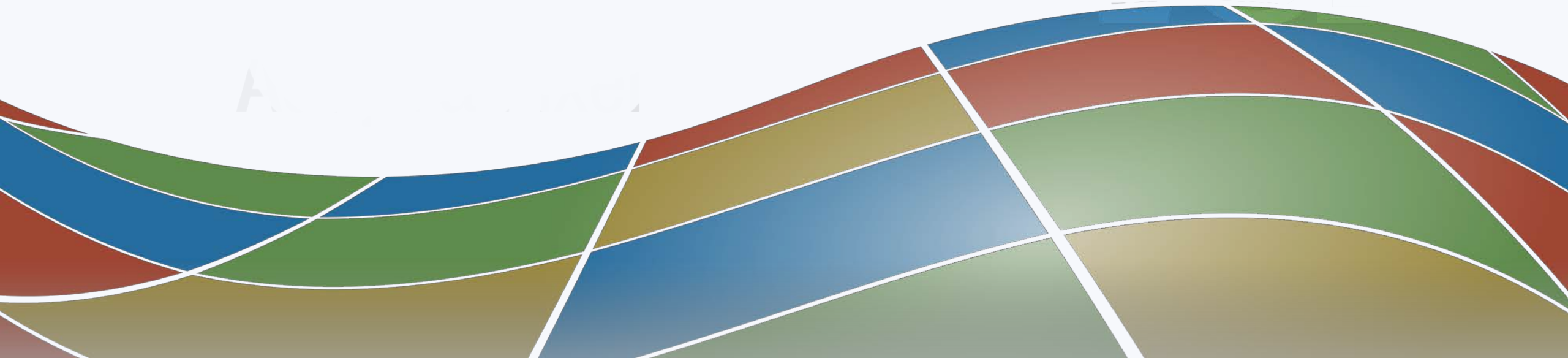
GLOBE Observer

Why Observe Land Cover?

GLOBE Observer Land Cover Adopt a Pixel



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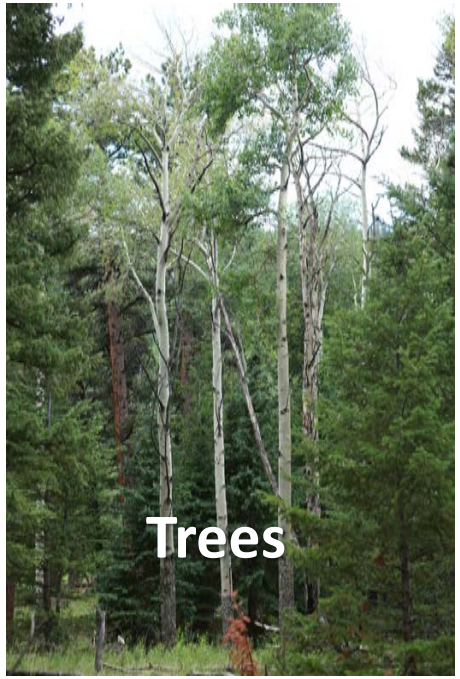
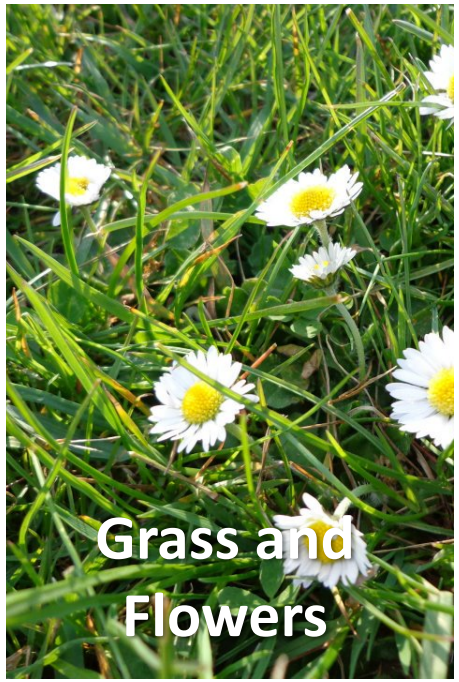
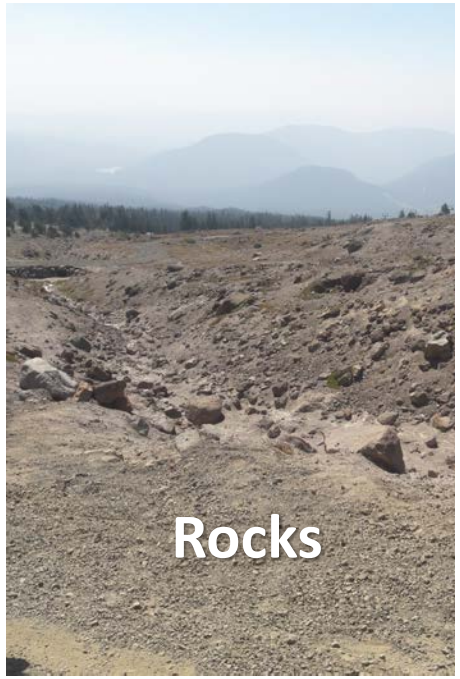
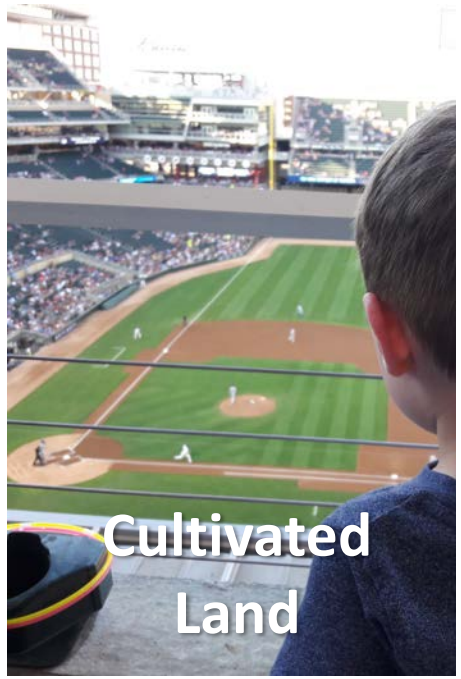
What is Land Cover?

