Luke Reusser
GEOL371
March 17th, 2009

Review of:
Borg, J., Dewoolkar, M., Bierman, P., **Stability evaluation of streambanks in Vermont.**

For Submission to:
Journal of Geotechnical and Geoenvironmental Engineering.

In this manuscript, the authors detail work undertaken to evaluating the stability of riverbanks at two sites near Burlington Vermont. They employ a variety of techniques and equipment to assess changes in cross-sectional geometry and material strength of banks, including vegetative and hydraulic effects, in order to determine rates of lateral retreat and factors of safety at seven cross-sections at each of the two sites. In conclusion, the authors find that the average rates of retreat at the Winooski River site and the Lewis Creek site are 0.061 m/month and 0.046 m/month respectively, and that unfortunately, classical techniques for determining factors of safety are inappropriate for the soil and bank types they studied in Vermont.

While the impressive amount of field, laboratory, and modeling work conducted during this study is evident, I don't think the manuscript is ready for submission for publication in its present form. I think many of the issues I will mention below can be addressed with some refocusing of the motivations for this study, as well as some reorganization and reprioritization of what material should and shouldn't be included in the final manuscript.

Overall Suggestions:

- The clarity and "easy of reading" of this manuscript can be greatly improved with a thorough reworking for grammar and sentence structure. There are many instances where the authors jump between tenses and active/passive voice making sections somewhat difficult to follow. Similarly, the use of commas will help the reader more quickly determine the emphasis of sentences.
- Similarly, I was a bit confused at times with the organization of the manuscript; there were instances where methods were mixed with results, and discussion mixed with methods. I think it would be helpful to pull these apart, and seeing as this is a rather technical paper, I think this is one of those instances where it would be beneficial to the reader to explicitly separate methods from results from discussion, giving each their own clearly labeled section.
- Focusing the introduction would improve this manuscript. What exactly did you try to do in this study, i.e. what are your questions or hypotheses? What is the significance of each of these in the present day understanding of streambank stability and land-management decisions? Later you discuss rates of lateral migration and factors of safety. May be worth calling these out in the intro.

Abstract:

- Overall, reads pretty well. Could use a little tightening
- The abstract would be strengthened if you end it not necessarily with a negative, but instead with a statement about what we now know about streambanks that we did not before.
- You call out phosphorous specifically in the abstract and introduction, and then as far as I can remember never go back to it. If you are going to include it as a motivation factor in your research, you should dedicate some time to it in the later sections of the paper.

Introduction:

- I think the structure is good…going from water to pollution to pollution sources to sed to streambanks. You could work on sentence structure some to make the first several paragraphs stronger.
- Third paragraph sets the stage for semi-quantitative approach.
- Forth paragraph, talking about your study could be stronger. I would maybe slim down the first three paragraphs and put more emphasis here. Introduce your hypotheses and maybe some of the techniques you will use to address each of them so readers know what to look for, as well as the end results you hope to get at (factors of safety and retreat rates if I am reading things correctly).

Factors Affecting Streambank Stability:

- I would explicitly define "surcharge." I had to look it up…essentially evapotranspiration I think.
- In the explanation of variables of eq. 2, you could exclude the ones you already define for eg. 1.

Site Selection and instrumentation:

- I'm not sure these first two paragraphs are necessary. I think what's really important is that you established two sites…one on the lower Winooski and one on Lewis Creek. Maybe just say this and then list the reasons why you chose these.
- For the site instrumentation section, I'm not sure you need quite as much detail as you have provided. For instance, the length and diameter of the rebar you used.
- There is an error in the diameter of the rebar stable. Reads 13 cm, but I think it should be 1.3 if you are going to include it.
- Is it typical to list both metric and English units in engineering pubs? If not, I would just go with metric. Including both is a little distracting at times.

Site Investigation:

- Like I mentioned at the top, this is one of those sections that is a combination of methods and results. I think things would be easier to follow if you clearly pull apart all of your methods (cuz there are a lot of them) from your results and put them in separate sections that are clearly labeled. Then have a third section dedicated strictly to discussion of your analysis and then your overall conclusions.

Analysis:

- After reading the first section on Lateral Retreat, I wanted to see a table comparing the two sites, including all sorts of pertinent information. Here are the things I was thinking: 1) site, 2) Channel Width, 3) bank height, 4) Bank slope, 5) degree of curvature for the meander (important for erosion rate), 6) mean discharge, 7) mean or max stream velocity, 7) retreat rate.
- In the last sentence of the Lat retreat rate paragraph, you describe signs of aggradation along the cut bank with no evidence of deposition from above. What do you attribute this to? What is its relevance?
- In the slope stability section, you introduce several modeling packages. I think these are methods, and should be pulled out into the methods sections earlier in the paper.
- Going back to your mention of phosphorous at the beginning, what does what you have done tell us about its delivery to surface water bodies?

Conclusions:

- For those of us who aren't in the field of stream bank stability and soil mechanics, can you state your findings more clearly in the form of "here is what we now know about stability of these two banks that we didn't know before conducting this study?
- Again, the phosphorous. If you are going to push it at the beginning of the paper as the motivation of your work, I think you need to get back to it in the conclusions.

