Physical geology

Unit .5

Plateaus and plains

Definition

Plateaus.A plateau is a flat, elevated landform that rises sharply above the surrounding area on at least one side. Plateaus occur on every continent and take up a third of the Earths land.

Plains. A **plain** is a flat, sweeping landmass that generally does not change much in elevation. Plains occur as lowlands along valleys or on the doorsteps of mountains, as coastal plains.

Characteristics and types of plateaus and plains.

Plateaus.

A plateau is a flat, elevated landform that rises sharply above the surrounding area on at least one side. Plateaus occur on every continent and take up a third of the Earths land. They are one of the four major landforms, along with mountains, plains, and hills.

There are two kinds of plateaus: dissected plateaus and volcanic plateaus.
A dissected plateau forms as a result of upward movement in the Earths crust. The uplift is caused by the slow collision of tectonic plates. The Colorado Plateau, in the western United States, has been rising about .03 centimeter (.01 inch) a year for more than 10 million years.

A volcanic plateau is formed by numerous small volcanic eruptions that slowly build up over time, forming a plateau from the resulting lava flows. The North Island Volcanic Plateau covers most of the central part of the North Island of New Zealand. This volcanic plateau still has three active volcanoes: Mount Tongariro, Mount Ngauruhoe, and Mount Ruapehu.

Erosion can influence the shape of a plateau. Soft rock often erodes away on

the top of a plateau. Many plateaus are therefore topped with a hard, durable surface called caprock. Caprock protects the plateau from erosion of the soil underneath it.

Valleys form when river water cuts through the plateau. The Columbia Plateau, between the Cascade and Rocky mountains in the northwestern United States, is cut through by the Columbia River.

Erosion shapes plateaus in other ways. Sometimes, a plateau is so eroded that it is broken up into smaller raised sections called outliers. Many outlier plateaus are composed of very old, dense rock formations. Iron ore and coal often are found in plateau outliers.

The largest plateau in the world is the Tibetan Plateau, located in central Asia. It stretches through the countries of Tibet, China, and India and occupies an area of 2.5 million square kilometers (1.5 million square miles), which is four times the size of the U.S. state of Texas.

Oceanic Plateaus

Plateaus in the ocean are divided into two groups. One group is made of continental crust. The other is made of igneous rock. Igneous oceanic plateaus represent an age between the older, less-dense continental crust and the younger, more dense oceanic crust.

Plains.

In geography, a **plain** is a flat, sweeping landmass that generally does not change much in elevation. Plains occur as lowlands along valleys or on the doorsteps of mountains, as coastal plains, and as plateaus or uplands.

In a valley, a plain is enclosed on two sides, but in other cases a plain may be delineated by a complete or partial ring of hills, by mountains, or by cliffs. Where a geological region contains more than one plain, they may be connected by a pass (sometimes termed a gap). Coastal plains would mostly rise from sea level until they run into elevated features such as mountains or plateaus.

Plains are one of the major landforms on earth, where they are present on all continents, and would cover more than one-third of the world's land area. Plains may have been formed from flowing lava, deposited by water, ice, wind, or formed by erosion by these agents from hills and mountains. Plains would

generally be under the grassland (temperate or subtropical), steppe (semi-arid), savannah (tropical) or tundra (polar) biomes. In a few instances, deserts and rainforests can also be plains.

Plains in many areas are important for agriculture because where the soils were deposited as sediments they may be deep and fertile, and the flatness facilitates mechanization of crop production; or because they support grasslands which provide good grazing for livestock.

Depositional plains

The types of depositional plains include:

Abyssal plains, flat or very gently sloping areas of the deep ocean basin. Planitia, the Latin word for plain, is used in the naming of plains on extraterrestrial objects (planets and moons), such as Hellas Planitia on Mars or Sedna Planitia on Venus.

Alluvial plains, which are formed by rivers and which may be one of these overlapping types:

Alluvial plains, formed over a long period of time by a river depositing sediment on their flood plains or beds, which become alluvial soil. The difference between a flood plain and an alluvial plain is: a flood plain represents areas experiencing flooding fairly regularly in the present or recently, whereas an alluvial plain includes areas where a flood plain is now and used to be, or areas which only experience flooding a few times a century. Flood plain, adjacent to a lake, river, stream, or wetland that experiences occasional or periodic flooding.Scroll plain, a plain through which a river meanders with a very low gradient.

