

**SANGAM SKM COLLEGE - NADI**  
**LESSON NOTES - WEEK 1**

**SUBJECTC: GEOGRAPHY**

**YEAR: 11D/E**

<b>Strand</b>	Physical Geography
<b>Sub strand</b>	Soils – New Zealand
<b>Content Learning Outcome</b>	Explore the different soil types, their formation and uses and discuss the impact of human actions, climate change and the importance of using traditional & contemporary measures for soil conservation

**Soil** - a natural surface layer that contains living matter and can support plants. The **study of soil science** is often known as "**Pedology**".

**Soil Types and characteristics**

- ✓ Temperature and amount of precipitation influence soil formation:
- ✓ **Cold climate** like tundra areas have soil of little use for agriculture due to soils are frozen and decomposition of plant material to form humus is slow.

**Soil processes**

**Five key processes by which soil is formed** are:

**Leaching** - Leaching is the removal of soluble minerals from upper layer to lower layer of soil.

**Eluviation** - soil particles held in suspension, such as clay, are removed (e.g. washed away).

**Illuviation** - soil particles held in suspension, such as clay, are accumulated (e.g. deposited).

**Podsolisation** - occurs when strongly acid soil solutions cause the breakdown of clay minerals forming silica, aluminium and iron with organic substances in the soil. These minerals are removed from the surface zone of the soil and can accumulate in distinct dark sub-surface layers - very evident on inspection.

**Gleying** - occurs in waterlogged, anaerobic conditions when iron compounds are reduced and either removed from the soil, or segregated out as mottles or concretions in the soil eg. Marshy wetlands

**Alluviation** - (Materials being deposited by the action of rivers) includes materials laid down in river channels, on flood plains, in lakes and in foot of mountain slopes.

**Calcification** - occurs in dry and or very dry areas such as deserts. Rainfall is lacking and water in the soil move upwards towards the surface by **capillary action**.

**PATTERNS OF SOIL IN NEW ZEALAND**

**Two major divisions are recognized**

(i.) **Zonal Soils** - Refers to mature soils.

(ii.) **Azonal and Intrazonal Soils** - Soils are young and unstable without any distinct colour zones.

**Soil Type**

- (i.) The **main types of zonal soils are Spodosols/ podzols-** these are soils of the coniferous forests
- Low evaporation and rain causes heavy leaching and results in acidic soils.
  - The vegetative remains on A - horizon are partially decomposed due to low temperatures.
  - Naturally poor soils in terms of agricultural productivity

**Ways to improve quality of this soil type**

- Because of the acidic nature, application of lime is essential.
- Heavy applications of fertilizers

- With proper management and the input of the required industrial products, spodosols can be highly productive if the soil texture is favourable.

**(ii.) Brown Earths/ Brown Forest Soils**

- These soils occupy areas under deciduous woodland.
- The roots of trees penetrated deeply into the sub soil and tend to bring additional supplies of nutrients.
- The base rich nature of the soil attracts soil organisms such as earthworms, **rodents** (rats and mice) which carry humus downward or mineral materials upwards.