Land cover is what is on the surface of the land. It includes things like









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Land cover affects you

Habitat

Floods

Fires

Water Quality

Landslides

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Land cover defines habitats

Land cover provides habitats for all living things. Mapping land cover means mapping habitats for scientists to better understand where certain animals can live and how they migrate.

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Land cover and fire vulnerability

Land cover plays a big role in a community's vulnerability to wildfire. Homes and businesses built in a landscape prone to fire are at risk of being destroyed in a wildfire. Fire agencies recommend fire buffer zones with land cover that is not highly flammable.

More at https://www.fs.usda.gov/nac/buffers/guidelines/5_protection/11.html

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Land cover and flood vulnerability

Understanding exactly how much land cover change influences floods is a question of scientific research. In general, land cover influences the way water flows across the land. When cement or even packed soil replaces a forest or wetland, water flows across the surface as run off instead of being absorbed. This change could alter the flow of rivers and/or trigger flash-flooding. Water running over roads, lawns, and other urban or industrial surfaces

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Land cover and water quality

Water that flows over certain land cover types can pick up pollutants that impact a community's water quality. Water running over cultivated land, like lawns or farms, carries fertilizers to rivers and streams. Water run-off over cement, roads, and industrial areas picks up oil, fuel, and other chemicals. Chemicals in run-off can build up in water bodies, leading to algal blooms and associated low-oxygen dead zones and generally poor water quality. This Landsat image shows an algal bloom in Lake Erie from September 2017.

https://earthobservatory.nasa.gov/images/91038/lake-erie-abloom

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Land cover and landslides

Land cover is a factor in making a slope prone to landslides. In particular, trees anchor soil, so a hill that has been cleared has a higher risk of slipping than one that has not. Bare ground, especially recently burned ground, is also more prone to erosion, which can lead to landslides.

Learn more and help map landslides: https://pmm.nasa.gov/landslides/index.html

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Why does NASA study land cover?

NASA monitors Earth's vital signs from land, air and space using an array of satellites and instruments on the International Space Station to better understand our home planet.

We tackle some of the biggest challenges facing our planet today and in the future, including natural disasters, the availability of natural resources, rising sea levels and climate change.

NASA's planetary perspective means that we study the systems that work together to sustain life on Earth.

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Land Cover and Earth Systems

Earth's systems work together like cogs in an engine. Land cover is part of many of these systems.

- Plants are a critical component of the carbon cycle
- Land cover influences the water cycle
- Land cover influences heating and cooling
- Carbon, water, and energy are part of Earth's climate system. Changes in land cover can contribute to climate change. And, climate change contributes to changes in land cover.

