Landforms of Ethiopia and the Horn

- These landforms are the work of two opposite forces:
  - ***The endogenetic force*** *that originates from inside the earth.*
    - *For example, volcanic activity and tectonic forces.*
  - ***The exogenic force*** *that originates at the surface (denudation and peneplanation).*
- Altitude varies from about 116 meters below sea level at the Dallol depression (Kobar sink) to 4620 meters above sea level at Ras Dashen in Semein.
- If 1000 meters is chosen as a demarcating contour line between highlands and lowlands, 56 percent of Ethiopia's land is highland. This fact has given Ethiopia the name **"Roof of Northeastern Africa."**
- This elevated surface is bisected diagonally by the Rift Valley which extends from Syria to Mozambique across the East African lakes.
- The relief of Ethiopia and the Horn can be divided into three main physiographic divisions:
  - Highlands
  - The Rift Valley
  - The lowlands

A. The Highlands

- The Horn's highlands are:
  1. The Northwestern Highlands
  2. The Southeastern Highlands

1. The Northwestern Highlands of the Horn

- Stretch from Ras Kassar in Eritrea to the highlands of Gamo-Goffa in southwestern Ethiopia.
- They are separated from the southeastern highlands by the Rift Valley. They consist of:
  - **The Plateau of Eritrea:** is located between the course of the Barka River and the coastal plain of Eritrea.
    - It is bisected by the upper basin of the Mereb River. The plateau is capped by basaltic rocks.
  - **The Plateau of Tigray:** is separated from the Eritrean plateau by the Mereb River.
    - It lies to the southeast of the upper course of the Mereb/Gash River and to the northeast of Tekkeze River Gorge.
    - High mtn peaks are:
      - *Mount Tsibet – 3988 m.a.s.l*
      - *Mount Ambalage – 3291 m.a.s.l*
      - *Mount Assimba – 3248 m.a.s.l*

- **The North Central Massifs:** These are the most rugged and dissected plateaus of Ethiopia.
  - Within each of the plateaus are small arable lands known as **ambas** which are isolated from one another by **gorges.**
  - The Tekezze, together with its tributaries, is the main river that drains the region.
  - Tekezze River has divided the North Central Massif area into western (Semein) and eastern (Lasta and Wollo) massifs, which are connected by the **Yejju-Wadla-Dilanta** plateau.
  - South of these is found the Gojjam Massif (the most extended tableland and is comparatively less dissected):
    - It is formed on the core of the Amedamit-Choke mountains.
    - It is carved by the Abbay river that effectively separated it from the Shewa plateau in the south and the Amahara Saynt Massif in the northeast.

- Famous mountain peaks on these massifs are:
  - Legeda (in Gondar) – 4532 masl, Analu (in Gondar) – 4480 masl, Ras Dashen (in Semein) – 4620 masl, Er (in Gondar) – 4456 masl, Kolo (in Lasta) – 4300 masl, Guna (in Gondar) – 4231 masl, Abuna Yoseph (in Lasta) – 4190 masl, Hey (in Gondar) – 4154 masl, Birhan (in Gojjam) – 4100 masl)

- **The Plateau of Shewa:** The Shoan Plateau is a dome-shaped plateau that serves as a watershed between the Awash and Abbay River basins.
  - It extends westwards into western Wellega through Horo Guduru and forms a crescent shape which causes the Abbay to swerve and drain northwards. The Shoan plateau is separated:
    - from the plateau of Gojjam by the Abbay gorge in the north
    - from the southeastern highlands by the Awash River and the Rift Valley.
    - from the Highlands of Keffa by the Ghibe River.

- It is drained by the tributaries of the Abbay and the Awash Rivers.

- Its high mountains are:
  - Mt. Abbuye Meda (on the northeastern margin) – 4000 masl
  - Mt. Guraghe (on the southeastern margin) – 3721 masl

- **The Southwestern Highlands:** include areas of Wellega, Illubabor, Gamo Goffa and Keffa.
  - Lie south of the Abbay trough which is greatly eroded due to heavy rain for almost **all of the year**.
  - It is **the wettest region** of the country with a total average annual rainfall of above 1500 mm.

- Only a few areas are above 2500 meters. The highest points in the region are the:
  - Gamo-Konso Highlands (in GamoGoffa)
  - Maji-Korma Highlands (in Keffa Zone)
  - Kulo-Konta Highlands (Keffa zone)
  - Benishangul mountain (in Benshangul Gumuz)
  - Tullu Wallel (in West Wellega)
- Mt Gughe has the highest altitude: 4200 m asl. It is found in the Gammo plateau.
- These highlands are well-known for the production of coffee, inset and maize.