**(iii.) Chernozems**

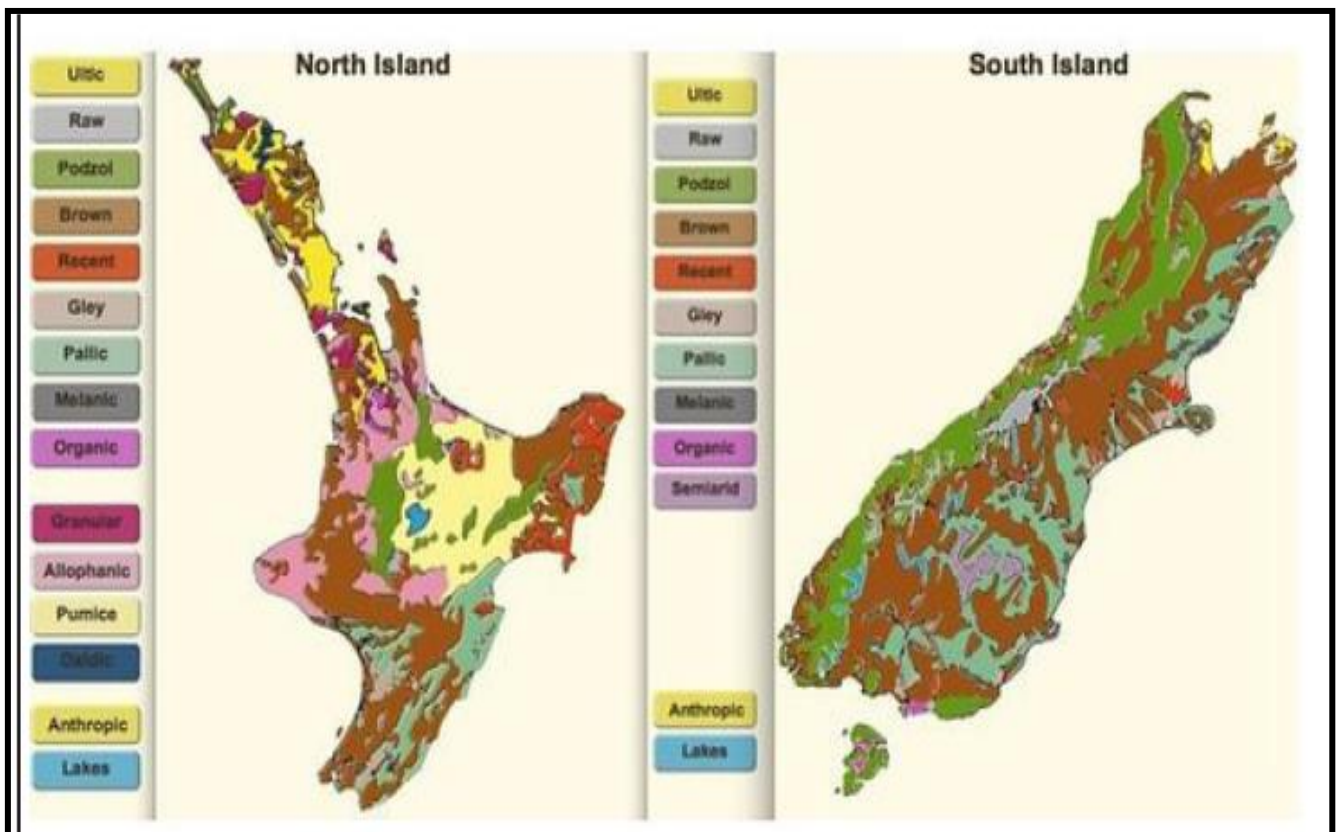
- Very fertile soils of the temperate grassland.
- The grass vegetation produces dense turfs and when these die, the humus is returned to the soil and they are rich in humus and there is little or no leaching.

**(iv.) Laterite**

- It occurs when **leaching proceeds at a very rapid rate**. These soils are formed in humid tropical areas and consists of aluminium iron compounds

**(v.) Tropical black earths**

- Formed from **volcanic rocks** which are rich in **calcium carbonate**.
- Fertile and occurs in low lying areas.
- **Soil exhaustion** is when soil is cultivated and crops are harvested the salts taken up by crop and the available humus are not returned.



**REVIEW QUESTIONS**

1. Distinguish between a.) Leaching and capillary action b.) Eluviation and illuviation

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**2. Refers to matured soil known as \_\_\_\_\_.**

**3. The available humus tends to be used up when the soil is cultivated and crops are harvested known as \_\_\_\_\_.**

**SANGAM SKM COLLEGE - NADI**  
**LESSON NOTES - WEEK 2**

**SUBJECTC: GEOGRAPHY**

**YEAR: 11D/E**

<b>Strand</b>	Physical Geography
<b>Sub strand</b>	Soils – New Zealand
<b>Content Learning Outcome</b>	Explore the different soil types and their formation.

**PROCESS OF SOIL FORMATION**

✓ **Five factors** are parent material, climate, topography (relief), organisms (biota) and time.

(i) **Weathering** - Produce primary and secondary minerals as well as determining the rate of release of nutrients and the soil depth, texture and drainage.

(ii) **Organic sorting**

- Several processes operate within the soil to reorganize mineral and organic matter into horizons e.g. Earthworm activity is a significant factor in sorting material in to different particles and sizes.