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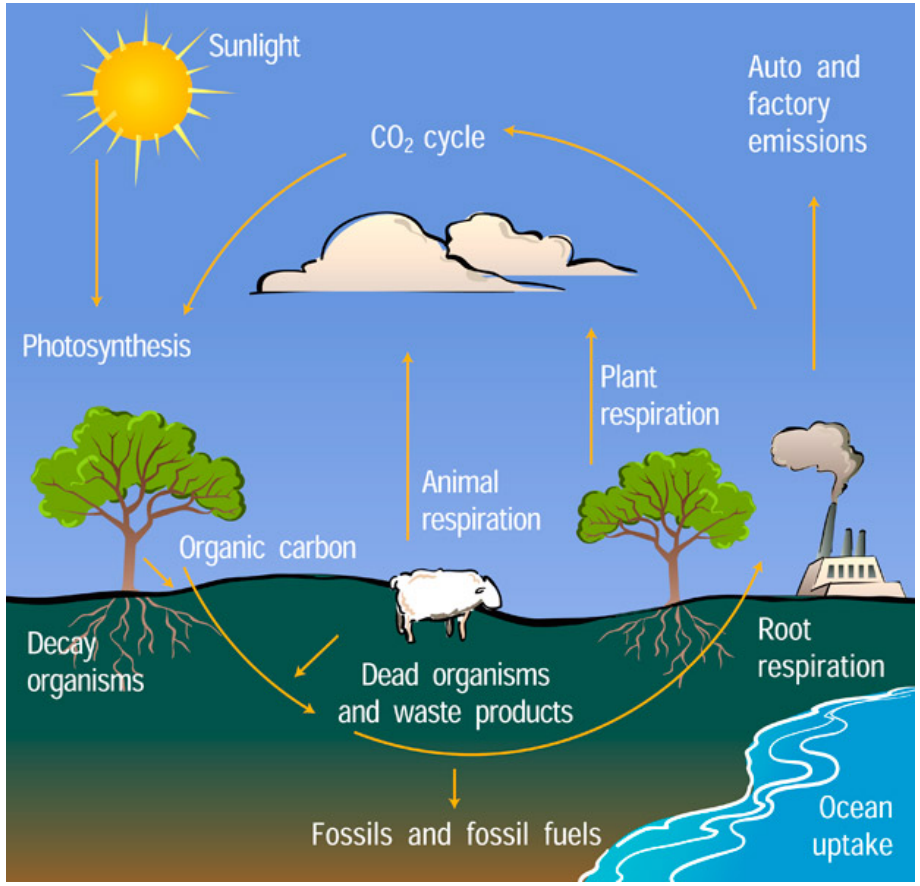
Plants are a critical component of the carbon cycle.



Plants absorb carbon from the atmosphere during photosynthesis. The carbon becomes part of the plant. When a plant dies, it releases that carbon back to the atmosphere.

Other land cover types, such as cement or urban areas, contribute to carbon gas emissions to the atmosphere. Once in the atmosphere, carbon gases act like the thermostat controlling Earth's climate.

Land cover change can change the balance of carbon in the system. If a formerly plant-covered area is paved over, then carbon gas is added to the atmosphere and less gas is removed, since the plants are no longer there. If a barren area is reforested or other plants grow, then more carbon gas is absorbed from the atmosphere.

Read more on the Earth Observatory

Figure courtesy UCAR Center for Science Education

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Land cover influences the water cycle

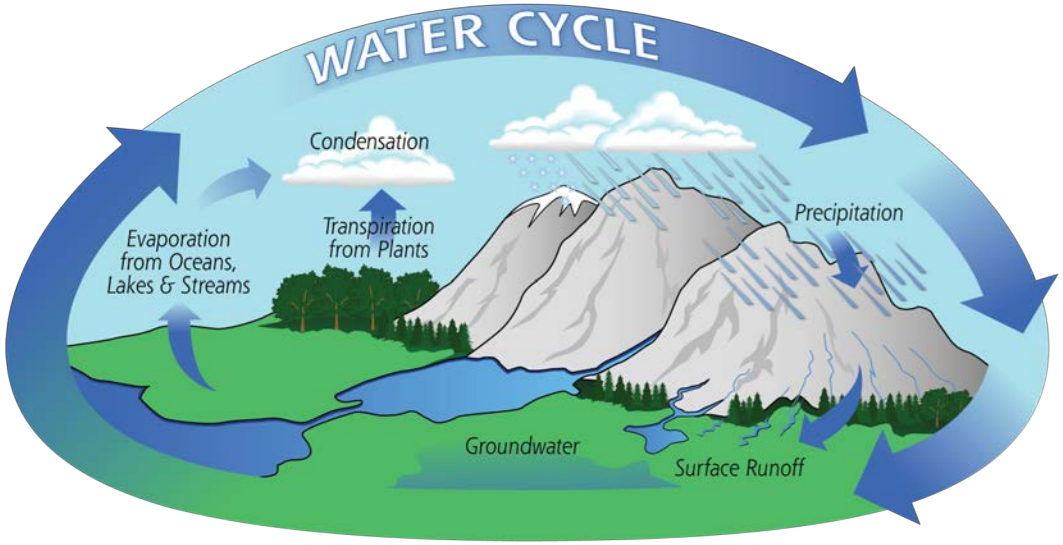

Figure from NASA GPM.