Lee Corbett
GEOL 371
3/18/09

Review of: Stability evaluation of streambanks in Vermont
Authors: J.L. Borg, S.M. ASCE, M.M. Dewoolkar, M. ASCE, and P.R. Bierman

In this manuscript, the authors present data from a study that uses semi-quantitative field methods to assess and monitor stream bank stability along two channels in Vermont. The research appears to fill a void in the current understanding of bank stability, and describes a useful and relatively simple method for collecting data.

Please refer to the hard-copy edited version of the manuscript for small comments regarding structure and rhetoric. In addition, I have several broader comments:

1.) Your manuscript is very focused on methods. Can you incorporate that into your title? Maybe something like "Evaluation of stream bank stability in Vermont using semi-quantitative analysis".

2.) I think your manuscript would benefit greatly from some careful editing. I understand that this is just a draft, but clear writing helps facilitate a successful presentation of your ideas. I marked up a lot of places in the text to give you a starting point.

3.) Overall, your manuscript provides a high level of detail which unfortunately makes the important parts difficult to find. Remember that this is a way for you to present your findings and results, not an instruction manual for someone who wishes to repeat your study. Your "Factors Affecting Streambank Stability" section was thorough and well-researched, but I don't think all this information needs to be included. Depending on the readership of the journal, it might be more appropriate to minimize the amount of time you dedicate to this and simply provide the necessary citations for people who want to learn more. Your "Site Selection and Instrumentation" section has a lot of detailed information that won't be of interest to the vast majority of your readers (e.g. diameter of rebar staples) and makes the results difficult to find. I'd suggest cutting out a lot of these details and focusing more on the presentation of your findings and the implications of your results.

4.) Your manuscript might benefit from being organized in a more typical fashion. The way you have it now mixes your methods with your results, and I think it makes it difficult to pick out the meaningful parts of your paper. Dividing this information into a more traditional "Methods", "Results", and "Discussion" format might make it easier to read, especially since most of your readers will be used to reading scientific papers.

Good luck with edits and publication. Well done!

Lee Corbett
abcorbet@uvm.edu

AHolland review of "Stability evaluation of streambanks in Vermont" by J. Borg

This paper compares methodology for measuring streambank stability from data collected from several field measurements at two sites in Vermont.

I think this paper provides extensive research on different methods available for measuring aspects of streambank stability. I would suggest this paper be accepted after it includes the changes below.

I would recommend reworking the layout of the introductory material, the set-up is all there but it currently seems more like presenting the facts than a flow of a story. It is hard to know where you are going with the material and what knowledge we should be building on for from the introduction paragraphs. In your paper objective paragraph I would include another sentence describing that you are collecting multiple measures to identify which ones are better performers or are more accurate.

I would combine some of the sections together to clarify where you are at in the paper such as 1-introduction, 2-methods (including site selection, instruments used, measurements recorded), 3-Analysis (results), 4-Conclusions. This may be an over simplification of the layout but I was a bit confused in the fourth section as to whether I was still in methods or had moved onto results. For example, section 2 is nicely parsed out by topic but I think it could be combined with the first section as it also includes introduction material to the different methods used. If combined the "introduction" would be section 1.1 and then 1.2 is factors affecting streambank stability with the further break down of 1.2.1 etc. for the individual factors. As the next section is a detailed description of the measurements taken for the study, it could clarify the material before this point as introduction to the study. When reporting site investigation material in section 4, I would recommend keeping the order the same as the method overview given in Section 2. The sections on vegetation effects had a good flow where the information and equations given in section 2 were presented in results.

Through out the paper there is a tendency to have two related points broken into two sentences when they could be combined to improve the flow. For example, line 206-207, could be combined to say, "Of the reaches where instrumentation privileges were granted, only reaches with prevalent failing streambanks and streambanks that were marginally stable were further considered. This point is something that is addressed in the writing style guide linked from the journal website under 'direct vs indirect statements'.

The paper wraps up with analysis and concise concluding results but I would like to see a small conclusion paragraph along with these final points that relates this back to the big picture discussed in the introduction regarding phosphorus and surface water contaminants. If this material is not reworked into the paper later then I would recommend removing some of the introduction material on this and focus more on describing the different methods for evaluating streambank stability.

Stability evaluation of streambanks in Vermont

J.L. Borg, M.M. Dewoolkar, & P.R. Bierman

Review by Andrea Pearce, 18 March 2009

This manuscript documents the instrumentation and monitoring of streambank stability and erosion rates on two rivers in Vermont. Field-work included topographic surveys, in-situ soil strength tests, in-stream and near-bank groundwater level monitoring and soil suction measurements. Soil samples were collected and returned to the laboratory for several standard analyses including strength tests. The effect of riparian vegetation was evaluated via root tensile strength testing. Bank stability was modeled to develop a factor of safety, indicating whether or not the banks were inherently stable or not.

This manuscript documents an array of observations and tests to gauge streambank stability. In general these parameters are not easy to obtain and can provide valuable insight as to the nature of streambanks in the Champlain lowlands. While these methods are thoroughly documented. The importance of the work could be bolstered with a clearer introduction to how this work may be applied (perhaps if it could be useful for recommendations for river management folks?), and more of a discussion of the implications of the work at the end to frame your primary conclusions.

