Weathering, Erosion, and Deposition in the Texas Ecoregions:

Weathering, erosion, and deposition shape the topography and soil characteristics of Earth’s surface. For example, in Texas, these processes have formed a variety of landforms (beaches, plateaus, mountains, and canyons) as well as soil types (fertile soil, clay rich soil, and sandy soil). The combination of topography, soil, and climatic conditions (precipitation and temperature) in an area determines the types of ecosystems the area can support; this is critical to defining ecoregions.

In Texas, there are ten different ecoregions including:
1) East Texas Pineywoods
2) Oak Woods and Prairies
3) Blackland Prairie
4) Gulf Coast Prairies and Marshes,
5) Coastal Sand Pains
6) South Texas Plains (Brush Country)
7) Edwards Plateau
8) Llano Uplift
9) Crosstimbers and Prairies/Rolling Plains
10) High Plains
11) Trans-Pecos/Chihuahuan Desert
12) Marine Environment

These ecoregions are named after the major ecosystem types (for example, East Texas Pineywoods) or topographical features (for example, Edwards Plateau) present in their areas. Each of these ecoregions is impacted differently by weathering, erosion, and deposition.

Water is an agent of weathering and erosion. Generally, the precipitation trend goes from wet to dry when moving from the east part of Texas to the west part. Starting in the east, and moving west are the ecoregions of East Texas Pineywoods and Gulf Coast Prairies and Marshes, and then moving generally to the west are the Oak Woods and Prairies, Blackland Prairie, Crosstimbers and Prairies, South Texas Plains (Brush Country), Edwards Plateau, Rolling Plains, High Plains, and ending in the far west is the Trans-Pecos ecoregion.

In all of the ecoregions, wind and rain can weather and erode the landforms and soil. Rivers are also powerful weathering and erosion agents. They can cut into rock and form canyons. When rivers deposit eroded material, they change their shape or extend the shoreline. When waves along coastlines deposit sediment, they extend beaches; when they wash sediment away, the waves erode beaches. Rivers, rock formations, soils, topography, and precipitation in an ecoregion will determine how the processes of weathering, erosion, and deposition work to reshape it.

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The **Trans-Pecos** ecoregion occupies the westernmost portion of Texas. The Chihuahuan Desert and Big Bend National Park are included in this region. The Guadalupe Mountains and Davis Mountains are located in this ecoregion as well, making it the most mountainous area of Texas. This ecoregion ranges in elevation from 2,500 ft. to 8,749 ft. and receives on average less than 12 inches of rainfall a year, but this varies with elevation. The majority of plants in this ecoregion are mesquites, cacti, juniper, and other desert species.

In general, soil in this region is eroded due to the decline of grasslands. Deposition after the weathering and erosion of the Guadalupe and Davis Mountains has formed the soil in this ecoregion. In the Chihuahuan Desert, wind acts as the main erosion agent, creating sand dunes. When this ecoregion does receive rain, it can lead to flashfloods and rapid runoff, which can weather and erode the rocks and sediment. Erosion of the limestone cliffs takes place because of acid rain.
The East Texas Pineywoods ecoregion has topography that is fairly flat and fertile, with elevations between 200-800 ft. and with sandy soils. It is one of the wettest regions in Texas, receiving between 35-50 inches of precipitation annually. These conditions support pine and hardwood ecosystems. Periodic forest fires allow pine trees to maintain their status as the dominant ecosystem. The presence of plants and trees helps to prevent soil erosion during rainfall events, which occur in this ecoregion. If there are no plants and the soil is exposed to water and wind, it is easily eroded.