2. The Southeastern Highlands of the Horn: include the plateaus of Hararghe, Sidama, Arsi, Bale, Somali highlands

- They are the main sources of the Wabishebelle and Genalle rivers and bounded:
  - in the west, by the fault line of the Rift Valley
  - in the east, by the Ogaden Lowlands
  - in the south by the Elkerie and Borena Lowlands.
- These highlands are subdivided into the plateau of Hararghe, Arsi, Bale and Sidama.

i. The Plateau of Hararghe: rises sharply from the fault line of the Rift Valley and extends gently to the east up to Jijiga. After Jijiga, a fall in elevation takes place, giving way to the Ogaden Lowlands.

- The Plateau is drained by the left-bank tributaries of the Wabishebelle River.
- The Hararge Plateau area and its foothills are significant producers of coffee, chat, sorghum and millet.
- The highest points of this plateau are Mount Gara Muleta (3381 masl) and Mount Jebel Tita (3122 masl).

ii. **The Plateau of Arsi:** consists of the Gugu and Chillalo Massifs.

- It is an extendingly rolling plateau; it is a very suitable plateau for farming (wheat).
- The highest points on the Arsi plateau are Mount Chillallo (4136 masl), Mount Bada (4139 masl) and Mount Kaka (4180 masl).

iii. **The Bale Massif:** is separated from it by the headstreams of the Wabishebelle.

- The Bale Massif is dominated by:
  - Mount Tulu Dimtu (4377 masl)
  - Mount Batu (4307 masl)

iv. **The Plateau of Sidama:** is separated from Bale by the Genalle River.

- The area constitutes the southwest extension of the southeastern highlands.
- The plateau slopes away gently to the south and is drained by the Dawa River and its tributaries.
- The Jemjem is the dominant part of the plateau.

v. The Somali Highlands: are the extension of the southeastern highlands of Ethiopia.

- Their average altitude doesn't exceed 1500 masl. They rise gently in the west and descend sharply to the Indian Ocean coasts.

3. The Rift Valley System: is a set of fractures in the earth's crust that extend from the Dead Sea in the north, through the Red Sea, to Mozambique in the south.

- Major faulting and rifting took place at the end of the Tertiary Period of the Pleistocene Epoch as a result of tectonic epeirogenic activity.
- It has been the scene of intense volcanic activity and minor faulting. It is the most unstable physiographic division of the area.
- It covers a total length of 1700 kilometers in Ethiopia and Eritrea.
- From an economic point of view, the Afar Triangle is becoming increasingly significant for its great potential in the extraction of salt, geothermal energy and irrigable agriculture.

Subdivisions of the Ethiopian Rift Valley System

i. **The Afar Triangle (Northern Subdivision):** is the largest and widest part of the system. Altitude ranges from 116 meters below sea level at the Kobar Sink to about 900 meters above sea level at Awash and characterized by:
    - faulted depressions (the Dallol Depression) and grabens (also called troughs)
    - volcanic mountains.
    - a large part of the area is covered by extensive salt plains and lakes (Lake Assale and Lake Afrera).

- The Afar triangle is bounded by parallel fault lines on the east and west. Its floor is made up of:
    - grabens such as the Tendaho Graben
    - volcanic ash and lava deposits
    - Lacustrian and fluvial deposits, and
    - Volcanic mountains such as Mount Fentalle.

- What is more, the Afar Triangle has special characteristics that do not exist in other regions of Ethiopia do not bear. It consists of:
  - fossil rich sediments
  - rich archeological sites which have shown us that the area was the home of the ancient ancestors of primates and hominids.

ii. The Main Ethiopian Rift (Lake Region or Central Part):

- Covers the area from the **lower Awash** basin up **to Lake Chamo**.
- This subdivision is the most elevated part of the Ethiopian Rift Valley.
- It is also the wettest, most densely vegetated, and most densely populated.
- Sedentary farming is practiced here. The area also includes numerous lakes of enormous aesthetic value.

iii. The Chew-Bahir Rift (Southern Subdivision): is also known as the Omo-Ghibe trough. It is the smallest section.

- It consists of an extensive shallow marshy area covered by tall grasses.
- In the vicinity of Arba Minch, this part of the Ethiopian Rift valley system is split into the **Ganjuli** and the **Galena Valleys** by the **Amaro mountain range.**

B. The Lowlands of the Horn

- Occupy the **peripheries** of Ethiopia on its eastern and western sides, running from north to south.
- Have relatively harsh and very hot climates.
- It constitutes more than 35 percent of the total area of the country and inhabited mainly by pastoralists.
- The lowlands of the Horn are subdivided into:

Western and Southeastern lowlands

i. The Western Lowlands

- Extend from western Eritrea in the north up to the Omo-Ghibe River in the south, bordering the Sudan. They have a general elevation of 500 – 1000 masl.
- These lowlands are sub-divided into:
  - The Setit and Barka Lowlands (in Eritrea)
  - The Tekezze and Angereb Lowlands (in Tigray and Amhara regions)
  - The Abbay Dinder Lowlands (in Benishangul and the Gumuz Region)
  - The Baro-Akobo Lowlands (in Gambella)
  - The Omo-Ghibe Lowlands (in SNNP)