Glacial plains, formed by the movement of glaciers under the force of gravity.Outwash plain (also known as sandur; plural sandar), a glacial out-wash plain formed of sediments deposited by melt-water at the terminus of a glacier. Sandar consist mainly of stratified (layered and sorted) gravel and sand.Till plains, plain of glacial till that form when a sheet of ice becomes detached from the main body of a glacier and melts in place depositing the sediments it carries. Till plains are composed of unsorted material (till) of all sizes.Lacustrine plains, plains that originally formed in a lacustrine environment, that is, as the bed of a lake.Lava plains, formed by sheets of flowing lava.

Erosional plains

Erosional plains have been leveled by various agents of denudation such as running water, rivers, wind and glacier which wear out the rugged surface and smoothens them. Plain resulting from the action of these agents of denudation are called *peneplains* (almost plain) while plains formed from wind action are called *pediplains*[1]

Structural plains

Structural plains are relatively undisturbed horizontal surfaces of the Earth. They are structurally depressed areas of the world that make up some of the most extensive natural lowlands on the Earth's surface

Deccan Plateau

The **Deccan Plateau** is a large plateau in western and southern India. It rises to 100 metres (330 ft) in the north, and to more than 1,000 metres (3,300 ft) in the south, forming a raised triangle within the south-pointing triangle of the Indian coastline.

It extends over eight Indian states and encompasses a wide range of habitats, covering significant parts of Telangana, Maharashtra, Karnataka , Andhra Pradesh , Kerala and Tamil Nadu

The plateau is located between two mountain ranges, the Western Ghats and the Eastern Ghats, each of which rises from its respective nearby coastal plain, and almost converge at the southern tip of India. It is separated from the Gangetic plain to the north by the Satpura and Vindhya Ranges, which form its northern boundary. The Deccan produced some of the major dynasties in Indian,history including Pallavas, Satavahana, Vakataka, Cha lukya, and Rashtrakuta dynasties, the Western Chalukya, the Kadamba Dynasty, Kakatiya Empire, Musunuri Nayakas, Vijayanagara and Maratha Empire and the Muslim Bahmani Sultanate, Deccan Sultanate, and the Nizam of Hyderabad.

Weathering

Definition

Weathering involves disintegration or decay of solid rock due to change in temperature and weather and their impact on the composition of rock.

Physical weathering does disintegration of rock without chemical reaction and the chemical weathering does change in chemical compounds within rock.

Sudden change in temperature causes fissures in the rocks through which water penetrates to motivate chemical weathering along with sudden contraction and expansion due to change in temperature peels out the upper layer of rock known as exfoliation.

Processes

Erosion

Once a rock has been broken down, a process called erosion transports the bits of rock and mineral away. No rock on Earth is hard enough to resist the forces of weathering and erosion. Weathering and erosion constantly change the rocky landscape of Earth. Weathering wears away exposed surfaces over time. The length of exposure often contributes to how vulnerable a rock is to weathering. Rocks, such as lavas, that are quickly buried beneath other rocks are less vulnerable to weathering and erosion than rocks that are exposed to agents such as wind and water.

As it smoothes rough, sharp rock surfaces, weathering is often the first step in the production of soils. Tiny bits of weathered minerals mix with plants, animal remains, fungi, bacteria, and other organisms. A single type of weathered rock often produces infertile soil, while weathered materials from a collection of rocks is richer in mineral diversity and contributes to more fertile soil. Soils types associated with a mixture of weathered rock include glacial till, loess, and alluvial sediments.

Transport

Weathering processes can vary in rate and are the first step in creating sediment to form sedimentary rocks. After the formation of sediment, often times this sediment is transported throughout the environment via wind or water. Wind currents can begin sorting sediments across Earth's surface and forming dunes. Water transportation takes place in both freshwater and marine environments. Rivers can carry sediment large distances and even deposit material within the ocean. Surface and submarine currents within the oceans can redistribute sediment and transport material throughout the continental shelf or deeper into the ocean.

Deposition

Deposition occurs when the agents (wind or water) of erosion lay down **sediment**. **Deposition** changes the shape of the land. Erosion, **weathering**, and **deposition** are at work everywhere on Earth. Gravity pulls everything toward the center of Earth causing rock and other materials to move downhill.