The Piney Woods ecoregion receives ample precipitation and has abundant vegetation. Vegetation such as pine forests and grasses holds soil in place. Very little erosion takes place in these areas. Seasonal flooding occurs along riverbanks. Sediments are carried and deposited in different locations along the river route. The thick areas of vegetation help to inhibit river erosion. These characteristics of the Piney Woods ecoregion provide stable environments for wildlife to thrive. However, the soil of this region is predominantly coarse textured sands, produced from weathered granite over thousands of years.
The Gulf Coast Prairies and Marshes ecoregion is found along the southeast coast of Texas and consists primarily of flat plains with low elevations (less than 150 ft.). Average rainfall ranges between 30-50 inches and soils are clay or sand-rich in various locations. The dominant plant species are tall grasses, live oak trees, and mesquite. Along the Gulf Coast, waves can erode beaches in one area and redeposit the sand in a different location along the coast. The sand may also redeposit to form sandbars. Strong storms and hurricanes in this area can increase beach erosion. This erosion can destroy habitats for animals such as turtles, seagulls, and pelicans. The cities of Houston and Galveston fall within this ecoregion.

The Gulf Coast Plains and Marshes experience large amounts of weathering, erosion, and deposition. Wave action, a cause or agent of weathering, erosion, and deposition, is constant along the Texas coastline. The effects of wave action may happen slowly or very quickly. Sediments may be weathered and eroded along beaches and carried out into the ocean to form sand bars. Sediments may also be deposited along the coast, forming sand dunes and/or barrier islands over time. During catastrophic events such as hurricanes, wave erosion accelerates. Environments for wildlife such as shorebirds and turtles can be destroyed quickly.
In central Texas, in the area known as the Texas Hill Country, is the Edwards Plateau ecoregion and Llano Uplift ecoregion. This high plateau ranges from 600-3000 ft. in elevation and receives 23-35 inches of rain annually. Short grasses and woodlands dominate this ecoregion. In recent years, it has been discovered that the soils and hill slopes are ideal for wineries to grow grapes. One prominent feature in the Edwards Plateau ecoregion is Enchanted Rock. This is a large dome of granite that is physically weathered through exfoliation, where sheets of rock peel away from the rock surface. The Edward Plateau has large amounts of limestone rock formations, which are vulnerable to chemical weathering, which has led to the formation of a large cave system underground.

The Edwards Plateau/Llano Uplift ecoregion is located in central Texas. An unusual landform in this ecoregion is a dome of granite called Enchanted Rock. The Enchanted Rock experiences a type of physical weathering called exfoliation. Exfoliation is a process in which the surface of rock weathers by peeling into sheets instead of breaking down into small sediments. This region is often referred to as Central Texas or The Hill Country. This area is considered the highest risk area in the country for flash floods. Weathered soil and rock from the ecoregion is eroded and deposited in the upper South Texas Plains Ecoregion.
Located west of the Rolling Plains, the **High Plains** ecoregion occupies the area we call the Texas Panhandle. This ecoregion is a level plateau that ranges in elevation from 3000 to 4500 ft. Because this area is so flat, it experiences some of the highest winds in the United States. The Palo Duro Canyon is located in this ecoregion and was formed by the weathering and erosion of rock by the waters flowing through the Red River. It is a very dry ecoregion, prone to drought, and on average receives only 15 to 22 inches of rain annually. These dry conditions can lead to wind erosion in areas with little vegetation. For the most part, the High Plains consists of short-grass prairies.

The Texas High Plains span from Southern West Texas into the Panhandle. This semi-dry area is predominantly flat with deposits of wind-blown materials that blanket the region. Wind is a primary agent of weathering and erosion in this region. Large dust storms are common in this ecoregion. The dust storms carry soil and deposit it in new areas in the ecoregion. Tornadoes are a **CATASTROPHIC EVENT** that is common in this ecoregion. Tornadoes can cause weathering of land features, erosion of soil, and deposition of soil and debris. Areas such as Palo Duro Canyon, are formed by weathering and erosion caused by wind and water action.
Weathering, Erosion, and Deposition: Post Oak Savannah/Blackland Prairies (3)/Oak Woods and Prairies (2)

