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Wetland Plants

A Source of Nutrition and Ethno-medicines

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This book is dedicated to our teachers and parents

Foreword

The Himalayan region has many wetlands of different sizes and shapes, which make it a distinctive ecosystem that fulfills an essential function in the overall water cycle of the basins. Wetlands found in the Himalayan region are important as they provide shelter and food to living organisms. Pastures on the banks of wetlands are used for grazing and have also been known as the home of several rare endemic species of fauna and flora.

The biodiversity of wetlands has great economic and aesthetic value, and this diversity is helpful in maintaining overall environmental health. Most people around the world depend on aquatic resources for food, medicines, and commercial purposes such as tourism and fishing. However, due to many reasons, these wetlands are facing serious threats. Data included in this illustrated wetland guide will help readers, regardless of their botanical background, recognize the plants included in this book.

The main purpose of this book is to explore the wetland flora of the Himalayan region, to identify those plants that are beneficial to mankind, and to inform people about the challenges faced by these wetland areas and the strategies adopted for their conservation. This book not only helps with identification of wetland plants, but also helps in conservation and protection of most valuable resources.

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Preface

Wetlands are a major feature of the landscape in all parts of the world, covering nearly 6% of its area (i.e., 8.6 million km^2). They are the ecotones between terrestrial and aquatic ecosystems, have unique hydrologic functions, and are extensively utilized for the sourcing of food, medicine, etc., along with shelter, thus forming dynamic and significant ecosystems needed by all living beings. Such lands include bogs, fens, marshes, peatlands, moors, swamps, bottomlands, and mangrove forest areas that may be wet year round or during certain periods of time.

Unfortunately, most wetlands and water bodies are under increasing threats as they are drying up rapidly due to various man-made impacts. Many of them are now transformed into other land forms, such as paddy fields, human settlements, and sites for developmental projects. These aquatic life forms play an important role in supplementing human diet and nutritional balance; besides, they also support the livelihood and income of a considerable section of society living around them. Unfortunately, there is little recognition of wetland landscapes for their current and potential value in supplying dietary food items. As 38% of wetlands in the country have been lost in the past 10 years and many more are under threat, there is a need to take up ethnobotanical surveys of important resources that are used locally so that an action plan can be developed to protect the ones in extensive use.

The aim of this book is to identify the most common edible wetland plant species that are either used for food or medicinal purposes or both, the nutritional values of edible wetland plants, and species that need immediate attention for conservation as per local perception as well as based on the extent of the pressure. It is expected that this study will not only document the local knowledge for the use of these plants, which may be lost in the near future as traditional cultures are eroding day by day, but also help in maintaining a linkage between local culture and its ecosystem, which is of utmost concern for the conservation of the local environments.

This volume provides complete, comprehensive, and broad subject-based reviews for students, teachers, researchers, policy makers, conservationists, and NGOs interested in the field of biodiversity and conservation of wetland plants.

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We wish to express our gratefulness to our respective family members for their cooperation during collection of plants. We are also thankful to all those who could not be mentioned individually, but their direct or indirect help is highly appreciated.

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Chapter 1
Wetland and Wetland Plants

1.1 What Are Wetlands?

A wetland is a diverse ecosystem of the world that is covered by water, either seasonally or permanently, where oxygen-free approaches succeed. The main feature that differentiates wetlands from other lands or water bodies is the typical flora of aquatic plants, which are adapted to the distinctive hydric soil. They are associated with many functions which includes purification of water, storage of water, processing of nutrients and carbon, maintenance of shorelines, and support to fauna and flora. They are also considering as a most diverse ecosystem on earth providing habitats to many plants and animals species. Whether any single wetland plays those features, and the way to which it does them, depends on features of that wetland and the waters and lands in their surroundings. Procedures for quickly evaluating these features, ecological health of wetland, and general condition of wetland have been established in various areas and have added to wetland protection partially by educating public through awareness programs about the functions and the services of ecosystem provided by wetlands.

Naturally wetlands occurred in every part of the world. Wetland consists of three types of water brackish, salt water and fresh water. The main types of wetlands are marsh, swamp, fen and bog; sub-types consist of flood plains, mangrove forest, vernal pool, mire, sink. Peatlands are also included as a type of wetlands. Wetlands can be non-tidal or tidal. Many wetlands are intermediate areas among aquatic ecosystems and uplands, though some are dispersed throughout the landscape in highland depressions that assemble water or in areas where ground water approaches the top surface.

The amount of water in wetlands highly depends upon the rate of precipitation on that area. Some wetlands are totally flooded while others are seasonally flooded but keep saturated soils during the drought period. When the wetlands are rarely flooded still they have ability to provide saturated soil which supports wetland-adapted

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vegetation and for hydric soil features to grow. Development of hydric soils takes place when chemical changes occurred in the soil due to the oxygen deficient environments linked with extended saturation.

Depending upon the hydrology of water different communities of plants are observed in different kinds of wetlands. The plants that grow on these wetlands are termed as hydrophytes which mean water loving plants and the produce special structures to survive in these areas. Many insects, birds, and other animal species are totally dependent on wetlands to complete their different stages of life cycle, also some species use while many other wetlands for resting, feeding or other activities.

1.2 Defining Wetlands

In the above mentioned paragraph we can describe all the features of wetland clearly but still there has been a lot of argument done to precisely explain what creates a wetland. A practical definition turn into serious in organizing habitat for legal resolutions, particularly in identifying which lands are protected by federal and state laws. Finally in 1979 the U.S. Fish and Wildlife Service defined wetlands as:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water.

Wetlands have one or more of the following 3 characteristics:

The land supports largely hydrophytes;
The substrate is mostly un-drained hydric soil
The substrate is saturated with water or covered by shallow water at some time throughout the developing season of the year.

Keddy (2010) defined wetland as "an ecosystem that rises when accumulation by water creates soils dominated by aerobic and anaerobic processes, which in return, forces the rooted plants to adapt themselves for flooding."

1.2.1 Ramsar Convention Definition

According to Ramsar international wetland conservation wetlands are defined in two ways (Figs. 1.1, 1.2, 1.3 and 1.4):

> Wetlands are regions of fen, marsh, peatlands, whether artificial or natural, temporary or permanent, with water that is flowing or static, brackish, fresh or saline, including regions of sea water whose low tide depth does not increase from six meters.

> Wetlands may include riparian and coastal regions nearby the wetlands, and bodies of marine water or islands deeper than 6 meters at low tide lying inside the wetlands.