



**Silliman, B. R., E. D. Grosholz,
and M. D. Bertness (ed.) *Human Impacts
on Salt Marshes: A Global Perspective***

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“The state of our marshes is not good!” claim Brian Silliman, Edwin Grosholz, and Mark Bertness at the end of their edited book *Human impacts on salt marshes: A global perspective*. As I sit here writing this review, I can look out my window and see some of the expansive North Inlet salt marsh and I am skeptical. The cordgrass is growing well this year, perhaps helped along by the freshwater dumped from the regular summer thunderstorms that have played havoc with my field work. Water column nutrient concentrations are again low, which is usual for this well-flushed, ocean-dominated system. My vertebrate-loving colleagues tell me that there are plenty of fish (and dolphins, and sharks) in the tidal creeks. Everything is as it should be. But wait! Is that a small dieback area over there? And I think I see some *Phragmites* at the edge of the marsh. Are those periwinkles just hanging out or are they secretly plotting to mow down the entire marsh? Such is the paranoia that can grip a fellow after reading through nearly 400 pages documenting a suite of anthropogenic stressors that directly or indirectly affect salt marshes.

The basic objectives for the *Human impacts on salt marshes* book are to: 1) summarize the causes and consequences of anthropogenic impacts on salt marshes, both in North America and abroad, and 2) integrate this information and provide it to coastal managers to allow them to combat a range of threats and promote cohesive marsh conservation efforts. This edited volume contains 18 chapters (plus introductory and concluding text by the editors) by a total of 41 authors, almost a quarter of whom are located

outside the United States. While much of the book focuses on lessons learned from research in North American salt marshes, the international authorship helps provide the “global perspective” mentioned in the book’s subtitle.

The first part of the book covers Invasions in North American Salt Marshes. The global invasion of *Spartina* spp., with an emphasis on invasions along the Pacific coast of North America, is documented in Chapters 1 and 2. Chapter 3 discusses several examples of invasive animals and their impacts on salt marshes, while the fourth chapter provides a long-term perspective on native vs. invasive *Phragmites australis* in eastern North American marshes.

The second part of the book deals with Human Inputs and Consumer Effects and includes chapters on goose overgrazing in Arctic marshes (Ch. 5), periwinkle grazing and fungal farming in southern U.S. marshes (Ch. 6), and a hypothesized alligator-nutria-plant trophic cascade in marshes on the U.S. Gulf of Mexico coast (Ch. 7). These chapters provide compelling evidence that there are times and situations when top-down control can limit primary production and affect ecosystem structure and function. I think that Keddy and coauthors have it right in Ch. 7 when they suggest that salt marshes are controlled by a combination of both top-down and bottom-up factors. There is just too much evidence for both modes of ecosystem regulation to believe that salt marsh food webs are exclusively top-down or exclusively bottom-up regulated.

Land Use and Climate Change are covered in the third part of the book. Two chapters use New England marshes as a case study on the effects of shoreline development (Ch. 8) and tidal restrictions and ditching (Ch. 9) on the biological and physical properties of salt marshes. Chapter 10 is a wide-ranging chapter that covers marsh

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responses to sea-level rise from the early Holocene to the present and into the future. The final chapter in this section discusses the long-running elevated CO₂ study at the Smithsonian Environmental Research Center as a heuristic model for understanding the impacts of elevated CO₂ on salt marsh plant interactions and carbon cycling.

The fourth part of the book, Die-off, Loss, and Conservation, explores timely issues including potential causes of large scale sudden salt marsh diebacks that have been reported in the last decade throughout the eastern United States (Ch. 12) and spatio-temporal patterns of permanent marsh loss due to marsh “reclamation” (i.e., filling) and hydrologic alterations within coastal North America, from presettlement to the present (Ch. 13). The final chapters in this part of the book focus on restoration and conservation of salt marshes in the northeastern U.S. (Ch. 14) and U.S. Pacific coast (Ch. 15). As a non-practitioner of wetland conservation and restoration science, I learned a lot about the principles, planning steps, and considerations that need to be addressed to maximize the chances for a successful wetland restoration project.

