Biogeosciences Discuss., 6, C257–C261, 2009
www.biogeosciences-discuss.net/6/C257/2009/

Biogeosciences Discussions

Interactive comment on "Effects of long-term flooding on biogeochemistry and vegetation development in floodplains – a mesocosm experiment to study interacting effects of land use and water quality" *by* A. M. Banach et al.

Anonymous Referee #2

Received and published: 1 May 2009

General

Shallow soils from two fields differing in prior land-use history (intensity of fertilization, mowing vs pasture) were collected and subjected to 9 months of continuous inundation with flood waters that differed in sulfate and nitrate concentrations. The paper is well organized and written, but in parts missing some key information.

The results especially for vegetation development are clear for the two fields measured. The results would be more generally applicable if sods had been taken from more than

one field of each type.

The discussion could be strengthened by more thoroughly incorporating details of other studies of floodplain biogeochemical and vegetation response to flooding but with varying experimental conditions such as timing and duration of inundation, quality of water or soil characteristics. It could further be strengthened by providing more details of local hydrology: pristine/natural, changed by flood control, and proposed changes.

Abstract

should be improved for clarity and content. Information needed to understand results is sketchy.

First sentence is too long and diffuse, with many important concepts, suggest breaking it down. Following is a suggestion as to the different thoughts being presented:

Raising safety levees and reinforcing dykes is not a sufficient/adequate and sustainable solution to the intense summer floods occurring with increasing frequency in Eastern Europe. An alternative, creating permanently flooded floodplain wetlands, requires improved understanding of ecological consequences. A mesocosm study was initiated to understand the role of previous land use (fertility intensity) and flooding water quality on soil biogeochemistry and vegetation development.

A clearer description of the study design here would help, including the length of flooding and the time (ie 9 months starting in January, under natural conditions of temp and light)

1 Introduction

Page 3266, line 4: does dyke replacement signify dyke elimination? Is dyke equivalent to a levee for flood control?

Page 3268, line 10: What is meant by permanently flooded? Is it permanent cover of water in fields, or is it a floodplain open to flooding by river when flood stage is reached?

That is, a reconnected floodplain subject to periodic naturally occurring floods.

2 Materials and methods:

The two meadows chosen for samples, do they have different land use histories by accident, or because they differ in some properties making them useful for only pasture or haymaking respectively?

Do they have the same hydrology/degree of connectedness to the adjacent river? Is the depth of water table, and frequency and duration of inundation similar?

Is the organic matter similar for both types of fields in terms of origin, quality and state of decomposition? What was the nature of the fertilizer used?

Soil is characterized for upper 20 cm, and the water table is normally below 30 cm. Does this matter? Soils with this high organic matter content and a water table that is lower than the peat should be somewhat oxidizing and losing elevation?

2.2 Experimental design

When were the sods removed from the field? After the growing season? How long were they acclimated before being flooded? What is the size of each sod?

What were the hydric conditions of the sods like prior to the beginning of flooding? Was the water table drawn down, or were the sods kept fully saturated?

2.3 Measurements and chemical analyses

What was the frequency of sample collection for water analyses? I didn't see a description of how surface waters were sampled except for turbidity. Probably more detail is needed here. Also, are there estimates or a record of the volume of water needed during the nine months to keep water levels 20 cm above the surface for all of the plots? How would this affect the chemistry of porewater and surface water?

2.4 Vegetation description

I think above-ground harvesting of vegetation occur twice, once after 6 months, 3 months prior to end of experiment (page 3271, line 25-26) and then after 41 weeks. Did this affect the data from fig. 6, which are after 41 weeks, and represent growth from week 24 to week 41? Did this influence other experimental results, such as porewater chemistry, regrowth of species? Some discussion/clarification may be useful.

2.5 Data analysis

Page 3272 line 12 and 13. sentence not needed, better shown on relevant tables.

3. Results

Consider leaving out the first sentence of second paragraph. Check to make sure each reference to table or figure is correctly identified. For example, Table 4b not found. For example, Page 3273, line 10. Is reference to table 4b correct? Table doesn't show changes in concentration of NO3 after 1 week.

3.1. Soil response to flooding

Consider combining figures 2 and 3 to 2a and 2b, and figures 4 and 5 to 4a and 4b. Possibly consider putting surface water text references in a paragraph following the porewater discussion, rather than mixing both media in one paragraph, for clarity and ease of reading.

3.2 Vegetation response

The results are clearly shown in Fig 6 for vegetation growth between 24 and 41 weeks. It may be helpful to graphically show the data from the period after 24 months.

I find tables 6a and b confusing and not helpful in the format used. Perhaps these data could be shown a different way?

4. Discussion:

In the discussion it would be nice to know what the natural floodplain flooding timing,

durations, depths and frequencies are for similar systems. Perhaps there are references? This would enable judgment of appropriateness of mesocosm design to help inform management decisions.

I would like to see some discussion on how continuous flooding of sods from January to October relates to proposed management changes in flooding regimes at the research sites. What is the expectation for vegetation development over many years with this kind of simulated hydrologic regime?

I would like to see a bit more detailed discussion and contrast of the different responses to short term summer growing season flooding compared with the long-term flooding. To some degree, this is included, but a more detailed discussion would be nice.

Can the strikingly different vegetation development from the two types of fields be fully explained by differences in water-quality response to flooding? What are other possible factors that were not explicitly addressed? For example, it seems to me heavy fertilization should affect soil organic matter properties beyond those chemical comparisons given in the table.

5. Conclusions

Page 3281 lines 23 to end expand just a bit.

Vegetation development was hindered in sods taken from the field that had had lots of prior fertilizer applications except if flood water was stripped of nitrate or sulphate. Are concentrations at these low levels realistic for many river systems? A few? Some hint at how applicable these conditions are in general would be helpful. Perhaps it is easier to find fields that have not had this history of fertilizer application, and concentrate floodplain rehabilitation on these types of fields, which apparently can handle higher river sulfate and nitrate concentrations, at least for a while.

Interactive comment on Biogeosciences Discuss., 6, 3263, 2009.