



## Antarctic Circle

The Antarctic Circle is an imaginary line that falls on the parallel of Latitude at about 23.5 degrees from the South Pole and 66.5 degrees south of the Equator. On about December 21 in the Southern Hemisphere, the sun shines directly over the Antarctic Circle and doesn't set below the horizon.

## Archipelago

An arc-shaped chain of Islands. These Islands usually form where two of the earth's Tectonic Plates meet, and one slides beneath the other. This is a region of intense heat and energy, resulting in earthquake and Volcano activity. Along the line where these plates meet, tubes of Magma extend from the Ocean floor to the water's surface. These tubes become volcanoes, and their Lava forms the Islands. The islands of Japan and the Philippines are archipelagos.

## Arctic Circle

The Arctic Circle is the line that falls on the parallel of Latitude at about 23.5 degrees from the North Pole and 66.5 degrees north of the Equator. On about June 21 in the Northern Hemisphere, the sun shines directly over the Arctic Circle and doesn't set below the horizon.

## Atoll

A ringlike Island or reef built of coral, the rock-hard skeletons of tiny sea animals called polyps. Atolls form on the rims of underwater volcanoes and often encircle a shallow saltwater pool called a Lagoon. The flat Coral Reef rings sometimes support plants, trees, and sand dunes. Ridges, "blow holes," and other coral structures protect atolls from waves and bring sea water, oxygen, and food to the polyps. Atolls are found in warm tropical areas, such as the Indian and southwestern Pacific Oceans, and the Caribbean Sea. The largest atoll, at 840 square miles (1,352 square km), is Kwajalein in the Marshall Islands in the northern Pacific Ocean.



## Bathymetry

The science of measuring and charting the depths of an Ocean, Sea, Lake, or other body of water. Researchers used to measure Ocean depths by lowering weighted ropes into the water. More recently, they set off explosions and read the shock waves that bounced off underwater features. Another mapping technique uses sonar, sending very high sound waves into the Ocean and measuring the time it takes the echoes to come back. These echo soundings can be plotted on a chart and used to create Maps of the Sea floor. Bathymetry also refers to the facts obtained by this process. Bathymetry revealed that the Ocean floor, like the surface of the land, has many Mountains, Plains, and Canyons.

## Bay

An open, curved indentation in the shoreline of a Sea, Ocean, or Lake. A bay is typically bigger than a cove but smaller than a Gulf. Hudson's Bay in Canada is the largest bay in the world at 316,500 square miles (819,734 sq km). Chesapeake Bay's 3,237 square miles (8,834 sq km) makes it the largest inland bay in the United States.

## Beach

A gently sloping band of sediments, such as sand and stone, dropped by waves at the waterline of an Ocean or Lake. The upper limit of a beach is that line reached by the highest water level. A beach's size and shape depend on seasonal changes, the supply and type of sediments, the shape of the coastline, Winds, Tides, ocean currents, and waves. The water pounding on rocky coastlines smashes cliffs into smaller and smaller pebbles and sand. Beaches change rapidly as Wind and waves constantly carry away, move, and replace the sand and other materials. The sandy beaches of Island Beach, off the New Jersey coast, stretch over 100 miles (161 kilometers). The beaches on Lake Michigan's Mackinac Island are rocky and narrow.

## Bight

A long gentle curve in the shoreline of an open coast, or the Bay formed by this curve. The Great Australian Bight, on the south coast, stretches for several hundred miles from Eyre Peninsula to the Archipelago of the Recherche. The protruding Delta of West Africa's Niger River is flanked by the Bight of Benin and the Bight of Biafra.

## Biome

A large area with a certain community of plants and animals and distinguishing features like Climate, rainfall, soil type, salinity, light intensity, and food sources, that distinguish it from other biomes. A biome is the largest ecological unit and may contain many Ecosystems. Land biomes often are named for their main type of plants, such as Grassland or Rainforest. Physical features sometimes give an aquatic biome its name, like Coral Reef. The Arctic Tundra is a huge biome that stretches around the globe. Coral Reefs are unique and fragile biomes that support thousands of species of sea life. The four major aquatic biomes are called Coastal Waters, Coral Reef, Freshwater, and Open Ocean. The nine major terrestrial biomes are Coniferous Forest, Desert, Grassland, Mediterranean, Mountain, Rainforest, Savanna, Temperate Forest, and Tundra.

## Boreal Forest

The largest and most northern Forest on earth. Called Taiga in Russia, this wide band of needle-leaved spruce, fir, pine, larch, and other conifers circles the globe through Canada, Alaska, Siberia, and much of Scandinavia. The boreal forest lies between denser Forests to the south (at about 45° north Latitude) and the treeless Tundra to the north. The trees thrive on a long season of cold and snow and some can withstand temperatures of -70° F (-57° C).

## Butte

A tall, isolated rocky hill or Mountain with a flat top and steep sides. These strangely shaped formations are pieces of ancient Plateaus that have been eroded away by Wind and water. The eroded shapes of buttes, and mesas, which are larger, fill Monument Valley on the border between Utah and Arizona.

## Caldera

A large, circular depression caused by the collapse of the top of a Volcano, either by an explosion or by the loss of Magma underground. Large calderas mark the surfaces of Mars, Venus, and Jupiter's moon, Io. When Mount Mazama, in southern Oregon, exploded 6,500 years ago it lost two miles of its height and formed the caldera which now holds Crater Lake. Kilauea, in Hawaii, and Katmai in Alaska's Aleutian Islands, are calderas resulting from the collapse of volcanoes. The 50-mile-long (80.5 km) Lake Balaton in Hungary is a water-filled caldera formed when a Magma chamber collapsed.

## Canal

A human-made waterway built either for watering farm land, controlling floods, draining land, or other water-moving purposes, or to let boats navigate from one body of water to another. The Panama Canal is a navigation canal through Central America that connects the Atlantic and Pacific Oceans. Laborers removed over 262 million cubic yards of earth and took over 40 years to build this canal. The 101-mile (162.5 km) long Suez Canal connecting the Mediterranean and Red Seas cut over 4,000 miles (6,437 km) off the water route from Britain to India.

## Canyon

A deep Valley with steep sides, typically cut by a fast-flowing River into land that is continually being uplifted. Canyons form in dry regions, where there is little water run-off to erode the nearly vertical rock walls. Submarine canyons are deep Gorges in the Ocean floor caused by underwater currents, earthquakes, tidal waves, undersea landslides, and other phenomena. The Grand Canyon, the largest and most famous canyon in the world, is a mile deep and 278 miles (447 km) long. Hell's Canyon, cut by the Snake River where Idaho meets Oregon, is the deepest canyon in the United States at 7,900 feet (2,408 m). The deepest canyons in the world are in Peru. The Cotahuasi and Colca Canyons in the Andes Mountains are 10,500 feet (3,200 m) or more deep—twice as deep as the Grand Canyon.

## Cape

A pointed piece of land jutting into the sea from the coastline of a Continent or large Island. Cape Cod, Massachusetts, and the Cape of Good Hope in South Africa are similarly shaped hooks of land.

## Cay

A low, small coastal bank or Island of sand, rock, or coral built up by waves to just about sea level. Some cays rest on flat Coral Reefs. A cay forms when sand

builds up along the edge of a reef, on the side opposite the prevailing Winds. They change shape as more sand is deposited in calm Weather or eroded during storms. There are many cays in the Gulf of Mexico and the Caribbean, including the Florida Keys and Cayo Grande off the coast of Venezuela.

## Channel

The deepest part of a Stream bed. A channel is also that part of a River, Bay, Strait, or other waterway that is deep enough for boats to pass through areas that are otherwise too shallow. A channel is also a waterway, wider than a Strait, that joins two larger bodies of water. The English Channel separates Great Britain from the European Continent and joins the North Sea and the Atlantic Ocean.