My recommendation is to accept this manuscript with revisions focusing on setting the stage for the work. In the description of the methods used, there are several cases where multiple methods are described, yet only one used. With the exception of the BST/DST tests, I'm not sure if you need to describe both in each case, it may be clearer for the reader if you do not. Comments on specific lines are included below:

- Lines 41 – 47 In general try to keep the introduction (particularly the first few sentences) focused on issues around sediment and P loading due to streambank erosion, your motivation for doing the research. The discussion of other types of pollution draws attention away from your main focus.

- Line 54 – Maybe check a newer reference for this. Many farms are required to have documented phosphorus management plans now that NPS-P loading is more widely recognized. I'm not sure if it's just for dairy farms or all larger ag operations.

- Lines 63- 71 – There has been quite a bit of work done attempting to estimate erosion rates and p-loading in streams. Your introduction would be more compelling if you included a couple more specific examples from the literature.

- Lines 72-76 – If you give specific examples of how these types of sampling techniques have been successfully used in other projects you will convince the reader that the type of assessment you're doing is necessary and justified.

- Lines 78-82 – State your objectives clearly and perhaps in more general terms than you do here. These statements read like methods (e.g. relate soil strength properties, to bank retreat rates, or something like that)

- Site Selection and Instrumentation: Maybe you could start this section off with general information about how you chose the sites and give stats on the streams themselves (drainage area, bankfull width, slope, describe the riparian vegetation) to give the reader a sense of the setting.

- Site Selection and Instrumentation: I think if you tighten up the language you use in this section it will more quickly guide the reader to the important details. There are places where you could combine sentences and get the necessary information across.

- Lines 306-308 – If there really aren't a lot of data comparing the BST and DST you might want to include a plot of some of the data, it could be helpful for other people interested in using the BST.

- Tensile Reinforcement – You describe two methods in detail and then only use one. It might be clearer to the reader if you only describe the method that you used in your analysis. The other information is useful and might be better suited for your thesis for someone to reference if they were interested in the method.

- Slope Stability – Again, I would be inclined to leave out the method you didn't use and focus on the method you did use.

Good job Jaron. Good luck getting this revised and published.

Review of: Stability evaluation of streambanks in Vermont

Authors: Borg, Dewoolkar and Bierman

Overall impressions:

It is clear that an enormous amount of time and energy went into collecting the data contained in this report however I think the overall purpose of this paper is lost somehow. While the introduction and abstract seem to place emphasis on the need to evaluate stream banks due to their propensity to cause natural types of water pollution, I didn't feel like those themes were continued throughout the paper. At least I didn't feel like they were carried out in the way I was expecting them to be. The methods were extremely detailed and I think if this paper is meant to provide a new method for "quickly" measuring streambank stability then that's fine, but that just wasn't made clear up front. Part of my personal difficultly with this paper was because I am not very familiar with streambank studies or the mechanics and jargon used to talk about their properties, however, particularly in the introduction, I found the grammar and some awkward wording difficult to work through. I'm sure most of this would be corrected with a read-through of the paper, particularly focusing on comma placement. As far as the other sections go, I was confused by the mixing of the methods and the results. It would seem clearer if there was a clear division of these two sections and that they were labeled as such. As they are now, I think the section labels are quite confusing and I did not find it entirely clear what each section is going to be about before I read it.

Title:

I think that some reference to the fact that this is a method based paper (if that's really the way you're choosing to go with this) should be included in your title. Perhaps something like "A new framework (or method) for efficient evaluation of streambanks in Vermont" would be more appropriate.

Abstract:

I liked your abstract a lot. I thought it set up the importance for this study very well and made me really want to read the rest of the paper. After reading the paper however, it should also be made clear here that this is a methods paper and you are attempting to optimize the efficiency of streambank evaluation.

Introduction:

Again, I found the first part of the introduction very clear and illuminated very well the effects that streambank erosion can have on our water supply. The second paragraph was the hardest for me in the whole paper. It might be just a proof-reading thing to clean up the wording here and get the main points across a little more clearly, or it could be over-editing to the point where words just don't make sense next to each other anymore. We've all been there. I think the ideas in this paragraph are important ones and that it should just be rewritten and read over. In this introductory section I would have liked to have heard how current methods for streambank evaluation are done and the drawbacks associated with them. I don't think this case is well made. Why do we need a

new method? What was wrong with the old way of doing things? Was this even done to any large extent or are you trying to make the case that it should be done much more often? These are all questions I think need to be answered in that first part of the intro.

Part 2: Factors affecting s.b. stability:

I think what would have really helped me here would have been a summarizing paragraph before delving into all of the individual factors that maybe groups the factors into a meaningful way. For instance: Soil mechanics (strength), environmental effects (vegetation) and hydrologic effects (stream classification, soil water ect.). As a whole I feel like this is a methods section while the title of the section suggested to me that I was going to be reading about how each of these factors influences streambank stability and its importance, as though it were more of a secondary, more structured introduction.

Although I found that the individual sections describing each factor were fairly clear, I didn't understand the purpose for supplying so much information. Maybe the equations and descriptions of the variables could go into an appendix and the equations can simply be referenced by citations with their application or relevance discussed.

