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BOOK REVIEWS

HOW TO STUDY WETLANDS?

Anderson, James T. and Davis, Craig A. (Editors). 2013. Wetland Techniques. Volume 1: Foundations. xii + 459 pages. 131 illus., 89 illus. in color. Springer, Dordrecht, The Netherlands. ISBN: 978-94-007-6859-8 (soft cover). € 74.99.

Anderson, James T. and Davis, Craig A. (Editors). 2013. Wetland Techniques. Volume 2: Organisms. xii + 332 pages 59 illus., 34 illus. in color. Springer, Dordrecht, The Netherlands. ISBN: 978-94-007-6930-4 (softcover). € 74.99.

Anderson, James T. and Davis, Craig A. (Editors). 2013. Wetland Techniques. Volume 3: Applications and Management. xii + 270 pages. 47 illus., 35 illus. in color. Springer, Dordrecht, The Netherlands. ISBN: 978-94-007-6906-9 (softcover). € 69.99.
Three volume set price: € 199.99.

Wetlands, which were once treated as wastelands, have been receiving increasingly greater attention. First they were recognised for supporting large populations of resident and migratory waterfowl diversity but soon many of their functions and values ranging from high production to regulation of floods and droughts, water quality and climate change were discovered. Wetlands remain the only ecosystem for whose conservation and wise use an international convention - the Ramsar Convention was adopted as early as 1971. Wetlands include however a very wide range of inland, coastal and marine habitats which have been investigated for many decades and naturally, the researchers relied on methods drawn from difference disciplines such as soil science, limnology, terrestrial ecology, , and many others. Over the past 40 years or so, has emerged a distinct discipline of wetland science and management that can now be considered to have come of age with many books, journals, courses, research centres and institutes, specialised professional organisations and conferences, which cater to the needs of the students, researchers, managers and also policy makers. In this context, the three volume compendium on 'Wetland Techniques' drew special attention because for the first time the researchers who depend upon widely scattered resources, could expect all the methods necessary for studying wetlands in one place.

I wondered how could the methods for studying so diverse kinds of wetlands from so different climates be easily described in just over 1000 pages. It is indeed a stupendous task. But soon going through the Preface itself I realised the limited sphere of the volume with respect to the diversity of world's wetlands. The editors define wetlands as "lentic systems that take on characteristics of both terrestrial and aquatic systems" and restrict the scope of the volume largely to inland freshwater wetlands of the United States. An interesting and useful feature of the volumes is the inclusion of a comprehensive list of references, and a number of exercises for the students to work upon in the class room, field and laboratory. First, let us examine each of the three volumes.

The First Volume is devoted to those aspects which characterise wetlands and help delineate them. These include the three main components - hydrology, soils and vegetation, which constitute an integral part of the wetland definition by the U.S. Fish and Wildlife Service (Cowardin et al. 1979). The volume begins with a chapter on Study Design and Logistics which deals with the fundamental aspects of any study- the sampling in the field from a large population, and the effect of sample size. It describes basic concepts such as replication, treatment, randomization, selection of variables, etc. in the context of wetlands.

The second chapter provides a comprehensive account of Bathymetry and Mapping of wetlands by using a wide range of survey techniques - from simple manual wading in shallow wadeable wetlands to the use of GIS and remote sensing. The example of Molera wetland (in fact a constructed treatment wetland in California) is used to describe the method and the same is included for the students' exercise.

The next chapter deals with the methods of Wetland Hydrology in considerable detail. It follows a water budget perspective. The chapter includes several methods for stage measurement and converting them into volume; measuring precipitation; direct measurement of evapo-transpiration as well as its estimation from energy balance; stream gaging and estimation of river discharge; and assessment of inflows and outflows from wetlands. Inflows are assessed from both diffuse overland flows and from rainfall-runoff relationships. The hydrological methods also cover the groundwater inflow and outflows, estimation of hydraulic conductivity and direct seepage, as well as soil water content. I did not find something on recording the duration and amplitude of periodic water level changes within a wetland that will of course require monitoring water levels over a year.

Next chapter describes the characteristics of Hydric Soils and techniques for their identification. According to the National Tecnical Committee for Hydric Soils, these are soils formed under conditions of saturation, ponding or flooding long enough during the growing season to develop anaerobic conditions in the upper part. The definition by the National Food Security Act adds that the hydric soils should support the growth and regeneration of hydrophytic vegetation. The chapter provides a very detailed account of the soils, extending from definition to general soil characters such as texture, bulk density, hue, colour, parent material and the role of topography.