Deposition is the geological **process** in which sediments, soil and rocks are added to a landform or landmass. Wind, ice, water, and gravity transport previously weathered surface material, which, at the loss of enough kinetic energy in the fluid, is **deposited**, building up layers of sediment.

Agents of weathering

Wind. Rock can be broken down by the acJon of other rocks over Jme. Abrasion is the breaking down and wearing away of rock material by the mechanical acJon of other rocks. Three agents of physical weathering that can cause abrasion are moving water, wind and gravity. Also Rocks suspended in the ice of a glacier can cause abrasion of other rock on earths surface. And moving water rocks can become rounded and smooth. Abrasion occurs as rocks are tumble in water hieng other rocks. Wind abrasion occurs when wind li_s and carries small parJcles in the air. The small parJcles can blast away as surfaces and slowly wears them away. During a landslide large rocks can fall from higher up a slope and break more rocks below causing abrasion.

Pressure change. The cause of this magnificent rock and scienJfic breakthrough is a pressure change in the most outer layer of the rock…The applicaJon of conJnuous force by one body on another that it is touching. It was formed by physical weathering.

Temperature. Temperature change is when the temperature changes its causes the rock to weather. One example of this is ice (frost) wedging. Ice wedging is caused because water goes into cracks and when the water freezes, the ice expands and causes a bigger crack in the rock as seen in the picture on the right. Temperature change is physical weathering.

Water. The cause of this is water. The definiJon of the cause is when water moves it tumbles the rocks and they rub against each other. This is physical weathering because even when the rocks rub together it is sJll rock. We chose this picture because it shows the effects of water weathering best. This kind of weathering interacts with Earth's spheres because the hydrosphere is interacJng with the atmosphere and geosphere.

Types of weathering

Weathering is often divided into mechanical weathering and weathering processes. Biological weathering may be part of both processes, in which living or once – living organisms contribute to weathering.

Physical Weathering

Physical weathering, also known as mechanical weathering or disaggregation, is the process class that causes rocks to disintegrate without chemical change. Abrasion (the process by which clasts and other particles are reduced in size) is the primary process in physical weathering.

Due to temperature, pressure, frost etc., physical weather may occur. For instance, cracks exploited by physical weathering will increase the surface area that is exposed to chemical action, thereby increasing the rate of disintegration.

Where does Physical Weathering occur?

In places where there is little soil and few plants grow, such as mountain regions and hot deserts, physical weathering occurs especially.

How does Physical Weathering occur?

Either by repeated melting and freezing of water (mountains and tundra) or by expanding and shrinking the surface layer of rocks baked by the sun (hot deserts).

Chemical Weathering

Chemical weathering changes rock composition, often transforming them into different chemical reactions when water interacts with minerals. Chemical weathering is a gradual and ongoing process as the rock mineralogy adjusts to the environment near the surface.

The rock's original minerals develop new or secondary minerals. The oxidation and hydrolysis processes are most important in this. Chemical weathering is enhanced by geological agents such as water and oxygen, as well as biological agents such as microbial and plant-root metabolism acids.

Where does Chemical Weathering occur?

These chemical processes require water and occur faster at higher temperatures, so it is best to have warm, humid climates. The first stage in soil production is chemical weathering (especially hydrolysis and oxidation).

Biological Weathering

Biological weathering is the weakening and subsequent breakdown by plants, animals and microbes of rock.

Growing roots of plants can put stress or pressure on rock. Even though the process is physical, a biological process (i.e. growing roots) exerts the pressure. Biological processes can also produce chemical weathering, such as when organic acids are produced by plant roots or microorganisms that help dissolve minerals.

Microbial activity breaks down rock minerals by altering the chemical composition of the rock, making it more weather sensitive. One example of microbial activity is lichen ; lichen is a symbiotic relationship between fungi and algae. Fungi release chemical substances that break down rock minerals ; the algae consume the minerals thus released from rock. Holes and gaps continue to develop on the rock as this process continues, exposing the rock to physical and chemical weathering.

Burrowing animals can move fragments of rock to the surface, exposing the rock to more intense chemical, physical, and biological processes, thereby indirectly enhancing the weathering process.