Part 3: Site Selection and Instrumentation

The title of this sections suggested to me that this was intended to be the actual methods section. In terms of site selection, I was curious about how many properties gave you permission to work on their land since out of those, only 2 sites were selected. If only 3 sites were available, that seems reasonable and that your criteria for study sites were not prohibitively restrictive. However, if there were 15 sites that you had to pick from and only 2 matched your monitoring criteria, the applicability of your method comes into question. As a side note, you mention heavy-drilling equipment; what would this have been used for?

Part 4: Site Investigations

The title here does not give me any real indication of what this section is about. What it seemed like to me was a mix of more methods and results. I think that these two types of information don't necessarily blend well together and you might be better off separating them into different sections. As in the part 3 section, I found that an initial summarizing paragraph may have helped me work through this paper. It could list all the things you measured and why and how your selection of measurements gets at the whole picture of bank instability.

Part 5: Analysis

This title usually suggests to me that these are the methods used in the data analysis, but in this case I gather that this is the results section. I think it would make more sense to label it as such.

Part 6: Conclusions

I think you have an opportunity here to really make the case for the applicability of your study and why it's better than others. You can put this into a larger framework and I'd include some of the implications of your work, kind of like a broader impacts section.

Stability evaluation of streambanks in Vermont
By J.L. Borg, S.M. ASCE, M.M. Dewoolkar, M.ASCE and P.R. Bierman

Review by Christina Syrrakou

The paper presents a study on the stability of two stream reaches located in Lake Champlain basin of northern Vermont. In this study the various parameters that can determine the streambank's stability are analysed and also the laboratory testing of the data is presented. The methods used include both subsurface investigations as long as surveys on the locals soil deposits type and strength.

The paper presents an interesting topic and a variety of methods including soil mechanics and modeling. The language used is relatively simple trying to address a broad audience. Generally, I think that the writers succeed in passing the main concepts and important aspects of the study to the reader. One point though, that once revised could strengthen the quality of the paper is the correction of syntactical errors (for example absence of commas, sometimes verbs and use of too small sentences in my opinion) that sometimes make the manuscript a bit difficult to follow. Also, I think that the figures could be better presented, that is in a more formal way with a more analytical explanation on the captions.

More specifically for each subsection: The abstract is quite good in content although I think that the last sentence that reflects the conclusions does not match the conclusions that were afterwards analyzed. The introduction was satisfactory and gives the reader a general aspect on the matter. However, I got a bit confused on the relation between the phosphorus sediments and erosion to the bank's stability. Maybe an initial explanation on the term and what would make a streambank stable could help the reader and especially a non-expert reader. The last paragraph showing the aim of the study is quite good. The second part on the "Factors Affecting Streambanks Stability" is well-written. As for the formulas though, I think some units would be helpful and also a range of values for the various parameters (like τ). The "Site Selection and Instrumentation" part was also presented in a good way. One thing that I would like to suggest is the change of the title "Site Investigations" to "Collection of Data" or something similar so that relates more to the "Analysis" (or "Analysis of Data" perhaps?) part. As for the conclusions, I think that some additions could be made such as the writers' final conclusions on the two streams' stability.

So, I suggest that this paper is published with minor revisions. Some specific points that should be revised are the following.

- L37 Maybe you could explain more in which way this study showed the validity of the Iowa borehole.
- L73 Here you refer to a semi-quantative approach but I don't think it is very clear whether the specific method you used is one.
- L78 Maybe you could clarify that the specific survey is on Lake Champlain's basin in northern Vermont.

- L99 You do not explain what τ is and also some units would help. In addition, is there a range for the values of τ ? The same thing applies to the other formulas.
- L104-106. It is mentioned that this system is used where only non-negative pore water pressures exist. Was that the case for the specific study?
- L138 What is θ? It seems that you use it in formula (3) but you also mention it earlier.
- L198 Do you imply that a multitude of site visits were performed for this study?
- L210 Why did the soil deposits have to be composed of sand, silt and clay? Do you mean that they were expected to be composed out of these materials?
- L221 Maybe you could mention briefly the pin method. In that way you would strengthen your argument about using the other method.
- L241 You mention that a pressure transducer was located with direct exposure to the stream water. Is that why there is a second transducer in figure 3.2 in the first well?
- L255 Could you explain what are the roller ball tilt switches?
- L273 You could add to the sentence that the reason the sieve analysis was made was for soil classification.
- L275-277 You explain the various materials that compose the banks of Winooski River. I think you should add a reference there.
- L286-290 I didn't understand why you used index methods in order to compare to the measured values.
- L294 I think that a picture of the BST apparatus would be helpful to the reader.
- L306-310 You compare values contained by the BST method and the DST method and say that the variation in the results was probably due to disturbance of the sample. However, since the DST method is more commonly preferred could that mean that there is something wrong in the BST method?
- L326 Why is it important that the specific species exists in the area and how does a species affect the effects of roots to the shear strength?
- L357 What would be a realistic value?
- L359-360 Can you explain more what I would want to see in the figures?
- Figure 2.1 I think that the curve should not touch your y-axis since the volumetric content cannot go to zero due to residual saturation. Also, you could add the 0 and 100% values on the x-axis.
- Figure 3.1 Maybe a name of the location would be helpful.
- Figure 3.2 Were all the wells at the same depth?
- Figure 4.1 Some kind of "drawing" on the photo would be helpful in determining where the layers exist.
- Figure 4.4 Not needed.

