

CHARACTERISTICS OF WATERSHED (WATERSHED MANAGEMENT)

SoABE

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Learning Objectives

1. Climatic Characteristics

Rainfall & its movement, Intensity, Duration, Temperature, Wind Velocity, Humidity, Transpiration, and Evaporation

2. Physiographic Characteristics

Size, Shape, Slope, Drainage Density, Elevation, Land use, Vegetation Cover, Soil, Geology, Hydrology, Hydrogeology

3. Socio-economics Characteristics

Statistics on people and their health, wants & wishes, Cattle and Farming Practices, People Participation

Watershed Characteristics

Each and every watershed has distinct characteristics of its own.

No Two Watersheds are Identical

1. Climatic Characteristics
2. Physiographical Characteristics

All the above characteristics affect the **pattern of disposal of stream flow**

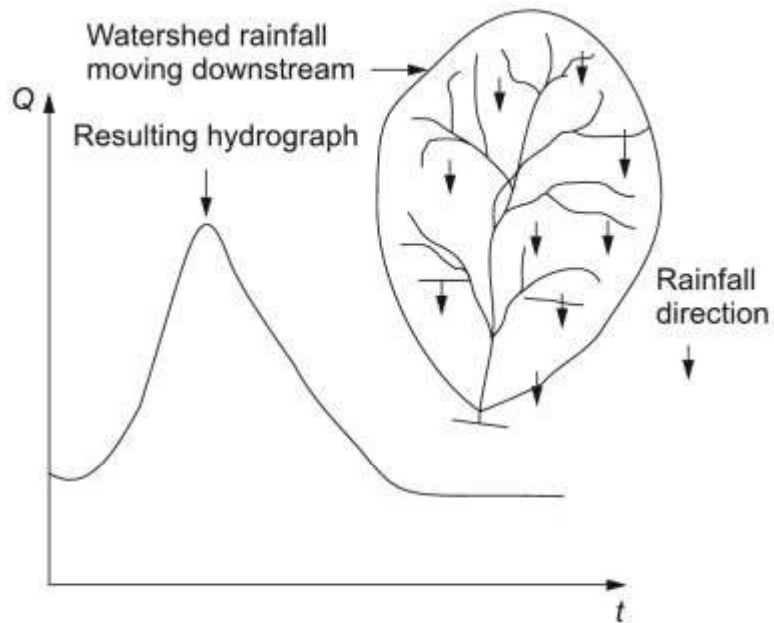
Climatic Characteristics

- If the climatic condition is **dry** before the rainfall, loss of runoff is more due to infiltration and evapotranspiration.

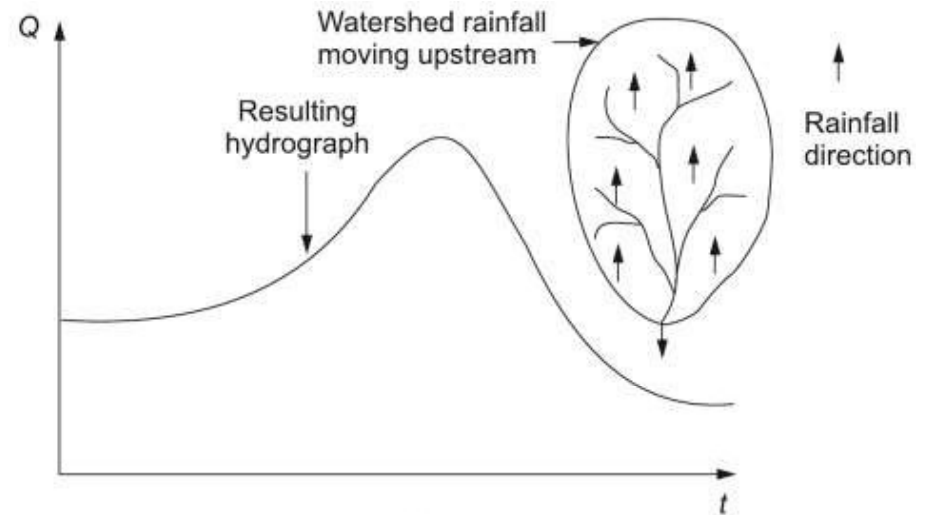
Climatic condition depends on **Temperature, Wind Velocity, and Humidity**

Transpiration, Evaporation, and Evapotranspiration depends on **Climatic Condition**

- The more the **intensity** of rainfall in the watershed, the more is the peak flow disposal from the area.
- If the **duration** is less, time taken to dispose with lower peak flow is also less



Watershed rainfall moving downstream.