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Factors affecting weathering

One factor that affects weathering is the total surface area of mineral or rock; the processes of weathering increases proportionately with the amount of open space at the surface of the rock and extend through the rock. Climate is another factor that affects the weathering process. Composition of rock or mineral substance can also affect the process of weathering. The final element that affects weathering is time.

Products of sediments

Sediments

Sediment is solid material that is moved and deposited in a new location. Sediment can consist of rocks and minerals, as well as the remains of plants and animals. It can be as small as a grain of sand or as large as a boulder.

Sediment moves from one place to another through the process of erosion. Erosion is the removal and transportation of rock or soil. Erosion can move sediment through water, ice, or wind.

Water can wash sediment, such as gravel or pebbles, down from a creek, into a river, and eventually to that river's delta. Deltas, river banks, and the bottom of waterfalls are common areas where sediment accumulates.

Glaciers can freeze sediment and then deposit it elsewhere as the ice carves its way through the landscape or melts. Sediment created and deposited by glaciers is called moraine.

Wind can move dirt across a plain in dust storms or sandstorms. Sand dunes are

made of rocky sediment worn down by wind and collision with other sand particles.

Sediment is important because it often enriches the soil with nutrients. Areas rich in sediments are often also rich in biodiversity. Sedimentary soil is usually better for farming. Deltas and river banks, where much sediment is deposited, are often the most fertile agricultural areas in a region.

Soil

Soil minerals form the basis of soil. They are produced from rocks (parent material) through the processes of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break down parent material.

The types of parent materials and the conditions under which they break down will influence the properties of the soil formed. For example, soils formed from granite are often sandy and infertile whereas basalt under moist conditions breaks down to form fertile, clay soils.

Regolith

Regolith, a region of loose unconsolidated rock and dust that sits atop a layer of bedrock. On Earth, regolith also includes soil, which is a biologically active medium and a key component in plant growth. Regolith serves as a source of other geologic resources, such as aluminum, iron, clays, diamonds, and rare earth elements. It also appears on the surfaces of the Moon, other planets, and asteroids; however, the material found on other celestial bodies explored so far does not contain soil. The word is the Greek term for “blanket rock.”

Rivers

Definition

A **river** is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. In some cases a river flows into the ground and becomes dry at the end of its course without reaching another body of water. Small rivers can be referred to using names such as stream, creek, brook, rivulet, and rill. There are no official definitions for the generic term river as applied to geographic features, although in some countries or communities a stream is defined by its size. Many names for small rivers are specific to

geographic location; examples are "run" in some parts of the United States, "burn" in Scotland and northeast England, and "beck" in northern England. Sometimes a river is defined as being larger than a creek, but not always: the language is vague.

Rivers are part of the hydrological cycle. Water generally collects in a river from precipitation through a drainage basin from surface runoff and other sources such as groundwater recharge, springs, and the release of stored water in natural ice and snowpacks (e.g., from glaciers).

Orgin of river

The origin of rivers at Earth has a long history. It is related to the appearance and development of the continents and islands as a result of tectonic-magmatic processes as well as to the formation of the Earth's hydrosphere in the process of juvenile water inflow to the Earth's surface. A large role in its formation belonged to the processes of complicating global water exchange and erosion development as well as changing climatic conditions. In the processes of their development, rivers changed the direction of their currents and had different water content during the different geological epochs. Their development was influenced by the repeatedly occurring inland water bodies of lagoon type and inland seas, level oscillations of the basins as well as land glaciation events, especially significant in the Northern Hemisphere. The processes of erosion, transport and deposition of sediments occurring with a different intensity during the geological epochs in the past and at present, as well as economic activity (creation of water reservoirs, water withdrawal for irrigation and numerous economic needs) determined the evolution of rivers and a modern look of the river network.

Types of stream

Streams go through stages in its lifespan beginning with the initial phase known as a "young" stream and followed by a "mature" or "old stream."

1.Alluvial Fan: When a stream leaves an area that is relatively steep and enters one that is almost entirely flat, this is called an alluvial fan. It is shaped like the letter E, and to fully understand what an alluvial fan is, you have to understand how streams work.