## Chaparral

Low evergreen scrub vegetation. These dense thickets of drought-resistant trees and shrubs can regrow quickly after seasonal fires. Chaparral is also the name for the Biome where these plants are common. It has a hot, dry summer and wet, mild winter. Although there is little or no Rain in the summer, too much Precipitation in the winter washes nutrients from the rocky, thin soil. Chaparral is often found between other Biomes like Desert (drier) and Grassland (wetter). Chaparral occurs in coastal California and Chile, the Mediterranean, South Africa, and southwestern Australia.

## Cirque

A bowl-shaped, steep-walled hollow or basin at the head of a high Mountain Valley. A cirque is formed by water freezing and thawing between the head of a Glacier and a Mountain, the grinding action of the ice against the rock, and Erosion caused by the Glacier as it pulls away from the Mountain. Rainwater collects into Lakes called tarns in older cirques whose Glaciers are long gone. The Cirque de Gavarnie forms a natural amphitheater in the French Pyrenees. The back wall of Antarctica's Walcott Cirque is 10,000 feet high (3,048 m).

## Climate

The pattern or cycle of Weather conditions (such as temperature, Wind, Rain, snowfall, humidity, clouds), including extreme or occasional ones, over a large area, averaged over many years. Factors that affect climate include where a place is on the earth, local land features like Mountains, the type and amount of plants like Forests or Grassland, the nearness of large bodies of water, prevailing Winds, and human activities like burning fossil fuels, farming, or cutting down Forests. Two places can be close together and have very different climates. Hawaii's northeast slopes are wet, but the southwest, on the other side of the mountains, is much drier. Two places far apart on the globe can have very similar climates. The southeastern United States, like eastern China, is temperate, humid, has a hot summer, and has no dry season. Chicago and Moscow both have cold winters and hot summers. Colder climates aren't always closer to the North Pole. Great Britain is farther north than Newfoundland, but since it's warmed by the Gulf Stream its climate is warmer and milder than that of "The Rock."

## Continent

One of the earth's six major land masses, each several million square miles of rock rising from the Ocean floor. The six continents are Eurasia (Europe, China, India), Africa, Australasia (Australia, New Guinea), North America, South America, and Antarctica. The boundaries of continents are not their shorelines but an edge up to several hundred miles offshore where the gentle slope of the continental shelf drops off abruptly. Continents may look like single pieces of solid land, but they're more like jigsaw puzzles with many joined pieces.

## Continental Drift

The slow movement of the earth's land masses over its molten inner layers of Magma. About 200 million years ago, all the land mass on the outer crust formed one big Continent, called Pangea. Pressure from the motion of the melted interior broke the brittle crust into pieces. These pieces, called Tectonic Plates, carry the Continents and Oceans around the earth's surface, like cookie pieces on pudding. As molten rock came up through great cracks, or Faults, in the crust, it opened the Faults and pushed the plates apart. The plates have been moving at the rate of about one inch per year for hundreds of millions of years. Magma still rises up to mid-Ocean ridges where it hardens into new crust and moves the Continents around. When two plates grind alongside each other or overlap, the heat and pressure cause earthquakes and volcanoes. When they collide, the land crumples into Mountain ranges. The Himalayan Mountains are squashed folds of rock pushed up as the Indo-Australian plate moved northward into the Eurasian plate. The Red Sea and the Great Rift Valley in eastern Africa formed when two

Tectonic Plates moved apart and cracks opened in the earth. The Red Sea slowly widens as the plates move apart.

## Continental Shelf

The shallow underwater Plain that is a Continent's real outer edge. The continental shelf slants from the shore's low-tide line to the continental slope, a cliff that plunges abruptly to the deep Ocean floor. The shelf can be a few miles wide to over 200 miles (322 km), reaching a typical depth of 450 feet (137 m). It collects most of the sand, silts and other sediments that Rivers carry to the sea. The Arctic has the world's widest continental shelves; Antarctica has the deepest. The eastern continental shelf of the United States is over three times as wide as that on the West Coast.

## Coral Reef

A mound or ridge of coral polyps and their hard limestone remains, combined with sand and minerals. Coral reef Biomes occur only in shallow, warm waters, mostly in the Pacific and Indian Oceans. A coral reef provides a rocky shelter for a wide variety of sea life, but the reef itself is fragile and grows very slowly. Coral reefs include fringing reefs, which hug the rocky shelves extending from shores of Islands or Continents; barrier reefs, which are separated from the land by a Lagoon; and Atolls, which are ring-shaped Islands. The Great Barrier Reef in northeastern Australia is the world's largest system of coral reefs, stretching 1,250 miles (2,011 km) along the Queensland coast. El Capitan, the highest mountain in Texas, is made up of fossilized coral reefs.

## Coriolis Effect

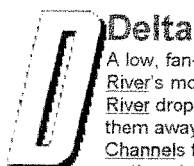
An effect of the earth's rotation on the paths of moving things like Wind, ocean currents, and airplanes. It acts at right angles to an object's direction of motion, deflecting it to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. Where these two hemispheres meet—at the Equator—there is no effect. The Coriolis Effect influences storm rotation, ocean currents, Weather, and the launching and orbiting of spacecraft.

## Crater

A bowl-shaped depression in the earth or the funnel-shaped opening of a Volcano. Many other planets have craters. Some are caused by volcanoes, but most of them are impact craters, the scars left by collisions with meteorites. The biggest crater in the world is Chubb Crater in Canada. Caused by a meteorite hitting the earth, it's nearly 2 miles (3.2 km) wide. Meteor Crater in Arizona, also an impact crater, used to be filled with water. Crater Lake in Oregon, formed in a volcanic crater, is the deepest Lake in the United States, at 1,932 feet (589 m) deep.

## Creek

A stream of water that is larger than a brook and smaller than a River. Narrow tidal inlets in low-lying coasts are also called creeks. Evergreen Forests and temperate Mountain Forests typically have many creeks.



## Delta

A low, fan-shaped Plain formed by the gravel, silt, sand, and clay deposited at a River's mouth where it slows to meet another body of water. The fast-moving River drops its sediments faster than the deeper, slower-moving water can wash them away. A delta is a region of Swamps, Sand Bars, and Lagoons divided by Channels through which the River moves. Climate, geologic setting, earthquakes, river slope, Erosion, flooding, Tides, and other local conditions affect a delta's size, shape, and other characteristics. The meeting of the Ganges and Brahmaputra rivers in Bangladesh forms the world's largest delta, over 1,500 miles (2,414 km) long and 500 miles (804 km) wide. Southern Africa's Okavango River never reaches the sea but ends in the world's largest inland delta where nearly all the water drains into Botswana's Okavango Swamps.

## Desert

A dry, barren region that receives little or no Precipitation, usually less than 10 inches (25 cm) per year. A desert can be hot or cold. Without many plants to hold the soil with their roots, the Wind can blow away topsoil and scour the landscape into fantastic shapes. Sand that catches on vegetation can form Dunes. The largest hot deserts in the world lie near Latitudes 30° South and 30° North, where descending high-pressure air masses push out the low-pressure air masses that bring moisture. Temperatures in the desert can range from over 100° F (38° C) during the day to below freezing at night. The largest hot desert is

Africa's Sahara, with 3.5 million square miles (9 million square km). Antarctica is a desert even though it's cold and covered with ice. Its annual Precipitation is less than 4 inches (10 cm) of rain, making it one of the world's driest areas. Atacama desert in northwestern Chile is the driest place on earth. Parts of it haven't had Rain in over 400 years.

## Doldrums

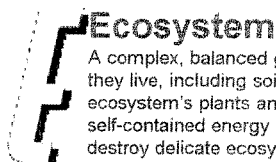
A band of mild, changeable Winds and long periods of calm near the Equator. Here, the northeast and southeast Trade Winds meet, and the air rises as it's heated by the sun. This upward movement means there's little wind moving along the earth's surface. Sailors gave the region the name "doldrums" because sailing ships were often stranded here. Tropical storms often start in the doldrums. Within this zone of low air pressure, the humid air cools as it rises, causing rainstorms, or, if the low-pressure area is moving in a spiral, it can turn into a hurricane or typhoon.

