

Ecosystem Management Emulating Natural Disturbance Project



2011-2012 Annual Report

Table of Contents

1) Executive Summary

2) EMEND Project Introduction

3) Core Activities

a. Core Activities Summary- 2011-2012

b. Core Activities Financials- 2011-2012

c. Planned Core Activities - 2012-2013

4) Grad Studies Activities

a. Grad Studies Activities - 2011-2012

b. Grad Studies Activities Financials- 2011-2012

c. Planned Grad Studies Activities- 2012-2013

5) Communications Activities- 2011-2012

6) EMEND Infrastructure

7) EMEND Safety

8) EMEND Management

9) Summary

Appendix1: Prescribed Burns Summary Table

1) Executive Summary

The EMEND project and its partners have delivered yet another successful, and productive year and have much to look forward to in the coming years. Although this year saw the tragic loss of one of our most promising scientists and leaders, Suzanne Abele, we have all emerged stronger and more committed to delivering on the goals and objectives of EMEND which Suzanne so deeply believed in.

The 2011-2012 year saw the completion of the 10th year re-assessment data collection, with the exception of the bird surveys which will be completed this coming summer. With this data in hand, our efforts will now shift towards synthesizing this extensive data set. Although this is a mammoth undertaking, we are excited to see what patterns and new ideas this synthesis may elucidate from the variable retention treatments conducted at the EMEND site. In 2012-2013 we will focus our efforts on this synthesis and continue to move towards an eventual 10 year synthesis publication for the experiment wide data. We have broken this synthesis into nine chapters focused on: 1) Introduction; 2) The EMEND landscape; 3) The EMEND Experiment; 4) Productivity and Silviculture at EMEND; 5) Biodiversity at EMEND; 6) Coarse Woody Materials at EMEND; 7) Soils and Nutrient Fluxes at EMEND; 8) Forest Health Dynamics at EMEND; and 9) Synthesis, Conclusions, and Management Recommendations.

The graduate studies program at EMEND saw the successful completion of two Ph.D. students, and two Master of Science students. Dr. Jaime Pinzon completed his work focused on variable retention harvesting impacts on the spider assemblages at EMEND, and Dr. Colin Bergeron completed his work on fire history at EMEND and landscape level indicators of biodiversity. Brett Bodeaux completed his work on the response of moth assemblages to aggregated retention harvesting and Esther Kamunya defended her work on the response of moth assemblages to the dispersed retention treatments at EMEND. Seung-Il Lee and Charlene Wood are both continuing their work on the role of coarse woody debris in conserving invertebrate biodiversity. We anticipate that Charlene will be defending her Master of Science thesis in the coming months, and Seung-Il will complete his final field season and begin the synthesis of his data sets this year. Two new students are coming on board this summer (Sonya Odsen -Bird responses at EMEND and Jared Amos -Pollinator Responses at EMEND). We also expect to see additional students starting near the end of 2012 as we anticipate the completion and approval of our NSERC collaborative research development grant which will provide new direction and enthusiasm to the graduate student work being completed at EMEND.

Finally, the 2011-2012 year saw the completion of another EMEND partner and researchers workshop with approximately 40 individuals present. We also produced two new EMEND research notes for this year, completed a promotional DVD for the EMEND project, and held a

field tour for Junior Forest Rangers at the EMEND site. All in all, 2011-2012 was a successful, and productive year for the EMEND project.

2) EMEND Project Introduction

The Ecosystem-based Management Emulating Natural Disturbance (EMEND) project, a valuable resource remotely located NW of Peace River, Alberta, Canada, is a large-scale (1000 ha) variable retention forest harvest experiment set within a 7000 hectare area of FMA tenure protected for long-range research. EMEND was originally designed to answer questions about how retention of green-tree residuals affects harvest cost, forest regeneration, patterns of succession, biodiversity, nutrient cycling, ground water characteristics and public perception. The EMEND resource comprises an 'experimental site' and a 'remote field research facility' (camp field lab). It is, we believe, the largest single site-manipulative forestry experiment in the world.

The experimental site that is the heart of EMEND was planned in 1996-97, laid out in previously unharvested forest in 1998-99, and developed through large industrial and public investment. It is planned to support world-class research activity for at least one stand rotation, or approximately 80-100 years. The experiment allows scientists to study a real working industrial forest from initial harvest through a first rotation harvest, thereby, providing insights into processes over an entire woodland life cycle on the western boreal plain.

The research at EMEND consists of two components: 1) a core research program that is designed to elucidate many of the long-term (i.e. 10+ years) patterns on the research site; and 2) a graduate student program that seeks to answer a broad range of scientific questions about the response of biodiversity, productivity, and social values to variable retention harvesting at EMEND.

