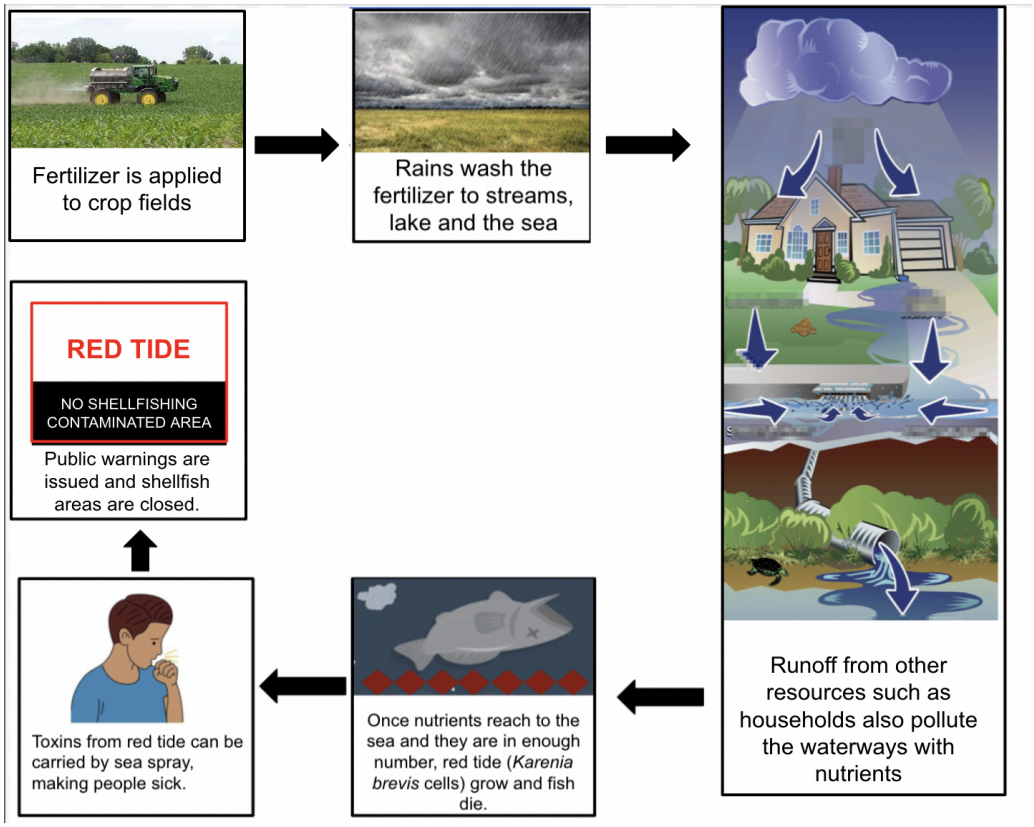
Match up the sentence number with where you would find the information provided about toxic algae blooms.

1. There are natural sources of nutrients in the sea, but nutrient pollution can occur when nutrients from the land run off into local waters.
2. Nutrient pollution can be thought of as the rocket fuel that can make algae grow rapidly.
3. It gives them a buffet of nutritious substances to live on.
4. The term for the enrichment of waters with excess nutrients, leading to algal blooms and the problems they cause, is eutrophication
5. There are many sources of nutrients that make their way from the land to the sea.
6. We apply lots of nutrients (fertilizers) on land to make lawns and golf courses look green.
7. The biggest source of nutrients comes from agriculture, and Florida has lots of farmland.
8. Most nutrients used in agriculture stay on land and support the growth of crops.
9. But some can run into rivers and streams when it rains, and can also seep into groundwater.
10. Even more nutrients runoff into rivers and streams when it rains hard (Figure 2).
11. Nutrients also make their way into waterways when we flush the toilet.
12. Without enough nutrients, red tide blooms do not occur and this is what happens most summers.
13. *Karenia brevis* cells may start to grow, but they die out because there are not a lot of natural nutrients in the Gulf of Mexico

Information	Sentence #
A.Describes where nutrients that humans use can go.	8-11
B.Describes how nutrient pollution helps algal blooms.	3
C.Gives the scientific term for nutrient pollution.	4
D.Gives the biggest source of nutrient pollution.	7

Question 4

Study Figure 2 below and then place the steps in order to show how nutrient pollution from humans can end up causing red tides, a disruption in the food web, and health problems for humans.