Land cover plays a role in several aspects of the water cycle.

- Plants absorb water from the soil and transpire water vapor to the atmosphere.
- Solid surfaces like rock or paved areas allow water to run across the surface, while soil and plant-covered areas tend to absorb water. A change in land cover can change how much water is absorbed into the ground vs how much flows in to rivers.

Read more from NASA GPM.

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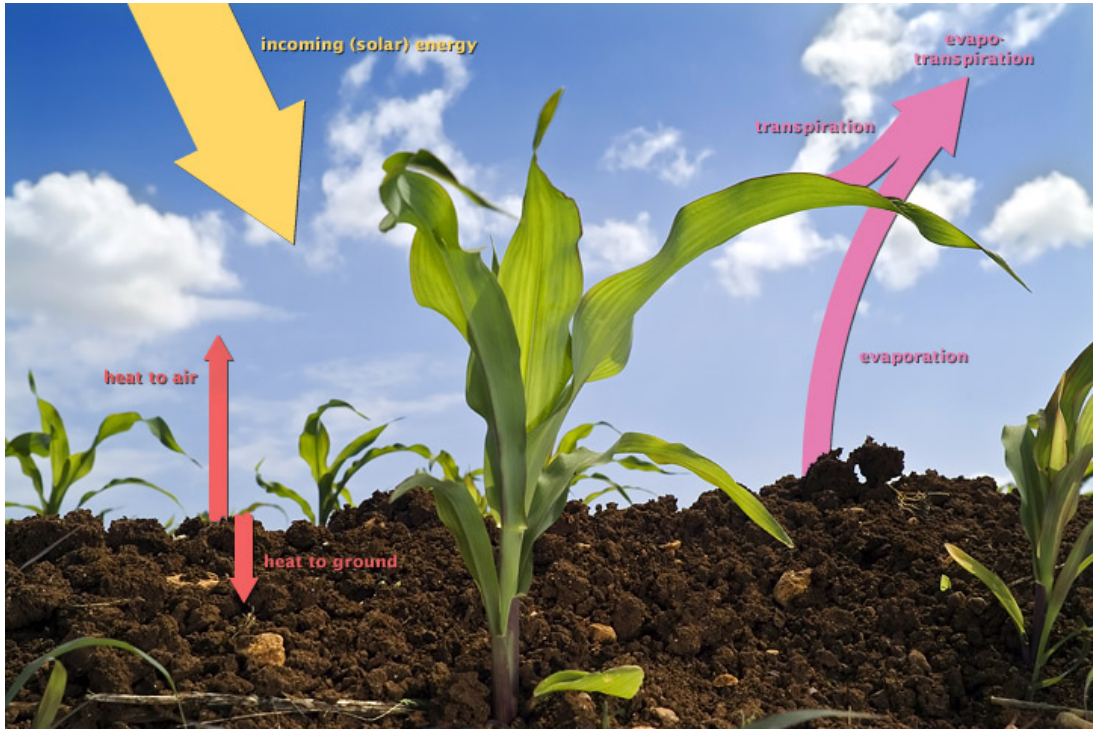
Land cover affects temperature



Plant-covered land is usually cooler than other kinds of land cover. Energy from the Sun heats the surface, but plants take in that energy along water and carbon to produce food through photosynthesis. That means that plant-covered land doesn't heat up as much as other surfaces. Plants also release water vapor and oxygen as a part of photosynthesis. Just as misters cool you off on a hot summer day, the water vapor cools the land and air.

Read more: earthobservatory.nasa.gov/Features/WaterWatchers

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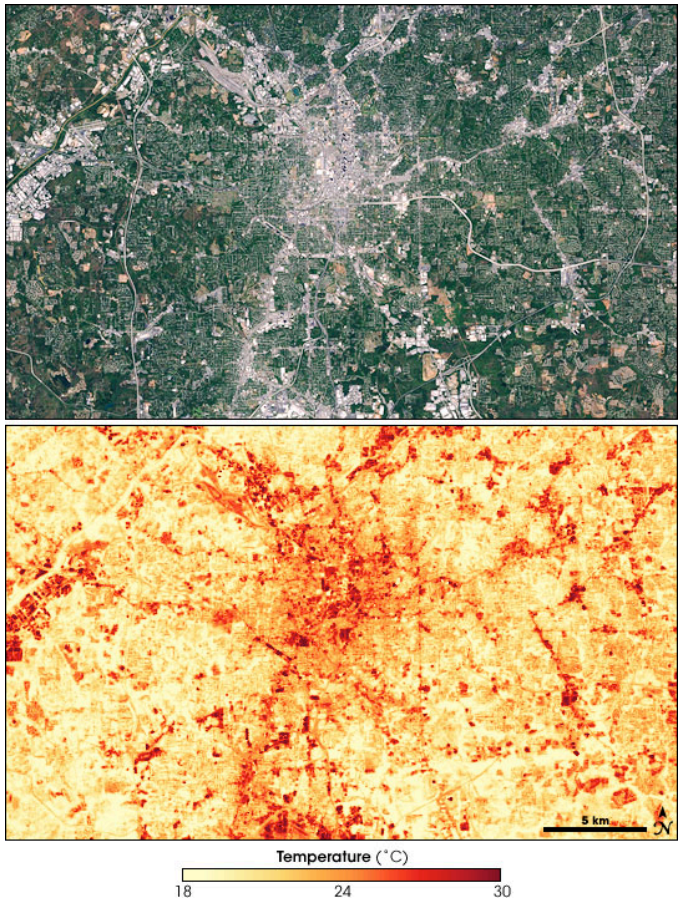
Land cover affects temperature