EMEND continues to inform management applications and policy that together strive to balance social, environmental and economic values, thus remaining relevant across northern boreal landscapes. While the program's roots were founded in forest management questions, the fundamental knowledge of boreal ecosystem species, functions and structural components holds distinct value beyond the forest sector and will be of significant value to any group attempting to manage boreal forest land, including the energy sector. The research site is readily accessible by all-weather forest road for monitoring and demonstration purposes. It consequently enjoys regular visitors as well as growing national and international reputation for its design, credibility, long-range view and its longevity as a model partnership of industry, government and academic collaborators.

The following sections provide an overview of both the core research program, and the graduate student research program at EMEND in 2011-2012.

3) Core Activities

Core Activities Summary- 2011-2012

During the past year of core research we have:

1. Completed, with one exception, the data collection required for the 10-year synthesis. This absorbed the efforts of a 'core crew' of students and a field coordinator who spent May-August on site to finish the 10th year assessment of shrub response and to ready the site for a year or more of little core research activity while a major synthesis document is being prepared.
2. The single unfinished 'exception' to the '10th year' reassessment has been to collect data about the response of songbirds. We simply were unable to recruit a student capable of taking this on, and furthermore, budget was insufficient to contract it out to a consultant, although this possibility was investigated. A promising MSc student, Sonya Odsen, who started in January 2012, will conduct this assessment during the upcoming summer. This will complete the planned '10th year re-measurement'.
3. The core work at EMEND was significantly de-railed during the summer of 2011 by two events: 1) Our field leader and data manager departed on maternity leave in September and, as a result, was unable to attend to field activities during the summer period; 2) To facilitate completion of the field aspects of the 10 year re-measurement we hired Suzanne Abele, who had worked as a core crew student and recently completed a MSc at EMEND. Although this meant carrying an unbudgeted position for an additional 6 months, it was deemed an important investment in the project. Suzanne was killed in a tragic quad accident on site on 18 August 2011 while leading the core crew party to the North end of the site to renew the project baselines, part of readying the site for 1-2 years of relative inactivity. Loss of this very promising young scientist was devastating for the project and essentially shut down the core activity at EMEND. In addition to the deep sense of personal loss that flowed from Suzie's death, the project has been pre-occupied in dealing with various safety reviews and investigations. Even if we had been able to muster the energy to go forward, the EMEND computers and data were tied up in the hands of investigators for more than 3 months! We did what we could, and slowly, we are getting the boat back on course. Despite these challenges, we were able

to complete the re-marking of the project baselines and the collection of the shrub inventory data as planned.

4. We developed a working template for the synthesis document and hired an Analyst (Kevin Solarik) and a PDF (Jaime Pinzon), both of whom have much experience with EMEND, to drive the day-to-day work required to flesh in the template.
5. Much work has been required to enter and organize data from the 10th year assessment for analysis and to consolidate data about the early phases of EMEND, data that was distributed among various scientists. Kevin Solarik has done yeoman's service to the project in accomplishing a great deal on this front. Kevin also took the lead on getting the most recent aerial photography (2010) geo-referenced and aligned with previous work. This has been critical for establishing the spatial context for EMEND, and the work required to meet this objective should not be underestimated.
6. A synthesis chapter that describes the design and execution of the experiment is in a reasonable first draft. In addition, we have made significant progress with chapters about Silviculture & Productivity and Coarse Woody material with internal documents now circulating among the team of authors. A strategy for development of the biodiversity chapter(s) has been developed and we have been hanging analytical outcomes on that framework and attempting to connect them to each other.

Core Activities Financials- 2011-2012

Funding support for the 2011-2012 Core activities at EMEND was provided by Alberta Sustainable Resource Development Legacy Funding- administered through the Foothills Research Institute. Approximately \$278,200 in additional legacy funding remains for the 2012-2014 period.

Description	Expenses April 1, 2011 to March 31, 2012
Salaries and Benefits	
Field Coordinator	\$46,577.74
Summer Core Crew (3-0-2)	\$37,276.17
Lab Tech (Taxonomy + Grad Support)	\$43,872.97
Data Analyst (PDF)	\$14,325.91
Other	
Camp Costs	\$53,586.08
Supplies	\$4,733.01
Truck Rental and Maintenance	\$13,805.07
Facility Maintenance and Utilities	\$6,221.76
Equipment Upgrades	\$955.74
Other/Hosting	\$477.15
Total Expenses	\$221,831.60

Planned Core Activities - 2012-2013

Completion of the prescribed burns at the EMEND site will continue to remain as a priority for the program. As conditions permit, we plan to focus on completing any outstanding burns on the EMEND site (See Appendix 1).

Core activity in the upcoming year will be almost entirely devoted to bringing the synthesis document into clear focus, and completing most of the elements as identified in terms of the following chapter outline. Specific objectives and timelines for the coming year are identified below.

Chapter 1: Introduction, including the conceptual background for SFM, motivations for the EMEND experiment and a short history of the effort, and broad objectives for the project. -- J Spence will lead with support from D Langor, J Volney and E Macdonald. An advanced draft to be tabled by 31 March 2013.

Chapter 2: *The EMEND Landscape*, including the bio-climatic context, forest composition and forest history and development. -- C Bergeron will lead with support from B Kishchuk, V Lieffers, E Macdonald, J Spence, D Langor and others. A final draft of this chapter will be tabled by 31 March 2013.