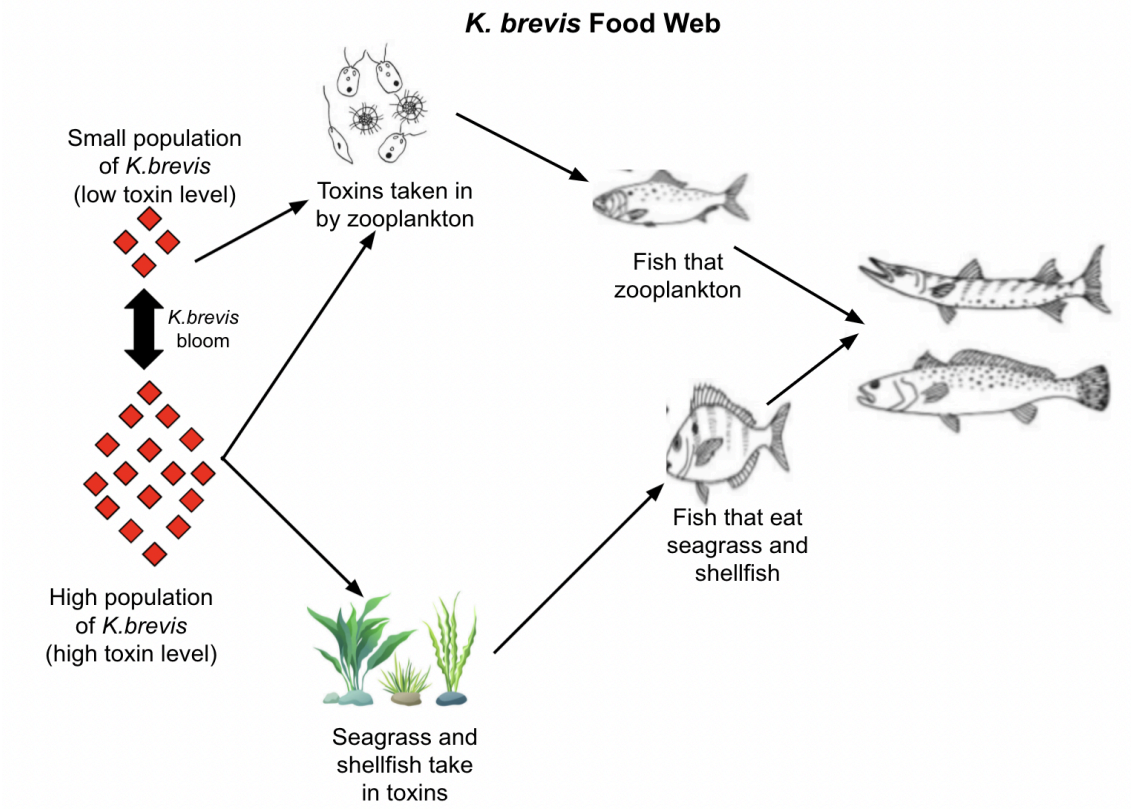


1- Toxins can get into the air and make people sick.
2- Storms wash nutrients into water sources.
3- Nutrients cause a red tide which can kill off organisms living in the ocean.
4- Fertilizer (often too much of it) is used in agriculture.
5- Households also provide runoff of nutrients that can cause pollution.
6- Leads to disruption in the food web, temporarily closes beaches to fishing and recreation.

