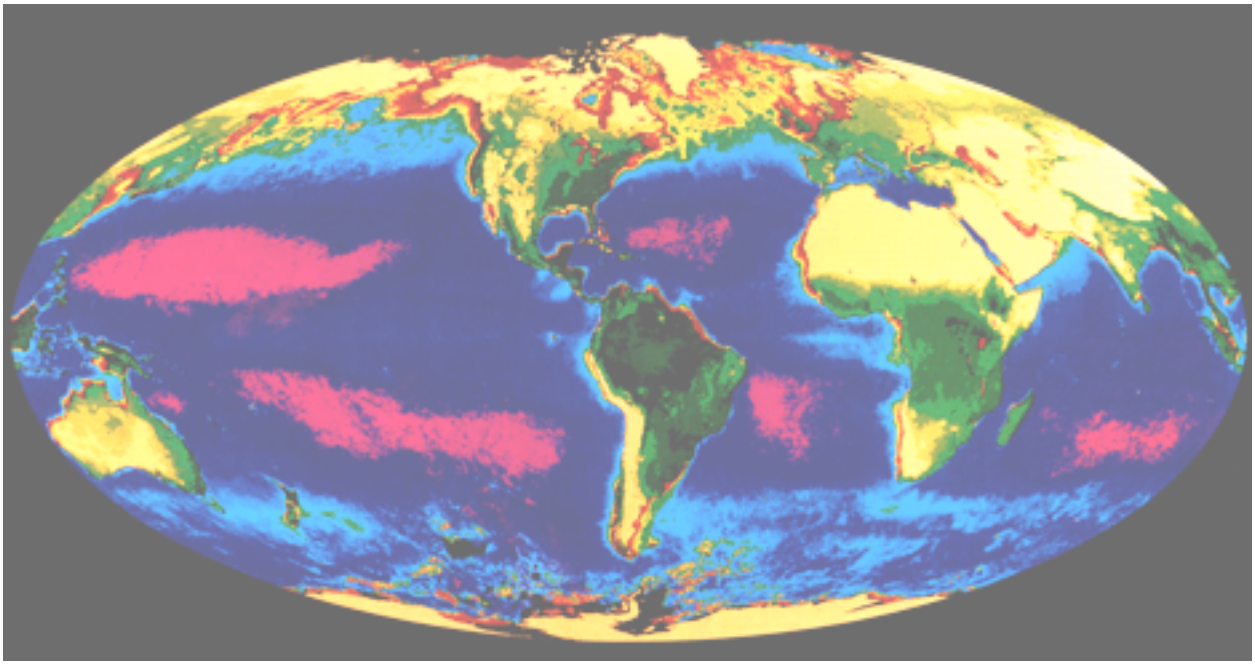
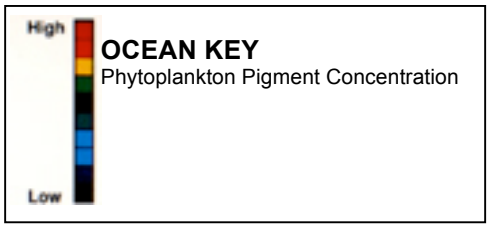
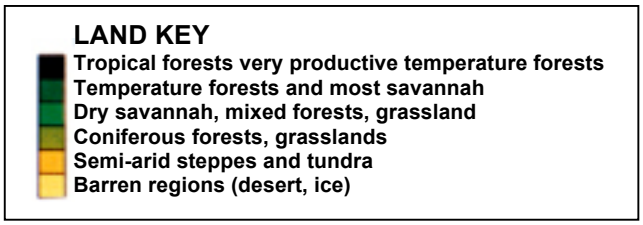
National Aeronautics and Space Administration
Goddard Space Flight Center
HqL-325

First Image of the Global Biosphere

This illustration of the global biosphere is part of NASA Goddard Space Flight Center's program of Earth-science research. It shows, for the first time, the patterns of plant life both on the land and in the oceans as observed from space. The illustration was produced by combining data from two different satellites and shows Earth as a complex system, teeming with life.







Ocean Measurements

The ocean portion is a composite of more than 66,000 images collected between November 1978 and June 1986 by the Coastal Zone Color Scanner (CZCS), which flew on the Goddard-managed NIMBUS-7 satellite launched in October 1978. The ocean color measurements made by the CZCS indicate the distribution and abundance of phytoplankton in Earth's oceans. Phytoplankton are microscopic plants that grow in the upper sunlight regions of the ocean and are the ultimate food source for most marine life. Their uptake of carbon dioxide during photosynthesis is also be a key factor in helping us to better understand the role of the oceans in the global carbon cycle.

Red and orange colors indicate areas of high concentrations. Yellow and green represent areas of moderate concentrations. Blue and violet colors represent the lowest concentrations.

The high phytoplankton concentrations along coasts and other regions where wind and currents mix the cooler, nutrient-rich waters near the surface, are often rich with fish and wildlife.

Land Measurements

The land vegetation image is a composite of three years of data, collected during 15,000 orbits from the Advanced Very High Resolution Radiometer (AVHRR) flown on the NOAA-7 satellite, launched in June 1981. The AVHRR measured land-surface radiation, which can be a measure of the potential for vegetation production on land.

The dark green areas (rain forests) show the highest potential for vegetation growth. The lighter shades of green highlight tropical and subtropical forests, temperate forests and farmlands, and some drier regions such as savannas and pampas. The yellow shades in the United States Midwest show lower potential . The great deserts of the world are evident as the lighter shades of yellow. The snow and ice covered regions are shown to have no productive potential in this image.

This study is part of NASA's multiyear global research program called Mission to Planet Earth that will use ground-based, airborne and space-based instruments to study Earth as a complete environmental system. Mission to Planet Earth is NASA's contribution to the U.S. Global Change Research Program, a multi-agency effort to understand, analyze, and better predict the effect of human activity on Earth's environment. Goddard Space Flight Center's projects for Mission to Planet Earth include: the Upper Atmosphere Research Satellite Mission; Earth Probes, such as the Tropical Rainfall Measuring Mission; the Total Ozone Mapping Spectrometer; and the Earth Observing System, the most ambitious science mission ever undertaken.

First Image of the Global Biosphere - For the Classroom

Research topics:

- Remote sensing
- Phytoplankton and their requirements
- Global carbon cycles
- El Nino
- Meteorological satellites

1. Rapid increases in phytoplankton biomass are known as "blooms." In the tropics, "blooms," are stimulated by upwelling of cool, nutrient-rich sub-surface waters. "Blooms" in temperate and polar seas are caused by a

different mechanism. What factor stimulates these seasonal blooms in temperate and polar seas? Remember that phytoplankton are plants and have certain requirements.

Answer: Amount of sunlight

2. According to the image on this lithograph, which continent has the largest percentage of tropical/temperate forests? Why is this area one of global concern? How will images such as this assist those in the study of deforestation?

Answer: a. South America

b. Problems related to deforestation, global warming, etc.

c. One way the images will assist scientists is in speeding the gathering of data regarding rates and areas of deforestation.

3. Have students create their own images by mapping the vegetation in the school area or a nearby park. Have them develop a color scale that demonstrates where vegetation is present and where it is not. You could have them get more involved by having herbaceous plants represented by a different color than woody plants.