Chapter 3: *The Experiment*, including the overall design, description of the treatments and cover-types and allocation of treatments to compartments. -- K Solarik has taken the lead on this chapter and an advanced first draft is completed with review inputs from J. Witiw on burning treatments. A final draft will be tabled by 31 Dec 2012 with support from J Spence, J Volney and others.

Chapter 4: *Productivity & Silviculture*, including harvest costs, fates of residual trees, incursion and establishment of germinates and suckers, predictive relationships between mensurational characteristics and whole tree biomass, growth of residual trees (elaborated through use of the forgoing relationships) and response of the understory to residual harvest (especially shrubs). -- K Solarik has taken the lead on this chapter and much progress has been made with a first working draft about 50% complete. A final draft of this chapter will be tabled by 31 December with support from J Volney, J Spence, E Phillips and others.

Chapter 5: *Biodiversity*, including impacts of harvest on all groups of plants and animals that have been assessed at EMEND, and where it is available a synthesis of information about post-harvest recovery of these taxa. -- J Pinzon has taken the lead on this chapter, with support from J Spence, E Macdonald, D Langor, S Bourassa, J Volney, J Witiw and others. Although all data but those for songbirds have been collected, we are still working to elaborate data about invertebrates from the '10th year assessment' through identification of samples; sorting and identification remains to be done for the final collection from 2009 and we anticipate that it will be completed by June 2012. The songbird data will be collected during the field season of 2012 and we have developed a plan for S Odsen, to design her analysis to deal with an overview of both harvest responses (collected in 2000) and the post-harvest recovery (data from 2005 and 2012). A considerable amount of data collected in both 2010 and 2011 about understory plant response remains to be entered and verified before analysis. This chapter will be complex. We plan that active writing will begin in September 2012, after elaboration and organization of the data is complete, with a reasonably advanced draft expected by 31 March 2013.

Chapter 6: *Coarse Woody Material (CWM)*, including rates of generation of CWM in both unharvested and harvested stands, generation of snags and logs, volumes of CWM in uncut stands and how these volumes were affected by retention harvest, life cycles of CWM in the western boreal. -- D Langor and D Williams have taken the lead on this work, with support from J Volney and J Spence. Two papers using the EMEND data are now in progress and these will form the basis, together with an extensive literature review, of this chapter. We plan active work on this chapter during 2012-13, with the expectation that a draft chapter can be tabled by 1 September 2013.

Chapter 7: *Soils and Nutrient Fluxes*, including soil nutrients and fluxes and how these have been affected by retention harvest, landscape and harvest effects on soil microbiology, how retention harvests affect these features at EMEND, and to the extent possible, the implications for the results presented in Chapter 6 for C-storage in soils at EMEND under retention harvest. Answering these

questions fully will likely require another complete re-measurement of soil parameters at the site; however, given the very small changes detected in the '5th year re-measurement' and the expense of the lab analysis alone (c. \$120K), we decided that it was pointless to re-measure these parameters again until at least 15 years post-harvest. -- B Kishchuk will take the lead on this chapter with support from S Quideau and others. We expect to develop the approach for this chapter and to begin the data consolidation work for this chapter during 2012-13. We plan to table an advanced draft of this chapter by September 2013.

Chapter 8: *Forest Health & Dynamics*, including tree damage from retention harvest as applied at EMEND, and effects of insects and diseases (as integrated with information about blowdown from Chapter 4) on aspen, balsam poplar and white spruce subsequent to retention harvest -- J Volney will take the lead on this chapter with support from B Tomm, D Langor, J Spence and others. We expect to begin the data consolidation work for this chapter during 2012-13, and to table an advanced draft of this chapter by September 2013.

Chapter 9: *Synthesis, Conclusions & Recommendations*, including an overall synthesis of information in the previous chapters to i) answer initial questions about thresholds of effect for forest structure, ii) lay the foundation for formal analysis of productivity-biodiversity trade-offs that will be undertaken using funds specifically targeted for graduate studies through an NSERC CRD grant that is in progress at this time, management implications of the EMEND findings and their applications in meeting the CCFM criteria for sustainable forest management, and new research directions that flow from the first decade of EMEND. -- J Spence will take the lead on this chapter with support from D Langor, E Macdonald, J Volney, J Witiw and J Pinzon. Although musings about the form of this chapter will begin during the upcoming year, we expect to deliver a reasonably final draft of this chapter by 31 December 2013.

Two additional chapters (treatments of the EMEND story about 'Fire' and 'Carbon') are being considered and may be added if the relevant results cannot be shoehorned into the above nine chapter outline and resources to develop them are available.

