# **Ecosystem Management Emulating Natural Disturbance Project** 2013 Annual Report



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## 1) Executive Summary

The year 2013 brought much change and renewal of the EMEND Project. A number of positive developments have helped enhance and stabilize the program. We believe that momentum established during 2013 will make 2014 - the start of the 15<sup>th</sup> Data Collection Year - a great success!

EMEND welcomed Amanda (Amy) Hayden first as Field Program Manager and, later in the year as Program Coordinator, after Matthew Pyper stepped down from this position to pursue Knowledge Exchange opportunities. Matthew will continue to support our Knowledge Exchange programs into the future.

The Core Crew and associated program was relatively small this year. Amy and the two undergraduate Field Assistants, Kimberly Rieter and Hongjing Feng, endeavored to prepare the site for renewed core work in 2014 by re-establishing and marking the baselines and sample plots at the EMEND project site. Trail and bridge maintenance was achieved with the help of the local Junior Forest Rangers, while replacement and renewal of the camp tent structures were completed when poor weather kept crews from the field. A major highlight for the year for Core Crew activities was application development and successful competition for FRIAA-FRIP funds with DMI, Canfor, and the Government of Alberta's assistance. These funds will help support 2 core crew students for 2 years of productivity data collection, including Silviculture and coarse woody materials work.

The new EMEND Safety Plan was completed and implemented successfully this year. All staff and visitors embraced the new Plan and provided feedback on ways to enhance it. Thank-yous go out to Mr. Gord Winkle, University of Alberta, Matthew Pyper, Amanda Hayden, and all who participated, provided support and feedback for the development of the Safety Plan and for a safe and successful field season. On final internal reviews of the Safety Plan and its test during the 2013 field season, the full new plan will be finalized for 2014 adoption and distribution to the EMEND partners. This accomplishment has been a noteworthy enhancement to earlier EMEND Health and Safety programs, particularly in the inventory of hazards, revisited development of controls and procedures, as well as improved process flow between the various components of that program. The inclusion of a better system for incident/near miss tracking and recall has enabled more efficient opportunities to report statistics and review trends, and in that lends itself to a more functional program that is responsive to trends both mid-season and at the year-end. The EMC had opportunity to review the 2012 and 2013 year end statistics as well as season-end recommendations of the EMEND field coordinator. They have provided comment on recommended 2014 actions and Health and Safety Plan enhancements to be reflected in current budget plan. It is perhaps noteworthy that some funding pathways are now requesting evidence of such plan implementation in their grant funding contracts, so EMEND is well-positioned to meet that requisite.

A number of graduate students and postdoctoral fellows in different stages of their projects worked at the EMEND site during 2013. Sonya Odsen and Jared Amos, both M.Sc. Candidates, successfully completed their final field seasons; Seung-III Lee completed the final required collection of beetles from his rearing drums; and, Dr. Colin Bergeron, in the capacity of PDF, successfully launched new work about decomposition that has been subsequently supported and extended through the FRIAA-FRIP funding. With the successful defense of her thesis on parasitoids at EMEND Marla Schwarzfeld completed her Ph. D. A major highlight in EMEND Graduate Work was the development and successful competition of the NSERC-Strategic Grant for Wet Areas Mapping Project through Dr. Ellen Macdonald and collaborators. We look forward to working with the new cohort of graduate students for 2014 who will be brought to us through the NSERC-CRD, the NSERC Strategic Grant, and all other projects.

Thanks to a short term grant from the Vice President of Research at University of Alberta we were able to purchase 5 replacement tents and 2 new ATVs for core crew use. This funding has also allowed us to keep on the Program Manager during the winter periods.

Despite good news about a number of grant/funding opportunities, these are directed mainly at graduate student work and, unless more funding becomes available, many core tasks will not be completed for 2014, including the core work on both productivity and biodiversity. Despite the FRIAA funding offering a start-point for the productivity work, a significant funding gap remains in resources required to mount the operational portion of EMEND's cyclic re-measurements. Of course, these are central to monitoring the ecosystem response to original project treatments.