I also enjoyed the last part of the book—International Perspectives—where individual chapters talk about the distribution and current threats to salt marshes in Europe (Ch. 16), South America (Ch. 17), and Australia/New Zealand (Ch. 18). Each of these chapters is laid out similarly; an overview of salt marsh distribution is followed by a presentation of historical salt marsh uses/threats, and then by a discussion of current and future threats to salt marshes. Having grown up and spent my entire professional career on the Atlantic coast of the United States, I have to admit that my perspective on wetland issues is geographically limited, so these chapters contained a wealth of information that was new to me. My favorite quote from the book is also in this section. In a discussion of why relatively little is known about fauna in Australian salt marshes, Thomsen and coauthors (Ch. 18, p. 375) note, “tropical salt marshes provide habitat for the salt water crocodile ... which may be a disincentive for fieldwork!”

Individually, each of these 18 chapters does a very good job of covering specific human impacts on salt marshes. I learned a lot by reading this book, and I intend to go back and re-read many of the chapters after I submit this review. The chapters are largely well-written and the figures/photos/tables are clear, large-enough, and readable. One thing that detracted from this book was the abundance of errors (typos and otherwise). Several examples: In multiple places, the IPCC is mistakenly referred to as the International (instead of Intergovernmental) Panel on Climate Change (p. 244, 320, 372). Carbon dioxide is most commonly measured with an infrared gas analyzer, not an infrared gas chromatograph

(p. 214). As far as I can tell, the Pacific Estuarine (*sic*) Research Laboratory does not exist (p. 294). There is at least one instance where the lead editor’s name was misspelled in a citation (p. 111, in his own chapter, no less), and I noticed some other misspelled author names elsewhere. There were enough errors that they were a moderate distraction in an otherwise well-prepared volume. More careful proofreading by the authors and editors would have been appreciated.

Collectively, this book *almost* does as good a job as the individual chapters in covering the scope of human impacts on salt marshes. Before I started reading the book, I compiled a checklist of stressors that I felt should be covered in a book on human impacts. At some level, all of the stressors on my list were covered in the book. In my opinion, however, the editors missed a major opportunity by not including a chapter that specifically examined the effects of nutrient enrichment on salt marshes. There are specific chapters on sea-level rise and elevated CO₂ so it’s not as though the book is structured so that only case studies and broad geographic perspectives are presented. In the editors’ defense, multiple chapters do mention nutrients or eutrophication, but this does not do justice to the decades of research that have been conducted in this area. In an informal poll of several colleagues, nobody could identify a single resource (e.g., article, book chapter) that summarized all aspects of how increasing nutrient supplies affect salt marshes, from plant production and community dynamics to food webs to biogeochemical transformations to marsh elevation changes. I would argue that such a chapter should be an integral part of any consideration of human impacts on salt marshes. Given that one of the emphases of the book is to “provide coastal resource managers with information necessary to identify and ameliorate human-induced threats,” I simply cannot understand why extensive information about a stressor (nutrient loading/eutrophication) that feasibly can be controlled/ameliorated on watershed-to-regional scales (in contrast with sea level rise and rising CO₂, both of which are global in scope) is not included. This is a major omission.

I started this review with a quote from the last pages of the book, so it seems appropriate that I end with a question from the beginning of the book: “Are salt marshes at risk?” The answer, as marsh ecologists, conservation biologists, and resource managers should know, is a sobering “Yes.” Even though marsh “reclamation” for agricultural or development purposes has dramatically slowed from historical rates, salt marshes still face many, many threats that will affect the structure, function, and even existence of salt marshes over the coming century. I think that this book deserves to be widely read—it compiles and synthesizes recent work on many threats into a single volume that can serve as a valuable resource

for researchers, conservationists, and managers—but I also feel that there is a significant hole in it. My suggestion is that purchasers of this book print out copies of several salt marsh / nutrient loading papers and keep them with the book. As examples, I suggest the following recent articles as they collectively address many aspects of nutrient effects on salt marshes: Caffrey et al. (2007; microbial and biogeochemical responses), Deegan et al. (2007; plant/algal/bacterial/invertebrate/nekton responses), and Langley et al. (2009) or Turner et al. (2009; both examined belowground biomass responses and marsh elevation changes). Until this book is revised with a chapter that synthesizes the extensive work on the impacts of excess nutrients on salt marshes, a journal article or two stapled into the book will have to do.

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