4) Grad Studies Activities

Grad Studies Activities - 2011-2012

EMEND provides an invaluable educational opportunity for domestic and international post-secondary graduate-students offering them simultaneous exposure to policy and management challenges associated with the Canadian boreal forest across-sectors, through interaction with all partners during the course of their research. The 2011-2012 year saw a number of successful thesis completions by students that had undertaken research projects at EMEND. These included:

1. **Dr. Jaime Pinzon- *Composition and structure of spider assemblages in layers of the mixedwood boreal forest after variable retention harvest***- Natural disturbances are important drivers of ecosystem change in the boreal forest and new approaches to sustainable forest management draw on natural disturbance patterns as a template for harvesting. The main premise for such an approach is that species have evolved and adapted to stand-replacing natural disturbances and thus are more likely to be maintained on landscapes managed to preserve spatial patterns of natural disturbance. I used spiders – one of the most important, diverse and ubiquitous groups of terrestrial predatory invertebrates – as a model for assessing the impacts of variable retention harvesting practices on biodiversity in the mixedwood boreal forest. Spiders were collected from the Ecosystem Management Emulating Natural Disturbance (EMEND) project landbase over a period of five years from different harvest treatments and forest-types. Results for 249 species in 18 families are included in this study. Changes in composition of spider assemblages clearly followed the disturbance gradient from clear-cut to uncut treatments and these changes were linked to habitat and forest structure. Ground-dwelling assemblages were mostly affected by harvesting, whereas canopy assemblages were less influenced when stand connectivity remained. Low tree retention (*i.e.*, 10-20%, which is the range currently applied by the forestry industry) showed some ability to mitigate adverse effects of clear-cutting; yet, higher retention levels are needed to maintain forest specialist species, especially in late successional seres (*e.g.*, conifer dominated). A “life-boating” effect of aggregated retention was evident, and was more effective when applied in combination with dispersed retention. The application of different harvesting practices alone is unlikely to entirely emulate the effects and processes caused by major disturbances on the landscape. Thus, keeping in mind that fire is an important component in the boreal forest, this type of disturbance cannot be excluded from management if the goal is to preserve a natural range of biodiversity. In conclusion, to sustain rich and diverse spider assemblages, management of the boreal mixedwood should aim towards maintaining landscape heterogeneity. Consequently, no single practice is effective to emulate natural post-disturbance patterns and to adapt harvesting to effectively imitate the processes of a disturbance driven system, a combination of prescriptions is recommended.
2. **Dr. Colin Bergeron- *Fire history, landscape biodiversity and indicators for sustainable forest management of the boreal mixedwood forest***- I examined the response of invertebrate assemblages to the forest mosaic established by past fire events, and tested the performance of trees as biodiversity surrogates in accurately reflecting relationships between fire history and invertebrate assemblages. Over 80 % of the studied landscape originated from three fire events; 35% from 1895 (107 years before sampling), 20% from 1877 (125 years before sampling), and 30% from 1837 (165 years before sampling). Less than 8% of the forest originated before the earliest fire detected in 1837. It was clear that even in the absence of fire for over a hundred years, sites with different fire history exhibited major differences in beetle composition and diversity. The oldest sites supported the highest richness followed by sites originating from the most recent fire event. Sites originating from the intermediate fire events had the lowest species richness. Furthermore, the relation between ground beetle assemblages and fire history corresponded to the directional succession shift from hardwoods to conifers described for the

mixedwood boreal forest. I found that canopy tree composition was a good indicator of the relationship between fire history and carabid assemblage. However, comparison of biodiversity surrogacy models built from either ground survey of trees or data derived from aerial photography reveals that both confusion among tree species, and inaccurate detection and estimation of less common tree species reduced the effectiveness of forest inventories as biodiversity surrogates. Ecosystem classification maps generated from multiple geo-referenced forest attributes performed better as biodiversity surrogates, especially in the detection of crucial old growth habitat. Composition and diversity of three invertebrate taxa (ground beetle, rove beetle, and spiders) were closely correlated to the ecosystem classification map. The use of many taxa improved the sensitivity of the biodiversity indicator to habitat parameters. Considering landscape history in the elaboration of conservation strategies for the extensively managed portion of the boreal forest will foster preservation of biodiversity.

- 3. Brett Bodeux- *Impacts of aggregated retention harvesting on the diversity patterns of nocturnal moth species assemblages in the mixedwood boreal forest of northwestern Alberta***