- It is characterized by arid and semi–arid conditions. The Baro-Akobo lowland is **the wettest lowland.**
- The communities practice nomadic and semi-nomadic pastoralist ways of life.
- Notable towns, such as Humera, Kurmuk, Omedla and Metema, also serve as business centers along the Ethio-Sudanese border.

ii. The Northeastern and Southeastern Lowlands

- They begin in Djibouti and run all the way to Somalia in the southeast, bordering the Indian Ocean. They consist of:
  - the Red Sea coastal plains (in Eritrea)
  - the Afar plains (in Afar) which are included in the Afar Triangle.
  - the Ogaden plains (in Somali region)
  - the Elkeri plains (in Bale)
  - the Borena plains (in Oromiya)
  - the Benadir plains (in Somalia)
  - Djibouti
- These lowlands are highly extensive lowlands.
- They are characterized by low annual rainfall-often below 500 mm.
- Most of these lowlands are covered by sandstones and recent marine deposits.
- The people practice a pastoralist way of life because of the harsh climate.

3.3.3. CLIMATE OF ETHIOPIA AND THE HORN

What do you know about the concepts of weather and climate?

- Both weather and climate are composed of the following elements: *precipitation*, *temperature*, *humidity*, *air pressure*, *wind*, *sunshine*, *etc.*
- The spatial and temporal distribution of climatic elements is governed by the climate control factors: latitude, altitude, revolution of the earth and the inclination of the earth's axis, distance from the sea, mountain barriers, weather systems, cloud cover, etc.
- **Latitude:** is the angular location of a place or point with reference to the direct rays of the sun.
- Ethiopia's location within the tropical zone results in:
  - high temperatures during most of the year
  - high daily (diurnal) ranges of temperature
  - relatively small annual ranges of temperature
  - little difference between summer and winter in the ratios of daylight to night.

- **Altitude:** is height above mean sea level.
  - Under normal conditions, there is a general decrease in temperature for increases in elevation.
  - The average rate at which temperature changes per unit of altitudinal difference is known as **lapse rate**.
  - The rate of change is 6^{o}C per 1000 meters. This change is called *environmental lapse rate* or *atmospheric lapse rate.*
  - Different places that exist on the same plane or angle of the rays of the sun might be expected to experience equal temperatures. However, due to the impact of altitude, they do not.