## Drumlin

A low, rounded mound of rock or clay left behind by a Glacier. These oval-shaped hills vary in size, but can be up to several miles long. They lie parallel to the direction the ice moved. Clusters of drumlins are common, giving the land a "basket of eggs" look. Scandinavia, central Wisconsin, central New York, and eastern Massachusetts have large drumlin fields. Boston's Bunker Hill is a famous drumlin.

## Dune

A mound of loose, fine-grained material, such as sand, heaped up and shaped by the Wind in Deserts and along shorelines. Dunes form when windborne sand catches on plants or rocks. They grow by slowing the wind, causing it to drop more sand. Dunes can be crescent, star, or wave shaped. Their size and shape depend on the supply of sand, the speed, direction, and consistency of the Wind, and the presence of obstacles to catch the Wind. Usually, the windward side (facing the prevailing Wind) has a gentler slope than the leeward (opposite the prevailing Wind) side. Dunes move downwind as grains of sand blow up the sloping side and roll down the steep side. Dunes in California's Mojave Desert move about 50 feet (15 m) per year. Some of the tallest dunes in the world, over 650 feet (200 m) high, are in the Sahara and Namib Deserts in Africa.



## Ecosystem

A complex, balanced group of plants, animals, and the Environment in which they live, including soil, air, water, sunlight, minerals, and nutrients. An ecosystem's plants and animals depend on each other for survival in a nearly self-contained energy and nutrient cycle. Human activity and pollution can destroy delicate ecosystems. A sealed terrarium is an artificial ecosystem. The Chesapeake Bay ecosystem, once teeming with oyster and crab beds, has been disrupted by large amounts of silt and other factors. California's redwood Forest ecosystems are thousands of years old. The tropical Rainforests in South America's Amazon Basin are highly complex and very efficient ecosystems.

## Environment

All of the physical surroundings in which animals and plants live. Many different physical factors affect a living thing in its environment, including land, light, temperature, water, gases, pressure, food resources, Wind, competition with other plants or animals, predators, disease, and events such as fires, floods, or volcanic eruptions. Each organism's environment is complex and affects its growth, reproduction, and geographic distribution. There are many different environments in the world and no single species can live in them all, not even people. Pollution, development, noise, and other human disruptions have a great impact on different environments.

## Equator

An imaginary circle around the middle of the earth halfway between the North and South Poles, at 0 degrees Latitude. The Equator is the longest parallel of Latitude. At the Equator, the sun's rays hit the earth directly, warming this region much more than the poles, where the sunlight strikes at a less intense angle. The circulation of warm equatorial air and cold polar air causes Winds and Weather around the globe. A similar circulation of warm and cold water, along with the Winds, causes ocean currents. Climates along the Equator are not limited to hot and tropical; there are also dry Grasslands, Deserts, even snow-covered Mountains. Countries on the Equator include Ecuador, Colombia, Brazil, Congo-Kinshasa, Uganda, Kenya, Borneo, and Sumatra.

## Equinox

Either of two times during the year when the sun is directly over the Equator and every spot on earth experiences a 12-hour day and a 12-hour night. In the Northern Hemisphere, the Vernal Equinox marks the beginning of Spring and occurs around March 21. The Northern Hemisphere Autumnal Equinox occurs around September 23.

## Erosion

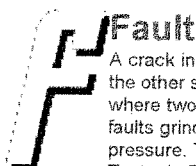
The gradual picking up, breaking down, and wearing away of land by moving water, Wind, or ice. These powerful forces act like sculpting tools that over a very long time can carve Plateaus, Fjords, and caves, smash rocky cliffs into sand, and smooth Mountains into Plains. Water freezing and thawing splits rocks apart. Water trickling through limestone dissolves rock, forming caves. Rain and melting Snow carry away loose soil. Rushing Rivers and Streams gouge Canyons and polish rock like sandpaper smooths rough wood. Moving Glaciers scour the landscape, picking up and leaving behind boulders, rocks, and debris. Glaciers and Rivers carry tons of rocks, soil, and silt to the Sea, where Wind-driven waves pound cliffs and move sandy Beaches. The Wind wears away dry landscapes where there are few plants to hold the soil. Violent storms like hurricanes can erode entire stretches of coastline overnight. Death Valley in California, the Great Salt Lake in Utah, and the Tarim Basin in northern China are all closed basins that are gradually filling up with sediments washed down from the surrounding slopes. In Utah and Arizona the eroding Winds have sculpted the rock into spectacular Buttes, arches, towers, and spires.

## Estuary

A River mouth that is flooded by a Sea or Ocean. Most estuaries are formed by a rise in sea level. These shallow coastal Wetlands support plants and animals that are adapted to the changes in salt and Freshwater. Many types of birds, fish, and other animals feed, bear young, or live in estuaries because of the plentiful food and the protection from the harsher Ocean conditions. London, England, New York City, and Hamburg, Germany, are just a few of the major cities built on estuaries. There are many estuaries along the eastern United States, from Maine to Florida.

## Extinction

The complete dying out or end of a species or other class of plant or animal. A species becomes extinct when it can no longer produce enough offspring to replace individuals that die. Most of all the species that ever lived are extinct. There are as many as 30 million species now, but there may have been billions over the history of the earth. Geologic changes, or changes in Climate or Environment can cause extinction. Hunting, logging, pollution, farming, and other Habitat-destroying activities cause the extinction of many plants and animals. By some estimates the world is losing as many as 100 species per day, most before we even know about them. There are nearly 10,000 species of plants and animals now considered in danger of extinction. Dodo birds once inhabited the island of Mauritius in the Indian Ocean. In the 16th century, sailors and settlers easily killed these large flightless birds. The pigs and rats the people brought with them ate the dodo eggs. By the 17th century, the bird was extinct. In North America, the passenger pigeon was hunted to extinction by 1914.



## Fault

A crack in rock along which one side moves up, down, or sideways in relation to the other side. In geology, a fault is a fracture in the earth's crust, or the line where two Tectonic Plates meet. Earthquakes occur when the sides of these faults grind against one another, build up pressure, and suddenly release the pressure. The sides of the San Andreas Fault in California ride on two different Tectonic Plates. The sides of the fault were displaced by about 21 feet (6 m) by the 1906 San Francisco earthquake. Africa's Great Rift Valley is a fault more than 6,000 miles (9,656 km) long.

## Fjord

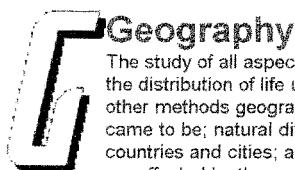
A long, narrow coastal Valley between tall, rocky cliffs, gouged out by a Glacier and flooded by the Sea. Most fjords are very deep. Sogn Fjord in Norway is 4,291 feet (1,308 m) deep. Norway is famous for its fjord coastline, but other places like Fiordland National Park in New Zealand have equally spectacular fjords. Eternal Fjord in Greenland is 50 miles long (80.5 km).

## Forest

A large area thickly covered with trees. Forests grow in different conditions, although large stands of trees need temperatures above about 50 degrees F (10 degrees C) in the warmest months and an annual precipitation over 8 inches (20 cm). Forests are distinguished by their main species of trees and plants, density, and soil type. They are as different as the needle-leaved Boreal Forests of Russia's subarctic regions, the mixed evergreen and deciduous temperate forests of the eastern United States, or Brazil's dense tropical Rainforests near the Equator. The different layers in a forest include the top or canopy, the shrub layer, and the floor. Forests produce tremendous amounts of energy, nutrients, and oxygen. They affect regional Weather as well as global Climates. Forests are one of the world's most complex Ecosystems, supporting more species than all others combined. Cutting down forests destroys not only the trees, but the birds, insects, plants, mammals, and other life forms that live there. Forests cover nearly two-thirds of Finland, the most densely forested land in Europe.

