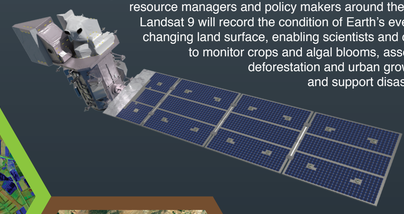
FACTORY EARTH

Making Products From Earth Materials

CHALK is made from ground limestone from a quarry and calcium carbonate (gypsum) that is mined or harvested from evaporation ponds.

CRAYONS can be made from soybean oil. Pigments from minerals are added to make the color; for example, ochre (an iron oxide mineral) is added to make red. Paper, made from wood, is used for the boxes and wrappers.

Launching in 2021, Landsat 9 will continue the nearly 50-year Landsat data record, providing actionable information to resource managers and policy makers around the world. Landsat 9 will record the condition of Earth's ever-changing land surface, enabling scientists and others to monitor crops and algal blooms, assess deforestation and urban growth trends, and support disaster relief.



PLAYDOUGH is primarily made of flour (from wheat) and salt mixed with water. Additional ingredients can be added for preservatives, fragrance and color.

A mixture of minerals (graphite and clay) are inserted into hollow wooden sticks to make **PENCILS**. Adjusting the ratio of clay and graphite powder changes the lightness and darkness of the pencil mark.

FISHSTICKS are typically made from white fish, like cod. Sticks are formed and coated with flour (wheat) and seasoned with salt.

BASEBALLS are balls of cork (from cork trees) that are wrapped with yarn (from sheep's wool) and leather (from cowhides). Printing on the ball can be made from soy ink.

Evaporation Ponds

Evaporation ponds are artificial ponds with very large surface areas designed to efficiently evaporate water by sunlight and exposure to the ambient temperatures. The raw materials are contained within mineral-rich brines—water with a high percentage of dissolved salts—that are located below the surface. The brines are pumped to the surface into large, shallow evaporation ponds where the water evaporates and the minerals are harvested. A variety of raw materials are extracted and used in everyday products such as: sodium chloride and potassium salts for the manufacturing of polyvinyl chloride (PVC); soda ash (sodium carbonate) for making glass and detergents; and lithium salts used to manufacture lithium batteries for smartphones, laptops, and other mobile devices. Evaporation ponds can be seen from space and the various colors indicate mineral composition.

Mines & Quarries

Mines are places where rocks, precious metals, and minerals are excavated and extracted. Satellite data are used to differentiate rock and mineral types. The Atlas Mountains in Morocco are rich in silver, gold, manganese, tin, cobalt, titanium, and zinc. A quarry is a type of mine called an "open-pit" mine. South Africa's largest open-pit mine is a major source of copper and iron. Data from space observations can also reveal geological features. This helps identify potential excavation sites. "Sub-surface" mines consist of tunnels and shafts cut into the Earth so that precious metals such as gold and silver, gemstones such as diamonds, and fossil fuels such as coal and uranium can be extracted. Mining activity, whether open-pit or sub-surface, can be seen from space, such as the Kiruna mine in Sweden which is the largest underground iron ore mine in the world.

Water

Found everywhere on Earth, from the polar ice caps to steamy geysers and in rivers, lakes, and streams, water promotes life and advances society's well-being in numerous ways. Water allows travel throughout the world and can be a power source for factories and homes. Earth's oceans are home to many creatures and also help regulate the planet's climate, absorbing heat in the summer and releasing it during the winter. The Earth's saltwater and freshwater bodies support fish, one of the primary sources of food protein for humans, especially in developing countries. Nearly a quarter of the oceans' fish live near healthy coral reefs. Reefs consist of coral animals, called polyps, that together form a community structure that provides habitat for more than a million plant and animal species. Reefs are typically found near the water's surface and help protect coastlines from storms and erosion.

Cropland

Food for people and livestock, as well as raw materials used in factories, are grown on croplands. For decades, Landsat satellite data have been helping agencies like the U.S. Department of Agriculture track how many acres are being farmed, crop health, and how much of every crop is produced each year. In addition to providing food, the corn and soybeans grown on croplands are used to create fuels, plastics, inks and other common products. Landsat satellite images show how cropland looks different around the world depending on regional conditions such as climate, rainfall, and topography. Cropland can appear as a patchwork of irregular shapes, or as squares, rectangles and even circular fields resulting from center-pivot sprinklers. Areas cleared for cropland and livestock grazing appear as a grid on the landscape in northern Argentina.

Forest

When trees grow higher than 16 feet (5 meters) across an area, it's called a forest. About 30% of the Earth's land surface is covered by forest. These areas provide raw materials that can be used to manufacture products that we use everyday, including lumber used for building materials and pulp that becomes paper towels and other paper products. Cork from the bark of cork oak trees is used in products like baseballs and wine stoppers. Forests provide habitat for many wildlife species. Trees act as Earth's purification system by absorbing carbon and other airborne chemicals and releasing oxygen. To help support sustainable uses of forests, scientists and resource managers use satellite imagery to map and monitor these areas. From space, we can see the contrast between the protected forest in New Zealand's Egmont National Park and the surrounding agricultural lands.

Rangeland

In areas where there is not enough rain or the climate is not right for farming, people sometimes use large open areas called rangelands to graze livestock. Native vegetation like grasses and shrubs often grow in rangelands. In the United States, rangelands are the largest single land cover type and make up more than half of the western part of the country. Much of this rangeland is used for grazing of livestock such as cattle, sheep and goats that support the world's food and clothing supplies, from beef and lamb to leather and wool. For people living in arid areas, grazing animals and their products provide income, food and shelter. Landsat images helps people sustainably manage large tracks of rangeland in the face of climate-driven change.

AMERICA VIEW℠

AmericaView is a nationwide, university-based, and state-implemented consortium that advances the widespread use of remote-sensing data and technology through education, outreach, and workforce development for the public and private sectors.

Earth Observation Day (EOD) is a STEAM outreach event sponsored by AmericaView to celebrate the Landsat mission, a joint effort of the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA).

EOD introduces students to Earth observations in a stimulating and dynamic way using the tools and technology of geospatial science. Enjoy the beauty of Earth captured by satellite and explore images used to solve some of Earth's most perplexing issues. Imagine pictures of the world's geography at your fingertips. The EOD web site (www.americaview.org/earth-observation-day) provides information on how to engage students in the use and analysis of free remote sensing imagery.

Download the game instructions at:
landsat.gsfc.nasa.gov/ESW2020

For more images and activities about Landsat, visit:
landsat.gsfc.nasa.gov
www.usgs.gov/landsat
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earthobservatory.nasa.gov

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