(iii) **Translocation of soil materials**

- **Translocation** is the movement of soil components in any form (solution or suspension, mixture of water and solid) or direction downward and upward.
- It usually takes place in association with soil moisture.

**FACTORS OF SOIL FORMATION**

<b>Climate</b>	Temperature and precipitation determine how quickly the soil weathers and soil properties such as mineral composition and organic matter content. Temperature directly influences the speed of chemical reactions. The warmer the temperature, the faster reactions occur. Moisture determines the chemical reactions that will occur. Greater soil moisture increases moves minerals deeper into the soil profile.
<b>Organisms</b>	The richness of organic matter depends on the living things that live on and in the soils. For instance, microorganisms help with mineral and nutrient cycling and chemical reactions. Bacteria, earthworms, fungi, and burrowing animals aid with soil aeration. Worms decompose organic matter as dead animals contribute to more decaying organic matter. Plant roots hold soils and provide vegetative residue.
<b>Topography</b>	Slope and aspect affect soil formation. The steepness of the slope affects the amount of deposition or erosion. Slopes may be exposed to more direct sunlight, drying out soil moisture and reducing fertility.
<b>Parent material:</b>	This refers to the organic material from which the soil is formed. Soils will carry the characteristics of the parent material, whether it's color, structure, texture, and so on
<b>Time</b>	Soils take many years to form. The age of a soil is determined by development, not chronological age. With time, organic matter settles deeper below the surface. Eventually they may change from one soil type to another

**SOIL PROFILE**

✓ **A soil profile is a vertical section through a particular soil from the surface to the underlying rock.**

### Processes:

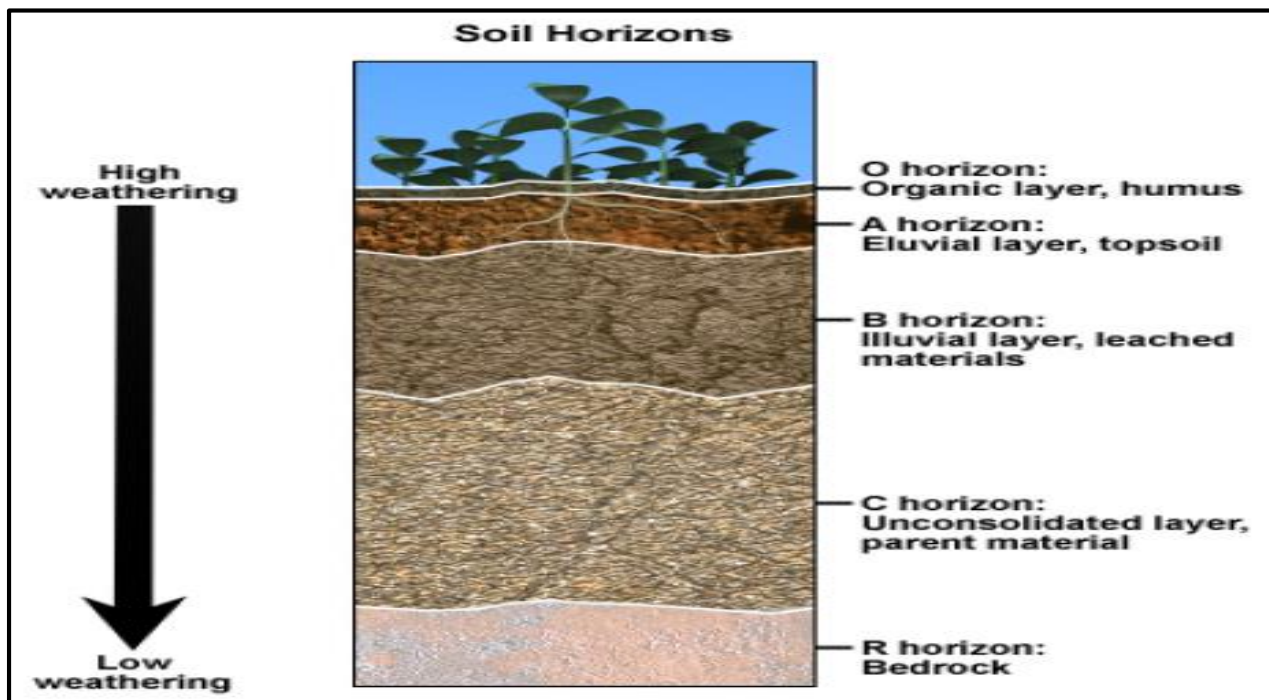
**O – Organic** material at the surface

**A- Horizon** – the top soil which contains some weathered materials and organic elements rich in humus. It is where biological activity and humus content are at their maximum.