I wish you good luck and I hope I was helpful.
C.Syrrakou

Review of

Stability evaluation of streambanks in Vermont

Borg et al.

This paper looks at stream bank erosion on two different streams in Vermont, the Winooski River and Lewis Creek. The research is being done because stream bank erosion directly affects how much phosphorus reaches a stream. This is important because phosphorus is quickly becoming one of the most wide spread pollutants in the US because of increased fertilizer use on farms. The research will provide a better understanding of how and why stream banks erode, which can help us identify problem streams and find ways to stabilize them. Average erosion rates have not been determined yet.

Because the data has not fully been determined yet it is a little hard to analyze, but the methods for getting the data seem very sound, which indicates the data should be sound. Again the logic of interpretations is a little hard to determine but they seem like they will be fine to me. I think the writing needs a little cleaning up, for the most part it is good but a lot of it is hard to follow and the numerous basic writing errors can make it a little hard to read. The figures are great, and I really see them as a strong part of the paper. They are easy to look at and understand. The only figure I have a problem with is 3.1, it is kind of hard to see the study sites on it.

I recommend that the paper is accepted with major revisions. I believe this paper needs to be published because it is presenting obviously important material and I think after all of the data is determined this will be a very solid, well done paper. A few things that need to be worked on are;

1. Just basic cleaning up of the writing, reading the paper out loud once would fix this.

2. Talk about the study sites in the introduction and abstract.
3. Flesh out the abstract more, I don't think it fully explains the paper.
4. Change figure 3.1 around
5. Fix up references ad citations.
6. Be more upfront about why stream bank erosion is important.

Charles Trodick

Eric Portenga
3/18/09

Review of Borg et al.

Borg et al. are taking a deeper look into the soil and riverbank conditions necessary for producing a realistic model for slope failure and determining slope stability. The study took a number of transects across the Winooski River in Burlington and Lewis Creek in Ferrisburg and data from these transects were collected over the course of two summers to put better parameters on a slope stability model. Factors such as matric suction and root density were studied to better constrain their control over slope stability.

I felt that some aspects of this paper were well constructed such as background and importance of this study; however, I also felt that a lot of loose ends were left hanging. For instance, the paper seems to focus mostly on slope stability, yet the whole first paragraph of the introduction was very detailed in describing water potability and phosphorus pollution. These two subjects are introduced, but never returned to in the end. It is hinted that slope stability comes into play in that as slopes fail and fall into rivers, they bring pollutants with them but, again, it is never really brought back into discussion later in the paper.

I thought the sections on matric suction and tensile reinforcement were well thought out and very interesting to read. Some phrases, however, were very difficult to read through and many sentences were not complete. This was a common comment of mine throughout the entire paper. Many words were missing in some cases, yet in others, extra words were added. Rather than creating a list of things to improve, my comments are in the hard-copy of the manuscript.

I would suggest major grammatical and punctuational revisions as well as a tying up of loose ends before submitting this manuscript for publishing.

Joe Bartlett

3/15/08

Review of Borg et al.

The purpose of this study was to monitor and model slope stability and streambank failure on two stream/river reaches. Field sites were surveyed and were tracked to determine the occurrence of mass failure. Lab testing determined other characteristics of the soils, including sheer strength effects of vegetation. This study also showed the importance of adding two metrics to soil strength determinations: the Iowa borehole shear test and matric suction measurement.

This study is appropriate for a technical article in the journal of Geotechnical and Geoenvironmental Engineering. In its current state, the paper requires a lot of work to be ready for publication, but it is a well thought out study with meaningful results. Major reorganization is the first step to getting this article closer to publication. The rough draft has no clear separation of methods and results, and the discussion is not yet written. The introduction contains a decent literature review and good background information. I would consider skipping most of the first few paragraphs of general background. Most of this should be common knowledge for the journal audience. The Introduction could start with a discussion of bank failure and sediment transport and then relate this to Phosphorous. Section 2 is good information but requires considerable effort to better blend into the paper and make a clearer connection to the study. The figures all look good and should make more sense with added description. After the paper is re-organized there are several areas of passive voice, weak language, and missing punctuation that are highlighted on the pdf. Specific recommendations for improvement are as follows:

L5: Title could be stronger

L26: Abrupt jump from streambank to P, introduce the mechanism for streambanks contributing P

L29: Awkward sentence would be better reworded to: Surveying, geotechnical investigations, and instrumentation were used to characterize…

L33: Awkward sentence

L35: “Classical” elaborate on this

L37: Important sentence that needs to be incorporated better

L72: Need to elaborate on the “waning confidence”

L86: Passive sentence

L166: Is this only assumed? You could probably give many more references here.

L203: If the selection process started with Hession’s sites you should state that and justify it based on existing soils data or something

L244: Too much detail on the pressure transducer installation – neither method is too crazy so just explain what you did, don't need all of the justification

L267: watch the use of significance

L270: Elaborate on this

L318: Elaborate on this

L369: Need more information in this section

L405: Why not?