Clear-cut forest harvesting is a major type of disturbance contributing to habitat loss and fragmentation in the boreal forest, which seriously threatens the boreal biodiversity. Forest management practices such as the use of aggregated green-tree retention have been developed to maintain species diversity within clear-cut areas by providing suitable local habitats and by enhancing their connectivity for affected species. Nocturnal boreal forest moths exhibit local declines in abundance and species richness in response to intense forest loss. However, it is unclear how the distribution and diversity of boreal forest moths respond to clear-cut harvesting with aggregated green-tree retention and whether moths of different life history traits (e.g., diet specialist vs generalist, and small-bodied vs larger-bodied) exhibit different responses to habitat loss and fragmentation. The objectives of this study were (1) to document and explain the impacts of clear-cut harvesting with aggregated green-tree retention on the spatial distribution and maintenance of moth species diversity and (2) to determine whether diet breadth or dispersal ability influenced the response of moth species to the impacts of clear-cut forest harvesting. In this study, nocturnal boreal forest moths were sampled using ultra-violet light traps distributed throughout a 400 ha area of intact mixedwood boreal forest and a 400 ha area of clear-cut boreal forest containing randomly distributed patches of aggregated green-tree retention that range in size between 0.1 and 5.0 ha, located in northwestern Alberta near the EMEND research site. Species-area relationships and beta diversity were used to examine the impacts of clear-cut harvesting on the distribution and diversity of nocturnal moths. Our results showed that the local abundance and species richness of nocturnal moths were significantly related to patch size of aggregated green-tree retention. Similarly, patch size increased the pairwise similarity and decreased the beta diversity of the moth species within the harvested boreal forest. The occupancy of nocturnal moth species was significantly related to diet breadth with specialist moth species occupying fewer local habitats than generalist species. Overall, this study showed that the local establishment and persistence of most nocturnal moth species populations are limited by patch size. Consequently, a clear-cut area with limited forested habitat supports considerably fewer moth species than a similar area of intact boreal forest. The

loss of forested habitat was particularly detrimental to moth species with narrow diet breadths, suggesting that diet breadth is an important predictor of the extinction risk for moths in response to habitat loss and fragmentation in the boreal forest.

4. **Esther Kamunya- *Conservation of boreal moth communities in the managed mixedwoods of northwestern Alberta: Impacts of green-tree retention and slash-burning***– Green-tree retention (GTR), which involves leaving dispersed or clustered live trees on harvested stands, is being adopted as an alternative to clear-cutting and to conserve biodiversity of managed forests. This thesis examines the post-harvest (8-10 years) recovery of boreal moths following retention harvest and slash-burning in the managed boreal mixed-woods of northwestern Alberta. Night-flying moths were light-trapped from coniferous (CDOM) and deciduous (DDOM) stands harvested to three retention levels (10%, 20%, and 50%) and stands harvested to 10% retention and burned (slash-burns). These were then compared to un-cut control stands that had regenerated from wildfires (~80-140 years ago). At the 50% retention level, moth communities of the DDOM cover type did not differ from un-harvested stands, but those of the CDOM cover-type were still very different. Retention at the 20% level was insufficient to promote recovery of moth communities on harvested stands of both cover types. Moths that feed on pioneer plant species in their larval stages increased in the 50% retention stands while feeding specialists decreased at both retention levels. Thus, higher levels of retention are likely required in order to conserve feeding specialists in managed mixedwood boreal forests. Larval abundance and richness greatly varied among trees of the same species due to tree height, diameter at breast height and the percent crown cover of individual trees. Retaining single dispersed trees of different species, size, and age class on harvested blocks may therefore help to maintain a diverse moth assemblage through the stand regeneration cycle. Burning slash after harvesting did not ameliorate the impacts of low retention harvest as moth assemblages in slash-burnt and harvested stands did not differ. It is likely that fire behavior and intensity is modified in stands where low retention levels have been applied. Hence, prescribed burning will better achieve conservation objectives as complements to high-retention or un-harvested forest stands.

In addition to these completed theses, other students moved their projects closer to completion. These students included:

1. **Charlene Wood- *Saproxylic beetle and coarse woody debris habitat associations in deciduous stands***. Charlene continued to process her beetle samples and began to synthesize the data and write her thesis chapters. Charlene's work is showing much promise as she continues to elucidate patterns between woody debris decay levels and the associated beetle communities. Charlene aims to complete her thesis this spring 2012.
2. **Seung-Il Lee- *Saproxylic beetles and coarse woody debris habitat associations in conifer stands***. Seung-Il continued his path towards completing his doctoral work and finished another

field season. Data collection has been successful to date and he continues to process his samples and identify his specimens. Another year of data will be required for Seung-Il's work, but again, it is showing much potential with some interesting patterns emerging.

3. **Marla Schwarzfeld- *Impacts of forest management on a boreal Ichneumonid community.*** Marla completed her work on the response of Ichneumonids to the treatments at EMEND and has a publication ready for submission. She continues to complete other aspects of her thesis which aim to better clarify the taxonomy of Ichneumonid wasps in Canada.
4. **Irma Diaz Aguilar- *Mesostigmatan mites at EMEND.*** Irma continued her work on diversity and community ecology and trophic structure of mites at EMEND. Irma has already reported new species of Mixozercon species from EMEND in a scientific paper in 2010.
5. **Guillaume Blanchett- *Statistical modeling of biodiversity at EMEND.*** Guillaume undertook a variety of exploratory analyses for the EMEND project including an exploration of the ability of Wet Areas Maps to predict beetle diversity on the EMEND landscape. He has also been capitalizing on the extensive dataset compiled by Dr. Colin Bergeron to conduct many theoretical analyses which have broad implications for theoretical modeling of biodiversity.
6. **Dr. Anne Oxborough (PDF)- *Litter-dwelling invertebrate diversity in mixedwood forests.*** Anne completed her work at the EMEND site and prepared her work for the component of her work to be completed in Ireland. Anne's project aims to examine community structure of litter-dwelling invertebrates in mixedwood forests of Canada and Ireland to identify structural and compositional indicators of invertebrate diversity; and, make management recommendations for enhancing invertebrate diversity in managed forests.