**B- Horizon** contains weathered parent material and animals. The zone of accumulation or **illuviation** where clays and other materials are removed from A Horizon and are re-deposited.

**C- Horizon** – is the sub-soil (weathered parent material). Consists mainly of recently weathered regolith on the bedrock.

**D – Horizon** – parent material



**Texture** - refers to the degree of coarseness of the mineral matter in the soil. It is determined by the proportion of sand and clay particles. A loam soil is likely to be least susceptible

**Soil Structure** - Soil structure refers to the way in which soil particles are grouped together into larger masses called peds.

### Organic matter

- ✓ Organic matter and humus is derived mainly from decaying plants and animals.
- ✓ Highest amount of humus is found in areas of temperate grassland forming the chernozems or black earth while in drier climate, there may be insufficient vegetation to give an adequate supply of humus.

**Soil Moisture** – the amount of moisture present in the soil. Clay has numerous small pore (microscopic structure which may retain water for long periods but also reduce infiltration rates.

### REVIEW QUESTION

1. Distinguish between soil texture and soil structure.
2. Identify the five factors affecting soil formation.
3. Suggest a reason the dark brown soil present in A horizon

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**LESSON NOTES - WEEK 3**

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**Soil nutrient**

- ✓ Nutrient is essential for plant growth and the maintenance of fertility of soils.

**Soil exhaustion can be avoided by**

1. Adding natural fertilizers **Example**, animal manure or artificial fertilizer such as potash and sulphate
2. Adapting **crop rotation** method example, certain ingredient of the soil extracted by one crop in one year may be replaced by cultivating a different crop in the next year.
3. Using **fallow**- leaving an area of plantation fallow or not planted
4. Practice **Shifting Agriculture** after a piece of land is exhausted the cultivation moves on to return to its natural vegetative cover.
5. **Strip cropping** of different crops in strips along the contours
6. **Mulching**- the use of mulching and composting
7. **Inter- cropping** of different crops in the same field

**Soil Erosion**

- ✓ Is the removal part of or all of the top layers of soil due to the action of wind and water.
- ✓ Extensive human activities and misuse of the land have caused the erosion of the soil

**Causes of Erosion**

1. Lack of vegetative cover
2. Overgrazing
3. **Shifting Agriculture** - the land is left abandoned after its fertility have deteriorated, has no vegetative cover against erosion, example India.
4. Monoculture

**Soil Conservation**

- Man depends on the soil for food production and therefore soil conservation programmes are necessary.
- **Soil conservation** means the saving or preservation of soil at an acceptable level of fertility.
- It involves saving the soil from erosion and improving its fertility and productivity

## AFFORESTATION

### 1. Vegetative Cover

- ✓ It is the first defence against soil loss from run offs.
- ✓ For forest and woodland this involves managed cutting and replanting of trees (afforestation).
- ✓ Crop land should be more intensively by mountain and improving soil fertility

### 2. Contour ploughing/ terracing

- ✓ Crops are planted following the contour



### 3. Strip cropping

- ✓ Crops are grown in alternative strip and at different times.
- ✓ This will prevent the land from erosion at the same time

4. Adopting **artificial** and **natural** fertilizers

5. Adopting **crop rotation methods**



## Impacts of climate change on soil

- Affects production in agriculture.
- Increases damage to the land or land degradation will occur in the form of soil erosion, desertification and salinization.
- Loss of peat soils, further impacting on the capability of soils to support the needs of agriculture.



## REVIEW QUESTIONS

1. Suggest two ways how soil exhaustion can occur.

2. Identify three ways of conserving the soil.
3. State the impact of climate change on the soil.