Extensive participation in fund-raising by the EMT during years leading up to 2013, have been basal to the collective award of c. \$2.9 million in funding to support a diversity of specific projects during the current 5-Year period. This success speaks to the continued relevance of EMEND's original aspirations and design today. Our partnership has also addressed current issues-of-the-day, management policy challenges, and the interests in broader society in science-based guidance to sustainability questions. The academic, industry and government partners have risen to the challenge of preparing and presenting a strong business case for EMEND, and we remain hopeful that such efforts will bear the fruit required to carry the project forward toward its long-term goals.



First ADM Tour May 2013



Searching for Baselines



 Becond ADM August 2013

# 2) EMEND Project Introduction

The EMEND (Ecosystem-Based Management Emulating Natural Disturbance) Project, is a valuable resource, remotely located NW of Peace River, Alberta, Canada. EMEND is a large-scale (1000 ha) variable retention harvest experiment set within a 7000 hectare area of forest tenure which is protected for long-term ecological research highly relevant to sustainable forestry in the western boreal region. 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 of forestry activities and management. EMEND, we believe, is the largest single site-manipulative forestry experiment in the world. It has been used by the Canadian government to illustrate the modern Canadian approach to forest management around the world.

The experimental site, that was developed largely through industrial and public investment, is the heart of the EMEND Project. Planning commenced in 1996-97, it was laid out in previously un-harvested forest in 1998-99, and forestry treatments started in the winter of 1999. "Core" data is collected at 5 year intervals; often it takes 2 years to collect this data. 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, within the western boreal plain, from initial harvest through a first rotation harvest, thereby, providing insights into processes over an entire woodland life cycle. The project's assets comprise an 'experimental site', a 'remote field research facility' (camp field lab) and some limited equipment (trucks, ATVs, chain saws, etc.).

The research at EMEND consists of two components: 1) a core research program that is designed to elucidate long-term (i.e., 10+ years) patterns of response to disturbance on the research site while answering questions defined by industry and government partners; and 2) a graduate student program that seeks to answer a broad range of scientific questions about the responses of biodiversity, productivity, and social values to variable retention harvesting through original scholarly research conducted at EMEND. Work under component #2 connects EMEND to a vibrant international research culture, while that under component #1 assists industry directly with development toward objectives that can be defined today, and that are set in the context of the present operating rules and policy for forestry in Alberta. Taken together these efforts comprise the double edges of the research and development sword, which we aim to keep as sharp as possible, given the resources available.

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 are founded in forest management questions, the fundamental knowledge of boreal ecosystem species, functions and structural components hold distinct value beyond the forest sector and are relevant and should be of significant value to any group attempting to manage boreal forest land, including the energy sector. The research site is readily accessible by an 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.



# 3) Structure of the EMEND Management Committee

EMEND continues to see direction occur through an EMEND Management Committee (EMC) comprised of representatives from partner organizations. Management of the research and extension program occurs through the University of Alberta, with scientific leadership shared between the University of Alberta and Natural Resources Canada (the Northern Forestry Centre (NoFC)). EMC members in 2013 included:

- John Spence (UofA, Science Co-Lead)
- Dave Langor (NRC, NoFC, CFS, Science Co-Lead)
- Jim Witiw (DMI)
- Jim Stephenson (Canfor)
- John Stadt (Alberta ESRD Forest Management Branch)
- Shawn Barraclough (Alberta ESRD Forest Management Branch, Peace River)
- Tim Vinge (Alberta ESRD—Forest Management Branch)
- Bill Tinge (Foothills Research Institute)
- Matthew Pyper (Fuse Consulting Ltd—Knowledge Exchange)
- Jean-Marie Sobze (novaNAIT Boreal Research Institute, AFEX) (Associate Member)

Amanda Hayden was hired in 2013 as the Field Program Manager responsible for camp operation and the activities of the EMEND Core Crew. Matthew Pyper served as Project Program Coordinator under contract with the Department of Renewable Resources for 20% of his time. In September 2013, through mentoring by Matthew, we have shifted the Program Coordinator tasks onto Amanda's work load. This was done to let Matthew focus more of his time on the Knowledge Exchange for the project. In December Matthew resigned as EMEND Program Coordinator and all the responsibilities of the position passed to Amanda. Matthew, under contract, will continue to facilitate the knowledge exchange program with assistance from other potential external contract support, as determined by the EMEND partner organizations.