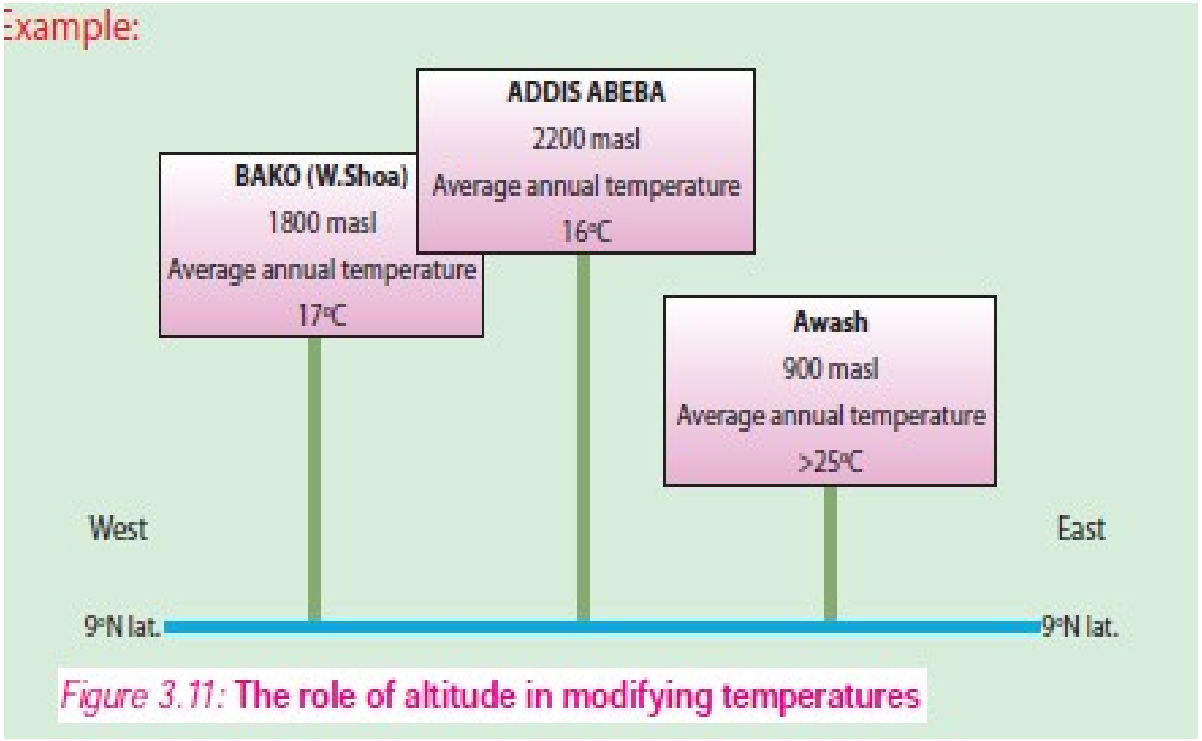


Figure 3.11: The role of altitude in modifying temperatures

- **Revolution of the Earth and Inclination of the Earth's Axis:**
- As the earth revolves around the sun, this inclination produces a change in the direction of the sun's rays, thereby affecting the length of time that the sun shines on the earth.
- Changes in the length of the day and in the directness of the sun's rays cause seasons.
- These different seasons result in the **temporal variation** of temperature in a year in Ethiopia.
- **Distance from water bodies:** Land masses absorb and release heat energy more quickly than water bodies do.
- Distance from the sea affects the climate only in coastal areas that are adjacent to the Red Sea and the northwestern Indian Ocean.
- **Mountain Barriers:**
- Places located on the *leeward side of mountains (also called rain shadow)* receive little rain.
- This effect occurs in the northwestern and northeastern lowlands of Ethiopia and the Horn.

- **Weather Systems:** are actually the effects of spatial variation of the overhead sun, which in turn results in the variation of temperature, pressure and rainfall.
- The apparent shift of the overhead sun between the Tropic of Cancer and Tropic of Capricorn contributes to the prevalence of different wind systems in different seasons.
- The major weather systems that impact over Ethiopia and the Horn are:
  - The Northeast Tradewinds (prevalent in December, January and February)
  - The Equatorial Westerlies (prevalent in June, July and August)
  - The Equatorial easterlies (prevalent in September and October, March and April).
- It is because of these weather systems that the rainfall period varies in Ethiopia and the Horn.

Spatial and Temporal Variation of Temperature in Ethiopia

A.Spatial Variation of Temperature in Ethiopia

- The two factors that most affect the spatial variation of temperature in Ethiopia are: **cloud cover** and **Altitude**
- **Cloud Cover:** acts as temperature **insulation** for the earth, for both day and night hours. By day, it can prevent the full force of sun's rays from heating the earth. By night, it can prevent the heat absorbed by the earth from escaping into the atmosphere.
- **Altitude:** is a major determining factor of Ethiopia's agro-climatic zones. These zones have traditionally been defined in terms of temperature.

Table 3.6: **Ethiopia's Agro-Climatic Zones**

Altitude in meters	Mean annual temperature in °C	Traditional agro-ecological name	Global equivalence
3,300 and above	<10	Wurch/Kur	Alpine or Afro-Alpine
2,300 – 3,300	10 – 15	Dega	Temperate
1,500 – 2,300	15 – 20	Woina Dega	Subtropical
500 – 1500	20 – 30	Qolla	Tropical
below 500	> 30	Bereha	Desert

- **Wurch-Zone Areas:** Exist only in the very high mountains of South Gondar, Wollo, Shoa, Arsi and Bale.
- Example: Mt. Ras Dashen in Semine Gondar; Mt. Guna in South Gondar; Mt. Megezez in North Shoa; Mt. Batu in Bale, etc.
- **Dega-Zone Areas:** are areas with lower altitudes and higher temperatures than Wurch-zone areas. Historically, Dega-zone areas were the home of concentrated human settlement. They were chosen because of the features below:
  i. secure location
  ii. reliable rainfall
  iii. absence of diseases such as malaria, etc.
- Due to this high concentration of human population, the Dega zone has been intensively cultivated and has a high rate of soil erosion, overgrazing and deforestation.
- Some of the humid areas of this zone support two growing periods per year under rain-fed agriculture. Example:
  - Dinsho in Bale, Chillallo in Arsi, Hulla in Sidama, Debresina in North Shewa

- **Woina-Dega-Zone Areas:** The Woina-Dega-zone areas contain most of Ethiopia's agricultural land. They are the country's main areas producing: Surplus grain and Inset and its derivatives
- There can be two growing seasons when rainfall reliability is high.
- **Qolla Zone and Bereha-Zone Areas:** are largely confined to lowland areas with altitudes of 1500 meters and below.
- They are sparsely populated and their populations are primarily engaged in pastoralist activities. They occupy
  - The peripheral areas of Ethiopia and Eritrea
  - Most of Somalia and Djibouti

B. Temporal variation of temperature in Ethiopia

- In most of Ethiopia, high temperatures are recorded from March to June. Low temperatures are recorded from November to February These variations are primarily due to.
  - the tilting of the earth at 23½º to the normal elliptic
  - the distance of the overhead sun and its apparent north-south movement across the equator as the earth revolves around the sun

