

Interactive comment on “Climate suitability estimates offer insight into fundamental revegetation challenges among post-mining rehabilitated landscapes in eastern Australia” by P. Audet et al.

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GENERAL COMMENTS

On the whole, I found "Climate suitability estimates offer insight into fundamental revegetation challenges among post-mining rehabilitated landscapes in eastern Australia" a thought-provoking article surrounding how best to target revegetation actions given potential climate constraints. However, I have a number of concerns that I think would require addressing before it is suitable for further publication. In particular, I think the

C9444

authors need to consider whether NDVI is a good predictor of early establishment which is what they appear to concentrate on. I also think they should consider whether their results are sensitive to different assumptions as outlined in more detail below. Akin to other reviewers, I wonder whether some of the message is obvious but having said that, I think it is good to consider the obvious in a rigorous framework. I believe Audet et al. attempt to do this, and in a broad sense raise some noteworthy points, particularly if mine-site restoration plans don't already consider climate suitability.

SPECIFIC COMMENTS

ABSTRACT I'm not sure that the use of the word 'susceptible' is helpful in this context. It begs the question susceptible to what? I believe it is easier to see it as a suitability index that goes from ideal - moderate - least suitable, with no requirement to use the word susceptible. Later on in the abstract they use the word 'unsuitable' - this communicates the concept perfectly well.

Further details on how the suitability index is derived would be good. (I elaborate on this further below).

INTRODUCTION Line 13, pg 18547 - not sure why divergence is a result of the land-form elements. I think this needs elucidating further.

Line 21, *ibid* - suitability of climate factors. Taking away climate change, the expectation would be that the neighbouring analogues should be suitable references unless other abiotic conditions are radically different) and therefore that the climate would be suitable for these communities. However, this raises the point that what conditions are suitable for establishment may be different to what is suitable for continued maintenance of natural communities (depending on the growth form). This highlights the core of the problem, and I am uncertain how NDVI gets at this core.

Thus, on page 18548, line 5, the authors state: "...analysis seeks to assess various climatic parameters ... that are relevant to rehabilitation development (particularly plant

C9445

early establishment), and to compare these combined criteria across different geographic locations currently affected by ongoing mining activities". I am unsure how the scale of the NDVI measures relate to the scale of the mine sites, nor how long the mine sites have been undergoing rehabilitation. I think more direct measures of plant early establishment would confirm the suggestions made by the authors - this is mentioned in the discussion but I think needs emphasising more (perhaps in the abstract).

Line 25 onwards seems to be a repetition of the abstract.

MATERIALS AND METHODS

If BGs policy is for repeatability of work, then I think substantial rewording of the methods is required. I did not always follow the chain of logic and found that some parts obscured rather than illuminated.

Page 18549, line 13-15 - unclear sentence. line 20 - criteria relevant to the early establishment of native vegetation. Again, does NDVI give a good indication of early establishment? I agree rainfall / soil moisture is clearly important - perhaps some references to papers that demonstrate this in the Australian or worldwide context?

Line 23 - what is IBRA?

Line 26 - mean monthly temperature. This is mentioned but then not used in any data analyses - why?

Page 18550, lines 1-5 - state clearly why were the different rainfall metrics chosen (perhaps not just in the Table 2, which is only referred to later in any case). Also justify the different break points for the analysis i.e. >25 and <3mm. Have these been demonstrated as being ecologically and hydrologically important. If so, then just look at that. If not, perhaps look at other values in some kind of sensitivity analysis and see whether this changes the conclusions. Also, why (line 1) are the number of days 'relative'?

Line 7 - "each of the sites' climate parameters was scored qualitatively". How was
C9446

this done. Were all parameters equally weighted or did e.g. annual rainfall have more weight than days under 3mm? I assume equal weight; would changing weight have any effect on results? Note that some think median rainfall is a better indication of an area's average rainfall than its mean - does this change results?

Line 7 onwards - this is the area in particular that needs more explanation to be repeatable by others. As well as the points raised immediately above, for % number of days per year with rainfall events above or below a certain threshold - were these calculated out of total number of rainfall event days or total days in a year?

Page 18551, equations. Could justify combination in arithmetic way. Why not multiplicative or a ratio? Does this change results in any way?

Line 10 onwards on NDVI. Need more information on how spatial results match the mine sites and how NDVI gives a good indication of plant early establishment in the mine sites. Although I may be missing something regarding how this has been worked out? Is the resolution good enough to only look at NDVI on the rehabilitated areas or does it include surrounding vegetation?

In the discussion changes to mine practice are mentioned e.g. irrigation, drainage etc that presumably aid vegetation establishment. If so, how can NDVI then aid in understanding the climate suitability unless the modifications were unsuccessful?

More elucidation on why two one year El-Nino / La Nina periods were used and what months these actually corresponded to - note that on lines 26/27 pg 18553 these are referred to as one year El Nino periods whereas in this section they are referred to as lasting less than the calendar year. More justification is required for extending it to the year? My understanding is that El Nino's / La Nina phases often last longer than a year too? Exactly how long did they last for this analysis?

Page 18552 - line 8 onwards. Could multivariate analyses have been used or because of only 9 sites, there would be too few degrees of freedom? What distribution are the

p-values calculated on, or were they calculated via permutation tests?

RESULTS

On page 18554, line 25 it is noted that there are two non-significant rainfall criteria for predicting NDVI. What happens if these criteria are taken out of the overall suitability index? Does it change the conclusions? Note that the two non-significant criteria are also the two that could be most open to sensitivity analysis as mentioned earlier. Can you cite any literature for the inference that the non-significant results relate most to short term vegetation development. Again, this also relates to whether there are different criteria for establishment vs continued growth?

DISCUSSION

The discussion is on the whole structured well, and I thought the statements surrounding the importance of seasonal intensity in rainfall (page 18557, lines 12 onwards) were useful. In this vein, I think you could make a strong message of the Discussion that no one rainfall parameter allows you to predict suitability for rehabilitation but that an index is required. However, others may argue that one of your Figures shows annual rainfall correlates well with NDVI and, providing NDVI does indeed relate to early establishment potential (as per my earlier points), then is there any need for the index?

Again, I think a stronger demonstration needs to be made of NDVI's potential to describe early establishment given statements such as page 18556 line 13 "particularly regarding the early-establishment of plants among post-disturbance ecosystems"

Page 18558 line 17 - a southern hemisphere perspective. This may need emphasising or rephrasing to make it general. I find it surprising that this closing perspective in terms of how to deal with seasonal rainfall in mining rehabilitation has not been discussed before.

In Table 1, do the different primary commodities lead to fundamentally different land-form elements and if so, does that have any influence on suitability for rehabilitation?

C9448

TECHNICAL POINTS

A number of long sentences and some use of jargon, particularly in the abstract. I think it would aid understanding if these were shortened and simplified to communicate the fundamental message.

Some typographical points: Page 18548, line 4 - should be "annual" rather than "annually" Ibid, Line 22 - weather-bound is unclear. Page 18552, line 4 and 5 - think should be "began"

Interactive comment on Biogeosciences Discuss., 9, 18545, 2012.

C9449