### **EMEND Management Committee Organizational Chart 2014**



# 4) Core Activities

## a. Core Activities Summary- 2013

The 2013 Core Crew Staff were busy this summer preparing the EMEND Site for the coming Year 15 Core Remeasurement, which will commence in 2014. Please see the below diagram for a summary of Core Crew time allocations in 2013. The Time drain associated with commuting is perhaps noteworthy in reflecting the remote nature of the EMEND research forest site. This aspect might be addressed in future CFI applications.



Plot maintenance was the largest priority and where a majority of the Core Crews time (31%) and effort was spent. As a part of the plot maintenance we attempted to find and remark the Baselines (BL) in all compartments at the EMEND Site. Approximately 86% of all BL on the site were completely or partially remarked. We had difficulty locating c. 14% of the baselines because the original lines had grown in or degraded. These 10 BL, located mainly in burns, slash-burns or slash-harvest blocks, must be re-established and re-marked during the 2014 season. Permanent-Sample Plots (PSP) were also re-marked. Using GPS we re-logged each PSP start and end data points. We will finish remarking PSPs during the 2014 as we proceed with data collection.



Orientation, Training and Safety activities included ATV training, bear awareness training, first aid training, camp and site safety orientations, road surveys, and safety meetings. These tasks comprised a combined total of 9% of the Core Crew's time.

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Trail and Camp maintenance took up 5% of the core crew time. In 2013 the Core Crew took advantage of poor weather and few guests to paint the interiors of all 5 tent bases. In July and August the Peace River Junior Forest Rangers assisted the core crew in two large projects including the maintenance of the main ATV trail in F as well as building two bridges (one in F one in A). Without their help these much needed projects would not have been completed.

This summer the crew was able to complete the 2010 Shrub data collection. The remaining plots were sampled and data was passed on to Brad Tomm, at CFS, and has been added to the EMEND Database.

After a request for assistance from Hosen Alam (PhD Candidate) and Soung Ryu (supervisor), the Core Crew allocated 12 hours total (4 hours each trip) to visit and record precipitation measurements in 4 trial sample plots. This data assisted in the fire resistant landscapes project which is a part of the CRD.

A large majority of the Field Program Manager's time was spent reorganizing the EMEND Camp Facilities office and files, acquainting herself with the policy, procedure, and methodologies of the EMENDP Project. Office work was also compiled of data entry, user bookings, and taking care of camp necessities such as ordering water, reminding contractors, taking inventory of supplies and equipment, etc.

Another component of the Field Program Manager's tasks (Other) was time spent in town getting supplies, maintaining equipment, dealing with faulty raidios, and running things to and from the catering company.

This fall has been a successful season with development of a new hiring, orienting and training methodology being put in place for both the core crew staff as well as the graduate students. As well as having the finished product of the safety plan in place. Both could not have been completed without the help and input of both past and present graduate students and employees.

An important aspect of the Core Program in 2013 has been development of the EMEND Synthesis Report. Please see the brief summary below on the work Jaime Pinzon has completed.

# Jaime Pinzon—Ph.D & Postdoctoral fellow—Responses of biodiversity to variable retention harvest: A 10 year tale

Most of my research time this year has been directed towards the EMEND synthesis for the biodiversity portion. During this time I have been working with Brad Tomm (CFS) in activities related to the EMEND database (data checking/cleaning, data management, etc). The outcome from these activities is the almost completely updated EMEND database (up to the last experiment-wide data collection that took place between 2008 and 2010). Unfortunately there are still a few minor issues that have been identified during this process (shrub and early pitfall-trap data).

One of the main gaps, in terms of data, that now has been filled, is the inclusion of the 1999-2000 spider data. After almost 15 years, the person who helped in the collection and identification of this material, agreed on making it available to the database. I received this raw data earlier this year and spent a considerable amount of time cleaning, organizing and updating it to the standards for inclusion into the EMEND database. Then Brad and I spent more time figuring out a number of issues that were evident with these data, most of which are solved now.

