Preliminary Comments on the Integrated Science Assessment (2nd External Review Draft) from Dr. Frank Gilliam

Comments on

1.8 Wetland Ecosystem Nitrogen Enrichment and Acidification

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This section of the Integrated Assessment highlights potential effects of excess N and, often related, acidification on a wide variety of wetland ecosystem types, from bogs and fens to coastal wetlands/estuaries. Full disclosure, I am not a wetland ecologist, so my comments need to be taken with that in mind. The section begins with an important distinction between most wetlands and their terrestrial counterparts—atmospheric deposition of N and S does not elicit acidification response in wetlands. Conversely, excess N can bring about numerous changes in many components that threaten the structure and function of wetland ecosystems. These include biogeochemistry and the ecophysiology of plants.

As stated in this section, the outcome of the earlier ISA is quite clear—*the body of evidence is sufficient to infer a causal relationship between N deposition and the alteration of biogeochemical cycling in wetlands*. On the other hand, both spatial variation and variation among types of wetland often preclude broad generalizations, wherein they can serve as either a source or a sink for a variety of N compounds. The figure referenced herein (Figure 11-2) is an extremely useful summary of quite recent N-manipulation studies examining N processing in contrasting wetlands, including coastal marsh, mangroves, riparian wetlands, and bogs.

The ISA is similarly clear regarding the effects of excess N on wetland biota—*the body of evidence is sufficient to infer a causal relationship between N deposition and the alteration of growth and productivity, species physiology, species richness, community composition, and biodiversity in wetlands*. A conclusion of responses highlight what is generally known about unimpacted wetlands, regardless of type: they are typically highly N-limited. Thus, the initial responses to added N is that they exhibit characteristics along a gradient toward N saturation. Initially, there is enhanced growth and net primary productivity, plant tissue N increases, along

with profound shifts in plant and microbial communities. These rates of these changes decrease over time, as these system move toward N saturation.

Similarly, biodiversity, particularly of wetland plant communities, declines in the face of N enrichment. This can be especially serious, considering the hallmark of wetlands as have such high plant species richness. Moreover, numerous endangered species can be threatened by excess N. Ultimately, this section highlights yet another parallel with terrestrial ecosystems regarding N enrichment. Excess N decreases abundance/richness of sensitive species, whereas it increases abundance/richness of tolerant species.

Comments on

1.4 Gas-Phase Direct Phytotoxic Effects

This brief section documents that little new work has been done the direct effects of SO_2, NO_2, NO, PAN, and HNO_3 on plants. Early conclusions, however, had been quite clear that that is a causal relationship between plant exposure to all of these and injury to vegetation.