

## Gulf Stream Voyage Plankton Lesson

A CIESE Realtime Data Project

<http://ciese.org/curriculum/gulfstream/teacherbiology/>

### Objectives

Students will be able to:

- interpret chlorophyll a concentration maps and sea surface temperature data
- use the data to determine concentrations of phytoplankton in the ocean

### Materials

computers with Internet access

[Student Worksheet](#)

### Background

[The Living Sea; Predators and Prey](#) (Background information)

[SeaWiFS Teachers Guide](#) Studying Ocean Color from Space.

When investigating the productivity of the ocean, it is necessary to look at the first link in the ocean food chain. These are often single-celled plants called phytoplankton. (Click here to see [pictures of phytoplankton](#) taken with a microscope.) These [primary producers](#), which contain the pigment chlorophyll, require sunlight, nutrients, carbon dioxide and water to continue the process of photosynthesis and respiration. This is called plankton primary productivity. The rate at which this process of primary production occurs can be limited by nutrient supply and the amount of available sunlight. Therefore, areas of the ocean where abundances of phytoplankton pigment concentrations are found should, theoretically, be abundant in nutrients supply and receive adequate amounts of sunlight.

### Procedure

When investigating the productivity of the ocean, it is necessary to look at the first link in the ocean food chain, single-celled plants called phytoplankton. These primary producers contain the pigment chlorophyll and require sunlight, nutrients, carbon dioxide and water to continue the process of photosynthesis and respiration. In order to determine ocean productivity, we can use chlorophyll a as an indicator.

6 molecules carbon dioxide + 6 water molecules  $\xrightarrow{\text{solar energy chlorophyll}}$  1 sugar molecule + 6 oxygen molecules (Photosynthesis)

1 sugar molecule + 6 oxygen molecules  $\xrightarrow{\text{life support energy}}$  6 carbon dioxide molecules + 6 water molecules (Respiration)

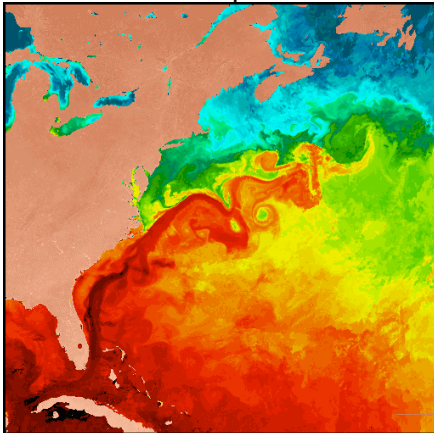
1. Explore the [SeaWiFS Browser](#).

2. Click on the link for the current month from the selection of months below the global picture. This will give averaged results for an entire month's data. \*\*If it is the beginning of a month, select the previous month's data for a better image.

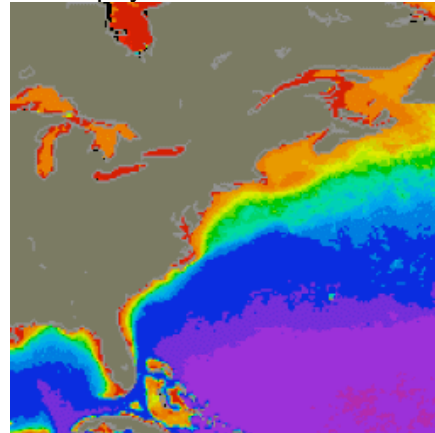
3. Click on the color bar on the right-hand side of the global picture and answer the questions on the Student Worksheet.
4. Click the back button to return to this month's global data.
5. Compare the recent chlorophyll a concentration maps with current [sea surface temperature data](#).
6. To see changes in ocean productivity throughout the year, use the archived images on the [SeaWiFS browser](#).
7. Access the Previous Year's Data by choosing that link below the global map.
8. Start with the January composite (all data collected in January) map.
9. Click on NEXT MONTH to continue to viewing the data throughout one year. Concentrate looking at the polar regions and the North Atlantic basin and answer the questions on the Student Worksheet.

### Assessment

Sea Surface Temperature



Chlorophyll a Concentration



1. Sensitive satellite instruments can detect different colors in the ocean which can reveal the presence and concentration of what?
2. Why are phytoplankton so important?
3. Explain the role that phytoplankton play in the "Carbon Cycle".

What are the units that chlorophyll a is measured? And what is chlorophyll a representing?

What color represents the highest concentration of chlorophyll a?

What color represents the lowest concentration of chlorophyll a?

In broad terms, what regions show the highest concentrations of chlorophyll a?

In broad terms, what regions show the lowest concentration of chlorophyll a?

In general, do colder or warmer waters contain higher concentrations of chlorophyll a?

Compare the chlorophyll a concentration maps with sea surface temperature maps. Is there a relationship between the temperature of the water and the presence of phytoplankton?