Pulsing sheetflow and wetland integrity

In the April Review by Sklar *et al.* (*Front Ecol Environ* 2005; **3(3)**: 161–69) one section is entitled "Animals beset with flood and drought". Traditionally, people were beset with flood and drought; the major foci of water management in South Florida were flood protection and water supply (Davis and Ogden 1994). However, the measures introduced for these purposes brought about a series of unexpected impacts, leading to the deterioration of the Everglades. The Comprehensive Everglades Restoration Plan (CERP), which was a focus of the Review, was initiated to reverse this deterioration and to restore the integrity of ecosystems by "getting the water right".

Flood and drydown are recurrent pulsing events characteristic of many wetlands. These ecosystems have evolved with natural hydrologic pulses (Odum *et al.* 1995), which maintain the diversity of native species, the integrity and health of wetland ecosystems, and the ecosystem services that the wetlands provide (Junk *et al.* 1989; Dong 2005). This is also true for the Everglades (Davis and Ogden 1994). Yet Sklar *et al.* do not mention the need for this kind of hydrologic pulse in the Everglades.

In the predrainage Everglades, a sheet of water would rise and inundate almost the entire marsh area in the wet season; with the arrival of the dry season, the water table receded into the ground and a mosaic of connected sloughs and isolated waterholes formed (Douglas 1947). It was this pulsing sheetflow that characterized the natural hydrology and shaped the configuration of the Everglades ecosystems. This pattern had many important features: a large pulse magnitude, including extreme high–low events; rain-dependent frequency; distinct seasonal timing and temporal patterns involving particular change rates and durations; broad spatial coverage, with expanding and shrinking water fronts; parallel directions; slow and uniform currents; and spatial continuity and connectivity. In the past century, canals, levees, landscape compartmentalization, and water control operations severed the continuous surface sheetflow, altered flow directions, changed flow vectors from the predrainage conditions, created artificial upstream and downstream pulses, reversed or altered temporal patterns, and decoupled hydrologic pulses from climate seasonality and the phenological rhythms of the biota. As a consequence, the abundance of native species declined, extinction risks increased for endemic subspecies, native biodiversity decreased, non-native species invaded the region, food web structures became distorted and destabilized, and nutrient cycling and fluxes were altered (Davis and Ogden 1994). These impacts severely damaged ecosystem functions and services.

It would be misleading to suggest that animals are *beset* by flood and drought. Rather, natural hydrological pulses with a large magnitude is the necessary condition for the health of animal communities and the integrity of the Everglades ecosystems. This is not just a semantic matter; it represents a potential conflict between the integrity and health of natural wetlands and the short-term demands of particular interest groups. The desire to keep water stable for flood control and water supply may compete with the ecosystem's need for pulsing sheetflow at various locations and times. I would argue that the restoration of pulsing sheetflow should be one of the primary objectives for CERP. Without the restoration of the pulsing features and the spatial continuity and connectivity of the surface sheetflow in the major portion of the central Everglades, its achievements will be severely compromised.

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Women in Ecology

In their article in the May issue, Damschen *et al.* (*Front Ecol Environ* 2005; **3(4)**: 212–19) investigated how current undergraduate ecology textbooks portray the role of women scientists. They found that women are only rarely portrayed as founders and innovators in ecology, and are less likely than men to be presented as working scientists, cited as scientific reviewers, shown in illustrations and photographs, and listed in the book indices. Damschen *et al.* recognize that, in the past, there were fewer women ecologists, thereby reducing opportunities for their representation in current textbooks, and they do not argue that textbook writers deliberately exclude the work of women scientists from books. Nonetheless, they focus on textbooks as a means of highlighting the work of women scientists, suggesting that a policy of deliberate inclusion in texts will create a more positive atmosphere for women in ecology and improve the retention of women scientists.

This is an admirable goal, but placing the burden on textbook authors is probably mistaken. Authors writing textbooks in any field seek to present the subject as effectively as possible to aid learning. The atmosphere in the

classroom, however, is developed principally by the instructor, not the textbook author. The instructor assigns the text, chapters, and supplemental reading for different topics – in short, deciding what information to offer students. In this context, textbooks are simply tools. Texts can include many examples of women in science, yet be ineffectual if the instructor treats female students with hostility or indifference. In the same way, instructors who are supportive of female students can offer encouragement, regardless of whether texts promote the activities of female scientists. Although this is admittedly easier if textbook examples exist, a committed instructor will make a point of adding appropriate supplemental materials to his or her curriculum – and women students will very likely respond, not so much to the curriculum, but to the support of the professor.

Women are hardly the only members of the scientific community who have historically been under-represented in the sciences. Throughout the 19th and 20th centuries, barriers existed for a variety of "minority" groups, based on ethnic, racial, gender, sexual orientation, or religious factors. These barriers certainly still exist, albeit more subtly. Differences in pay scales and tenure among scholars performing similar functions at universities are among the most commonly cited indicators of these barriers, and the slow pace of advancement among women overall in the sciences is apparent at all educational levels in the US. While textbook authors should highlight the work of women scientists where appropriate, we think that Damschen *et al.* overemphasize the impact of textbooks. Active mentoring of women students seems a far more effective means of redressing traditional inequalities than slanting textbooks to include more examples of women's scholarship (Primack and O'Leary 1993; Primack and Stacy 1997).

There is also a danger in advocating the adjustment of texts to achieve a social goal. Good science requires limiting observer-based biases. By recommending that authors deliberately skew data sources, Damschen and colleagues are infusing political motivations into what should be a balanced discussion of facts, hypotheses, and observations. Although we agree with their goals, we find the method unacceptable. Other efforts to alter science texts to promote a political or social agenda have already created major controversy (Olmstead 2002). We contend that it is vital that authors and publishers withstand these attempts and focus entirely on creating textbooks that are accurate and well organized discussions of the science at hand. We therefore argue against asking textbook writers to deliberately include examples beyond what is appropriate for teaching the subject. Authors face enough challenges in writing well-balanced books without having to incorporate social concerns better handled by instructors seeking to support their female students.

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Authors reply

We agree with Primack and Platt that course instructors are instrumental in creating positive learning environments and textbooks should "present accurate and well-organized discussions of the science at hand".

Our primary recommendation is not that textbook writers "skew data sources", but that they present the work of female ecologists at levels that match their representation in the field, which has not been the case historically and is not the case currently. Thus, we are not asking that writers "include examples beyond what is appropriate for teaching the subject", but rather that writers include examples that are appropriate for teaching the subject. We also suggest that a "balanced discussion of facts, observations, and hypotheses" includes discussing how scientists, who are inevitably influenced by cultural and societal norms, shape research priorities, questions, and methods. Such discussions reveal biases, create balanced research programs, and advance the field of ecology. These same arguments can extend beyond the scope of our paper to other under-represented groups.

We agree that the burden of including the contributions of women scientists should not be placed solely on textbook authors. However, textbooks provide insight into the norms of the scientific community that supplemental material cannot convey. Many instructors also use textbooks as a source of classroom examples; a dearth of coverage of the accomplishments of women scientists in textbooks will translate directly into a dearth of coverage of these accomplishments. Textbook authors have a unique responsibility to represent the face of ecology, and they have a special role to play in shaping students' perceptions of science.

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For Erratum section, please see page 51