## Freshwater

Water that contains very little salt, less than half of one percent in concentration. Streams, Rivers, Ponds, Lakes, and inland seas are freshwater if their water source is Precipitation. Most of Earth's freshwater supply is stored as ice. The ice in Greenland and Antarctica holds between 70 and 90 percent of all the freshwater on Earth. One-fifth of the world's liquid freshwater is in Lake Baikal in Russia. The Great Lakes in North America hold another fifth of the world's supply of liquid freshwater.



The study of all aspects of the earth's surface, including its physical features and the distribution of life upon it. Through observation, surveying, mapping, and other methods geographers study earth's structures, what they are and how they came to be; natural divisions like Mountain ranges; political divisions like countries and cities; as well as industries and other human activities that affect or are affected by the earth's surface. Geographers are interested in how all of these things relate to one another. They look for patterns, uncover trends, describe processes, and study relationships. Geography helps us know and understand the world around us. There are many different fields within geography, such as biogeography, which studies the distribution of plants, animals, and humans on earth; physical geography, which deals with the physical structures, such as Mountains, Oceans, and coastlines, and factors such as Climate; and cartography, which comprises the art of Map making and the science of Map analysis.

## Glacier

A large, thick mass of ice that forms high in Mountains until it becomes heavy enough to move downhill. Glaciers form over many years in permanent snow fields where more snow falls in winter than can melt in summer. As snow falls, its weight squeezes the air out of the layers underneath until they recrystallize and compact into blue-tinted glacial ice. Eventually, the glacier's tremendous weight forces it to move downslope like a very slow River of stiff toothpaste. Some glaciers move a few inches a year, others move over 100 feet (30.5 m) a day. Earth has about 6 million square miles (15.5 million square km) of glaciated land, found on many Islands and all of the Continents except Australia. Icebergs are chunks of glacial ice that break off, or calve, and float out to sea. About 10 percent of the earth was covered by glaciers during the last Ice Age, which ended about 10,000 years ago. Some glaciers in the Himalayas extend for 50 miles (80 km).

## Gorge

A deep, narrow River Valley, with nearly vertical rock walls. Gorges are carved by Rivers wearing away the surrounding rock. A gorge can also be formed when the roof of an underground cave collapses. The Guilin region in southern China, now filled with steep-sided gorges between high Mountains, was once a flat landscape over limestone caves.

## Grassland

Vast open land covered with grasses or grasslike plants. Grassland develops in regions that are too dry for many trees or shrubs to grow, but too wet to become Desert. Grassland once covered as much as 40 percent of the earth, and is still one of the most widespread Biomes in the world. It includes tropical Savannas; temperate meadows, pampas, prairies, steppes, and veldts; and arctic or alpine Meadows. Grassland thrives in areas with periodic fires and large herds of grazing animals, conditions that would destroy other Ecosystems. Human activities like burning, mowing, and the cutting of Forests also create and sustain grasslands. Some grasses, such as elephant grass in East Africa or New Guinea's pit-pit grass, grow nearly 10 feet (3 m) tall. Nearly all of the prairie that

once covered the North American Midwest is now turned into farms or pastures.

## Gulf

A large indented stretch of a coastline. A gulf is smaller than a Sea and similar to, but bigger and usually deeper than a Bay. Some have Islands at their mouths, or are separated from the ocean by Straits. Most gulfs were formed by a rise in Sea level, but some like the Gulf of California were formed when a large piece of the earth's crust dropped below sea level. The Gulf of Mexico is the largest gulf in the world. The Persian Gulf is the warmest.

## Gulf Stream

A strong, warm network of Ocean currents that flow from the Gulf of Mexico and the Caribbean Sea north along the North American coast, and northeast across the Atlantic Ocean. The Coriolis Effect, Winds, and differences in water temperature and salt concentration move the warmer, saltier Gulf Stream clockwise into the cold North Atlantic Ocean. The intrusion of this warm current into an otherwise cold region greatly affects the Climate of northwestern Europe. Because of the Gulf Stream, English winters are mild and the winter air west of Norway is more than 40° F (22° C) warmer than the average temperature at that Latitude.

## Habitat

The place where an animal or plant lives, including all living and nonliving factors. The habitat supplies all the resources that an animal or plant needs to survive. An organism can have different habitats in different phases in its life cycle. A habitat can be any size or anywhere. Ponds, caves, Islands, even a host organism invaded by parasites are all habitats. Russia's Lake Baikal is a unique freshwater habitat. The world's only freshwater seal lives here, as well as nearly 2,000 other species of animals and plants. Some of the lakes in Africa's Great Rift Valley have lots of sodium bicarbonate in them, making them inhospitable to many creatures. Though only specially adapted species such as algae and shrimp live in this harsh habitat, they in turn attract millions of hungry flamingoes.

## Harbor

Any part of a body of water that is sheltered from Wind, waves, and ocean currents and is deep enough to provide a safe place for ships to anchor. The shelter can be from artificial barriers like breakwaters or jetties, or from natural land forms. People built many breakwaters in order to create the harbor at Madras, India. Land barriers like the Marin Headlands and the San Francisco Peninsula protect San Francisco Bay's harbors from the Pacific Ocean.

## Island

A piece of land, smaller than a Continent, completely surrounded by water. Continental islands like Great Britain and Sri Lanka share the Continental Shelf with adjacent Continents, but have either broken off or become separated from mainland by the rising Sea level. Oceanic islands like Hawaii are volcanic piles of Lava that rise above Sea level from the Ocean floor. Islets are very small islands. At nearly 840,000 square miles (2,176,000 sq km), Greenland is the largest island in the world.

## Isthmus

A narrow strip of land between two Seas or Oceans that connects two bigger land areas. The Isthmus of Panama is the narrowest part of the Americas, only 30 to 120 miles wide (50 to 200 km). It connects North and South America between Costa Rica and Colombia. The Isthmus of Suez is the only land bridge between the Continents of Africa and Asia.

## Jet Stream

One of several long, swiftly moving air currents that flow eastward through the earth's upper atmosphere. Differences in air temperature and pressure cause the air to circulate between the Equator and the North Pole and South Pole. This movement, combined with the coriolis effect, forms the prevailing winds and jet streams. Jet streams have speeds up to 310 mph (500 kph) in narrow bands about 33,000 to 164,000 feet (10,000 to 50,000 m) above the earth. They shift position as well as speed with the seasons. They affect global Weather patterns, such as the formation of cyclones and Monsoons, and are thought to cause some of the turbulence that gives aircraft the occasional bumpy ride.



## Lagoon

A small, calm, relatively shallow salt water Pond or Lake separated from open Ocean by a barrier, such as a Coral Reef or sand bar. Lagoons form in Deltas, where a River drops its sediments at the Ocean; inside ringlike Atolls in the deep ocean; and between coastlines and barrier Islands or reefs. The lagoon in the Seychelles' Aldabra Atoll sits amid four coral Islands in the Indian Ocean, and is home to the world's largest population of giant turtles. Mexico has many freshwater lagoons along its coastline.

## Lake

A large hollow in the land filled with fresh or salt water. A lake is bigger than a Pond and smaller than a Sea. Lakes can be gouged out by Glaciers (the North American Great Lakes, the English Lake District). They can form when water fills up the Crater of an extinct volcano (Crater Lake, Oregon). And they can form when part of the earth's crust drops and collects water (Lake Tanganyika in Africa). Lakes die when they fill up with sediment, fill up with vegetation and become Swamps, or dry up faster than Streams can fill them up. The deepest Freshwater lake in the world, Lake Baikal in Siberia, is over a mile deep (1.7 km) in some spots. Canada has more lakes than any other country. Lake Eyre in Australia covers 5,530 square miles (14,323 sq km) when flooded, but most of the year it's a dry lakebed because the water evaporates away in the Desert heat.