Grad Studies Activities Financials- 2011-2012

Funding support for the 2011-2012 grad studies activities at EMEND came from a variety of sources including: Daishowa-Marubeni International, Alberta Conservation Association- Biodiversity Challenge Grants, NSERC Discovery Grants, and Alberta Sustainable Resource Development- Ecological Indicators grant administered by the Foothills Research Institute.

Description	Expenses April 1, 2011 to March 31, 2012
Salaries and Benefits	
Grad Students	\$72,242.63
Summer Assistants and Other Support	\$21,879.25
Post-Doctoral Fellow's	\$20,776.31
Technicians	\$12,727.76
Other	
Camp Costs	\$7,616.02
Supplies	\$1,234.86
Truck Rental and Mileage	\$5,527.46
Publications	\$0.00
Conferences	\$2,791.27
Knowledge Exchange	\$9,100.00
Total Expenses	\$153,895.56

Planned Grad Studies Activities- 2012-2013

The 2012-2013 year will see a resurgence of graduate work at EMEND. Submission of a joint DMI/Canfor/NSERC Collaborative Research Development Grant will help us to complete various projects currently in progress, and expand the graduate work occurring at EMEND. The EMC is also finalizing an "EMEND Grad Studies Framework" that will see enhanced clarity of roles and deliverables, and increased interaction between EMEND student researchers and partners from industry and government. This engagement will occur from the point of research project initiation, through the active fieldwork stage, as well as during the final synthesis of findings and management applications. It is intended to be a reciprocal experience where students also gain site-level insight into policy and forest management activities, and the challenges in natural resource management decisions. Currently planned graduate activities for the 2012-2013 year include:

1. **Charlene Wood- *Saproxyllic beetle coarse woody debris habitat associations in deciduous stands.*** Charlene will continue to push her work towards completion and we should see a successful completion of her Master's degree project in 2012. Her efforts will focus on data synthesis and writing.
2. **Seung-II Lee - *Saproxyllic beetles and coarse woody debris habitat associations in conifer stands.*** Seung-II will spend another summer in the field collecting his final year of data and will

proceed with sample processing and identification. He will begin to focus more heavily on data synthesis and thesis writing into the latter part of the 2012-2013 year.

3. **Irma Diaz Aguilar- *Mesostigmatan mites at EMEND.*** Irma is currently focused on completing her analyses and hopes to successfully defend her PhD work in 2012.
4. **Sonya Odsen- *Song Bird Response to Variable Retention Harvesting at EMEND.*** Sonya is a new addition to the EMEND project and has started her work towards a Master of Science degree under the supervision of Dr. John Spence and John Acorn. She is currently focused on developing her field program and will conduct the much needed bird surveys at the EMEND site beginning this summer. She will also work to integrate data from previous years so as to perform a multi-year synthesis of song-bird responses to the treatments at EMEND. Sonya is an enthusiastic and talented student and we look forward to what she can offer to the EMEND project as a whole.
5. **Jared Amos- *Pollinator responses to variable retention harvesting at EMEND.*** Jared is a new student on the EMEND project and has entered a Master of Science program with much enthusiasm about studying the pollinator bee community at EMEND. Jared will be supervised by Dr. John Spence and Dr. David Langor. He is currently developing his field program and will be up at EMEND this summer to collect his first year of data.
6. **Additional Students-** 2012-2013 will also see the incorporation of additional students into the EMEND graduate student mix, assuming successful approval of the DMI/Canfor/NSERC collaborative research development application. We look forward to bringing on new students to work on the biodiversity, wildlife, soils, fire, and social dimensions of the EMEND project. The NSERC CRD funding application anchors the relevance of these diverse themes to the CCFM criteria defining sustainable forest management in Canada's boreal forest, with the intent of inspiring refinement or development of science-based management tools, practices and policy. The EMC hopes this renewal of EMEND research opportunity will also prepare enthusiastic students as the next generation workforce to meet the challenges of one of Canada's flagship sectors through a highly interactive university-industry-government collaboration.

5) Communications Activities- 2011-2012

EMEND knowledge and research progress are shared among EMEND partners through a number of initiatives. Fostering a relationship of regular interaction between graduate students and EMEND partner representatives is emphasized as a critical part of the EMEND experience, from the point of forming the research project question through to development and discussion of management practice implications.

Annual Workshop

The annual EMEND workshop was held on the 15th of April, 2011, at the Northern Forestry Centre, Edmonton, Alberta. This workshop brought together all the researchers, graduate students, and industry personnel involved in the EMEND project to discuss important matters regarding the EMEND project. This year included a variety of partner presentations and researcher presentations. Approximately 40 people attended the workshop this year.