Streams normally gather smaller streams as they move along, and the smaller streams that join the main flow are called tributaries. Occasionally, there can also be distributaries, which are smaller streams that actually flow

outward. These distributaries most often find their way back together and form a single valley, but when they instead fan out over a broad area, the result is an alluvial fan.

Alluvial fans form when a stream leaves a canyon and flows out to a lowland that is essentially flat. The sediment generated by the canyon's erosion means the stream will have a very large load by the time it arrives on the flatland. The flatland is a little steeper at the mouth of the canyon, and the Badwater Road Alluvial Fan in Death Valley, California, is a perfect example.

2.Braided stream: Usually found close to very high mountains, braided streams have multiple channels that continuously branch and join along the entire length of the stream, which in turn creates numerous longitudinal bars between the channels. Also known as anastomosing, it is not the same thing as alluvial fans because the channels do not form into fan shapes or distributaries.

They are called braided streams because the pattern resembles hair tresses that are braided together. Moreover, they tend to rejoin very quickly and their flow is concentrated on a narrow valley that has no actual floodplain. There is a Providence Canyon in Georgia that has a small stream on the bottom, and it demonstrates what braided streams look like.

3.Deltas: Deltas result when streams enter a standing body of water, usually an ocean. If the body of water is able to move the sediment as fast as it arrives, deltas will not form. Deltas are like alluvial fans in one aspect because there are distributary channels which spread out from a single channel.

Deltas usually form the shape of a triangle, which is another reason for their name, and the river usually subdivides into other small rivers before flowing into the sea; an example of this is the Mississippi Delta.

4,Intermittent stream:Intermittent streams are those streams that usually flow during the wet season – usually winter through spring – but which are typically dry during the hot summer months. They flow for part or most of the year, but they do not always carry water during the dry season.

Also called seasonal streams, they are supplemented by the runoff from rainfall or other types of precipitation, and they only flow during certain times of the year, usually as a result of groundwater which provides enough water for the flow of the stream to be maintained.

5.Meandering stream:A meandering stream consists of large loops that flow across a wide flat floodplain and is surrounded by valley walls. If the mountains are too close to the sea, you usually don't find these types of streams. They are always found in relative flat areas– including floodplains – as well as places where the sediment is made mostly of muds, fine sands, and silts.

6.Perennial stream: Perennial streams have water flowing through them all year long, and the source of the water can be either surface water, groundwater, or both. This doesn't mean that there is water in every inch of its bed, but at least part of the stream will have some water in it. These are permanent streams, and they rely on normal amounts of rainfall for their existence. Also, the aquatic bed is located below the water table for most of the year with a perennial stream, and they are very well-defined channels as well.

7.Straight channel stream: Sometimes, streams are not perfectly straight, but have no major twists and turn about them, and these are called straight channel streams. These types of streams are confined to a single channel, and their banks and valley walls are essentially the same things.

Stages of river

The young stage.

The river is usually small and flows down steep slopes with lots of energy. The features found in the youthful stage of a river are all formed by the processes of Erosion.

V-Shaped Valley

The river will erode downwards in its youthful stage. This is called ***vertical erosion***. This leaves steep sides which are exposed to weathering which in turn loosens and eventually breaks up the rock and soil. This loose material will then fall into the river and be transported downstream. The result is a valley with steep sides and very narrow floors which looks like a "V".

Waterfalls

Waterfalls are found where there are different types of bedrock i.e. where soft and hard rock lie side by side. While the river is able to erode the soft rock, it is unable to erode the hard rock. As a result of this a difference in height begins to form and a waterfall is created as the water drops from one level to the other. The force of the water and the debris carried by the river down the slope creates what is known as a plunge pool at the base of the waterfall.

Potholes

Potholes are formed from hollows in a rivers bed. Water and its load (pebbles) flow into the hollow and the force of the current and the swirling action of the pebbles causes the hollow to become wider and deeper to form a pothole.

The Mature Stage

In the mature stage of a river the slope becomes gentler and the river becomes much wider as it is joined by many tributaries. The river is also carrying a load now that has been eroded from further upstream.

Meanders

Meanders are bends or curves which are found in the mature stage (middle course) of a river. As the land is much flatter than it was in the youthful stage the river tends to swing from side to side. As it does so the current will be stronger on the outside of the bend and so ***Erosion*** will take place, while on the inside of the bend the current flows more slowly so ***Deposition*** will take place

The Old Stage

At the Old age stage the river is usually at it's widest. The land is also at its flattest. This means that the river has to work very hard to make its way to the sea. The main agent at work now is Deposition.

