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Introduction
1. Introduction

Water is a widespread, life sustaining substance with many unique chemical and physical properties. As a universal solvent it dissolves gases, nutrients and materials. Because of its physical properties a quite different set of environmental conditions is presented to the different groups of its inhabitants to live in similar conditions. Physical properties of water, its origin, concentration and circulation of the substances dissolved in it have been studied thoroughly. Importance of the water quality in regard to human health has become widely recognized in recent years.

Ecologists, hydrologists and engineers have been playing special attention to the aquatic environment. Lotic aquatic environment can be broadly defined as any water course that contains water moving downhill at any time of the year (Matthews, 1998).

Most water courses continue to flow/run throughout the year and are called perennial whereas some dry up during summer and are termed as intermittent. Streams that gain water from the water table are called the effluent. On the other hand the streams originating at high altitude often flowing into drier area and loosing their water to ground water table are termed as influent streams.

A most important feature of lotic system is that they change in systematic fashion from source to sink. All river systems being a collection of headwater streams pass through a series of intermediate stages of different sizes and conditions. Though rivers form a variety of patterns, the
same basic process operates worldwide. Mountain rivers are one of the most valuable resources. The term “Mountain River” conjures up a version of crystal clear water in the pristine setting (Ward, 1994). The high gradient of a typical mountain river coupled with a highly irregular bed structure results in rapid current and high turbulence. According to geographers an ideal stream rises in the mountains and flows swiftly over rocks and boulders to the foothills, where it is still swift enough to carry sand and small stones along. Due to the uneven bed the flow of water in streams generally is turbulent and exerts a shearing force that causes particles to move along the bed by pushing or rolling and skipping which is referred as bed-load. The fine particles (sand and silt) those move in suspension constitute suspension load. Hence the conditions in the aquatic system are not stable rather they are integrative and dynamic. The condition at a place in a watershed is being a summation of the events occurring upstream. So any change viz. erosion, deposition and catastrophic events in a particular range will show its effects throughout the downstream. Under natural conditions stream follows the rule of flow of energy as it moves through the simplest path where least work is to be done. During its unidirectional flow a stream leads to longitudinal gradient in channel slope (from steep to flat), hydraulic characteristics (from shallow to deep), river morphology and sediment size. Ward (1989) summarized that stream ecosystem actually interacts in four dimensions: upstream and downstream, laterally, vertically (with ground water) and time. When the course of the river is changed perhaps by reducing natural sinuosity local reach slope gets changed and instability generally results. Environmental degradation also brings about changes in the morphology of the stream, such as gradient, sinuosity and bed material at or near the surface of the channel. In general there are five major hydraulic conditions that most affect the distribution and ecological success of lotic biota. These are
velocity profile, suspended load, bed load movement, water column effect such as turbulent, and substratum interaction (Gore, 1996).

Community ecology is the relationship between biotic community (number of species, abundance and distribution of abundance between species) and physical habitat (Smith, 1998). Physical habitat in the stream strongly influences the biotic composition. Stream habitat provides the template upon which the ecological organization of lotic ecosystem is observed (Poff and Ward, 1989; Townsend and Hildrew, 1994) and biotic assemblage may have dramatic and persistent impact by alteration of these habitats (Nieme et al., 1990).

Habitat is influenced by factors operating at a number of spatial and temporal scales. At regional scale geomorphology and climate affect stream hydrology, sedimentation, nutrient input and channel morphology (Hughes et al., 1994). At more local scale land use through alteration of stream habitat can have significant influence on macro-invertebrate assemblage (Richards and Host, 1994).

Voluminous scientific works have been documented on the ecology of most of the important river systems of the world. During the last 20 years biodiversity in rivers, hill streams and associated water-bodies got sever set back as result of habitat degradation due to discharge of effluents into these water bodies, extensive use of pesticides in the catchment areas, input of both organic and inorganic substances from the upstream. Similarly during this period the fish biodiversity got reduced due to several reasons e.g. elimination of flood prone area as a result of water management practices, loss of breading grounds, drastic decline in fecundity, fragmentation of suitable habitat, breakup of fish community structure and food chain. One cannot deny the fact that the fish communities indicate the health of the water body; hence, quality assessment of various hydrological and ecological characteristics of a stream becomes essential for a better understanding of correlation of the
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fish fauna with its environment. Hora (1930) stated that, of all the factors, the strength of water current, high percentage of dissolved oxygen and nature of food, appears to have greatly influenced the evolution of fishes in hill streams. In the past several attempts have been made for the habitat restoration, to quote a few: river Thames in England for restoring the salmon, river Mississippi in the United States for total restoration of aquatic habitat and Ganga Action Plan in India.

The natural fishery resources of western Himalayas are immeasurable but during the last few decades the Himalayan streams like any other stream have been encroached by human being due to several factors e.g. construction of dams, tourism activities, extensive road construction, industrialization (especially in foothills) deforestation and population pressure. As a result these fishery resources have been declining qualitatively as well as quantitatively. Unfortunately, much information on the past history of most of the streams is not well documented because most of the areas are out of reach of the scientific community.

In the last few decades there has been increasingly greater emphasis on the deterioration of water quality of Indian rivers (Trivedy et al., 1990; Singh and Nautiyal, 1990; Kishor et al., 1998). Most of the rivers have been unmindfully used for the disposal of domestic and industrial wastes. For example the river Ganges that was considered as the embodiment of purity today is amongst the most polluted rivers of the world. Like major rivers in the plains streams in the uphills also have been subjected to pollution and human intervention.

Keeping in view the fast deteriorating conditions of our rivers and streams a survey of different streams of western Himalayas (Himachal Pradesh and Garhwal region) was carried out to select the study sites to get a composite picture of the stream ecology vis-à-vis fish life.