Spatial and Temporal Variation of Rainfall in Ethiopia and the Horn

A.Spatial Variation of Rainfall in Ethiopia and the Horn

- The spatial variation is the result of the strength and nature of prevailing weather systems that result from:
  - the apparent movement of the overhead sun
  - prevailing winds
  - the associated Inter-Tropical Convergence Zone
- **Inter-Tropical Convergence Zone (ITCZ):** is a low pressure zone formed by the convergence of Northeast Trade winds and the Equatorial Westerlies.
  - It shifts north and south of the equator following the position of the overhead sun.
  - In July, its position is at the Tropic of Cancer.
    - Ethiopia and the Horn come under the influence of the Equatorial Westerlies and Easterlies.
    - This wind bring moisture to the highlands but decrease their magnitude and length of rainy periods northwards.

- In January, its position shifts to the Tropic of Capricorn leaving the region for the prevalence of the Northeast Tradewinds that are non-moistrue-laden.
  - During this time, only the Eritrean coastal lands and the Afar region receive rain.
  - In most of Ethiopia, western Eritrea and Somalia, it becomes dry season.
- In March and September, the position of the ITCZ is around the equator.
  - the Equatorial Easterlies provide rain to the highlands of Somalia, and to the Central and Southeastern lowlands and highlands of Ethiopia.

B. Temporal Variation of Rainfall in Ethiopia

- There are two main rainy seasons: "*Kiremt (summer) and Belg* (spring)" that contribute more than 90% of the country's rain supply.
- There are two other rainy seasons – the autumn rains, called the *Metsew*, and the winter rains.
- The winter rainy season supplies rain only to the Afar lowlands, the Red Sea coastal areas and the eastern escarpment of the Eritrean highlands.

Rainfall Regions in Ethiopia and the Horn

- Based on rainfall distribution, five types of rainfall regions can be identified in Ethiopia These are:
  - year-round rainfall region (wet in most months)
  - summer rainfall region
  - autumn-and-spring rainfall region
  - winter rainfall region
  - merged spring, summer, and autumn rainfall region
- **Year-Round Rainfall Region:** includes the southwestern plateau comprising the highlands of Wellega, Keffa, Illubabor and Gamo Goffa.
  - This region can be represented by: Gore, Mizan, Metu, Bonga, Gambella, etc.
  - The region has more rainy days than any other part of the country. The average rainfall varies from 1400 mm to 2200 mm.
- **Summer Rainfall Region**: is the **largest** in the country.
  - This region consists of the Northwest Highlands and Western Lowlands, and can be represented by: Debremarkos, Fitche, Gondar, Bahrdar, etc.
  - Its moisture-bearing winds are the Equatorial Westerlies and Easterlies.

- **Autumn-and-Spring Rainfall Region:** covers the southeastern highlands and associated lowlands up to the Somalia coasts. They can be represented by: Gode, Moyalle, Jijiga, Yabello, Baydhabo.
  - Moisture-bearing winds are the **Equatorial Easterlies**.
  - The region's average rainfall varies from less than 500 to 1000 mm.
- **Winter Rainfall Region:** consists of the eastern escarpment of the western highlands, the middle Rift Valley section, the Afar subdivision and Eritrea.
  - The winter rainfall region can be represented by: Mitswa, Assaita and Djibouti.
  - The region's moisture-bearing winds are, the North Easterlies.
  - The air mass is continental (dry) and has only a short sea trajectory (that is the Red Sea).
  - The region's total annual moisture is very low and of short duration.
- **Merged Spring, Summer and Autumn Rainfall Region:** is the smallest in the country.
  - It consists mainly of the western foothills of the Southeastern Highlands.
  - The total annual rainfall varies from 1500 mm to 1000 mm.
  - It covers a corridor that stretches from the Sidama Highlands to the Hararge Plateau.
  - The region is represented by the: stations-Assaita, Awash, etc.

3.3.4. NATURAL VEGETATION AND WILD ANIMALS OF ETHIOPIA

Types of Natural Vegetation of Ethiopia

- ***Natural vegetation*** refers to any original plant grown in and covering an area. The distribution of natural vegetation is influenced by: a*ltitude, climate, soil type, and drainage*
- The types of natural vegetation in an area are strongly determined by ***temperature and rainfall***. That is why the natural vegetation of an area is a good indicator of the area's climatic conditions.
- **Natural Vegetation's Relationship to Altitude and Rainfall:**
  - The lowlands have harsh environments due to low rainfall and are characterized by *xerophytic plants*, while the highlands are characterized by different types of *tree stands* and *forests.*
- Based on altitude, we can classify the natural vegetation of Ethiopia into the following five types:
  - Afro-alpine and sub-Afro alpine
  - Forests
  - Woodland savanna
  - Steppe vegetation
  - Desert and semidesert vegetation

1. Afro-Alpine and Sub Afro-Alpine Vegetation: is found at very high altitudes (above 3300 meters).

- Is very similar to European alpine vegetation.
- Sub-afro-alpine vegetation is found between 3000 – 3300 m, while Afro-alpine vegetation is found at higher altitudes than these. In Ethiopia, Afro-alpine and sub-Afro-alpine vegetations are found in the:
  - *Highlands of Semein and*
  - *Highlands of Bale*
- **Afro-Alpine** vegetation consists of tussock grasslands, serules, scattered mosses and lichens.
- **Sub-Afro Alpines** are predominantly woodland scrubs.
  - Gibra (Lobelia rhynchopetalum) and Asta (Erica arborea) are dominant plant species in this region of natural vegetation.

