Hydrol. Earth Syst. Sci. Discuss., 6, C2057–C2066, 2009
www.hydrol-earth-syst-sci-discuss.net/6/C2057/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Nitrogen retention in natural Mediterranean wetlands affected by agricultural runoff" *by* V. García García et al.

V. García García et al.

viquigar@um.es

Received and published: 17 September 2009

Interactive comments on "Nitrogen retention in natural Mediterranean wetlands affected by agricultural runoff" by V. García García et al.

We want first to thank the Anonymous Referee 1 for his/her constructive comments of our manuscript. All his/her comments have been taken into account and responded below.

1. The Referee 1 wrote: "The authors calculate the mean retention efficiencies by setting any negative retention values to zero. Whilst this discounts these negative values, a better solution may be to report median retention efficiencies. This better

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

reflects on the source/sink character of wetland systems". Answer: We agree with the referee. We have included in the results of the revised manuscript (text and table 3) the median values of the retention efficiencies.

2. The Referee 1 wrote: "The authors report N species retention efficiencies, concentrations and loads. Whilst these measurements are important to understand these systems, catchment managers are mainly interested in Total N retention and efficiency. It would not be a difficult task to include Total N retention efficiencies, concentrations and loads, and this should then better support the author claims". Answer: We agree with the referee on the fact that catchment managers are usually interested in TN retention efficiency. Then, we have included in the table 3 of the revised manuscript the values of TN retention efficiencies, concentrations and loads.

3. The Referee 1 wrote: "Use abbreviation for Nitrogen (N) after first instance (line 23 p5342)". Answer: We agree with the referee and "Nitrogen" has been changed by "N" after the line 23 p 5342 in the revised manuscript.

4. The Referee 1 wrote: "The authors should differentiate between wetlands and wetland streams – the latter of which is the focus of this paper as it is not always clear in the test. Perhaps the term wetland-streams should be the default term for this study". Answer: We agree with the referee and we have used the term "wetland-stream" as focus of our paper instead of "wetland".

Specific comments:

5. The Referee 1 wrote: "Line 18 p5342 improve rather than improves". Answer: We agree with the referee and this change has been included in the revised manuscript.

6. The Referee 1 wrote: "Line 19 p5342 remove -a-". Answer: We agree with the referee and we have removed "a" in the revised manuscript.

7. The Referee 1 wrote: "Line 9 p5343 diffuse pollution is less easily controlled". Answer: We agree with the referee and this change has been included in the revised

HESSD

6, C2057–C2066, 2009

manuscript.

8. The Referee 1 wrote: “Line 24 p5343 . . .in conjunction with agricultural drainage and wastewater treatment systems. . .”. Answer: We agree with the referee and this change has been included in the revised manuscript.

9. The Referee 1 wrote: “Line 6 p5345 An understanding of. . . rather than To gain an understanding of. . .”. Answer: We agree with the referee and this change has been included in the revised manuscript.

10. The Referee 1 wrote: “Line 21 p5345 Refer to Table 1 as well as Fig 1 here”. Answer: We agree with the referee and your suggestion has been taken into consideration in the revised manuscript.

11. The Referee 1 wrote: “Line 24 p5345 Ephemeral rather than temporal”. Answer: We agree with the referee on fact that the “temporal” term is not the most appropriate term to illustrate the temporary water regimen of our studied wetland-streams. However, according to the different definitions of the “ephemeral” term we found in the revision that Uys and O’Keeffe (1997) performed about the terminology used to descript the temporary river regimes, and in the U.S. Environmental Protection Agency, if the referee agrees, we would prefer to use the “intermittent” term instead of “ephemeral or temporal” terms. The different definitions of the “ephemeral” term that we have found are: âŮŔ U.S. Environmental Protection Agency: “wetlands that temporarily hold water in the spring and early summer or after heavy rains, and dry up often in mid to late summer” âŮŔ Uys, M.C. and O’keeffe, J.H.: Simple words and fuzzy zones: early directions for temporary river research in South Africa, Environ. Manage., 21, 517-531, 1997: Bayly and Williams, 1973: Streams that flow only seasonally and usually drain semiarid regions. Matthews, 1988: Rivers that flow less than 20% of the time. Day, 1990: Rivers that run for short periods after rain has fallen high in their catchments. Jacobson et al., 1995: Rivers that flow only after strong rains have fallen over their catchments.

HESSD

6, C2057–C2066, 2009

The different definitions of the “intermittent” term showed in this same revision of Uys and O’keffe, 1997 are: Bayly and Williams, 1973: Streams that flow only seasonally and usually drain semiarid regions. Williams and Hynes, 1976; Towns, 1985; Boulton and Lake, 1988: Streams with relatively regular, seasonality intermittent discharge. William; 1987: Natural bodies of water that experience dry phase of varying duration. Matthews, 1988: Rivers that flow for 20%-80% of the year. Delucchi, 1988: Rivers that only dry in parts.

