



## A Classification System for Streams and Watersheds in Rivers of Kerala for Effective Watershed and River Basin Management: A Case Study in Chalakkudy River

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### Abstract

The paradigm shift of natural resource management had been shifted to watershed based in the early 1970s in Kerala, but the conceptual and ecological shift for integrated watershed management assimilating the concept is still ambiguous. The Watershed Atlas and classification of the 44 rivers into small watersheds of 500ha, i.e. Microwatersheds is the main document used. It is imperative that the area alone not determine the property of a watershed but is determined by the factors such as topography, slope, rainfall ultimately the drainage density. A micro watershed in a flood plain is entirely different from a watershed with the same area in hilly terrain. The streams were mapped for the Chalakkudy River and categorised into its orders (1<sup>st</sup> order, 2<sup>nd</sup> order etc.) All the tributaries were numbered clockwise manner, and each stream was classified with a letter indicating order and numbered. Hence, properties of the stream can be obtained from the code indicating the stream order and number. This is proposed as an addition to the classification of each micro watershed in the river basin for an effective landscape – river basin – watershed level resource management. This could be adapted to other river basins as well and can contribute to effective communication and standardisation of river subunits in a restoration process.

**Keywords:** The Western Ghats, Stream classification, Ecology, Tropical

### 1. Introduction

Rivers are the complex natural ecosystems which connect all the ecosystems in a mountainous landscape. The Kerala state is blessed with 44 rivers, the catchments in the Western Ghats receives more than 300cm of rainfall. The Western Ghats has an intense influence on the distribution of rainfall over the region (Simon and Kumar, 2004). The undulating topography created by the Western Ghats, its varying microhabitats, along with rich biodiversity, brought this land as one of the beautiful landscapes on earth.

The streams classification first developed in Davis and the additional classification systems are adding the stream classification (Davis, 1899; Melton, 1936; Matthes, 1956). The classification of streams assists in organizing the observations of river data and moulding the many pieces together into a logical, useable, and reproducible system (Rosgen, 1994).

The river basins have been recognized and acknowledged as basic and optimal units for planning, management and conservation of natural resources (UNCED, 1992; Brooks and Eckman, 2000; UN, 2006). Hydrologically, the watershed is an area from which the runoff flows to a common point on the drainage system. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. It plays a crucial role in determining food, social, and economical security and provides life support services to rural people (Wani *et al.*, 2008). A watershed also called as a drainage basin or catchment area is

delineated as an area in which all water flowing into it goes to a common outlet. Watershed management is a form of ecosystem management, and it is an interactive process of integrated modifications of lands and waters within a watershed (Vannote *et al.*, 1980).

The watershed atlas (1996) provides maps and other relevant basic information including watershed characteristics, geography and climate 44 river basins of Kerala. Classification of the watershed as Micro, Mini, Milli watershed which is a classification based on the watershed area or extent and that has been in used identification of micro-watersheds in Kerala to have watershed level programs and planning. But the watershed characters from hilly terrains to plains differ even-though both are micro, mini or milli-watersheds with the same area of extent. Hence the watershed atlas could not reflect the nature or characteristics of watersheds, which is more dependent on drainage density and order of the streams. Identification of major streams and its classification based on stream characters and its integration into higher levels of watershed units (sub-basin and river basin) is important in ensuring the continuity of watershed-based planning and implementation.

The Chalakkudy river basin is mapped for its drainage; each stream was mapped, numbered, ordered and classified into respective micro and macro watersheds. A classification system for the streams is attempted here as an addition to the watershed atlas for more effective and scientific communication for integrated watershed management.