Another important gap identified from the biodiversity perspective and related to the updated completion of the EMEND database is the need of identification of rove beetles. These have been collected systematically together with other invertebrates using pitfall traps. In contrast to carabid beetles and spiders, which are

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fully identified, the only rove beetles identified are the samples from 1999 and 2000. Material from 2004 and 2009 are still awaiting identification and samples from the 2014 15<sup>th</sup>-year re-measurement will be added in the coming years.

Nonetheless, the update of the EMEND database is of great relevance, given that good and clean data is fundamental for the synthesis. This update, has allowed me to start performing final analyses for the biodiversity chapter in the synthesis. Currently, working together with Sonya Odsen (looking at the bird data) and Ellen Macdonald/Anna Dabros (looking at the vegetation data), I have been able to put most of my effort on the invertebrate data, pushing forward the analysis stage of the synthesis. My expectations are that we will have a working document that merges all the results early in 2014.

### b. Core Activity Financials- 2013

Funding support for the 2013 Core activities at EMEND was provided by the Alberta Sustainable Resources Development Legacy Funding, administered through the Foothills Research Institute. The SRD (FRI) Legacy funds are effectively exhausted to the point that the remaining nominal amounts do not warrant a 2014 FRI work plan submission. Part of 2014 Core budget will be provided for through the FRIAA-FRIP funding. FRIAA has advanced the fires \$150,000 (of the \$300,000) to DMI for allocation to the 2014 project period.

### c. Planned Core Activities - 2014

The 2014 summer season looks to be a busy one for the core crew. We are hoping to have an 8 person crew for this season as there is a lot of on the ground work to be done. The extent to which our plans can be achieved is all dependent on funding, that here in late March still hangs in the balance.

This year we were lucky enough to have received a FRIAA-FRIP Grant to help manage costs for the productivity studies within EMENDs core data: mensuration/forest health and snag assessment. There should be enough work here for 4 people for the summer season; although, only 2 of these positions have been funded. We would like to also schedule pitfall trapping, for the 2014 summer season; however this is dependent on funding availability. With pitfall trapping there will be enough work for an additional 4 people for the summer season. We may potentially need part-time sorters into the fall season as well. If this work is funded, it is our priority and goal to have the samples sorted and identified by the end of 2014. Core crew is also anticipating time for finishing BL remarking, PSP remarking and longing, and more trail maintenance including bridge building and trail clearing; hopefully with the help of the Peace River Junior Forest Rangers.

The 10 Year Synthesis report is still on our radar and is planned to be ready for internal-team editorial review in early 2015 with a targeted submission to publisher for technical editing-stage mid-2015. The project is being lead by a post-doctoral writing team in collaboration with the EMEND science leads.

# 5) Graduate Studies Activities

## a. Graduate Student Activities - 2013

EMEND provides an invaluable educational opportunity for domestic and international post-secondary graduate-students. We offer them simultaneous exposure to policy and management challenges, associated with the Canadian boreal forest across-sectors, through interaction with EMEND partners during the course of their research.

#### 2013 saw much progress from graduate students funded under the NSERC CRD at EMEND:

# Seung-II Lee – PhD candidate with John Spence – Early colonization of white spruce dead wood by saproxylic beetles in mixed stands

Deadwood-associated beetles (so-called saproxylic beetles) are a diverse group of organisms known to be threatened during traditional forestry activities. Retention of living trees in harvested landscapes has been strongly promoted as a way to conserve forest biodiversity; however, it is not known whether managing the amount and distribution of residual trees in harvest blocks can meet conservation goals for these beetles.

During the 2013 field season at EMEND, I sampled my last beetle collection from rearing drums, which were installed near the EMEND camp where they could be protected from wildlife disturbance. The objective of the study was to identify saproxylic beetle species that initially colonize two types of spruce CWD (logs and snags), and evaluate the role of aggregated retention patches in influencing early colonization of saproxylic assemblages in mixed wood forest. Identification of my specimens is in progress with a total of 10,888 individuals, representing 74 species that have already been identified. I expect this study will reveal the optimal combination of aggregated and dispersed retention harvesting for conserving saproxylic beetles.