Different materials absorb sunlight and radiate heat in different ways. Materials used in cities or residential areas, such as cement, metal, and asphalt, radiate more heat than plant-based land cover. As a result, cities can be as much as 8 degrees warmer than suburban or natural landscapes, a phenomenon knows as urban heat island. This image was made from Landsat-7 satellite observations. It shows Atlanta in photo-like natural color (top) and as a heat map. The cement-colored city is much warmer than the surrounding area. Urban heating is great enough to influence rainfall patterns.

Image from:
https://earthobservatory.nasa.gov/images/7205/urban-heat-island-atlanta-georgia

Read more:
https://earthobservatory.nasa.gov/Features/UrbanRain

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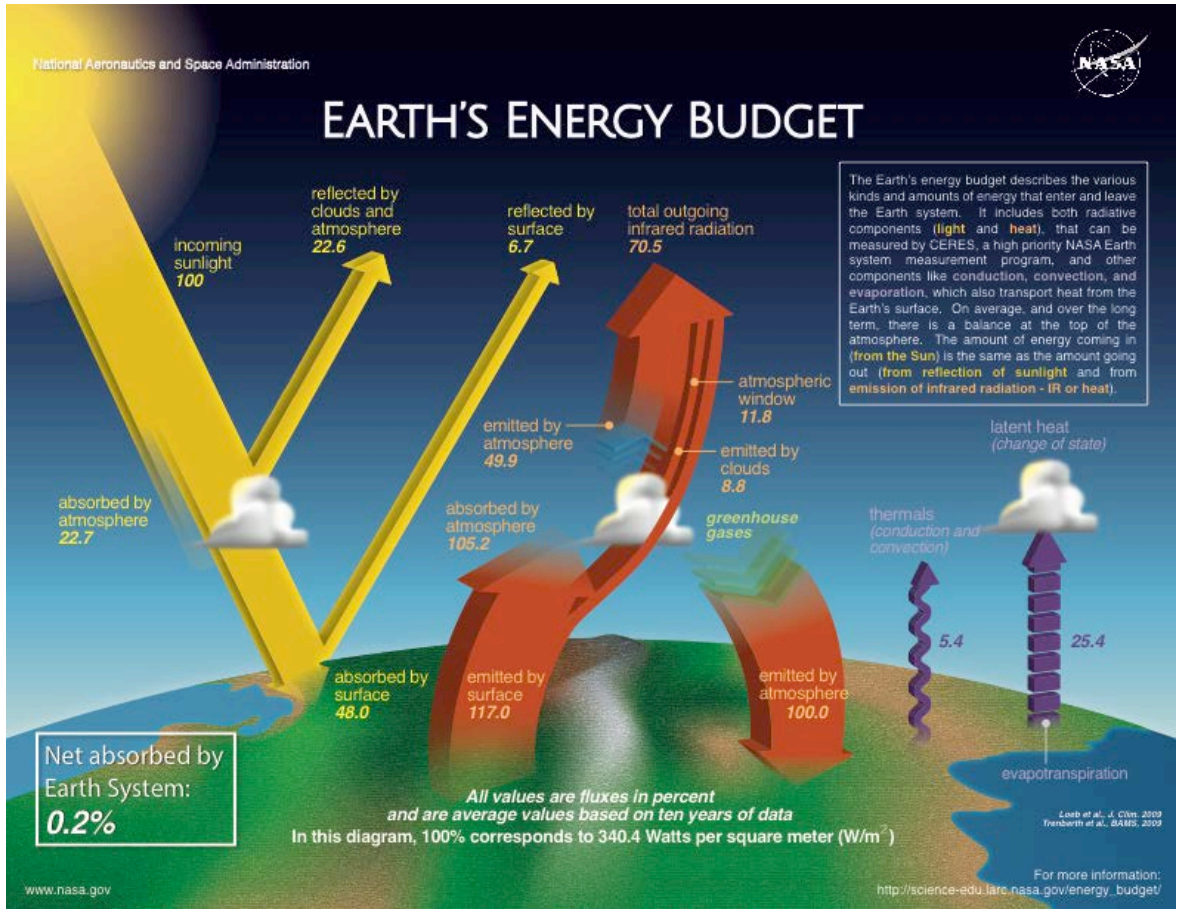
Land cover influences Earth's temperature



