



FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

Rainfed Agriculture and Watershed Management

Lecture -14

Factors affecting watershed management

Watershed characters (Size and shape, Topography & Soils)

Area and Length of Watershed

Climatic characteristics

1. Precipitation
2. Amount and intensity of rainfall
3. Land use pattern
4. Vegetative cover
5. Density
6. Social status of inhabitation

Size and shape

1. Size of watershed determines the quantity of rainfall received, retained and disposed off (runoff). A small watershed is pronounced by overland flow which is main contributor to result in peak flow.
2. While a large watershed has no overland flow significantly, but channel flow is the main characteristic. Large watersheds are also affected by basin storage.
3. Watershed size interacts with the extent of land use changes, as well as factors that affect weather and climate.
4. In smaller watersheds, the predominant interaction is between weather scale runoff-causing events storm whereas, in larger watersheds, the predominant interaction is between climate-scale runoff-causing events. While large-scale events or land use changes may impact small watersheds

Shape

5. Common watershed is square, rectangular, oval, fern leaf shaped, polygon-shaped, circular or triangular type and long or narrow.
6. Larger the watershed, higher is the time of concentration of runoff
7. So more water will infiltrate and utilized by the vegetation.
8. Shape of the land is determined by geology and weather.
9. It greatly influences drainage patterns.
10. Density of streams and the shape of a watershed in turn, affect the rate of overland runoff relative to infiltration.

11. A circular watershed would result in runoff from various parts of the watershed reaching the outlet at the same time.
12. An elliptical (oval) watershed having the outlet at one end of the major axis and having the same area as the circular watershed would cause the runoff to be spread out over time. Thus, produces a smaller flood peak than that of the circular watershed

Topography

- Topographic configuration such as slope, length, degree and uniformity of slope affect both disposal of water and soil loss.
- Time of concentration and infiltration of water are a function of these.

Slope of Watershed

- Watershed slope affects the velocity of runoff.
- Significant variation in the slope along the main flow path gives rise several sub-watersheds

Soil

1. Physical properties of soil, specially texture, structure and soil depth influence disposition of water by way of infiltration, storage and runoff.
2. Soil types influence the rate of water movement (lateral and vertical)
3. Finely grained soils, such as clays, have very small spaces between soil particles inhibiting infiltration and thus promoting greater surface runoff.
4. Coarse textured soils, such as sands, have larger pore spaces allowing for greater rates of infiltration and reduced runoff.
5. Surface roughness, soil characteristics such as texture, soil structure and soil moisture affect the runoff in various ways.
6. Generally soils with a significant portion of small particles have low infiltration capacity, whereas sandy soils have high infiltration capacity.

Area of Watershed

- Determination of a workable size of watershed area is important for a successful watershed management programme

Length of Watershed

- The watershed length is measured along the principal flow path from the watershed outlet to the basin boundary.

- As channel does not extend up to the basin boundary, So it requires to extend a line from the end of the channel to the basin boundary.

Climatic characteristic

Climate parameters affect watershed its manipulation in two ways.

1. Precipitation

2. Amount and intensity of rainfall

- The amount of rainfall and these parameters along with temperature, humidity, wind velocity, etc. regulates factors like soil and vegetation.
- Soil properties reflect the climate of the region.
- In the same way, the vegetation type of a region depends totally on the climate type.

Land use pattern, Land Cover and vegetation

Type of vegetation regulates the functioning of watershed;

Ex: Infiltration, water retention, runoff production, erosion, sedimentation

- Vegetation plays vital roles in the water cycle.
- Intercept's rainfall, impedes overland flow and promotes infiltration.
- Vegetation also uses water for growth.
- All of these factors reduce the quantity of runoff to streams.
- Vegetation binds and stabilizes soil thus, reduces the erosion.
- Vegetation also stabilizes stream banks and provides habitat for aquatic and terrestrial fauna.

Social status of inhability

By giving priority to the local people – a good step in itself –where more people are making decisions.

- Arising awareness of the people's role in the watershed approach
- Village communities, are made aware and are convinced of the advantages of this approach, i.e. the mobilization of the rural communities and their greater involvement in development programmes and project.
- Strengthening the capabilities of local organizations.
- Decentralization of decision-making by all players concerned, including those outside of watershed areas.