Editor Initial Decision: Reconsider after major revisions (20 Sep 2015) by Prof. Matthew Hipsey
Comments to the Author:
Dear Authors

Thank you for the revised version and reply to the previous reviewer comments. I have spent a while reading this revised version, and feel this is inching closer to being suitable for publication but still requires some careful editing. I have not sent this for re-review but rather provided some review myself to help clarify the required changes to the text of the paper. I realise this is frustrating given the effort you have put in to date, however, HESS is a high profile journal in the hydrological sciences and we strive to ensure the editorial standards of all accepted papers are of the highest quality.

I have outlined some specific points below and ask that you please take a careful look in all sections of the paper with these issues in mind.

Kind Regards
Matt Hipsey

Specific comments:

Comments: The new sentence at the end of the abstract is confusing to me. Pollution swapping is not defined (can this be done after first sentence when you mention transformation to other reactive forms?).Response: Pollution swapping is defined in the abstract after the first sentence

Also, the qualifying statement "While nutrient cycles have been …" is better for the intro as opposed to the abstract. Response: The introduction has been modified, so as it is no longer necessary to include this sentence.

Comments: Nonetheless, the sentence I think should be reworded as "… in situ in transformation and fate of the transformation products …" is not clear. Response: This sentence has been reworded and moved to the introduction

Comments: The changes to paragraph 1 (in response to reviewer 1) I also feel could be reworded. To support the statement that "less is known about constructed wetlands" a general text book on constructed wetlands is cited. Similarly the Kadlec and Wallace book is about treatment wetlands which are generally constructed wetlands and certainly this is a focus of the book. It is now cited when you make the point about general books on wetlands. Therefore, overall I find the assertion that there are no books on constructed wetlands (and that "…It emerges that we may know quite a number of aspects related to wetlands but not so much about constructed wetlands…") to be highly arguable and this section could be more accurate in setting up the motivation for this study. Response: Paragraph 1 has been reworded to focus study of C and N dynamics in CWs

Comments: I also think the wording of the last sentence here is quite a negative assessment saying that studies have not delineated pathways and not adopted appropriate designs – could this be qualified to say "rarely quantified all relevant pathways", for example? I think the first two sentences of paragraph 2 are good to make clear the current deficiency, therefore requiring this study.

Response: This sentences have been reworded and now read ‘Although CWs have a proven potential for organic C and N removal, with few exceptions (Dzakpasu et al., 2014), studies have rarely quantified all relevant pathways. This has meant that reported removal efficiencies have been variable (Seitzinger et al., 2002). If the fate of C and N is accurately quantified, appropriate design and management strategies may be adopted.’

Comments: As I interpreted it, the main reason reviewer 1 mentioned the text books was because of “general” content appearing in later sections.
Eg. “Soils with high permeability enhance downward nutrient movement to groundwater. High cation exchange materials in soil enhance NH4+ fixation by the soil matrix.”
“soils of CWs represent organic C and Nr-rich systems, where the products of the continuously occurring biogeochemical processes can be transported to fresh waters and to the atmosphere”.
“In low redox conditions with limited DO, methanogens can consume DOC and thus it is conducive to CH4 production”
There are lots of these well known facts throughout the sections that may be useful for introducing a sub-section and setting context, but currently appear as findings of the review.
Response: Such sentences have been rephrased or deleted where appropriate across all sections of the paper.

Comments: In the last example, the 3 sentences relating to methane production could be more concise and avoid the general statement by rewording ...:
Response: These sentences have been reworded to avoid the text book like comments.

Comments: “Carbon mineralization in sediments depends on the redox chemistry of soil, availability and quality of C (labile or recalcitrant) and temperature. In CWs, C cycling is very complex due to the changes in redox chemistry, which regulates production and consumption of CO2 and CH4 (Brix et al., 2001). In low redox conditions with limited DO, methanogens can consume DOC and thus it is conducive to CH4 production. “

may be more concise/specific as:

Response: The text has been changed to the following:

“The rate of carbon mineralization in CW sediments depends on the redox chemistry of soil, the bio-availability of organic C and temperature. In particular, areas of sediment subjected to prolonged low redox conditions (e. g, -150 mV) are conducive to methanogens and rates of CH4 emissions exceeding 132 mg m^{-2} d^{-1} (Brix et al., 2001), but this is highly variable depending on C:N ratio of the influent water and wetland seasonality. For example … “

Comments: This sort of sentence would allow you to be more concise further down this paragraph, where there are awkward sentences (Line 350-357) that don't follow a clear logic. Currently the sentence “Only a limited number of studies have considered CH4 and CO2 efflux from CWs (e.g. Mander et al., 2008)” is in the middle of a section about temperature and seems out of place.

I have noticed many more examples like these and have indicated this as I believe this is what Reviewer 1 was referring to but has not been addressed in this revision. Most I feel don't change the substance of the paper and can easily be dealt with by careful editing.
Response: This section has been reworded according to the suggestion of the Editor. The sentence "Only a limited number of studies have considered CH4 and CO2 efflux from CWs (e.g. Mander et al., 2008)" has been deleted.

Comments: The other issue that needs careful attention is the many assertions. For example:

"A fluctuating water table in CWs has significant impacts on GHG dynamics. Pulsing hydrologic regimes decreases CH4 but increases N2O emissions. In aerobic and anaerobic conditions caused by pulsing hydrology, incomplete nitrification and denitrification increase N2O emissions"

This is interesting but is not supported with a citation (as a side note it is also not clear to me how this is related to aquatic plants, which is the topic of the paragraph).

Response: This type of assertions has been rephrased throughout the paper. "A fluctuating water .....N_2O emissions" has now been put as an individual paragraph. Appropriate citations have been put in.

Comments: In the next section:
"Surface emissions of GHG from CWs are well recognised and have been commonly measured by chamber methods. The GHG produced in CWs can also be transported to the groundwater with the percolating water and emitted to the atmosphere upon discharge to surface waters."
Similarly requires substantiation by referencing appropriate studies, or changing the wording to indicate it is your suggestion. Also, I notice that in the early section there was only a limited number of studies (Mander et al 2008), but now it is stated that it is well recognized - so the sections seem to contradict each other.

Response: This type of sentences have been reworded or cited where appropriate. The studies reported on greenhouse gas emissions are still limited but only recently been recognised to be of high importance. It is considered as limited because the studies are limited to quite a few locations of the world and most of the reported studies have considered one or two GHG but not all three gases. We have rephrased that it is not well recognised but seems to be in our attention recently.