12. The Referee 1 wrote: “Line 23 p5346 How shallow was the water? What chance was there of sample contamination if the water was shallow?”. Answer: Surface water depth was between 0.5-10 cm. We have referred this value in the line 23 p5346 to the Table 1 in the revised manuscript. To collect the water samples, we always selected sampling points with enough water depth to avoid contamination by suspended solids from the sediments. Besides, water saples were taken very slowly with syringes.

13. The Referee 1 wrote: “Line 25-26 p5346 Were the samples from each transect combined or from each sampling combined? If so what was the rationale behind sampling combination?”. Answer: The water samples from each transect or from each sampling date never were combined. Each water sample was analyzed for N forms and Cl- concentrations. The N and Cl- concentration value for each transect was obtained from the mean value among the samples collected in a same transect (n=1-4).

14. The Referee 1 wrote: “Line 21-22 p5348 Why were negative retention values set to 0% when calculating mean retention efficiency? If negative retention values influenced the mean retention value significantly, then why not report the median value?”. Answer: We agree with the referee and in addition to the mean value, the median value (considering positive and negative retention values) has been included in the revised manuscript.

15. The Referee 1 wrote: “Line 25 p5349 Perhaps a seasonal response is not evident

HESSD

6, C2057–C2066, 2009

due in part to how the data is presented in Fig 3. Discharges are measured and displayed on approximately a monthly time step whereas rainfall is shown daily. Perhaps monthly rainfall totals would better match the timescales of discharge and may show a lagged seasonal response. Given the ephemeral nature of these systems various hydrological sinks in the catchments may need to fill prior to being realised in inlet discharge, resulting in a lag between rainfall and inlet discharge". Answer: Although we agree that the inlet discharge may show a lagged response to respect the rainfalls registered in the watershed, when we represent total monthly precipitation with the inlet discharge (Figures A y B, in the Taray and Parra wetlands, respectively), a seasonal pattern is still not evident probably as a consequence of agricultural inputs. Perhaps, to represent the total monthly precipitation with the inlet discharge would not be appropriate because we really could not differentiate between previous and posterior rainfall events to the inlet discharge measurement registered in each month. Then, we though that perhaps the accumulated total precipitation could have a positive effect on inlet discharge. However, when we represented this (Figures C y D, in the Taray and Parra wetlands, respectively), a seasonal pattern neither was evident.

16. The Referee 1 wrote: "Line 2 p5350 Table 2 reports mean values. Often data acquired from biological systems is not normally distributed, and skewed. Perhaps some non-parametric measures may better represent the central tendency values. For example, medians and 10th and 90th percentiles may provide more robust measures". Answer: We agree with the referee and we have included in addition to the mean value, the medians and the 10th and 90th percentile values for each variable in the table 2. We have removed the maximum and minimum values. In addition, TN has been included as a new variable in this table.

17. The Referee 1 wrote: "Line 20 p5350 the overall N retention efficiency should be reported as catchment managers are most often interested in this than the N species. N speciation is still useful in understanding how the wetland streams function and which species are retained the most". Answer: We agree with the referee and we have

HESSD

6, C2057–C2066, 2009

included the value of TN retention efficiency of studied wetland-streams in the results. In addition, we have included the TN retention efficiency, concentration and load values in the Table 3.

18. The Referee 1 wrote: “Line 1 p5352 Table 4 shows the results of the Spearman correlations “performed” rather than Table 4 shows the results of the Spearman correlations “done””. Answer: We agree with the referee and this change has been included in the revised manuscript.

19. The Referee 1 wrote: “Line 23-24 p5352 this study shows. . ..runoff “can remove N from water”. Prove is a bit strong. Answer: We agree with the referee and “prove” has been removed in the revised manuscript.

20. The Referee 1 wrote: “Line 9 p5353 Agricultural runoff rather than agricultural runoffs”. Answer: We agree with the referee and this change has been included.

21. The Referee 1 wrote: “Line 10 p5353 Better performances in this study may be due to setting negative retention values to zero. Reporting mean values whilst including extreme negative values may result in a negative outcome for natural wetlands. Extreme values influence the mean significantly. If all the values are accepted on face value rather than set to zero if they are negative, a median will only apply equal weight to all of the values - in other words it is not influenced by outliers in the same way as the mean”. Answer: We have included the median values in the text and Table 3 because we agree that this value show the data variability. Negative values of retention efficiencies were only showed by NH4+-N y TON-N. NO3–N retention efficiency was always positive in both studied wetland-streams during all the study period (Figure 5). In this sense, we believe that we can state that the mean retention efficiency for NO3–N was higher that the values found by Knox et al., 2008 and Jordan et al., 2003 in their studied wetlands.