Changes in land cover affect how, how much, and where energy is absorbed from the Sun. The flow of energy from the Sun and to Earth, and then back out to space as heat and light is called Earth's Energy Budget. If Earth absorbs more energy because of land cover changes, the planet will heat up. If Earth reflects more energy, Earth will cool down.

This diagram summarizes Earth's energy budget. The yellow arrows represent energy from the Sun in the form of sunlight. Some land cover surfaces, like snow and ice, reflect energy, the yellow arrows out. Other surfaces absorb more sunlight and re-emit that energy as heat, the red arrows. In general, dark things, like oceans, absorb more energy, while light things, like snow or ice, reflect more energy. The purple arrows represent energy that goes to evaporation and transpiration.

Read more and diagram source : https://science-edu.larc.nasa.gov/energy_budget/

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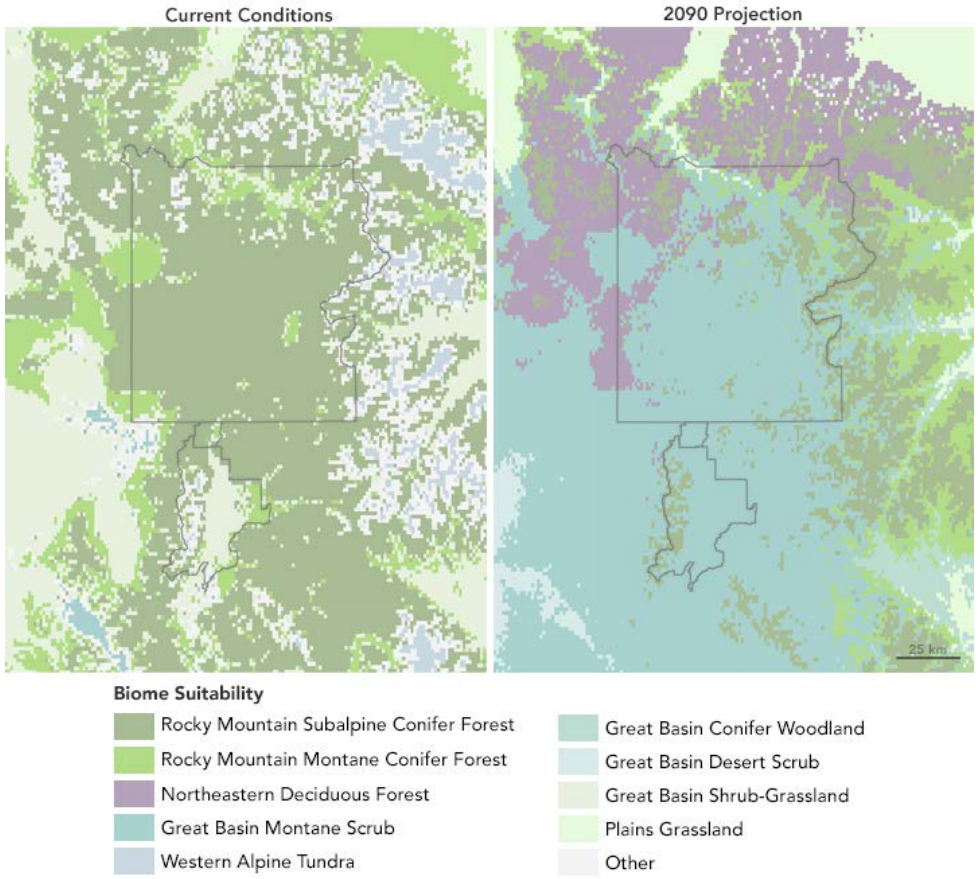
Warming temperatures change land cover



As global temperatures rise and weather patterns change in a warming climate, land cover is shifting. This image shows how Yellowstone National Park is projected to transition from primarily conifer forest to primarily scrubland.