Paper Title: **Stability evaluation of streambanks in Vermont**
Paper Authors: J.L. Borg, M.M. Dewoolkar and P.R. Bierman

Reviewer: **Lance E. Besaw**
Date: March 18, 2009

Summary
The authors study streambank stability in 2 basins in Vermont. They present numerous soil testing methodologies that are applicable for evaluating streambank stability. These methodologies are used to quantify soil and root strengths, bank erosion characteristics and relationships between the watertable and stream interactions. Although the methods and results sections are presented to great length, the discussion and conclusion sections are missing as the research is not yet completed. Major conclusion appears to be that classical soil mechanics principles are inadequate for analyzing streambank stability at the two proposed sites.

Evaluation
The quality of the data appears to be very well done. The authors present in great detail their methods and results. They follow ASTM protocols and site their sources for several of their methods. Overall, the methods appear to be very sound. However, portions from the methods and results sections are merged together, making the document difficult to read.

The authors do not present a significant amount of interpretation as the discussion section is missing.

Writing clarity was short point for this manuscript. Many of the sentences were run-on and or missing proper punctuation, making them difficult to digest.

Figures do not do a sufficient job presenting the necessary concepts to the reader. Figure 1 is lacking all quantification gradations. Figure 4 does not show the reader much of anything and may not be necessary.

Recommendation
Overall, I think the manuscript must go through some revisions to organize and more clearly present the reader the contributions of this study. The study does not appear to be completed at the time of this review. Thus it is difficult to gage the significance and contribution of this work. I suggest the paper be rejected as it requires major revisions.

Specific Comments
Authors must take more care in the punctuation of the paper. There are numerous places where commas are missing, which make the paper difficult to read.

Table and Figure references should be capitalized when called out in the text.

There also appears to be a lot of jargon used by the authors. I have an engineering background and was confused by some of the definitions/usages of terms.

I feel like the introduction needs to be revised. There is a lot of pertinent information and the research topic is important enough that a strong introduction would help frame the rest of the paper. I find the introduction unorganized and feel it may need more details.

Section 2 ("Factors affecting…") also presents a lot of good material. However, the section still needs some significant smoothing to increase readability. The general structure of it is laid out well.

A maximum factor of safety was found to be 1.04. Do the authors truly have the accuracy to confidently bring a factor of safety to the hundredths decimal?

Paper was lacking a discussion section.

Conclusions could have been stated more concisely to hammer home what the paper's findings were.

Meredith Clayton
GEOL 371
18 March, 2009

Stability Evaluation of Streambanks in Vermont

The aim of the study discussed in this report was to evaluate streambank stability in Vermont streams. This study reports the results of 2 years of data collection on the Winooski River and Lewis Creek. Several monitoring points were established on specific reaches of both streams in order to characterize their stability through the use of surveying, geotechnical investigations, and instrumentation. Mass failures, sediment removal, and deposition in the streambanks were observed through temporal surveys, while laboratory testing was used to determine soils strengths, root strengths, and soil erosion characteristics. Steambank stability was analyzed using classical soil mechanics from laboratory testing and variable stream and groundwater tables. These results revealed year-round instability in many of the observed banks. The study also reinforced the necessity of accounting for matric suction additions to soil strength and the validity of the Iowa borehole shear test.

It is clear that this paper is the result of vast amounts of hard work, but I believe that it remains too rough for publication in its current state. Overall I think you have created the beginnings of a solid introduction that could be improved significantly with a few changes. My first suggestion would be to consider how much you really need the part on conventional pollution. This is a rather minor suggestion. It is not irrelevant but you could probably do without it and make a more concise statement about pollution in waterways with sediments playing a key role. After all, your paper is really about streambank sediments so why not jump right in? More specifically, focus more on emphasizing the role of sediments rather than pollution issues. Secondly, you follow your introduction with a section titled "Factors Effecting Streambank Stability." This reads more like introductory/background information but you have also presented some methods here. I'm not sure that you need everything in there as some of the research does not seem especially important to the specific work in this study. I suggest separating out the introductory pieces from the methods pieces, or re-titling the section something like background and methods for evaluating streambank stability. Section 3 could be a subsection of your methods. Sections 4 and 5 seem to be relatively fine with the exception of typos and sentence structure issues which I have noted in the pdf mark-up. I did note that some pieces of section 4 involve descriptions of methods. I think your focus on polishing this paper should be re-structuring your sections so that you clearly separate introduction/background, methods, results, discussion, and conclusions. Once you have done this, you can focus on minor corrections such as addressing typos. As for section 5, you briefly mention future analysis on the Winooski site. I would like to see more of an explanation here. Are you planning to do this or are you stating that it should be done in order to make more conclusive assumptions? I think you are on the right track, you just need some time to iron out the kinks and you will have a nice paper based on a solid scientific study.

- Work on defining each section and teasing out parts that don't fit in a particular section.
- Read through text and address many typos and incomplete sentences
- Work to clarify descriptions of work performed (I think this will resolve itself if you address the typo/incomplete sentence part)
- Add labels to figure 4.4 and possibly Figure 4.1
- Elaborate on conclusions

Mark Isselhardt

Critical Writing (Geology 371)

3/18/09

Borg J. L., et al., 2009 Stability evaluation of streambanks in Vermont **for submission to the Journal of Geotechnical and Geoenvironmental Engineering.**

This manuscript describes investigations of streambank stability in northern Vermont. One section of the Lewis Creek and one section of the Winooski River were characterized and intensively monitored for soil type, stability and bank failure. The monitoring data was used to quantify the bank stability using computer models as well as established analytical techniques. The results are not yet complete for this manuscript. The results that are reported relate to the soil strength and factor of safety.