Watershed rainfall moving upstream.

- If the rain moves downstream, the peak stream flow of watershed occurs quickly
- If rain moves upstream, the peak flow occurs late

Climatic Characteristics

For the correct design of hydraulic structures like

- Dams
- Weirs
- Barrage
- Reservoirs
- Spillways
- Retaining walls
- Embankments

a peak flow assessment of run-off or flood should be accurately worked out

Physiographic Characteristics



Shape:

- Watersheds differ in their shape based on morphometric parameters like geology and structure.
- The shape of watershed has a dominant effect on the characteristics of the hydrograph of the watershed such as **peak flow, overland flow, and base of hydrograph (run-off time)**.

Physiographic Characteristics

Size:

The size of watershed is governed by the size of stream or river and the development and management works taken.

- For minor irrigation project, size may be few hundred square kilometers
- For Tank or Pond Irrigation, size is just few square kilometers
- In Watershed management works in hilly or undulating topography, the size of watershed may be even much smaller .

Measurement of precipitation as well as water retention, drainage from the watershed complex for a bigger size of watershed

Physiographic Characteristics



Slope:

It controls the rainfall distribution and movement, land utilization and watershed behavior.

If slope is more,

- the velocity is more, and hence flood water drains quickly
- results in higher peak discharge
- reduces infiltration
- increases the soil transportation

Physiographic Characteristics



Drainage:

The Stream Order, Drainage Pattern, and Drainage Density have a profound influence on watershed as to runoff, infiltration, land management etc.

- It determines the flow characteristics and erosional behavior.
- If drainage density is more, peak runoff is more.

Physiographic Characteristics



Physiography:

Type of land, its altitude and physical disposition immensely speak about a watershed as to the climate and planning the activities in greening.

- Hilly tract could be useful mainly for Forestry
- Plains of populated areas could be utilized for Crops

Physiographic Characteristics



Land Use:

The land in watershed is used for numerous purposes such as

- dwelling houses
- cultivation
- livestock
- water harvesting
- roads and railways

Land use affects the run-off rates.

Physiographic Characteristics



Vegetation Cover:

- Vegetation cover retard the flow and increases the infiltration and interception, there by reducing the peak flow.
- Vegetation cover protects the soil erosion.

Detailed information on vegetation helps in choosing type, mode and manner of greening the watershed

Physiographic Characteristics



Soil:

- The soil such as sand absorbs a larger part of run-off water, so the rate of flow is less. Clay soil produces more flow as its absorption is less.
- Soil parameters such as depth, nature, moisture and fertility determines crops.

Physiographic Characteristics



Geology:

Rocks and their structure control formation of a watershed itself because their nature determines size, shape, physiography, drainage, and groundwater conditions.

- Geological conditions affects the run-off of watershed. If there are some cracks in rocks joining surface water and groundwater, a part of water flows quickly underground.
- Lakes, Storages, Swamp hold a part of excess rainfall

Physiographic Characteristics



Hydrology:

The availability, quality and distribution of surface water is basic to the final goal of growing greenery in a watershed.

- Hydrological parameters such as intensity and duration of rainfall help in quantification of water available in watershed.
- If rainfall continues for longer period with low intensity, evaporation and percolation increases but run-off is less. Further it may cause landslide in sloping hillside areas.

Physiographic Characteristics

Hydrogeology:

The groundwater demand for irrigation, farm plantation, drinking water, domestic use and industrial use is more as it is relatively less polluted and pure.

➤ The information about aquifer such as nature, thickness and characteristics should be known for better planning of watersheds.