More at: https://earthobservatory.nasa.gov/Features/NationalParksClimate

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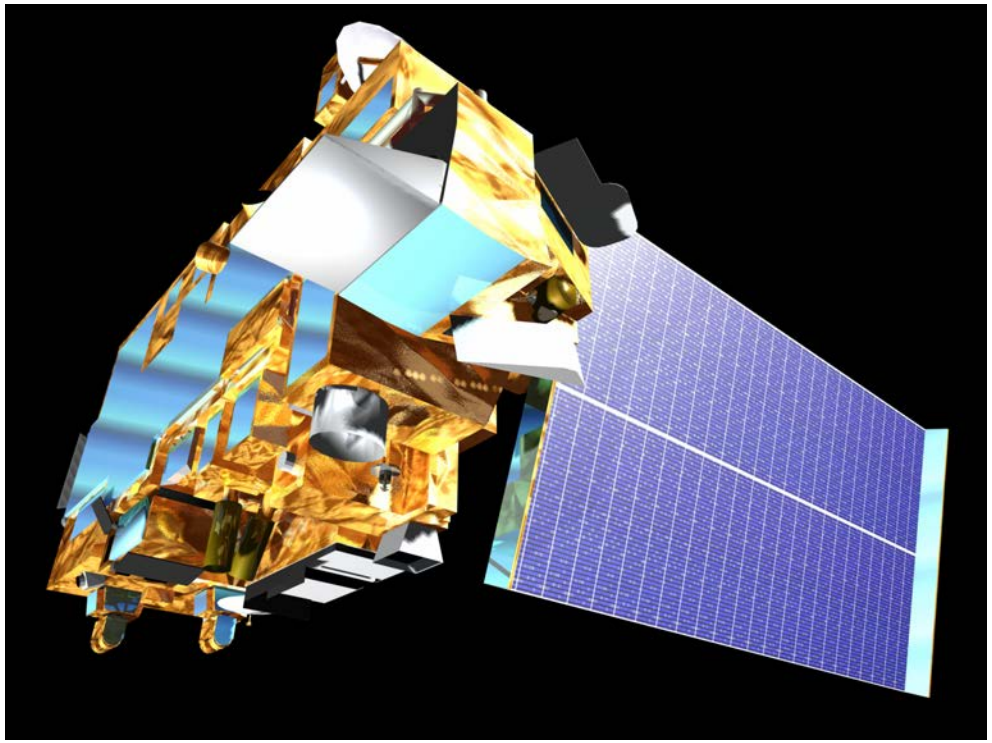
Satellites and Land Cover

To understand how land cover fits in Earth's processes, scientists study global and regional land cover using satellite data and computer models.

NASA's Terra and Aqua satellites carry an instrument called the Moderate Resolution Imaging Spectroradiometer (MODIS) that images the whole Earth every day. Scientists have produced a global land cover map using MODIS data. Each map pixel has a resolution of 500 meters, which means that land cover is defined for each square area of land measuring 500 meters by 500 meters, or 1/3 of a mile by 1/3 of a mile.



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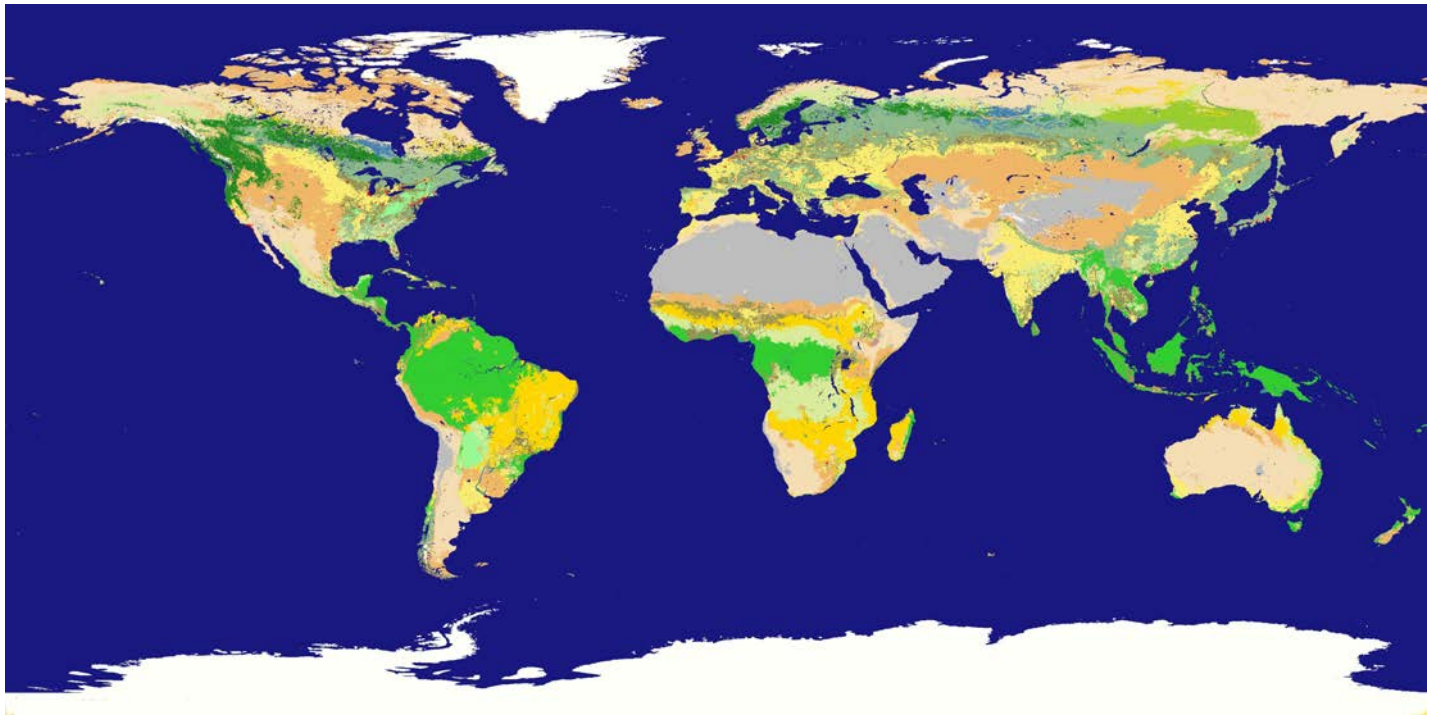
MODIS Global Land Cover