Knowledge Exchange Activities

Through the University of Alberta, the EMC maintains a contract relationship with both nova-NAIT's Boreal Research Institute (BRI) in Peace River, and the Knowledge Exchange Program at the Department of Renewable Resources-University of Alberta, to assist the design and local delivery of specific activities set-out in an annual knowledge exchange workplan reviewed and endorsed by the EMC. 2011-12 was a transition year, while EMEND funding models were modified and being finalized. Consequently, knowledge exchange activities were limited to priority initiatives and in-progress projects.

- a) EMEND Insights- A new Research Note series was developed for EMEND this year under the title of EMEND Insights. This represents one of the biggest components of the knowledge exchange program and seeks to deliver on partner requests for non-technical summaries of results obtained during EMEND focused research projects. Two notes were published this year:
 - a. The Intersect between retention harvests and natural regeneration- Kevin Solarik, Vic Lieffers, and Jan Volney
 - b. Gatekeepers of the forest: the ichneumonids of EMEND- Marla Schwarzfeld and Felix Sperling
- b) Site Tours- The Boreal Research Institute facilitated a tour of the research site for the Junior Forest Rangers program over the summer of 2011. These tours provide a valuable resource for promoting sustainable management of natural resources to the next generation of resource managers.
- c) EMEND Promotional DVD- Thanks to the support of the Alberta Forest Extension Network (AFEX) www.afex.ca, the EMEND promotional DVD was completed and circulated to the various research partners and past program participants. This product offers partner perspectives on EMEND research program value and the extent of its reach during the first decade, improving human understanding of Canada's forest biodiversity and lending important insight on the complexities of managing boreal resources sustainably for the benefit of present and future generations. DVD's were also provided to local libraries and schools to help promote the world class work that is being undertaken at the EMEND research facility. Further promotion and distribution of this high quality media is occurring through partner websites, as well as copies provided

to senior federal and provincial Ministers and officials (Natural Resources Canada, Alberta SRD, Environment Canada), Forest Products Association of Canada, Peace River MLA, local Federal MP, northern Alberta forest products and energy sector companies, and the international research community.

EMEND Promotion to Prospective New Partners

In recent history the EMC has attempted various strategies to promote relevance of EMEND knowledge to potential new funding collaborators, namely the oil and gas sector. Increasingly, the hydrocarbon industry sector is being challenged by domestic and international interests under its social license for public land access to demonstrate tangible results in reducing environmental footprint and progress in restoration performance. Some organizations (e.g. OSLI) have been assembling an inventory of research projects that might have utility in monitoring systems or land management decisions guiding disturbance and restoration activities with a meaningful influence on local species and ecosystem processes, while also providing business benefits. Tim Vinge and John Spence lead an attempt to promote four areas that EMEND knowledge-base could assist that sector in developing and demonstrating improvements in planning and restoration; footprint reduction, ecosystem recovery, business efficiency and cost, monitoring template. More recently, a brief orientation document¹ was drafted to support additional efforts by Vinge in clarifying opportunity value for their sector. To-date, interest remains present, however uptake has been slow and uncertain.

6) EMEND Infrastructure

EMEND partners and researchers benefit from a range of infrastructure representing capital investments that support the field activities and promotion. These include a University base camp and field lab (equipment, buildings), a temporary camp site, the research forest site compartments, all-weather road access, All Terrain Vehicles, and a visitor staging area. The project also relies on a website for storing and sharing data and project information. It is important that the EMC maintain an eye on the condition of these fundamental elements supporting the research effort.

- a) Field Infrastructure- During the 2012 year, it is recommended that the EMC consider an assessment of the condition of its field capital as part of a needs-assessment. At least 3 areas have been identified during 2011 that appear to be due for renewal discussions; ATV fleet (ranging from 2004-2005 age, 5800-7600km, 280-770hrs), tent platform canvas, visitor staging area (gazebo's). Enhanced protection of the research forest

¹ 2012, Vinge T., Spence J.R., Witiw J., "Clarification on the Utility & Opportunities Associated with the EMEND Research Program (circa 1997) For Energy Sector Activities" -unpublished

lands (7000ha) and collective EMEND research investments in this site remain an important action item that Alberta SRD (Stadt) is still pursuing.

- b) EMEND Website- The website was intended to function as a tool for EMEND partners to serve a variety of functional needs. This media is also critical in conveying an external message on active project-status and ongoing scientific work at the site, as a catalyst to assist funding investments, attraction of new partners and attraction of new researchers to the site from partner institutions as well as other domestic and international organizations. The EMC directed the completion of a gap analysis on the current website as an initial step offering clarity of needs and an evaluation of the current website in meeting those needs. Kevin Solarik lead a preliminary assessment and consultation with EMC representatives to produce draft recommendations that will have utility in forming an action plan to up-date and renew this resource (e.g. contents, aesthetics, web design, function, content up-dates to non-secure and secure interface components). This includes recommendations regarding potential solution paths. Some of the content-related items for the public interface component may represent short-term tasks that the CFS (Langor, Elofson) has agreed to investigate as near term fixes. Along with developing an action plan and cost estimates, the EMC will need to clarify future website administrative arrangements for public interface and proprietary interface components.
- c) Base Camp- Historically, the base camp has been operated and maintained by local contractor resources during the active season, and demobilized for winter. The operating costs of this EMEND facility are intended to be allocated between core and secondary research programs.