It describes the formation of hydric soils and various processes in them such as anaerobiosis, sulphate reduction, organic matter accumulation, depletion of iron and manganese, and different redoximorphic features. It describes various physical and field indicators, and also points out that some soils may not have typical physical indictors. Field indicators are often valid for specific land resource regions. Both classroom and laboratory exercises are devoted to identification of field indicators.

The next chapter deals with the common phytosociological methods methods of sampling and analysing the wetland vegetation. It elaborates upon the choice of wetlands along with the time and scale of sampling, and describes the plot methods, plotless methods and releve (transect) methods of sampling in different situations. For data analysis, multivariate methods of classification and ordination are described together with the most commonly used diversity indices. The issues related to hydrological abd/or topographic heterogeneity are discussed. Whereas most methods apply for emergent and terrestrial species, 'bring the plants to you' approach by using rakes or frames is recommended for deepwater habitats.

Monitoring of water quality in wetlands that is covered in the next chapter, begins with a useful account of hydrologic, landscape, internal and temporal factors influencing water quality and also discusses the role of wetlands in improvng it. The authors of the chapter have done very well by referring to many available texts on methods of water quality analysis and restricting their task to summarising in a table the methods, sample size, preservation, etc. for all major parameters of interest.

The last chapter of the first volume deals with the methods for studying biogeochemistry of wetlands. After discussing the role pf plants and microbes, and wetting and drying cycles, the chapter covers in detail the cycles of carbon, nitrogen, phosphorus and sulphur, and the measurement of Eh/redox status. Carbon cycle is covered with methods for the estimation of tree and herb biomass, fine root biomass, litterfall and its decomposition (litter bag method, cotton strip method and soil respiration), and methane emission. Emergent vegetation of wetlands is known to have a larger proportion of belowground biomass than aboveground but only the clipping method is described to determine the herbaceous biomass. Methods for estimating the bulk density of soils and their organic matter content as well as the gain and loss of sediments in wetlands are also described. The use of FeO paint coated PVC tubes (IRIS tubes) or plates is recommended for sulphide determination of sulphides.

The Second Volume of Wetland Techniques is devoted to the study of a wide range of organisms- from microbes to mammals. The first chapter on algae begins with their biology, phylogeny and habitats, and groups them into planktonic, benthic (epipelic, epiphytic, epixylic) and metaphyton. Methods for collection, identification, enumeration and preservation of algae are by those for the estimation of the algal biomass, biovolume, pigment concentration, extracellular enzyme activity and nutrient content. Methods based on biomass, oxygen and ^{14}C are described for for estimating algal productivity. The chapter further includes a discussion on N and P limitation.

Methods for the study of soil bacterial community in wetlands constitute the second chapter. It covers techniques from sampling, transport, storage and processing to the isolation and identification of bacteria. Methods for preparing culture media and isolation and cultivation of strains are included. Significantly, the authors describe also the molecular techniques which are now gaining prominence. Wetland fungi are described in some detail in the next chapter. The distribution of various groups of fungi in different microhabitats and their role in wetlands are discussed. Slime molds (myxomycota) and lichens are also considered but only general methods are given for their sampling and analysis (culture and/or identification). However, the student exercises include isolation and biodiversity, and culture using baits which are also discussed only briefly without much detail.

The chapter devoted to Protozoa describes first their biology, reproduction and nutrition, and then the methods for collecting samples, concentration of organisms and their identification. It describes in some detail a case study of a constructed wetland in Germany, and in conclusion, highlights the need for rapid sensitive techniques for various pathogenic protozoans.

The next chapter on investigation of aquatic and terrestrial invertebrates in wetlands provides fairly detailed account of sampling the organisms by using open cyclinders in water columns, emergence traps, activity traps, sweep nets, etc. For terrestrial organisms, the use of various kinds of nets and traps is explained for both flying (aerial nets, flight intercept, light traps and sticky traps) and non-flying invertebrates (sweeping nets, aspirators, vaccuum samplers, pitfall traps, mist nets). The chapter further discusses the processing of samples, sieving, killing and handling of live samples, and identification. It includes a section on making binary identification keys but for some strange reason uses the example of organisms other than invertebrates. The Table entitled "simple key for biological objects" (page 191) is not only unrelated but, to say the least, also unnecessary as it tries to differentiate between squirrel and turtle, and maple tree and fescue grass which do not require a key even by a layperson.

