



Student Name:

Date:

Period:

## Global Phytoplankton Distribution Story Map

### Link to Story Map:

<https://nasa.maps.arcgis.com/apps/MapSeries/index.html?appid=426fc4ec6f8b456d847c5729a683753d>

### Part A: Engage

A.1 Where do phytoplankton live?

A.2 Based on the image, what characteristics do you think help the phytoplankton live in this environment?

A.3 Analyze the aquatic food web. Describe how phytoplankton are necessary to the survival of Emperor Penguins.



**A.4** Analyze the Pacific Ocean waters off the coast of Washington State. What do you observe in this image?

**A.5** Review the color bar scale for net radiation. What do the colors mean?

**A.6** Review the color bar scale for chlorophyll concentration. What do the colors mean?

**A.7** In the Northern Hemisphere, what are the values for net radiation during the spring and fall?

**A.8** List the value of net radiation in the Northern Hemisphere during the summer, then list the value of net radiation in the Northern Hemisphere during winter. What do you notice?



**A.9** Which two seasons experience a greater difference in net radiation values? Fall and spring or summer and winter?

**A.10** What patterns do you observe between net radiation and chlorophyll concentration?

**A.11** Which regions of the world experience both the extreme highs and lows for both net radiation and chlorophyll concentration?

**A.12** Which regions do not experience these extremes?



## **Part B: Explore**

**B.1** Why might different types of phytoplankton look so much different from one another?

**B.2** Review the color bar scale. What do the colors mean?

**B.3** Compare the chlorophyll concentrations in the coastal areas to open ocean. What do you observe?

**B.4** Compare lower latitudes like those in Florida and Hawaii to those of higher latitudes like Alaska. What do you observe?

**B.5** What patterns exist between these nitrate nutrients and chlorophyll concentration?

**B.6** Based on the rivers and watershed basins data on the map, where does the Mississippi River (highlighted in magenta) eventually drain?



**B.7** What effect does this river drainage have on chlorophyll concentration?

**B.8** Make a claim about the relationship between cool ocean currents and the nutrients that phytoplankton require. Provide evidence to support your claim?

**B.9** Where do you see interaction between ocean currents of different temperatures?

**B.10** Describe this interaction in the middle of the ocean. Describe this interaction around coastlines. Use evidence to identify where this interaction appears the most.



**B.11** Which color represents low sea surface temperature? Which color represents high sea surface temperature?

**B.12** Which color represents low chlorophyll concentration? Which color represents high chlorophyll concentration?

**B.13** Describe the relationship between sea surface temperature and chlorophyll concentration.

**B.14** Based on these data, what range of sea surface temperature do you think most phytoplankton prefer?

**B.15** What variable is represented on the x-axis? What is the range of values?



**B.16** What variable is represented on the y-axis? What is the range of values?

**B.17** Do the data repeat in recognizable ways? Explain.

**B.18** Name another example of Earth System data that would follow a similar pattern.

**B.19** What variable is represented on the x-axis? What is the range of values?

**B.20** What variable is represented on the y-axis? What is the range of values?

**B.21** Do the data repeat in recognizable ways? Explain.



**B.22** What patterns or trends do you see in the two sets of data?

**B.23** How do the patterns in the graph relate to things you know?





## Part C: Explain

**C.1** What does the narrator mean by saying, “phytoplankton help our planet breath?”

**C.2** Why do warming ocean waters have large consequences for phytoplankton?

**C.3** Why do warming ocean waters have large consequences for the health of our planet?

**C.4** How do phytoplankton transfer carbon from the atmosphere to the deep ocean?

**C.5** As you navigate through the next section, fill in the chart on your student sheet by describing how these three factors contribute to phytoplankton growth and in which regions of the world these factors take effect.



1. Upwelling

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2. Runoff

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3. Shortwave  
Radiation

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**C.6** Describe why phytoplankton are not found in remote ocean gyres. Use the major ocean currents data as evidence in your explanation.

**C.7** Explain how farming has contributed to increased phytoplankton productivity in the Gulf of Mexico?



**C.8** Why can high-latitude phytoplankton only bloom in the spring and summertime?

Note: Make sure you have completed your chart from question C.5. before moving on.

**C.9** Why do phytoplankton prefer cooler ocean waters over warmer ocean waters?



## **Part D: Elaborate**

**D.1** For each of the following types of phytoplankton, list the regions where they are found in the animation (high latitudes, mid-latitudes, equator, low-latitudes).

**Prochlorococcus:**

**Synechococcus:**

**Flagellates:**

**Diatoms:**

**D.2** Which part of the world contains the most biogenic rock deposits?

**D.3** List three other locations where some biogenic rock deposits are found.

**D.4** What pattern do you notice between biogenic rocks and phytoplankton habitats?

## Part E: Evaluate

**E.1** As a class, you will work to create your own concept map for the topic **Phytoplankton**.

Instructions:

1. Brainstorm main ideas and terms related to Phytoplankton. Think of ways in which changes to phytoplankton populations relates to other spheres of the Earth System (Atmosphere, Biosphere, Geosphere, Hydrosphere)
2. Organize these ideas. Create groupings based on how similar they are to one another or their relation to the different spheres.
3. Map out the ideas by putting them into boxes and rearranging them around the main topic.
4. Connect the ideas through phrases that describe their relationship.