Ox-Bow Lakes

Ox-Bow lakes are Horse-Shoe shaped lakes which are found near the end of a rivers course (Old Age Stage). During times of flooding there will be an increase in the speed and volume of a river. Therefore when a river comes to a tight meander that it cannot go around it simply bursts its banks and cuts through the bend. The water which flows around the bend will now be flowing slowly and so deposition will take place. Over time the meander will become cut off from the main river because of deposition. The cut off meander is then called an Ox-Bow lake.

Floodplains

Floodplains are almost flat plains of land which lie at the sides of rivers that are in their old stage. During times of heavy rain the river may rise until it breaks its banks and floods the surrounding flat land. When the floods eventually subside, thin layers of ***Alluvium*** are deposited on the land. When the river has flooded many times the layers build up into a thick fertile covering over the floodplain.

Deltas

A Delta is a triangular area of land which has been formed by a river depositing its load as it enters the sea or a lake. A delta will only form if a river has been carrying a large load of Alluvium and the alluvium is being dropped off at a faster rate than the tides/currents can carry it away.

The streams that a river divides up into to make its way around the deposited material are called ***Distributaries***.

Alluvial fans

An alluvial fan is a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt. This sediment is called alluvium.

Alluvial fans are usually created as flowing water interacts with mountains, hills, or the steep walls of canyons. Streams carrying alluvium can be trickles of rainwater, a fast-moving creek, a powerful river, or even runoff from agriculture or industry. As a stream flows down a hill, it picks up sand and other particles—alluvium.

The rushing water carries alluvium to a flat plain, where the stream leaves its channel to spread out. Alluvium is deposited as the stream fans out, creating the familiar triangle-shaped feature.

The narrow point of the alluvial fan is called its apex, while the wide triangle is the fan's apron. Alluvial fans can be tiny, with an apron of just a few centimeters spreading out from the trickle of a drainpipe. They can also be enormous. Over time, water flowing down the Koshi River in Nepal, for example, has built up an alluvial fan more than 15,000 square kilometers (almost 5,800 square miles) wide. This "megafan" carries alluvium from the Himalaya Mountains.

Lakes

Definition

A lake is a body of water surrounded on all sides by land. Lake water is still or **standing**, meaning it doesn't flow from point A to point B in the same way a river's does.

Since they are often fed by rivers, springs or precipitation (a.k.a. rain and snow), lakes are primarily freshwater. However, some of the more famous lakes, like the Dead Sea and the Great Salt Lake, are **saline lakes** and contain only saltwater.

Types of lakes

1.Aeolian lakes**:**If a lake is formed due to the result of wind activity, they can be called aeolian lakes. Usually found in very dry environments, they are also called interdunal lakes, and they can also be formed when water from precipitation accumulates in a cavity between two sand dunes. Moses Lake in the State of Washington is an example of an aeolian lake.

2.Artifical lakes: A reservoir is the most common type of artificial lake, and they generate hydroelectric power, supply water for home usage and industries, and are usually formed through the interception of two different bodies of water. Examples include Lake Mead, which was formed by the Colorado River; and Lake Nasser, which was formed through the interception of the Nile. Essentially, an artificial lake is one where the water is used for public use, so it is always a body of water surrounded by land.

3.Fluvial lakes: When the flow of a river is not straight but bends throughout the course of the river because of nonuniform land topography, several lakes can be formed by the running water along the way, and these lakes are called fluvial lakes. In Iowa in the United States, there is a fluvial lake called Carter Lake.

4.Freshwater lakes: Lakes with freshwater are the most common types of lakes in the United States. They are fed by rivers and have no out-flowing streams. Some of the most well-known types of lakes include the five great lake – Huron, Ontario, Michigan, Erie, and Superior.

5.Meteorite lakes: These lakes occur when a meteor or asteroid crashes into the surface of the earth and forms a depression. Years later, precipitation can accumulate in the depression, which creates this type of lake. When scientists study these types of lakes, they can gain a lot of valuable information about various types of extraterrestrial objects.