This paper is still in progress. A great deal of work has been done but there are number of analyses that have yet to be run, results observed and conclusions reached. This poses a challenge to the review (especially in the final sections of the paper). There are some awkward sentences and other small grammatical mistakes. These will be caught as the paper moves towards publication. I have made suggestions on a hard copy of the manuscript. The introduction is a bit brief and could use a stronger hypothesis or key statement of what this study is hoping to accomplish. What was the goal of this work? The abstract and later in the paper the two shear tests (BST and DST) are emphasized. The reader should be introduced to these tests early on (including their limitations and benefits). Section 2 (Factors affecting streambank stability) was very dense. There are many citations of relevant work but it needs to be filtered through the scope of the research being done. What level of knowledge is the reader of this Journal expected to have? Some terms are not clearly defined in sections 1&2. If the readership is presumed to be experts in the field then some of the length of section 2 could be trimmed. The methods section and the results section appear to be merged in some places. Is this a requirement of the Journal? Section 3 feels out of place. Could this information be incorporated into an earlier section? It might help to set the stage. In section 4.3 Soil Strengths, the text and figures should be placed in context (are any of the elevations near flood stage?). Also, the discussion that accompanies Figure 4.2-4.3 states a lack of correlation. Was the data tested for correlation or is that an observation? The analysis section should include more of analysis of data collected (influence of vegetation for example or more comparisons between the two streams). There should also be a more detailed discussion of Figures 5.1-5.3. The conclusions section is equally sparse. As it stands, this paper is not yet ready for publication. The additional erosion tests need to be conducted before the big picture will emerge. When these tests are done the paper will be much stronger and ready for submission

Here are some specific comments on the figures: Figure 2.1, How is this concept drawing different then what you observed in the data? Could you incorporate some of your data into this illustration?

Figure 3.1: Could this be simplified to include the state boundary and then an inset that indentifies only the streams in the study? As it is now the graphic is hard to interpret. It would also be

helpful if the two stream reaches were shown on a simplified topographic map (even better if the Sites could be labeled).

Figure 4.2 & 4.3: Could these graphs be combined into one? If not then the axis should be in the same scale for ease of interpretation.

Figure 4.4: This could probably be replaced by text in the body of the paper.

Nice work Jaron

Review of: Stability evaluation of streambanks in Vermont

By Borg J. et al.,

This study investigated two streams in Vermont, as a temporal study of streambank erosion. It was made apparent that erosion in streambanks leads to increased pollutant loading into water bodies. Modeling of stream bank erosion is limited to sites that have monitored for the paramaters affecting streambank stability. This study is the first of its kind in Vermont. Stream banks were defined in terms of failure surfaces which were then divided into a finite number of slices. The boundaries of the slices were given driving and resisting forces. A factor of safety (resisting forces : driving forces) was ultimately used to describe the stability of the slope. Section two is a nice progression through the effects on stream bank stability: vegetation, pore-water pressures, and hydraulic. The vegetation and pore-water pressure affects can be accounted for with modifications to the Mohr-Coulomb criteria. The hydraulic effects are quantified with a scour equation. The Winooski River and Lewis Creek were monitored in this study and seven cross sections at each river were performed temporally to quantify changes in stream bank geometry. Data logging systems were installed to monitor major parameters like barometric pressure, groundwater level, and slope failure. Soils were profiled at each site by use of bore holes, and soil strengths were assessed with use of a bore hole shear test and a direct shear test. The effect of root tensile strength was quantified with two techniques; the method using shear tests at different zenith angles gave realistic results. The analysis section provided data on the rate of stream bank recession. Factors of safety were plotted with respect to water elevation, and the streambanks were determined to be unstable.

The paper does a nice job of stepping through the stream bank erosion factors and defining the corresponding equations that compensate for the effects, such as the extra cohesion due to root presence. For the final analysis I was not sure if the factors of safety were determined with the Mohr-Coulomb equation, if they were determined by a model, or whether they were determined by a model that uses the Mohr-Coulomb equation as its basis. Maybe placing a picture of the GeoStudio model output would be beneficial to help illustrate failure shape. You discuss that classic soil mechanics is not satisfactory; do you have any suggestions why? Would incorporating the matric suction be enough to improve the current model?

I think that you introduce briefly why your study stands out as important in Vermont, but I think more discussion would be beneficial near the end of the paper. I think you need to discuss the applicability of creating this more empirical model. I feel like the empirical part of the results were not stressed and that is where your paper is truly unique. After revision of the paper I believe it will be an important addition to the literature on stream bank stability analysis.

Following are some further suggestions I have:

- I think the intro motivation section on pollutant loading could be shortened to one paragraph, but maybe an additional paragraph could describe problems in Vermont.

- Preceding equation 4 you discuss changes in pressure at the granular scale, and I was not sure that if that was what was used in the equation. So, is the added angle constant for matric suction a micro or macro scale constant? Because you are interested in the macro scale.

I have also included some inline comments for you. Good luck with further preparation.