2. Forests: are characterized by broad altitudinal ranges (450 – 3300 m) and large variations in mean annual rainfall (200 – 2200 mm).

- This results in the formation of highland and lowland forests.

A. **Highland Forests (forests that grow between 1500 - 3300 masl altitude):** consist of:

- Kerkha (Arundinarial) 2800 – 3000 masl
- Tid (Juniperous Procera) or Coniferous trees 2200 – 2800 masl
- Zigba (Podocarpus) 1800 – 2200 masl
- Woira (Oliia Africana) and Kosso (Hagenia Abbyssinia (1500 – 1800)

B. **Lowland Forests (forests that grow below 1500 m altitude) (gallery/riverine forests)**

- They grow along the banks of the Awash, Wabishabelle, and Ghanalle Rivers where moisture is available in the soil.
- The predominant trees are Sholla and Warka.
- In areas where mean annual rainfall exceeds 500 mm, Baphia forest predominates.

3. **Woodland Savanna:** are found in both highland and lowland areas.

- Their altitudinal range is 250 – 2300 m, and their mean annual rainfall range is between 200 – 1400 mm. (Example: acacia, grass etc.)
- It experiences marked seasons and are characterized by scattered acacia trees.
- In areas where mean annual rainfall is more than 1000 mm, these grasslands can form attractive park-like areas with acacia, wild fig, sycamore and kosso trees.
- Ethiopia's savanna grasslands are found in the southern half of Ziway, Langano, Abiyatta and Hawassa.

4. Semi-desert and Desert Vegetation: consists of short acacia, thorn bushes, succulent plants and a few rough grasses.

- Is found in the Eastern, Northwestern and Southeastern Lowlands, i.e., in areas where annual rainfall is below 500 mm and drought persists for a long period of time.

Wild Animals of Ethiopia

- Ethiopia has about 277 species of mammals and 862 species of birds.
  - Seven species of mammals and twenty five species of birds are endemic to Ethiopia.

Types of Wild Animals in Ethiopia

- The many types of wild animals found in Ethiopia can be grouped into the following broad categories:
  - **Common wild animals:** These ones are animals commonly found in many places of the world, including the hyena and the jackal.
  - **Game animals:** These are animals that are killed for sport. Ethiopia's game animals include herbivores and carnivores. They are found in the lowlands.
    - Here are some examples of Ethiopia's game animals:
      - Herbivores:
        - Browsers eg. Giraffes
        - Grazers eg. Wild asses, zebras, etc.
      - Carnivores eg. Lions, leopards, cheetahs, etc.

- **Arboreals:** are tree climbing animals including the Colobus monkey and baboons.
  - Are mostly found in the rainforest regions of Ethiopia.
- **Aquatic animals:** includes Fish, crocodiles and hippopotamus.
- **Birds:** for example, Pelicans and flamingoes.
- **Rare/Endemic animals:** They are at great risk of extinction, especially the Walia Ibex and Semien Fox. The following are some of them:
  - Walia Ibex (wild goat), found in the Semein highlands.
  - Mountain Nyala (Dega Agazon), found in the Bale mountains.
  - Gelada' or 'Chelad' baboon, found in the Semein highlands.
  - Menilik's Bushbuk ('Dikula') in the Shoan and Bale highlands.
  - Swayne's Hartebeest ('Korkay'), found in the Nechsar park and the Sankalle sanctuary.
  - Semein Fox ('Key Kebero'), found in the Bale and Semein Highlands.
  - Wild Ass (Yedur Ahiya), found in the Afar and Southeast Lowlands.

Causes of the Extinction of Wild-Animals

- The main reasons for such conditions are the shrinking and destruction of habitats, which are mainly forest land by way of:
  - rapid expansion of farmland, settlements, and industrialization
  - expansion of grazing land
  - wide spread practices of illegal hunting in search of meat, skin, fur, horn and ivory.
  - frequent wild fires
  - migration of the wild animals to neighboring countries adds to their perpetual disappearance.

Conservation Measures

- Here are some conservation measures that have been recommended:
  - establish national parks, game reserves and sanctuaries.
  - Monitor and administer existing conservation areas properly.
  - establish and implement strong laws that effectively prohibit illegal hunting.
  - educate the public about environment protection.
  - protect habitats.
  - educate and encourage local communities to protect their animals' habitats and resources.