Steps: _____ , _____ , _____ , _____ , _____ , _____ .

Question 5

Using Figure 3, sort the organisms by the role they play in the ecosystem.

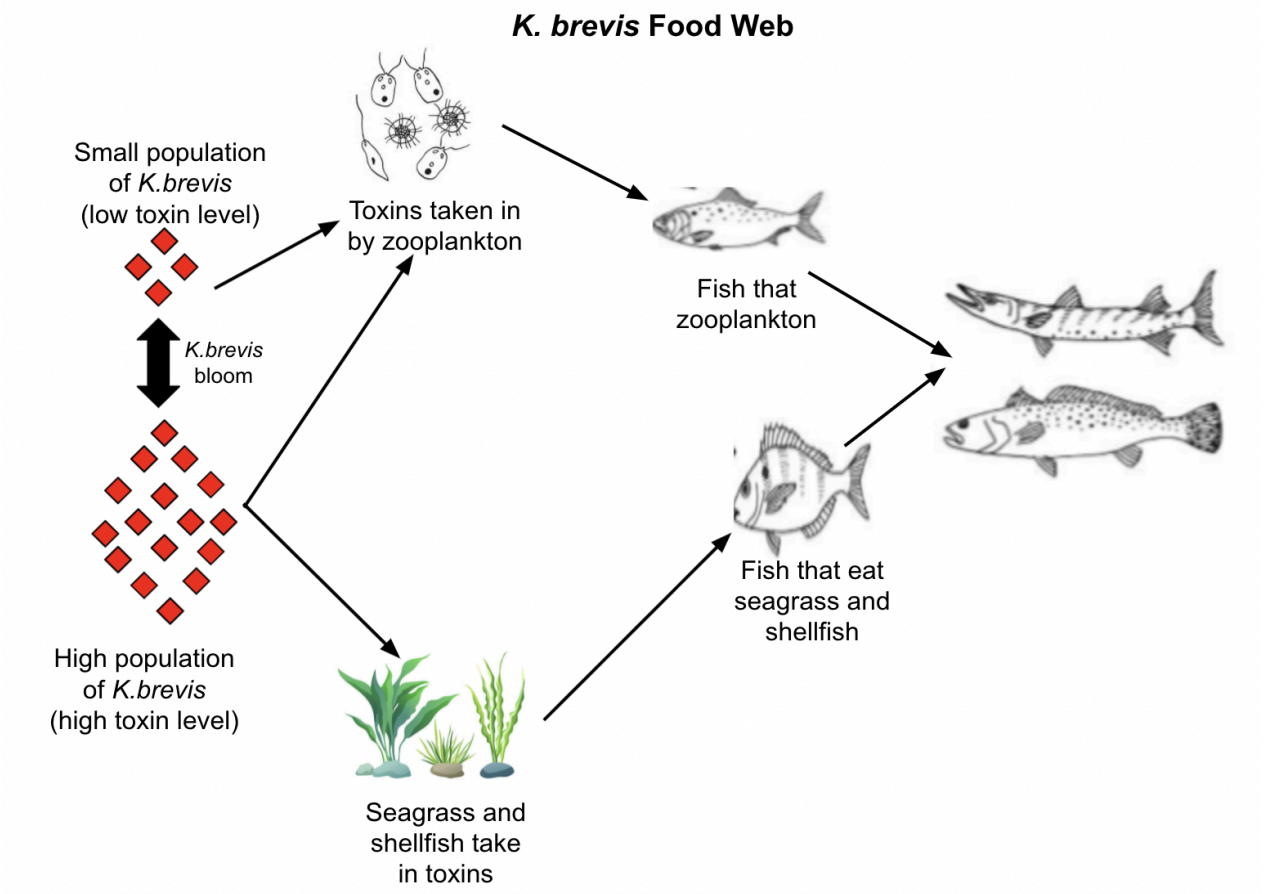


Organisms to sort: seagrass, K.brevis Algae, Fish that eat other fish, zooplankton, fish that eat seagrass

Producers	Primary Consumers (Herbivores)	Secondary Consumer (Carnivores)

Question 6

Figure 3. *K. brevis* Food Web



Using Figure 3, **select 2** choices that best explain the death of carnivorous fish during a red tide.

