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Theoretical concepts of Surface water hydrology and measuring arrangements

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INTRODUCTION

Surface water hydrology is the sub-field of hydrology concerned with above earth water, in contrast to groundwater hydrology that deals with water below the surface of the earth. Its applications include rainfall and runoff, the routes that surface water takes (for example through rivers or reservoirs), and the occurrence of floods and droughts. Surface water hydrology is used to predict the effects of water constructions such as dams and canals. It considers the layout of the watershed, geology, soils, vegetation, nutrients, energy and wildlife. Modelled aspects include precipitation, the interception of rain water by vegetation or artificial structures, evaporation, the runoff function and the soil surface system itself.
When surface water seeps into the ground above bedrock, it is categorized as groundwater, and the rate at which this occurs determines base flow needs for in stream flow, as well as subsurface water levels in wells. While groundwater is not part of surface-water hydrology, it must be taken into account for a full understanding of the behaviour of surface water.

In contrast to groundwater hydrology, which deals with water below the earth's surface, surface water hydrology is the area of hydrology that deals with water that is above the surface of the planet. Its uses include determining precipitation and runoff, the paths taken by surface water (such as through rivers or reservoirs), and the frequency of floods and droughts. The consequences of water engineering projects like dams and canals are predicted using surface water hydrology. It takes into account the watershed's topography as well as its geology, soils, plants, nutrients, energy, and wildlife. Factors that are modelled include precipitation, evaporation, the role of runoff, and the soil surface system itself. Other aspects include the capture of rainwater by vegetation or man made structures. Groundwater is defined as surface water that has soaked into the earth above bedrock; the pace at which this happens impacts base flow requirements for instream flow as well as subsurface water levels in wells. Although groundwater is not a component of surface water hydrology, it must be considered in order to fully comprehend how surface water behaves.

DESCRIPTION

Variability of water

This variability in water supply is largely influenced by climate. Together with geographical characteristics such as topography, soils, and land use, hydrologic variability affects the development and character of surface water systems such as lakes and rivers. Flow variability is also becoming increasingly recognized as an important factor in the health of riverine aquatic ecosystems. Extreme floods are important because many of the processes that shape the river occur during the largest floods, also known as reset events. Hydrologic conditions during extreme low flow periods are also important and can impact species selection.
Measuring, estimating, and/or predicting stream flow is an important task in surface water hydrology. There exist a variety of methods for monitoring stream flow and each method remains specific to a particular type of stream. The methods to quantify and monitor the stream flow are grouped into four categories:

- Direct measurement methods.
- Velocity area methods.

- Constricted flow methods.
- Noncontact measurement methods.

All necessary theoretical concepts of each process, their physical modelling and their real life measuring arrangements are discussed elaborately. Necessary schematics diagrams and practical photographs are used along with illustrative examples to make the theoretical concepts clear. More real life applications are considered in the last module in which Hydrological design concepts are developed. The single point or location at which all surface drainage from a basin concentrates as outflow is the basin outlet. The time required for the rain falling at the most distant point in a drainage area (*i.e.,* on the fringe of the catchment) to reach the basin outlet is called the time of concentration. This is a very significant variable since only such storms of duration greater than the time of concentration will be able to produce runoff from the entire catchment area and cause a peak flow.

CONCLUSION

It is expected that some regions may have significant reductions in precipitation or major variations in the timing of wet and dry seasons with many aspects of the economy, environment, and society dependent on water resources, such changes in the hydrological cycle will have the potential to severely impact upon environmental quality, economic development, and social well-being. Water treatment is the alteration of a water source in order to achieve a quality that meets specified goals. The treatment of public drinking water to remove pathogenic, or disease causing, microorganisms began about that time. Treatment methods included sand filtration as well as the use of chlorine for disinfection. The virtual elimination of diseases such as cholera and typhoid in developed countries proved the success of this water treatment technology. In developing countries, waterborne disease is still the principal water quality concern. Although approximately 98 percent of liquid fresh water exists as groundwater, much of it occurs very deep. This makes pumping very expensive, preventing the full development and use of all groundwater resources.