Monitoring and assessment of fish are addressed in the sixth chapter. Fish are an important component of wetlands biodiversity and data on their abundance, community structure and productivity provide valuable insight into the condition and health of a wetland. The authors aptly begin with the fact that numerous transient fishes use wetlands seasonally and describe the constraints in fish sampling because the fish community is affected by seasonal and ontogenetic changes in wetland use by transient and resident fish as well as the hydrologically dynamic (periodic water level changes) nature of the wetland habitats. The chapter provides fairly detailed account of various sampling gears - the active ones (moving gear to fish) and passive ones (fish moving to the gear) and how the boats and gears are affected by depth and bottom substrate. Other techniques include pushnet and light traps for larval fish, electrofishing (influenced by abiogenic and biogenic turbidity and water chemistry) and also the use of explosives and toxicants. Fish marking, telemetry, hydroacoustics, hooks and lines, and baited traps are also discussed.

The final chapter of this volume deals with wildlife which include the avian fauna- the most important components the wetlands are known for and that lied at the center of wetland conservation movement. The chapter describes various kinds of waterfowl, shorebirds, marsh birds, songbirds, etc. and methods for their census oand monitoring. Other wildlife covered in the chapter include

terrestrial and aquatic herpetofauna (reptiles and amphibia), raptors, bats, rodents and carnivores. Live and pitfall trapping methods as well as surveys based on camera traps, tracks and signs are discussed for different groups. Student exercises focus upon herpetofauna, birds and small mammals.

The third volume deals principally with different aspects of management of natural and human-made wetlands. It begins with a discussion of biological response to stressors, anthropogenic influences, mitigation of impacts, restoration of degraded wetlands and its evaluation over time. This is followed by a description of the Index of Biological Integrity (IBI) as a tool to ascerain the condition of a habitat or resource with respect to its biological communities. The IBI can be based on different taxa such as birds, amphibia, fish, plants or macroinvertebrates. Major part of the chapter describes in detail the designingand building of an IBI with the help of an example from Wesr Virginia using a birds based index.

Second chapter examines wetland classification. After a brief historcal account, it describes in detail the Hydrogeomorphic (HGM) classification which groups wetlands into riverine, depressional (playas and potholes), slope, mineral soil flats, organic soil flats, estuarine fringe, and lacustrine fringe wetlands. The source of water and hydrodynamics for each wetland, as well as hydrologic biogeochemical and habitat related functions of wetlands are described. It is followed by a detailed account of applying the HGM classification in the field for functional assessment of wetlands. The classification and functional assessment are again discussed as classroom exercises and laboratory exercises.

The next chapter entitled Wetland Design and Development deals with the creation and restoration of wetlands. Restoration has to be based on an understanding of the type of wetland that occurred there in the past or is appropriate, the key ecological processes that created and sustained it, the changes that have occurred in the landscape and wetland attributes, and of the needs for restoration as well as the management objectives and capabilities. The chapter addresses these aspects before describing the techniques for land survey and topogaphic restoration, construction equipment, hydrological considerations (water source, movement, control structures), and aspects of vegetation establishment such as factors affecting germination. An example of Duck Creek Conservation Area is included. Developing a general design for restoration of a degraded wetland constitutes the only laboratory exercise.

The chapter on management of wetlands for wildlife introduces the general principles, wetland characteristics and succession, and the annual cycle of wildlife such as waterfowl, shorebirds, amphibia, reptiles and mammals. Among the inland wetlands, prairie wetlands, moist soils, forested bottomlands and agricultural fields are covered by a description of techniques for their management, whereas issues of salinity, water level, vertical accretion (or sediments) and fire are discussed for the management of coastal wetlands. A brief note on regulations and permits is also included.

Globally wetlands are recognised now for their numerous ecosystem services that transcend far beyond the original concern for them as habitats for waterfowl and other wildlife. The chapter on ecosystem services elaborates upon the sustainable management paradigm based on wetland functions and processes, and uses the HGM approach to wetland typology for discussing the ecosystem services of different kinds of wetlands. The chapter concludes with a brief account of economic valuation of ecosystem services. In their discussion on the limitation of the economic valuation, the authors very rightly point out (page 212) that the 'valuation techniques usually target specific service rather than the whole system. Given the complex interactions among different services, the need to develop a systematic method of considering the full range of values provided by the wetlands is urgent and challenging:".

The concluding chapter of the volume introduces aspects of environmental education and interpretation with some application to wetlands. It us largely descriptive in nature in nature with little guidance in the form of methods or techniques though it offers tips for writing goals and objectives of interpretation, and for effective design of signages.