GLOBE Observer collects land cover data to help verify satellite-based land cover products, including the global MODIS Land Cover Map and regional land cover maps based on Landsat satellite data or other instruments.

For more maps and a key, see https://neo.sci.gsfc.nasa.gov/ and select Land, Land Cover

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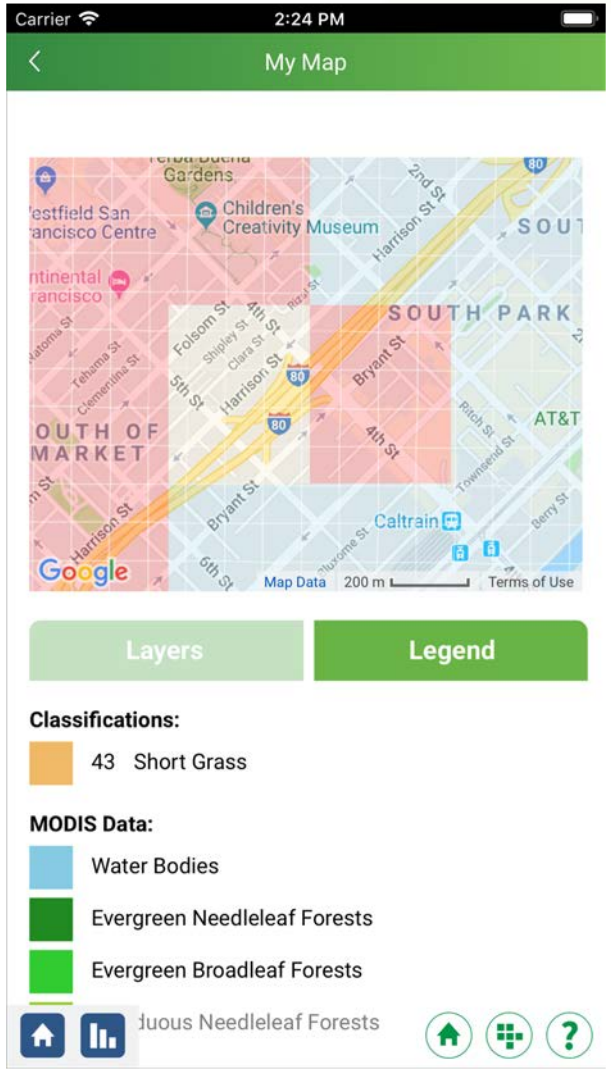

You can help verify MODIS land cover through GLOBE Observer.

- From the land cover home screen, click “my map.” The map will show your land cover observations on top of MODIS classifications.
- Select the squares that are different from MODIS classifications, then select “report a difference” at the bottom of the screen.
- Explain the difference between your observation and the MODIS classification in the text box.

There are many reasons that your observations might be different than the MODIS classification.

- You are seeing in more detail, so you may have classified something smaller and different than the rest of the MODIS pixel, like a park (cultivated grass) in a city (urban).
- The area you mapped may have changed since the MODIS map was made.

Just note any difference you see so that location is flagged as a place scientists might want to check using your photos and classification.

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Observe Land Cover

To get started observing land cover with GLOBE Observer

1. Download the app: https://observer.globe.gov/about/get-the-app
2. Register
3. Select Land Cover and complete the in-app training