7) EMEND Safety

This year proved to be an extremely difficult year for the EMEND project with the loss of Suzanne Abele, a very promising young scientist. Safety on the EMEND field site has always been the top priority for the EMEND management committee and has never been taken lightly. Our safety plan, which is developed using the current forest industry standard, is robust and arguably one of the strongest safety programs for field based research at the University of Alberta.

As a result of this incident, the EMEND Management committee has decided to undertake a thorough review of our current safety program. We have sought out the services of Mr. Gord Winkel at the University of Alberta. Gord has extensive experience and is the past VP of Environment, Health and Safety at Syncrude Canada Ltd. His services will be used to ensure

that the EMEND safety program remains one of the most comprehensive, and best executed programs at the University of Alberta.

8) EMEND Management

EMEND continues to see direction occur through an EMEND Management Committee comprised of representatives from partner organizations. Program management occurs through the University of Alberta representative, with science leadership direction shared by the University of Alberta and Natural Resources Canada –NoFC. EMC members include:

- Tom Archibald (Foothills Research Institute)
- Shawn Barraclough (Alberta SRD –Peace River)
- Christine Kreibom-Quinn (Canfor)
- Dr. Dave Langor (NRC, NoFC, CFS)
- Matthew Pyper (UofA Knowledge Exchange)
- Dr. John Spence (UofA)
- John Stadt (Alberta SRD –Forest Management Branch)
- Tim Vinge (Alberta SRD –Oilsands Reclamation Branch)
- Jim Witiw (DMI)
- Associate: Jean-Marie Sobze (novaNAIT Boreal Research Institute, AFEX)

During 2011 the EMC resolved a need for an enhanced administrative model and improved capacity to assist EMEND administration, field management, work planning and reporting routines. A new term staff function was endorsed in-principle that would be shared with the University for EMEND tasks and other University business needs. It is imperative that the EMC ensure EMEND remains visible, relevant and of business value to the individual organizations represented at the table. This staff role would serve to support those aspirations in concert with the EMC and the EMEND Program Manager. The position would be partly funded by EMEND budgets. Reporting relationship would be with the EMEND Program Manager and taking additional direction from the EMC team on matters of strategic and financial decisions. The position will provide a lead role in coordinating and maintaining momentum on a variety of key EMEND activities, to ensure critical dates and routine functions are addressed. During 2012, this position will be finalized including clarity on job description, funding formula and University-EMEND workload ratio.

Field activities in support of core research components will continue to occur through recruitment of student resources year-to-year as needed. The summer crew leadership function will in the future be identified from among senior candidates employed in previous season's core crews or candidates who were graduate student researchers.

9) Summary

As one can see from this summary, 2011-2012 was a slower, but productive year for the EMEND project. We were all deeply impacted by the tragic loss of Suzanne Abele at the EMEND research site and her presence and leadership at EMEND will be sorely missed. As we press on and focus on future opportunities at EMEND the future looks bright. We look forward to the successful submission and hopeful approval of our NSERC collaborative research development grant and anticipate much renewal of our graduate student programs at the EMEND site. In addition, the ongoing work to complete the 10 year synthesis document will no doubt provide insights from the experiment wide research program, and help to guide us down a future path for the EMEND project. We thank all of our past and present funders and look forward to continuing to provide science based information for the promotion of sustainable forestry operations locally, nationally and internationally.

Appendix 1

Burn Date	Block (#)	Canopy Composition	Area Burned (%)	Description	Status
					-2011
4/8/1999	926	CDOM	70%	Patchy burns in some areas.	Complete
26/04/00 & 14/05/10	943	ADOM	70%	Unsuccessful first attempt.	Complete
26/04/00 & 14/05/10					
1/7/2004	937	MIX	50%	N/A	Complete
18/05/06	883	ADOMU	50-60%	N/A	Complete
18/05/06	891	CDOM	40-50%	Unburned area – very wet.	Complete
18/05/06 & 17/10/10	901	MIX	<20%	Poor burning on both attempts.	Pending
14/05/10					
13/05/10	857	ADOM	<10%	Poor burning.	Pending
12/5/2010	865	ADOM	50-60%	Poor burning after number of attempts.	Complete
12/5/2010	866	ADOM	50-60%	N/A	Complete
N/A	872	MIX	N/A	Site has been way too wet to attempt to burn.	Pending
N/A	915	CDOM	N/A	Never attempted, too wet.	Pending
N/A	960	ADOMU	N/A	Never attempted, too wet.	Pending