## Latitude

Imaginary lines on the earth used to measure points on the globe north or south of the Equator, which is latitude zero. Circles, called parallels, are drawn on Maps or globes at specific distances parallel to the Equator. These lines, together with meridians of Longitude, form a grid over the globe. Navigators, mapmakers, and others use this grid to pinpoint exact places in relation to the Equator and the Prime Meridian (which is located at 0° Longitude). Latitude is measured in degrees, minutes, and seconds. A degree measures about 69 miles (111 km). Geographic latitude is an angle measured as if from the center of the earth. The North Pole and South Pole lie at the greatest possible latitudes, 90° north and south. Philadelphia, Pennsylvania, is located at 40° north latitude, the same as Beijing, China, and Ankara, Turkey.

## Lava

Fiery melted rock (Magma) that breaks through the earth's crust, like egg white bubbling through the cracked shell of a boiling egg. Lava sometimes oozes in broad sheets, but an explosive Volcano can shoot fountains of lava "bombs" as small as softballs and blocks as big as houses high into the air. Lava is a mixture of iron, oxygen, silicon, and many other elements heated over 1,000° F (537° C). Cooled lava can be ropery and smooth, spiny and sharp, even long and fine like strands of hair. Lava that reaches the sea shatters and erodes into tiny glassy particles, creating black Beaches in places like Hawaii. Lava cools into igneous ("formed by fire") rocks like pumice, basalt, or obsidian. Many Islands like Iceland and Hawaii are formed from big piles of lava, built up from the Ocean floor by many volcanic eruptions. Stromboli, in the Mediterranean near Sicily, Italy, has thrown lava blocks weighing 2 tons (1.8 metric tons) a distance of 2 miles (3 km).

## Longitude

Imaginary lines on the earth used to measure points on the globe east or west of the Prime Meridian at Greenwich, England. Greenwich is longitude zero. Meridians of longitude are measured in degrees, minutes, and seconds. The distance per degree of longitude measures about 69.18 miles (111.32 km) at its widest at the Equator and 0 at the North Pole and South Pole, where the meridians of longitude converge. Geographic longitude is an angle measured as if from the center of the earth. In order to indicate locations, circles, called meridians, are drawn pole to pole on Maps or globes. These and the parallels of Latitude form an imaginary grid by which exact places can be located in relation to the Prime Meridian and the Equator. Philadelphia, Pennsylvania, is located at 75° west longitude, the same as Barranquilla, Colombia.



## Magma

Fluid molten rock and gases miles beneath the earth's surface. Magma is hotter and lighter than the surrounding rock in the earth's mantle, so it rises, cools, and sinks again. If it flows onto the surface through fissures and cracks it's called Lava. If it's blocked from reaching the surface, the gases can build up like champagne in a corked bottle. The heat and high pressure then force the magma explosively through the crust, creating a volcanic eruption. Magma continually rises and solidifies in mid-Ocean ridges, making new Ocean floor and pushing the Tectonic Plates apart.

## Mangrove

A tropical coastal Wetland with thick growths of trees in a sheltered saltwater Swamp. The trees that grow in these habitats are also called mangroves. They get rid of salt through glands on their leaves. Some types have stilt-like roots that support the tree above flooding Tides or take in oxygen from the air. Mangrove seedlings can float long distances until taking root in a suitable spot. Mangroves in Ecuador, Thailand, and Malaysia grow as high as 148 feet (45 m). Mangrove forests protect coastlines from Erosion caused by Tides and storms, but people cut them down for wood or drain them for land. Snakes, shellfish, many species of birds, and lots of other animals live in mangrove Swamps. Oysters, snails, and anemones cling to mangrove roots. One unusual fish called the mudskipper uses its fins to skitter across the mud and up the roots. There are about 58,000 square miles (150,220 square kilometers) of mangrove Swamps in the Americas, Asia, Africa, and Australia. Rare West Indian manatees, also called sea cows, live in the mangrove Swamps of Mexico's Usumacinta Delta.

## Map

A picture of selected features of the earth's surface, usually from a bird's eye (overhead) view. Maps can also be of the stars, weather, a region's resources or industries, population, even places we can't see, like the bottom of the ocean. An architect's plans are a map of a building. Maps have been called "the language of Geography." Maps provide information about a place using symbols and signs to show physical, geographical, cultural, or political features, which can be natural like Mountains, artificial like roads, or imaginary like country boundaries. To read a map you have to look at the legend to see what the symbols mean. A map is drawn to a scale, the ratio of the actual size of the features to their size on the map. A map of a large area like the world has a smaller scale and shows less detail than a map of a small area like your neighborhood. Maps are oriented a certain way—north is usually toward the top of the map, east to the right. Relief maps show the vertical distance between high and low points on a landscape. Photographs taken from satellites hundreds of miles above the earth can produce highly detailed, accurate maps.

## Marsh

A wetlands area always or sometimes covered with shallow water whose main types of plants are soft-stemmed reeds, rushes, sedges, and grasses. Inland Freshwater marshes form in the hollows left by Glaciers, where Rivers overflow their banks, on Lake edges, or in Ponds that have gradually filled up with sediment. Coastal saltwater marshes are found in River Deltas around the world. Conditions in a coastal marsh vary with the Tides. Animals and plants are adapted to cope with the salty flood of high Tide and the baking sun of low Tide. Nutrient-rich salt marshes are very productive Ecosystems, providing Habitats for oysters, crabs, turtles, muskrats, and many species of migratory birds. The only remaining nesting ground for whooping cranes is in the marshes of Canada's Wood Buffalo National Park. In southern Sudan, papyrus marshes grow where rocks slow the upper Nile River. Rice is a vitally important food plant grown in marshes around the world. Okavango marshes east of the Kalahari Desert in Botswana lie in an inland basin where the water has no outlet.

## Meadow

An area of Grassland in northern temperate Mountains. Meadows contain mostly sedges and grasses with small shrubs. Mountain sheep and goats and grizzly bears live in North American alpine meadows. Most of the postcard images of the Swiss Alps show alpine meadows.

## Monsoon

Strong seasonal winds in South Asia and other areas in the tropics and subtropics. In the summer, the southwest monsoon blows warm, moist air from sea to land, bringing heavy rain. The torrential storms can last several months and are vital to agriculture. In the winter, the northeast monsoon blows cold, dry air from the central Asian mountains to the sea, bringing dry, dusty conditions to India and neighboring lands. Monsoon-like rains also occur in northeast Australia,

East Africa, and the southern United States.

## Moraine

Debris, including boulders, rocks, and finely ground rock (called till or "rock flour") carried by a Glacier as it moves and left behind when the Glacier melts. Different kinds include ground moraine, which is a blanket of clay and sand as much as 15 feet (5 m) thick, spread under a Glacier; terminal moraine, a huge ridge of debris pushed ahead of the Glacier and left behind when the ice melts; and lateral moraine, formed by rocks and debris eroded from the sides of the glacial Valley onto the edge of the Glacier and left behind as a long ridge. Long Island, New York, and Cape Cod, Massachusetts, are moraines that were left behind when the Laurentide ice sheet receded 10,000 years ago.

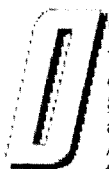
## Mountain

A rugged mass of rock that rises above the surrounding landscape. Volcanic Mountains, like Africa's Mount Kilimanjaro, form when Lava pours out of a Volcano's vent, forming a cone shape around the opening. Mountains also occur where Tectonic Plates move together or apart and Magma rises to the earth's surface. Fold mountains, like the Himalayas, form when two Tectonic Plates push against one another, crumpling the earth's crust. Fault-block mountains, like the Sierra Nevada in California, are huge blocks thrust up or down along Fault lines. Dome mountains, like the Black Hills in South Dakota, are bulges of land pushed up from below by Magma. Mountains are being built up and eroded away all the time. The Appalachians in the eastern United States are ancient fold mountains well worn by Erosion. Nine of the ten tallest mountains in the world (on land) are in the Himalayas. The largest mountains on earth are under the Oceans. The tallest mountain we know about, 10 miles (16 km) high, is Olympus Mons on Mars. The Andes in South America form the world's longest continuous mountain chain.