The Oak Woods and Prairies and Blackland Prairie ecoregions lie just west of the Gulf Coast Prairies and Marshes ecoregion and the East Texas Pineywoods ecoregion, with the Blackland Prairies located further west than the Post Oak Savannahs. These two ecoregions are very similar in topography, climate, and soil type. They receive less precipitation than the Pineywoods or Gulf Coast Prairies (only 35-45 inches), and have elevations ranging from 300-800 ft. The topography consists of hills and the soil ranges from clay-rich to sandy. The Oak Woods and Prairies ecoregion is defined by the oak woodland and grassland ecosystems. The Blackland Prairie ecoregion is dominated by tall grasses and gets its name from its black, fertile soils. If these ecosystems experience clear cutting of their trees and grasses, their soils become easily eroded by wind and water. Plowing farmland in order to plant crops also increases soil erosion. Because of its rich soil, most of the Blackland Prairie has been converted to farmland.

The Post Oak Savannah ecoregion is an area of north central Texas with gently rolling hills and lightly wooded plain. This area generally receives a moderate amount of rainfall that helps shape the land. Trees and grasses prevent large amounts of soil erosion due to water and wind.
The southern most ecoregion in Texas is the **South Texas Plains (Brush Country)**. This ecoregion has elevations of 300-1100 ft., receives only 20 inches of rain a year, and has very flat topography. Several major rivers, including the Rio Grande, run through it. Historically, the grasslands in this area were used to graze livestock, which led to exposed soil and erosion. This left behind soil more suitable to supporting shrubs and short trees. This area is better known as “Brush County.”

The South Texas Plains is largely covered with materials carried out from the erosion of the Edwards Plateau. The area adjacent to the Balcones Escarpment, is characterized by black soils that extend from Austin to San Antonio and westward. The area closer to the coastal comprises the low, flat country just interior from the coast. Further south, the area is blanketed with a thick cover of sand, some of which occurs as dunes. Most of the sand area, however, is stabilized by vegetation. Still farther south is the lower Rio Grande country, consisting of a smooth wavy to slightly rolling upland of black-earth soils and the lowland of the Rio Grande, including its delta area.
The Crosstimbers and Prairies ecoregion and the Rolling Plains ecoregion lie west of the Blackland Prairies. Both ecoregions receive similar amounts of precipitation (20-30 inches), but differ slightly in topography, soil, and elevation. These differences lead to subtle differences in their ecosystem types.

The **Crosstimbers and Prairies** ecoregion has elevations ranging from 350-1500 ft. and topography ranging from lowlands (similar to the Blacklands) to limestone uplands. It has rolling hills and dark clay soils that are well drained. Well draining soils allow rainfall to quickly infiltrate the soil and become groundwater, rather than to become runoff, which can lead to erosion. The limestone in this region is vulnerable to chemical weathering, so limestone land features are constantly changing. The Crosstimbers and Prairies ecoregion is a transitional ecosystem consisting of tall and shortgrass prairies, savannahs, and woodlands.

The **Rolling Plains** ecoregion lies west of the Crosstimbers and is even higher in elevation (900-4,000 ft.). The Rolling Plains is a part of the central United States Great Plains system. Like the Crosstimbers ecoregion, it has rolling hills. These topographical features are due to the several rivers that flow through this ecoregion. These rivers weather and erode the land, forming several canyons in this area. The material eroded by rivers can be deposited on the outer banks of the rivers, changing their shape. The material may also be deposited at the mouths of the rivers in the Gulf of Mexico, which extends the shoreline. These soils have high fertility so it is not unusual for the natural vegetation of grasses, shrubs, and some trees to be removed in order to allow farming.

The landscape is categorized by irregular plains with acidic soils along the parallel ridges and valleys, sandy and sandy loam soils on the uplands, and clay and clay loams occupy the low-lying areas. Elevation increases gradually from southeast to northwest. Additionally, many areas in this ecoregion are underlain with clay pan which affects water movement and availability for plant growth. The overall annual precipitation in this ecoregion is approximately 102 centimeters.