As mentioned earlier, the three volumes of Wetland Techniques focus on wetlands and students of only the United States and there also find practically no mention of the peatlands. It is somewhat surprising that wetland delineation which receives a lot attention in the United States, has not been covered. Various chapters differ in the scope, depth and style of presentation. Some chapters provide extensive theoretical background whereas others describe methods in finer details like those in a laboratory manual. The classroom and laboratory exercises at the end of each chapter are an important and useful aspect but lack uniformity in their presentation. The inclusion of applied aspects such as wetland management, restoration and creation (constructed treatment wetlands) in the third volume is very welcome feature but all of them deserved more detailed treatment. The authors should have also drawn attention to several comprehensive publications available on these aspects. Despite these few shortcomings, the three volumes make a very useful contribution which attempts to bring together the research methods from many disciplines that are required to investigate the wetlands, and thereby fill an important gap in wetland literature. The students of wetland science in the United States will undoubtedly benefit from these volumes. However, many of the methods can be readily followed by students in other countries and can be adapted suitably for local conditions. This initiative of the editors is likely to be followed up by similar efforts to revise, update and adapt the methodologies for wetlands in different parts of the world.

Cowardin, L.M.; Carter, V.; Golet, F.C. and LaRoe, E.T. 1979. Classification of Wetlands and Deepwater Habitats of the United States. US Dept. of Interior, Fish and Wildlife Service, FWS/OBS-79/31.

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MORE ON WETLANDS AND LAKES

Kar, Devashish. 2013. Wetlands and Lakes of the World. xxxv + 687 pages. 316 illus., 273 illus. in color. Springer, Dordrecht, The Netherlands. ISBN: 978-81-322-1023-8 (hardcover). € 169.99

After I had examined a couple of Encyclopedias devoted to lakes and wetlands, this volume was received with interest mixed with an element of curiosity about its scope and approach especially because it is a herculean task for a single individual to even list these ecosystems from the entire world. The description of the book on the publisher's website caused some confusion. It says, "The occurrence and description of wetlands in India with reference to those around the world is detailed in a sequential manner from local, provincial, regional, and national to global scenario". Then, it adds that "As Limnology and Fishery Science are interlinked, this book attempts to provide a holistic view of both the fields, along with their methodologies". Further, "the book also deals with a systematic, sequential and comprehensive treatment of the Limnology (physico-chemical and biological features) and Fisheries of the wetlands in India"; "it deals with the protocols of various Limno-logical methodologies" and "is a humble treatise to provide the undergraduates with a text concentrating on the common, fundamental features of all aquatic systems, and for the postgraduates, researchers, policy makers, administrators, etc. with the details of processes and applications with examples". It became clear to me that the author had no clear focus on the scope or the target readership.

As I browsed the contents and started reading the book, I got more confused about my own understanding of limnology, lakes and wetlands. The author does not take a clear position on the definition of limnology or wetlands except referring to the restricted and extended usage. This issue could be ignored if the author had not included oceans within the scope of limnology (p. 2). However, under the section 'Other Terminologies' the author abruptly switches to wetlands with an example from Sharavathi river basin in Karnataka. I discovered to my surprise that the entire para (p. 2-3) had been lifted verbatim from the Introduction of a publication by TV Ramachandra and Sreekantha (*http://wgbis.ces.iisc.ernet.in/energy/water/paper/con_Wetlands/Wetlands_index.pdf*).

Browsing a little further, I struggled to find why Malaysia was selected by the author to describe an example of limnological studies in a developing country instead of describing the science in India which he restricts to listing of a large number of references picked up randomly from an earlier review. I could again lay my hands on the source without effort but to my dismay that the text of the entire section 1.10 (p. 7-16) is copied verbatim from Ho (1995). Next nine chapters deal with lentic systems though the term is replaced by 'lakes' after describing the physico-chemical characteristics of 'lentic water' and 'lentic soil'. These chapters focus mainly on the laboratory methods for analysing a few parameters in water and soil instead of describing the variability across the range of lakes in the world. Only temperature, turbidity, transparency, pH, DO, free CO_2, alkalinity and conductivity are covered in case of water and in case of soils the parameters include temperature, texture, colour, moisture content, bulk density, conductivity, organic carbon, available P and K. Major nutrients in water have been ignored. The other chapters describes the lake classification, origin and evolution, lake hydrology, and lake biota (aquatic macrophytes, other organisms, and strategies for survival of aquatic organisms). A chapter inserted in between describes numerous lakes from different parts of the world. The descriptions and photographs have been copied from various sources - many available directly on the worldwide web. While material on Wikipedia may not be copyrighted, the author has ignored the copyright notice on the web and lifted material almost verbatim for the Section '6.9.2.1 The Highest Lakes in the World' (p. 120-126) from http://www.highestlake.com/highest-lake-world.html (copyright 2002 by Carl Drews).