## North Pole

The North Pole is in middle of the Arctic Ocean. The geographic poles are the northern and southern ends of an imaginary straight line through the center of the earth, the axis around which the planet rotates once every 24 hours. The earth wobbles slightly on its axis, so these spin poles shift in a roughly circular path. The geographic north and south poles are the center points of these circles. The wobble is due to the fact that all of the material that makes up the planet is always moving—because of earthquakes, Erosion, melting and freezing ice, Tides, and other phenomena. If all this water, ice, rock, and dirt didn't move around, the spin poles would be single points identical with the geographical poles. There are also north and south magnetic poles, which mark the strongest points of the earth's magnetic field. When your compass points north, it's pointing toward the magnetic pole. In 1985, the North Magnetic Pole was about 400 miles away from where James Clark Ross first discovered it in 1831.



## Ocean

The large expanse of salt water that surrounds the land masses of the earth is divided into several huge areas, known as oceans, and smaller areas called Seas. Oceans are the earth's largest continuous stretches of water. They cover almost three-fourths of the planet's surface. The five oceans are the Pacific, Atlantic, Arctic, Antarctic (Southern), and Indian. Their average depth is almost three miles. The ocean floors contain broad Plains, Mountains taller than Everest, and Valleys or Trenches deeper than any Canyons on land. In 1960, two researchers aboard the Trieste touched the deepest known floor of the ocean, just over 36,000 feet (11,000 m) deep in the Marianas Trench near Guam. Almost all sediments carried in Rivers, Streams, and Glaciers ends up in the oceans. The continuously moving oceans produce and regulate our Climates worldwide, supplying moisture to the atmosphere. The Pacific is the largest ocean at nearly 64 million square miles (over 165 million sq km).

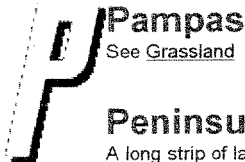
## Ocean Current

Ocean motion, like rivers flowing within the Ocean. Differences in the temperature, density, and salinity of the water cause the circulation of deep ocean currents. Colder, saltier water sinks, while the warmer, less salty water rises. Winds and the Coriolis Effect produce familiar surface currents, like the Gulf Stream. These currents follow great curving routes around the earth's surface, clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. Some currents move over 100 miles (161 km) per day. Ships and fish alike coast along on them. Currents influence world Weather patterns, stir up and distribute the Ocean's nutrients, and circulate warm and cold water around the planet. The Circumpolar Current completely circles the continent of Antarctica. In 1990, thousands of athletic shoes fell off a ship southeast of Alaska. Nine months later the shoes began to show up along the

coasts of British Columbia, Washington, and Oregon. Oceanographers learned a lot about currents from the floating shoes.

## Ocean Trench

A sheer-walled, deep Canyon in the Ocean floor, between 24,600 feet (7500 m) and 36,000 feet (11,000 m) below sea level. Trenches occur where one Tectonic Plate slides under another and melts. The intense heat and pressure here releases molten Lava, which can rise and form Island volcanoes, like Hawaii. There are many trenches in the Pacific Ocean. The lowest point in the ocean is at the bottom of the Marianas Trench, 7 miles (11 km) deep—as proven in 1960, when two explorers aboard the bathyscape Trieste touched bottom. The deep trench down the center of the Mid-Atlantic Ridge (a submerged Mountain range) is where Magma oozes out to create new ocean floor, pushing Europe and North America apart.



## Pampas

See Grassland

## Peninsula

A long strip of land jutting into a Sea or a Lake from the mainland. Peninsulas are almost surrounded by water. Peninsulas can be as varied as the thumb of land jutting between the San Francisco Bay and the Pacific Ocean; the ice-covered and mountainous Antarctic Peninsula stretching 800 miles (1,287 km) toward the southern tip of South America; or the rocky, scenic Lizard Peninsula in county Cornwall, England. The world's largest is the Arabian Peninsula.

## Permafrost

A layer of permanently frozen soil beneath the Tundra. Tundra plants grow in a thin top layer of soil, which thaws in summer. The permafrost keeps meltwater from draining, so the Tundra is soggy and covered with bogs in the summer. East of the Taymyr Peninsula in northern Russia the permafrost is 1,900 feet (579 m) deep. Pingos, landforms unique to the Tundra, form when frozen underground pools of water push up to form circular hills.

## Plain

A large area of relatively flat or gently rolling land. Some plains are formed when the Sea level lowers, such as the coastal plains of the Scottish lowlands and the coast of New Jersey. They can be formed by the smoothing action of Glaciers, as in central Canada; or when Glaciers deposit smooth layers of debris, such as in Illinois and Indiana. Plains can also be formed from the sediments left by ancient Seas, like the Great Plains east of the Rocky Mountains. Abyssal plains are immense flat plains between the continental slopes at the bottom of the Oceans.

## Plateau

A very large, flat area of land that usually is higher than the land around it. A plateau can sometimes be surrounded by Mountains. Also called tableland, a plateau is higher than a Plain and larger than a Butte or mesa. Often plateaus have a steep drop to the lower ground on at least one side. Plateaus cover about 45 percent of the earth's land surface. Some plateaus are built up from layers of Lava, but the largest are formed by the gradual lifting of the land surface. South Dakota's Badlands and the Painted Desert in Arizona are the remains of plateaus that have nearly been worn down to the level of the surrounding plains by Wind and water Erosion. The Grand Canyon slices deep into the Colorado Plateau, which is one of earth's biggest, covering tens of thousands of square miles. Spain, Yugoslavia, Turkey, Iraq, Iran, and Afghanistan are each made up almost entirely of a huge plateau.

## Pond

A body of still Freshwater that is smaller than a Lake and shallow enough for sunlight to reach the bottom. From 1845 to 1847, Henry David Thoreau lived on the shore of Walden Pond near Concord, Massachusetts. He made the pond famous when his book, Walden, was published in 1854.

## Prairie

See Grassland

## Precipitation

Water that falls to the ground, in solid or liquid form, including rain, snow, sleet, and hail. All precipitation is measured in its liquid water equivalent. Precipitation comes from clouds, which are formed of water vapor evaporated from the land and Oceans. This vapor condenses into tiny water droplets or ice crystals. When these droplets grow large enough, and the temperature is above freezing, they fall as rain. If the temperature is cold enough for them to freeze, they fall as snow, sleet, or hail. Sleet is snow that has melted and refrozen on the way down. Hailstones form in the powerful gusty Winds of thunderstorms, as frozen water droplets buffeted by the air are covered with layers of ice until they're too heavy to stay aloft and fall as hail. Mt. Waialeale, Hawaii receives an average annual rainfall of 471 inches (1,196 cm). But the one-year record belongs to Cherrapunji, India, which received 1,042 inches (2,647 cm) in 1861. In 1970, a hailstone weighing nearly 1.7 pounds (768 g), fell in Coffeyville, Kansas. In January 1996, Philadelphia received 30.7 inches (78 cm) of snow.



## Rain

See Precipitation

## Rainforest

A very dense tropical Forest of evergreen trees and a great variety of other plants and animals. Rainforests only occur in regions where temperatures and humidity are high and rain is very heavy, at least 80 inches (203 cm), per year. There is little undergrowth except along River banks, because the dense tree canopy blocks almost all the sunlight. Most of the wildlife lives in the canopy, including monkeys, sloths, snakes, frogs, birds, and insects. A rainforest is a very efficient Ecosystem, where microorganisms quickly break down organic matter into nutrients that the trees and plants rapidly absorb. Rainforests cover less than 10 percent of the earth's surface, but contain over 40 percent of all plant and animal species. If the present destruction of rainforests continues, some scientists estimate that at least one-fifth of the earth's species will disappear within 30 years. Cutting down the rainforest affects Climate. Rainfall in deforested parts of Panama has decreased by 20 inches (50 cm) in the past half century. In 1994 scientists in a remote Australian rainforest found a species of pine thought to have died out millions of years ago. The largest flower in the world, the rafflesia, grows 3 feet (1 m) in diameter—only in the rainforest. The largest expanses of tropical rainforest are in Central and South America, covering a total of 1,370 million acres (5,544,212 sq km).