Martin

Paper: 'Stability evaluation of streambanks in Vermont' by J.L.Borg, S.M. ASCE, M.M. Dewoolkar, M. ASCE and P.R. Bierman

Reviewer: Nikos Fytilis – 03/18/09

This paper's goal is to characterize the stability of two streambanks reach in the Lake Champlain of northern Vermont. This characterization would help and inform land management policy makers because the degree of stability is strongly connected with erosion deposits and loadings into lakes and waterways. The streams analyzed in this paper are only two of the many alluvial river beds of Vermont. A series of surveys were conducted to monitor geometric changes in river cut banks. These surveys include classical soil mechanics and laboratory testing as well as in situ subsurface investigations and monitoring of the soil deposits type and strength. The results after the two testing periods showed year round instability of the streambanks and the necessity to incorporate matric suction additions to soils strength.

The topic of this paper is very interesting but I think there is a lot of work to be done until this paper could be published. I think that you address the goal and the necessity of the paper very well. In general, I think that some parts are incomplete or missing and that is something that takes many points off from your paper. The other major issue of this paper is the figures and their captions. More analytically, the abstract is quite good but there are some minor mistakes (Line 29 streams) and some major (in the last sentence, you mention that this study showed the validity of the Iowa borehole shear test but I couldn't find a part in your paper that points out this result very clear). In the introduction, you could add some commas or rearrange some of your sentences in order to have a more formal and well structured introduction. I really liked the citation of others papers related to this topic and the way you finally conclude that your research adds a new approach to the determination of bank stability (even though the fact that I couldn't fully understand why the semi-quantitative approach is better from the others probably because I am not very familiar with the subject). I believe that the expert readers of the journal would perfectly understand what this approach adds to the characterization process of bank stability and they will especially like the last paragraph where you sum up all the necessary information from your research.

The 'Factors Affecting Streambank Stability' part is well written. I think it is not clear in the first equation what τ and what are the units for each of the parameters used. I believe again that there is a minor problem with the sentence's structure in some points in your text (Line 161-162 and 186-187). It would be helpful if you have a figure that shows what exactly the θ and ϕ angles are. Also, is there any equation that describes the relationship between c_r and c_r'? Something else that I noticed in this part is that you are not consistent in using lower or capital letters in your subsection titles. In the third section of your paper I faced some problems mainly because the figures 3.1 and 3.2 didn't help me at all. In the figure 3.1 I couldn't see where the two streams exactly located in the basin are. Additionally, you could create a map showing the

positions of the rods. At the end of this section, I think it would be good to explain more what the roller ball tilt switches are.

The Site Investigations part was also presented in a good way and I believe that there are few points which you can add to make it better. You could explain more why you used index properties, you could add a table with the DST and BST values as well as the friction angle values measured and you could add a photo with the tensile testing machine. In this part also, my suggestions are to discuss more some parts, like the correlation between the friction angle values and the elevation of sampling at Lewis Creek or which sieve holds the soil and which the roots. You can check my annotated document to see some minor mistakes in sentence's structure. Furthermore, the figure 4.4 is not helping and you can replace it with the figure I suggest to you showing together ϕ, θ and the various β angles. Finally, in the analysis one thing that could strengthen your paper is to discuss the slope for site 2 in figure 5.1 and explain more what the values under the bank id in table 5.1 corresponds with? Is they related with the 90 streambank situations?

As for the conclusion, I know that you are waiting the results from the tests for the erosion characteristics to finish that part so I can't say anything for this part. As I said the figures need a lot of work but I think you are in a good way. Keep up the good work and good luck.

Review of: Jaron Borg- Stability evaluation of stream banks in Vermont

By: Will Hackett

Jaron,

This is an interesting piece dealing with a topic of importance. The article discusses the slope stability and erosive nature of two different channels in Northern Vermont. The author first sets up the importance of this topic, setting the stage from the perspective of Phosphorous stored in sediment which is added to the water in the channel during erosive processes. The paper then moves into some background on channel/slope stability and sets up the study in terms of the sites themselves, and how data were collected.

The idea behind this paper and the field work which has gone into it are certainly sound. However, there are some important improvements which I think will make this a better paper overall. In terms of general notes: the text is somewhat rough, with instances of missing words, tense/ number agreement issues, and unclear sentences. A hearty proofreading should clear these up.

The first larger scale comment comes in the justification for this work. You mention Phosphorous as what seems like a primary motivation, but there is no mention of this in the title and no mention of it again later in the paper. I think it would be best to either focus on Phosphorous as your justification, and really bulk this section up- or don't focus on any one justification in particular, bringing in other background issues. Erosion at streambanks has all kinds of repercussions and in fact later in the paper you seem to focus more on the understanding of slope stability given various conditions simply as being important for its own sake. That would be a good opportunity to tie things in- there is plenty of good solid background to back this up.

The second point of improvement is that I find the text up until the study site to be somewhat disjointed, this should be streamlined and clarified with the new information suggested above. The study sites can be elaborated on in terms of geologic setting and perhaps some more detail about the conditions at each. On the other side, the construction details could be paired down (ie: stating the diameter of the rebar).

Once you get to the section describing what you actually did, I think it is important and should be emphasized more in terms of results, while knocking back the descriptions in the methods some.

From there, you should be able to tie these results back in with your justification to make some interpretations and allow for a good powerful conclusion.

This is an important work and I think with some reorganization, additions, and cleaning of the text it will be a very effective piece.

Good Luck!,

Will