- National Parks: are conservation areas for wild animals in which **legal hunting is allowed**, with some restrictions. The Ethiopian National Parks are.

Name	Area in km	Location
Gambella	5,061	Gambella
Yongudirasa	4,731	Afar
Omo	4,068	SNNPR
Gerallea	3,858	Somali
Allattish	2,665	Amhara
Bale Mountains	2,471	Oromiya
Maggo	2,162	SNNPR
Cheberra churchura	1,215	SNNPR
Abiyatta – Shalla Lakes	887	Oromiya
Awash	756	Oromiya-Afar
Nech Sar	514	SNNPR
Semein Mountains	225	Amhara

- **Game Reserves:** wild-animal conservation areas where tourists are allowed to practice licensed hunting. The game reserves of Ethiopia are:

Name	Area in km	Location
Borena	45,366	Oromiya
Lower Wabishebelle	23,788	Somali
Arsi	10,876	Oromiya
Bale	9,663	Oromiya
Western Shoa	9,136	Oromiya
Afdim Gewane	5,932	Afar-Somali
Akobo	5,049	Gambella
Mursi	4,561	SNNPR
Mizan Teferri	4,172	SNNPR
Jikawo	3,375	Gambella
Western Omo	3,200	SNNPR
Chercher-Arbagugu	3,045	Oromiya
Erer – Gotta	2,386	Somali
Geddeo	2,347	SNNPR
Dabus Valley	2,127	Benshangul-Gumuz
Boyyo	58	SNNPR
Segan Valley	N:A	SNNPR

- **Sanctuaries:** are wild-animal conservation areas where hunting is strictly prohibited. Example: Afar Gewane.

Name	Area In km^2	Location
Babille	6982	Oromiya
Sankele	54	SNNP
Yabello (yavello)	2500	Oromiya

3.3.5. SOILS OF ETHIOPIA

Formation of Soils in Ethiopia

- **Soils** are the uppermost loose or unconsolidated material overlying the earth's crustal rocks.
- Its major components are water, air, organic and inorganic minerals.
- Soils of Ethiopia owe their origin to:
  - parent rock material, which has been broken by way of weathering
  - climatic conditions: determine the speed and nature of the processes that form the soil; for example, extreme heat, or cold, could stop the work of bacteria, and the amount of moisture influences on several aspects of soil formation.
  - vegetation cover: adds humus to the soils and renders support to the soil making animals and bacteria.
- On the plateaus, the parent rocks are volcanic origin and experience sufficient rainfall.
  - The soils formed in these areas are red basaltic and black basaltic soils. Unlike the red basaltic soils, the black soils have high clay content that makes the soil difficult for farming.

- In areas where the hard crystalline rocks are the parent rock, the soils are poor and thin. They are also rocky and acidic. They range in color from **grey to brown**.
  - They are found in Hararghe plateaus and Borena lowlands.
- In the Afar region where recent volcanic deposits and dried-out lake deposits had occurred, very shallow and saline-dominated soils are formed.
  - Due to time and climatic effects, these soils are not deep and fertile.
- In the southeastern lowlands where the parent rocks are sedimentary rocks, the soils lack humus but are rich in phosphorous and potash.
  - They are also low in nitrogen content.
- In the lower course of the major rivers, transported soils often known as alluvial soils are dominant.
  - These soils because of their volcanic origin and continuous nourishment of water, are fertile.
- People depend on soils; conversely, the quality of the soils depends on how wisely people use the land.

Types of Soil in Ethiopia

- The soils of Ethiopia are basically derived from crystalline, volcanic and Mesozoic sedimentary rocks.
- According to the latest classification made by the FAO, there are eighteen classes of soil in Ethiopia.
- Here are the main soil types that cover more than 85 percent of the country:
- **Nithosols (red basaltic soils):** cover about 12 percent of the country.
  - are basically associated with high rainfall and are found in areas that were previously covered with forest.
  - are predominant in the Western Highlands of Wellega, Keffa, Illubabor, the Southern Highlands of Sidama, the Central and Western Highlands of Shoa, the Highlands of Gojjam and the Eastern Highlands of Hararghe.
  - are matured soils with **deep profiles**. They are highly leached and lack soluble minerals like Sodium, Calcium, etc., but they are rich in iron and aluminum.
  - are potentially good for farming and other agricultural practices since they are friable, and have a stable structure; as a result,
  - are the most widely cultivated soil type. They are the best soils for coffee, inset and cereals.