Formation of lakes

All lakes fill bowl-shaped depressions in the Earth's surface, called basins. Lake basins are formed in several ways.

Many lakes, especially those in the Northern Hemisphere, were formed by glaciers that covered large areas of land during the most recent ice age, about 18,000 years ago.

The huge masses of ice carved out great pits and scrubbed the land as they moved slowly along. When the glaciers melted, water filled those depressions, forming lakes. Glaciers also carved deep valleys and deposited large quantities of earth, pebbles, and boulders as they melted. These materials sometimes formed dams that trapped water and created more lakes.

Many areas of North America and Europe are dotted with glacial lakes. The U.S. state of Minnesota is nicknamed "The Land of 10,000 Lakes" because of the number of glacial lakes. Many lakes in North America, including the Great Lakes, were created primarily by glaciers.

Some lake basins form where plate tectonics changed the Earth's crust, making it buckle and fold or break apart. When the crust breaks, deep cracks, called faults, may form. These faults make natural basins that may fill with water from rainfall or from streams flowing in the basin. When these movements occur near the ocean, part of the ocean may be trapped by a new block of land thrust up from below the Earth's surface. The Caspian Sea was formed this way. Lake Baikal was also formed by the movement of tectonic plates.

Many lakes form as a result of volcanoes. After a volcano becomes inactive, its crater may fill with rain or melted snow. Sometimes the top of a volcano is blown off or collapses during an eruption, leaving a depression called a caldera. It, too, may fill with rainwater and become a lake. Crater Lake, in the U.S. state of Oregon, one of the deepest lakes in the world, was created when ancient Mount Mazama's volcanic cone collapsed.

Not all lakes are created by basins filling with water. Some lakes are formed by rivers. Mature rivers often wind back and forth across a plain in wide loops called meanders. During periods of flooding, a swollen, rushing river may

create a shortcut and bypass a meander, leaving a body of standing water. This type of small lake is called an oxbow lake, because its shape resembles the U-shaped frame that fits over an ox's neck when it is harnessed to pull a wagon or a plow.

Lakes may also be created by landslides or mudslides that send soil, rock, or mud sliding down hills and mountains. The debris piles up in natural dams that can block the flow of a stream, forming a lake.

Dams that beavers build out of tree branches can plug up rivers or streams and make large ponds or marshes.

People make lakes by digging basins or by damming rivers or springs. These artificial lakes can become reservoirs, storing water for irrigation, hygiene, and industrial use. Artificial lakes also provide recreational use for boating, swimming, or fishing.

Artificial lakes can provide electricity through hydroelectric power plants at the dam. Lake Mead, in the U.S. states of Arizona and Nevada, was formed when the Hoover Dam was built during the Great Depression. The dam was built to control the unpredictable Colorado River and provides electricity to the western United States.

Lake delta and deposits

Delta Lake is an open source storage layer that brings reliability to data lakes. Delta Lake provides ACID transactions, scalable metadata handling, and unifies streaming and batch data processing. Delta Lake runs on top of your existing data lake and is fully compatible with Apache Spark APIs.

Deltaic environments are gradational to both **fluvial** and **coastal environments**. Examples of deltas on a variety of scales can be seen **here** and a comprehensive website resource on modern deltas can be accessed **here**.

Deltas form where a river enters a standing body of water (ocean, sea, lake) and forms a thick deposit that may or may not form protuberances. The sudden decrease in energy causes the river to drop its sediment load. Deltaic deposits therefore become finer grained the farther out into the lake or ocean (distal edge). Across the delta, they are coarsest in the distributary channels and finest away from the channels. Many deltaic deposits resemble **lake** or shallow marine deposits at their distal margins and **fluvial** deposits at their proximal margins.

Deltas consist of a subaerial **delta plain or delta-top** (gradational upstream to a **floodplain**, and a subaqueous **delta front** (**delta-slope** and **prodelta .**

Delta plains are commonly characterized by distributaries and flood basins (upper delta plain) or interdistributary bays (lower delta plain), as well as numerous crevasse splays. Upper delta plains contain facies assemblages that are very similar to fluvial settings.

The **delta slope** is commonly 1-2° and consists of finer (usually silty) facies; the most distal **prodelta** is dominated by even finer sediment.

References.

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