## River

A long, large Stream of water that flows downhill in a Channel and runs into another river, a Lake, a Sea, or an Ocean. Springs, Rain, melting snow, and smaller Streams and rivers feed larger rivers. A river's rushing water is one of the most powerful agents of Erosion. You can see its force in places like the Grand Canyon, where the Colorado River has carved a Channel a mile deep into the surrounding rock. Large rivers carry many tons of sediment to the Oceans. The Nile in Africa is the longest river in the world. It stretches 4,180 miles (6,671 km) from Lake Victoria on the Equator, to the Mediterranean Sea. At 2,348 miles (3,779 km), the Mississippi is the longest river in the United States.



## Sand Bar

A bar or ridge of sand just under the surface of the water built up by currents in a River or by waves, Tides, and currents in coastal waters. Sand bars form as the water carries sediments into deeper water, such as a Bay, where they settle parallel with the shore. Sand bars can create shallow areas of water called shoals. Ships can run aground on sand bars that lie hidden just below the water.

## Savanna

An open Grassland with widely spaced trees in a hot, seasonally dry Climate. The largest savannas are found in Africa, South America, Australia, India, and Madagascar. Before large numbers of people settled the American Midwest, savannas were common in Kentucky, Illinois, Missouri, and other states.

## Sea

A large salt-water lobe of the Ocean partly surrounded by land. Some of the world's seas include the Mediterranean, the North Sea, the Arabian Sea, the Bering Sea, and the Coral Sea. The Coral Sea, northeast of Australia, is the largest sea in the world. The Caspian Sea and the Aral Sea are actually huge Lakes.

## Season

One of a few regularly repeating divisions of the year marked by earth's changing position in relation to the sun (from Solstice to Equinox and back again) causing different lengths of day and night and different temperatures from warm to cold. In temperate Latitudes the four seasons, summer, fall, winter, and spring, are marked by particular Weather, temperatures, and other conditions. In some tropical areas there are only two seasons, rainy and dry. Low-lying areas nearest the Equator experience few if any seasonal changes because the sun is always overhead. If the earth didn't tilt on its axis, the temperature at any one place would be nearly the same every day.

## Snow

See Precipitation

## Solstice

Either of two times each year that the sun reaches the highest Latitude (23.5° north or south of the Equator). The earth is tilted on its axis about 23.5° from vertical. As the earth orbits the sun, one hemisphere tilts toward the sun and receives more direct sunlight. That hemisphere is in summer, while the other is in winter. Six months later, the hemispheres' seasons are reversed. In the northern hemisphere we see the sun climb higher in the sky as summer approaches. On about June 21, it seems to stop rising higher. This is the summer solstice in the northern hemisphere (the winter solstice in the southern hemisphere). After that day, the sun drops lower in the sky as winter comes. On about December 21, the winter solstice in the northern hemisphere (the summer solstice in the southern hemisphere), the sun reverses its course and starts climbing once more.

## Sound

A relatively long arm of a Sea or Ocean forming a Channel between an Island and mainland, parallel to the coast. A sound also can connect two larger bodies of water, such as a Sea and an Ocean. Long Island Sound stretches between Long Island, New York, and the U.S. mainland.

## South Pole

The South Pole is on the continent of Antarctica. The geographic poles are the northern and southern ends of an imaginary straight line through the center of the earth, the axis around which the planet rotates once every 24 hours. The earth wobbles slightly on its axis, so these spin poles shift in a roughly circular path. The geographic north and south poles are the center points of these circles. The wobble is due to the fact that all of the material that makes up the planet is always moving—because of earthquakes, Erosion, melting and freezing ice, Tides, and other phenomena. If all this water, ice, rock, and dirt didn't move around, the spin poles would be single points identical with the geographical poles. There are also north and south magnetic poles, which mark the strongest points of the earth's magnetic field. The United States placed a red-and-white striped barber pole at its South Pole base.

## Steppe

See Grassland

## Strait

A relatively narrow waterway joining two larger bodies of water. A strait is also sometimes called a Channel, passage, or narrows. The Strait of Magellan is the only non-artificial connection between the Atlantic and Pacific Oceans.

## Stream

Flowing water in a Channel or bed. Streams start in high ground and run downhill to feed into Rivers, Lakes, or other bodies of water. They are in turn fed by other streams, Lakes, Rain, melting ice or snow, and springs that well up from underground. Swiftly moving high Mountain streams often have rapids and waterfalls.

## Sustainability

The ability to be supported, maintained, and renewed. In a sustainable Ecosystem, natural resources are not used up. They are used only as fast as they can be replaced. Right now, Rainforest trees are chopped down for lumber and other products. It would take centuries for all the diversity of the Rainforest to grow back. But there are sustainable ways to use Rainforest resources, like picking nuts and fruits, harvesting rubber, or using

plants for medicines.

## Swamp

An area that is always covered in still or slow-moving shallow water. Swamps can be Freshwater or salt water, in warm or cold Climates. A wide variety of woody plants and trees grow in swamps, though the exact mix depends on the swamp's location. Spruce, fir, and shrubby willows grow in swamps in Canada's Boreal Forest. Tupelos and knobby bald cypresses grow in the swamps of the United States' Deep South. Mangrove trees grow in saltwater swamps in tropical regions around the world. The largest swamp in the Caribbean, Cuba's Zapata Swamp, is home to an endangered species of crocodile as well as many unique species of birds. Spanish moss, a rootless plant related to the pineapple, hangs from the trees in South Carolina's swamps.

## Taiga

The Taiga, or Boreal Forest, is the largest and most northern Forest on earth. This wide band of needle-leaved spruce, fir, pine, larch, and other conifers circles the globe through Canada, Alaska, Siberia, and much of Scandinavia. The taiga lies between denser Forests to the south (at about 45° north Latitude) and the treeless Tundra to the north. The trees thrive on a long season of cold and snow and some can withstand temperatures of -70° F (-57° C). The soggy moss-covered bogs called muskeg are unique to the taiga.

## Tectonic Plates

About 200 million years ago, all the land mass on the earth's outer crust formed one big Continent, called Pangea. Pressure from the motion of the melted interior broke the brittle crust into pieces. These pieces, called tectonic plates, carry the Continents and Oceans around the earth's surface, like cookie pieces on pudding. As molten rock came up through great cracks, or Faults, in the crust, it opened the faults and pushed the plates apart. The plates have been moving apart at the rate of about one inch per year for hundreds of millions of years. Magma still rises up to mid-ocean ridges where it hardens into new crust and moves the Continents around. When two plates grind alongside each other or overlap, the heat and pressure cause earthquakes and volcanoes. When the plates collide, the land crumples into Mountain ranges. The Himalayan Mountains are squashed folds of rock pushed up as the Indo-Australian plate moved northward into the Eurasian plate. The Red Sea and the Great Rift Valley in eastern Africa formed when two tectonic plates moved apart and cracks opened in the earth. The Red Sea slowly widens as the plates move apart.

## Tide

The twice-daily rise and fall of the Oceans, caused by the pull of gravity from the moon and sun. As the earth spins, each part of the Ocean is under the moon once about every 24 hours. The water bulges toward the moon, creating a high tide. At the same time, centrifugal and other forces create a matching bulge on the opposite side of the earth, also a high tide. Halfway between them are the low tides. There are two high tides and two low tides each day. The largest high tides, spring tides, occur at the new and full moons because the sun lines up with the moon and the earth, increasing the pull of gravity on the Ocean. Neap tides, the smallest, happen when the moon and sun pull the Ocean in perpendicular directions. On most North American coasts the difference between high and low tide is several feet. But in Nova Scotia's Bay of Fundy, the tide rises and falls 53 feet (16 m).

## Tombolo

A neck of land or sand bar between an Island and the mainland or another Island. A tombolo forms when the Island slows the Ocean waves that are heading toward the mainland, causing the waves to drop their sediments between the two land masses. Waves and currents built the tombolo in Morro Bay, California, near San Luis Obispo. Tombolos can also be found in Costa Rica's Manuel Antonio and Marino Ballena national parks.