Despite having come across such large scale blatant plagiarism, I moved to the chapters on wetlands - an area of special interest to me. The book devotes 400 pages (about 60% of the total) in 16 chapters to cover a very wide range of topics from history, definition, origin, evolution, biogeochemistry, hydrology, biota (flora, plankton, fauna and fishes), bio-logical adaptations, ecosystem development and classifi-cation. Innumerable wetlands from all continents of the world are described in seven chapters of which one is devoted to India. Habitat mapping of the wetlands using remote sensing and GIS is discussed in another chapter. Reading the chapters could easily bring out large variation in the style, language and content of different sections and often within a section. It became evident that the material has been taken from different sources but I am astonished that pages after pages have been copied verbatim from the well known book on Wetlands by Mitsch and Gosselink (2007); for example, p. 192-196 on definition of wetlands, p. 259-261 on ecosystem development, chapter 15 (p. 215-219) on wetland hydrology and so on. Changing a word from 'major' to 'principal' or leaving out a sentence does not absolve the author from plagiarism. The chapters describing various wetlands are still worse as not only the text is borrowed heavily from the web but even the photographs have been copied. In case of India, wetlands have been selected at random and the description is highly uneven. For example, Dal lake in Jammu & Kashmir is one of the most investigated systems, and there are several Ramsar wetlands in te State. However, the account of wetlands of Jammu and Kashmir (p. 387-388) is among the poorest, although it is partly covered in a chapter on high altitude water bodies. The brief para on a typical Kashmir Himalayan lake (p. 388) does not even mention the name of the lake for which only a bit of information on primary production is provided. It is difficult to understand the importance of the pieces of information on isolated components and long lists of biota.

The next group of chapters deals with aspects of fisheries as well as use, problems, management nd conservation of wetlands but the placement of these chapters is quite illogical. The fish catching devices (the large diversity of nets and gears) used in India are described first and then follows an account of the "instruments to harvest fish" - the fisherfolk. Instead of a general account for even the Indian fisherfolk alone, this chapter is based on the author's studies on some wetlands in Assam only. The last chapter of the book is a brief description of a few aspects of management of fisheries in Indian wetlands. Sandwiched between the chapters on fisheries is a casual account of potentials and problems of wetlands, various developmental activities and aspects of their management and conservation. Some aspects of human impacts

on wetlands such as siltation and eutrophication, hydrological alteration and exotic species are mentioned briefly in general and for several Indian states. The chapter on developmental activities refers to only aquaculture in Indian perspective whereas the chapter on management again focuses on fisheries and their community based management.

The book suffers badly from ethical viewpoint. Besides, text the photographs and tables are also plagiarised. In no case the source of photographs is mentioned throughout the book. Tables are extremely rare and with out acknowledgement of the source. Figures have not been used at all. The outline maps of location maps of numerous water bodies are of no value whatsoever. Majority of the photographs are very poor in quality, and in many cases nothing can be seen (e.g., p. 369, 384, 395, 424, 447, 448, 462, 464, 480, 498, 500, 513, 536, 538, 540). I could not find anything in the book to support the claim of the book to be "a handy guide for lab and field studies". Many parts of the text are totally without any reference, and the references at the end of each chapter are certainly not up to date. The summaries at the end of every chapter are generally repeated from the text. The hefty volume is neither suitable as a textbook in introductory course in limnology and wetland biology nor it can serve as a reference for research workers and administrators, policy makers, conservationists and environmentalists as claimed by the author.

Reviewing this volume leaves an impression that the publisher has also not cared to follow any guidelines for controlling the quality of the content and production or for preventing plagiarism. Such volumes may only dent the reputation of the publisher.

Ho, S-C. 1995. Status of limnological research and training in Malaysia. Pages 163-189, In: Gopal, B. and Wetzel, R.G. (Editors) Limnology in Developing Countries, Vol. 1. International Association of Theoretical and Applied Limnology, USA

Mitsch, W.J. and Gosselink, J.G. 2007. Wetlands. John Wiley, New Jersey, USA. 582 pages.

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