A. The toxins move from the zooplankton to the seagrass and when the carnivorous fish eat the seagrass they die.
B. The shellfish absorb the toxins when eaten by the fish the toxins are passed along. Carnivorous fish then get the toxin as they eat other fish.
C. Carnivorous fish eat the algae and then are killed by the toxins.
D. The seagrass produces the toxins and kills the shellfish and carnivorous fish.
E. The zooplankton absorb the toxins as they eat the algae. When a fish eats the plankton the toxins are passed on. Carnivorous fish absorb the toxins as they eat the smaller fish.

Question 7

Evaluate the following questions that could be asked about red tides. Classify each question as a scientific/non-scientific question. *Remember, a scientific question means that you could perform experiments and/or measure data. A non-scientific question is opinion based and/or cannot be tested on the specified topic.*

1. Why do people like to study red tides?
2. Are fish afraid of red tides?
3. What are the levels of oxygen in a red tide?
4. How is light transfer through the water affected by red tides?
5. What are some respiratory diseases that affect humans?
6. How does the amount of certain chemicals affect the ability of red tide growth?

Scientific	Non-scientific

Question 8

Part of science is knowing if you are using unbiased and factual evidence to support your claims. Read over the following three article excerpts and then mark the following statements as true or false. *Remember that qualitative data is descriptive data and quantitative data is numerical data.*

Reading 1: "When I was visiting Florida, I saw that the water was red. I went into the water and found that it wasn't really fun to be in it. For a few days afterward, I didn't feel very well, but I got better. Now I know that I don't like it when the water is red. I learned later that the red water is called a red tide. Red tides are the worst."

Reading 2: "The Effects: Human Health
Excess nutrients and harmful algal blooms create toxins and compounds in water that pose danger for human health. There are several ways that people (and pets) can be exposed to these compounds.
Drinking, accidentally swallowing or swimming in water affected by a harmful algal bloom can cause serious health problems including:

- Rashes
- Stomach or liver illness
- Respiratory problems
- Neurological effects"

Excerpt taken from an article from the Environmental Protection Agency, Nutrient Pollution.
https://www.epa.gov/nutrientpollution/effects-human-health

Reading 3: Nitrogen pollution is a contributor to red tide growth. "Identifying nutrient sources is a complicated task because, at more than 1.2 million square miles, the Mississippi River Basin is the fourth largest basin in the world. It covers close to 40 percent of the lower 48 States. There are 31 States that drain, via the Mississippi River Basin, into the Gulf of Mexico, and nutrient sources are found throughout the basin.
Fertilizers used on crops, air pollution, and manure are some of the major sources of nitrogen transported from the Mississippi River Basin to the Gulf of Mexico."
Excerpt taken from an article from the USGS, Nitrogen and Water.

True	False	Statement 1: Reading 2 and 3 are biased because some people do not like those sources.
True	False	Statement 2: Reading 2 and 3 are not as biased as 1 because they are backed with data and contain sources.
True	False	Statement 3: Reading 3 has qualitative and quantitative data to back up its statements.
True	False	Statement 4: Reading 1 has qualitative data to back up its statements.
True	False	Statement 5: Reading 2 does not have data to back up its statements so its statements are not correct.

Question 9

Using data from the provided information, write a CER (claim, evidence, reasoning) arguing a significant cause of the red tide in Florida and its impact (effect) on the ecosystem's food web which includes humans.

Use qualitative evidence from the provided information to describe the cause and effect to back up your claim. You should also support each piece of evidence with reasoning of why that evidence supports your claim.

_____

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