- **Vertisols (black Basaltic soils):** cover about 10 percent of the total land of Ethiopia.
  - have high clay content; so, are sticky. For this reason and for poor drainage qualities, such soils are difficult to be used for farming purposes.
  - have excellent nutrients that could provide support for agriculture, but their poor drainage qualities limit their use for grazing purposes.
  - are largely found in Arsi, Bale and central Hararghe, where there are pronounced wet and dry seasons.
- **Acrisols:** are found associated with Nithosols.
  - cover about 4.5 percent of the country.
  - are widely found in the Southwestern Highlands of Ethiopia,where there is high rainfall.
  - are extremely leached; and therefore, have low productivity capacity.
- **Cambisoils:** are soils that developed from the recent lava deposits of the Quaternary Period.
  - are young and shallow.
  - are found on the rugged and sloping terrain of the Plateau of Shoa (eastern escarpment) and Chercher Highlands.

- **Regosols:** like the cambisols, are shallow and young; but they are coarse-textured.
  - have low agricultural value.
  - are found in the **Danakil and Ogaden** plains.
- **Xerosols:** are generally young and shallow, and are found in arid and semi-arid regions. They have a weakly developed profile.
  - are found extensively in the Northeastern escarpment, Northwestern and Southeastern Lowlands.
  - are characterized by high salt content and humus deficiencies.
  - have little significance for agriculture except places where they could be irrigated.
- **Yermosols:** are found in desert and semi-desert areas, as are xerosols.
  - are salty, acidic and have a weakly-developed profile.
  - are not suitable for cultivation, even when irrigated, due to their salty and acidic nature.

- **Luvisols:** are well-developed in areas where there are clearly marked wet and dry seasons and when leaching is not very high.
  - are among the best soils, since they have good chemical nutrients.
  - are intensively cultivated, except in areas that are steeply sloped or water-logged.
  - are found around Lake Tana, and in the eastern part of the Northern Central Highlands and in the Southern Lowlands.
- **Lithosols:** are similar to cambisols and regosols in their poor maturity and their location on steep slopes.
  - are found in areas of low precipitation.
  - cover the escarpments of the Northeastern and Chercher Highlands.
- **Fluvisols:** are soils that rivers have transported from highlands to lowlands.
  - cover about 10 percent of the country's total area.
  - are associated with river, sea and lake deposits.
  - have very good agricultural potential.
  - are found extensively in the lower regions of the Omo, Awash, Abbay and Baro-Akobo Rivers.

Soil Problems and Conservation in Ethiopia

- **Ethiopia's Soil Problem – Erosion**
- Soil Erosion by Running Water: is the most important soil problem in Ethiopia.
- Examples:
  - River Abbay alone carries away 3000 – 4000 million m^3 tons annually.
  - The Ethiopian highlands experience a loss of about 2000 tons of soil per square kilometer per year.
- Factors that Accelerate Soil Erosion in Ethiopia:
- Natural Factors:
  - Topography
  - The heavy summer rains:
- Human-Made Factors: accelerate the soil erosion that is caused by the natural factors and include:
  - **Deforestation:** forests provided cover for the land and protected the soil from the physical action of rainfall.

- **Bad cultivation practices:** by making the soil vulnerable to the natural forces. For example:
  - **Overcropping** –is the act of planting an area too densely. This approach to farming uses up the soil's nutrients faster than natural processes can replenish them and destroys the land's fertility.
  - **Overcultivation** –entails tilling land every year. Too frequent tilling can remove nutrients from the soil faster than natural processes can replenish them.
  - **Slash and burn** –people slash (cut down and dig up) all or most of an area's vegetation and then burn the results.
    - are also used to clear forestland in order to prepare it for farming, but unwittingly exposing the soil for erosion.
- **Keeping too many livestock (overgrazing):** The livestock destroys the vegetation faster than it can replenish itself. When the vegetation is destroyed, the land is laid bare and is therefore vulnerable to erosion. Goats are particularly damaging.
- **Unscientific tilling:** Most peasants do not use scientific farming techniques, such as terracing and contour ploughing, which serve as checks against soil erosion.
- **Using inadequately maintained tracks and trails:** Without adequate maintenance, frequently used routes across the countryside can gradually change into deeply eroded gullies and eventually make them blocked, for they are partly eroded.

Conservation Measures to Combat Soil Erosion

- Here are some conservation measures that have been recommended for minimizing soil loss by erosion in Ethiopia.
  - **Reforestation** – replanting trees immediately after tree harvesting;
  - **Afforestation** of areas that are not used for cultivation, are along steep slopes that are exposed to erosion.
  - Proper **terracing** of slopes and are set a side for cultivation.
  - **Intercropping** – this is the practice of growing two or more crops on the same field.
  - Controlling livestock populations.
  - Developing improved grass types that can feed more livestock.
  - Installing fences to control the movement of grazing animals.
  - Proper construction of tracks and routes so that drainage could not wash them easily.
  - Constructing **check dams**.
  - **Installing shelter-belts** and **windbreaks** in arid and semi-arid areas.
  - **Extending irrigation schemes** This measure would alleviate both drought and flood conditions. Stored water would be used during dry periods, and flood waters would be controlled and therefore would no longer be destructive or wasteful.