## Topography

The general shape and arrangement of a land surface, including its height and the position of its natural and human-made features. For thousands of years people have lived next to Rivers because the topography is flat and easy to build on. Unfortunately, Rivers periodically flood their banks. As more and more people live near Rivers, flooding destroys more communities and property.

## Trade Winds

Global winds that blow steadily toward the Equator from the northeast or southeast. Where they meet is a region of calm, called the Doldrums. Sailors named the reliable winds because they were good for commerce, or trade. The Northern Hemisphere trade winds move Weather from east to west. A hurricane that starts near West Africa is pushed across the Atlantic by the Trades, where it curves north because of the Coriolis Effect. From there, the westerlies can blow the hurricane further across the Atlantic, into the Caribbean Sea and sometimes even onto the eastern coast of the United States.

## Tree Line

The highest line on a Mountain or Latitude on a Continent above which trees can't grow. The tree line is also called the timberline. On a Mountain, this is where Forests end and alpine Meadows begin. At this Latitude in the Northern Hemisphere, the Boreal Forest ends and the Arctic Tundra begins. Factors such as Wind and snowfall affect where the tree line is in any particular place, but the most important factor is the area's temperature during the growing season. Ancient bristlecone pine trees grow very close to the tree line in mountains of the Southwestern United States. The tops of Mountains like Denali (Mt. McKinley), Kilimanjaro, and Everest are snowcapped because trees can't survive the fierce Winds, Snow, and cold at those altitudes.

## Tropic of Cancer

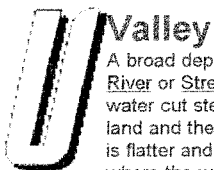
The Tropic of Cancer is the parallel of Latitude that is 23.5 degrees north of the Equator. In June, the sun is directly over the Tropic of Cancer. This imaginary line passes through Taiwan, India, Egypt, Algeria, the Bahamas, and Mexico.

## Tropic of Capricorn

The Tropic of Capricorn lies at 23.5 degrees south of the Equator. In December the sun is directly over the Tropic of Capricorn. This imaginary line passes through Australia, Botswana, Madagascar, Brazil, and Argentina.

## Tundra

The huge, treeless plain between the Boreal Forests and the Arctic Sea in Alaska and northern Canada, Greenland, Scandinavia, and Russia. There is very little tundra in the Southern Hemisphere, because there are few land masses at the appropriate Latitude (one exception is the Island of Kerguelen). Below the tundra's thin layer of poor soil is permanently frozen ground called Permafrost. Because of the Permafrost, water can't drain into the ground in summer, so it collects into Ponds and Wetlands. Tundra winters are long, cold, and dark and summers are short, cool, and light. In the most northern areas the growing season is only three weeks long. Tundra can look barren because there are no tall trees, but the ground is thickly covered with mosses, lichens, small plants, and stunted, matted birches and willows. Alpine tundra, high in mountains, is treeless and cold like arctic tundra, but it receives more sunlight and rainfall. Tundra is the earth's youngest biome, formed after the Glaciers retreated 10,000 years ago. Some tundra lichens live in areas so harsh, they grow only during one or two days of the year. Many tundra plants have dark leaves, to better absorb the brief summer sunlight.



## Valley

A broad depression between high ground, hills, or Mountains, usually with a River or Stream flowing along the bottom. Young Streams of swiftly moving water cut steep-sided, V-shaped Channels. But as the water wears away the land and the River reaches more level ground it flows more slowly and its valley is flatter and wider with gently sloping sides. A valley floor is the floodplain, where the water goes when the River overflows. Valleys are also formed when great sections of the earth's crust sink along faultlines. Though Glaciers gouged out California's Yosemite Valley, nearby Death Valley was formed when a crustal block sank.

## Veldt

See Grassland

## Volcano

An opening in the earth's crust through which red-hot, melted rock, or Magma, rises to the surface from deep inside the earth and spills out as Lava. Mount Fujiyama in Japan is a familiar cone-shape volcano, built up from many eruptions. But volcanoes can be small, low, flat, even submarine. Most volcanoes occur where Tectonic Plates move against, bump into, or slide under one another. The friction and tremendous pressure open cracks or holes in the crust.



Quiet, broad volcanoes develop where the plates are moving apart and the Lava flows easily. Cooled Lava hardens to build up the sides of a volcano. Thicker Magma, instead of flowing away, can cool quickly and clog the volcano's throat until the buildup of gases makes it erupt violently. Washington State's Mount St. Helens exploded this way on May 18, 1980, after lying dormant for 123 years. It destroyed the mountain's north side and filled the atmosphere with ash, steam, and poisonous gases. There are about 1,000 active volcanoes in the world, many of them circling the the edge of the Pacific Ocean to form the "Ring of Fire." Two of the world's biggest volcanoes are Mauna Loa and Mauna Kea on the Island of Hawaii.



## Watershed

The highest point of land that divides the area drained by one Stream from that of another Stream. On either side of this boundary, moisture from Rain, Snow, and other sources runs into a different drainage basin. Large watersheds have many tributary Rivers and Streams flowing into them. Watershed is also the name of the area drained by a River system. The largest watershed in the United States is the Mississippi-Missouri River system.

## Weather

The combination of conditions like sun, clouds, Rain, Wind, humidity, heat, and cold in a certain area and point in time. Weather is caused by the constant churning of the lowest layer of our atmosphere, called the troposphere. The sun's energy warms the air, land, and oceans—much more at the Equator than at the North Pole or South Pole. This uneven heating makes the warmer, low-pressure equatorial air rise and move poleward and the cold, high-pressure polar air sink and move toward the Equator. This colliding and mixing of warm, dry, cold, and humid masses of air, combined with the earth's rotation speed (faster at the Equator than at the poles), land features like Mountains or Oceans, and especially the amount of water in the air, determine the weather at any particular place. The driest cities in the world include Aswan and Luxor in Egypt and Arica, Chile. On average, each receives less than a tenth of an inch per year. Buenaventura, Colombia, regularly receives over 250 inches (635 cm) per year, making it the wettest city in the world.

## Wetland

Land that is flooded with shallow water either part or all of the time. The wetland Biome occurs along the edges of other aquatic areas, such as Lake shores, slow-moving Rivers, or ocean coastlines. Wetlands can be Freshwater, salt water, or a combination of both, called brackish. Freshwater wetlands include bogs, Swamps, and Marshes. Mangrove Swamps and salt Marshes are coastal wetlands. Wetlands exist in hot and cold Climates all over the world. They are extremely rich Ecosystems. People used to think they were "waste" land and drained them for other uses. Today, we know that wetlands clean the water that filters into underground springs and aquifers, soak up floodwaters like a sponge, help to regulate the flow of Rivers and Streams, and provide rich feeding grounds and nurseries for fish, birds, and animals. The Camargue wetlands on the Mediterranean coast of France are famous for the thousands of flamingos and other migrating birds that winter there. Canada has nearly one-quarter of the world's wetlands.

## Wilderness

A region with only natural, native plants and wild animals. Wilderness areas are not developed, cultivated, or inhabited by people. Immense stretches of Siberia's 4 million square miles (10 million sq km) are wilderness, untouched by industry or settlement.

## Wind

Moving air, varying in force from a slight breeze to a strong gale. Wind is caused when sinking masses of cold, high-pressure air from the poles meet rising masses of warm, low-pressure air from the Equator. This movement, combined with the rotation of the earth, land features, and other factors, causes predictable global winds like the polar easterlies and Trade Winds. Wind distributes heat around the globe, moves water from Oceans to land, and carries fine particles of sand and dust that wear away the landscape. Winds are named for the direction from which they come, such as westerlies or southeast Trade Winds. There are many seasonal and regional winds like the warm, dry Rocky Mountain chinook; the hot, dusty Saharan scirocco; and the cold, dry pampero in Argentina. The strongest surface wind ever recorded was 231 mph (372 kph) at Mount Washington, New Hampshire, in 1934.