22. The Referee 1 wrote: “Line 7-11 p 5358 Given how the data was treated, ie, setting negative wetland responses to zero, and hence discounting the possibility that wetlands

HESSD

6, C2057–C2066, 2009

may behave as sources under certain conditions, I would be cautious in claiming that wetland streams control nitrogen fluxes when using the retention data. What is clear is that the wetland streams are sinks under some circumstances, and sources under others. A complete N mass balance would be required to support the claim that these wetland streams can control N fluxes from agricultural land. This can be done with the existing data by summing the N species data or using the Total N data (not presented), and integrating the input and output N loads, or at least summing them for the study period. Given that the NO3 concentrations represent the largest fraction of the Total N, and this is where largest differences are evident in supporting the claim of N retention, the positive benefits of NO3 retention should significantly override any N release from the wetland streams. Answer: We have been more cautious with the terminology in the discussion and conclusions. We have used the information obtained from the N mass balance (TN input - TN output loads) (incorporated in Table 3 in the revised manuscript) to claim that the studied wetland-streams control N flux from agricultural lands.

23. The Referee 1 wrote: “Line 11 p5358 Is always of “better” quality than the entering them rather than is always of more quality than that entering them”. Answer: We agree with the referee and this change has been included.

24. The Referee 1 wrote: “Line 20 p5358 whilst these wetlands may be a natural tool for processing nutrients from agriculture, doesn’t that place these systems under threat? Artificial wetlands are essentially sacrifice areas that would reduce the nutrient pressure on these natural systems”. Answer: We agree with you, of course. However, in the Murcia Region because agriculture is widely extended in the landscape, these small wetland-streams are destroyed and desiccated to be occupied by new agricultural zones. In this study, we show that wetland-streams are very efficient in the TN retention from the surface water. Therefore, our findings add an additional functional value apart from the rest of values. The recognition of this functional value can be used to preserv them and even to create artificial wetlands. Anyway, we have included in the conclusion a new sentence about this.

HESSD

6, C2057–C2066, 2009

25. The Referee 1 wrote: “p5369 Table 4 probabilities can be removed from the table since the asterisk signifies whether the R value is significant or not”. Answer: We agree with the referee and the probabilities of Table 4 have been removed.

26. The Referee 1 wrote: “p5375 Fig 6 This figure is not essential as it is described by the Multiple Linear Regression (MLR) equation. If it was retained however, the figure would be more valuable if the data points that were used to derive the surface were included in 3D plot. This would allow the reader to discern whether the responses were truly linear or whether they were more likely to be curvilinear, and whether the data was heteroscedastic. A curvilinear response seems more likely given that NO3-N retention efficiency should plateau at 100%. In its current form, the MLR regression equation suggests that the wetland streams can retain more than 100% of the NO3-N inputs. Answer: In the revised manuscript, we have included a new graphic as Figure 6 which we have showed the data points that were used to derive the surface of the 3D plot.

Please also note the Supplement to this comment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5341, 2009.

Fig. A Taray wetland-stream

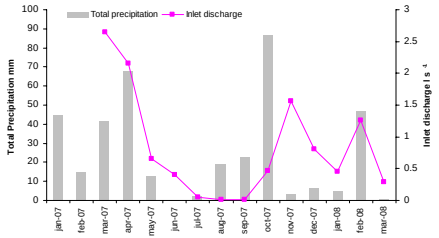

Fig. B) Parra wetland-stream

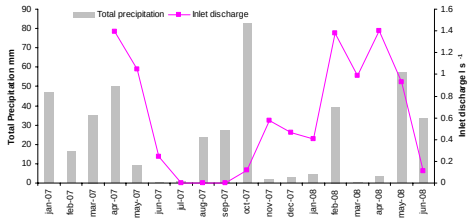

Fig. 1. FiguresA-B

HESSD
6, C2057–C2066, 2009

Fig. C) Taray wetland-stream

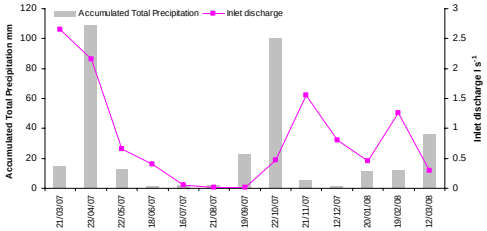

Fig. D) Parra wetland-stream

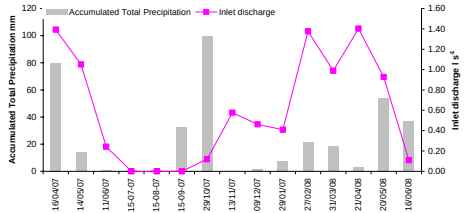

Fig. 2. FiguresC-D

HESSD
6, C2057–C2066, 2009