Aside from this project, the study of saproxylic beetle succession associated with decomposition stages of white spruce logs is now completed. The saproxylic beetle assemblages changed progressively with increasing stages of decomposition in white spruce downed CWD. Changes were gradual because assemblages of adjacent DCs were highly similar, but were very distinct from those of the next most adjacent DCs. Therefore, I underline the maintenance of the full range of decay classes of white spruce downed CWD is necessary to conserve the boreal saproxylic beetle fauna.

# Sonya Odsen—M.Sc. Candidate with John Spence—Boreal bird response to variable retention harvest over time

Work towards my Master's thesis has progressed substantially this year. In 2013 I completed my second (and final) field season at EMEND, fully entered my data, and have made strong progress on the statistical analyses of this data.

With the help of my field assistant, I successfully re-sampled 107 point count stations across the 72 harvested and control compartments at EMEND, and additionally sampled the 28 slash harvest/slash burn compartments. Each point count station was visited 3 times in June, for a total of 405 point counts. Sampling occurred between sunrise (0500h) and 1000h, when birdsong is at its most intense. My data were fully entered by the start of August. Since then, I have been exploring high-level statistical analyses to assess species abundance given imperfect detection. I am about to embark on an analysis using Bayesian modeling to address the question of species response to variable retention harvest.

I presented the results of my first field season at the CANFOR West graduate student conference in Kananaskis, Alberta, in April, where I won an award for best 5-minute presentation. I presented a poster with

preliminary results at the Society of Canadian Ornithologists' annual meeting in Winnipeg, Manitoba in mid-August. I am currently working on my poster and presentation for CANFOR West 2014.

I intend to complete the first draft of my primary data chapter by the end of 2013, and hope to have completed my thesis and published both data chapters by the end of 2014.

# Jared Amos – M.Sc. Candidate with John Spence—The effect of retention harvesting on pollinator population assemblages in the boreal forest of Alberta

The early part of the year was spent finishing the washing and drying of bee samples collected from the 2012 field season, as well as the identification of all the pollinators. I have determined that the few "bee fly" specimens I collected in 2012 are actually in the Muscidae and, therefore, I will only use bees and hoverflies as the focal pollinator groups of my study.

The 2013 field season was spent back at EMEND sampling pollinators. A total of 63 days were spent, with my field assistant, in the field sampling pollinators by net capture and pan traps. In order to collect more pollinators than last season, pan traps filled with glycol were left out for a week (rather than soapy water for 2-3 day), net capture deviated from baselines, and my field assistant and I split up to increase the number of flower patches visited. All insects caught by net were pinned while at camp this summer. With the visits of three tour groups (2 ADM and 1 DMI) during my summer field season I was able to speak about my project and reflect upon its importance in the EMEND landscape.

I am currently 90-95% finished going through the 288 vials of insects caught by pan trap this year. I am washing and drying the bees in the same way as last year, however I am now giving the hoverflies a bath in ethyl acetate to make them easier to identify.

The identification of species from last year has not yet been completed but all specimens have been identified to genus. There has been about 15 species of hoverflies collected. Interestingly some species such as *Rhingia* were not found this summer. Bees from multiple families and genera (7) have been collected, there are likely 7-8 species of *Bombus* at EMEND although more genera may be found as identification progresses. An interesting species of note is *Bombus terricola*, a species that is often reported as being in decline yet is fairly abundant along the roadsides at EMEND.

#### Hosen Alam—Ph.D with Soung Ryu—Duff Moisture Dynamics

In mid-July a colleague and his field assistants visited the EMEND field site to install moisture sensors, data loggers and rain gauges at 4 sites (850, 851, 852, 853). A rain gauge was also set up at Base Camp.

Rain gauge data was collected on a weekly basis by the core crew at each of the 4 field sites and on a daily basis at Base Camp. The rest of the data was retrieved in October 2013. Unfortunately only two of the four data loggers recorded data for the complete duration of the time. (One's battery died and the other had a cut cable).

My first priority now is to play with these data, even if the data is incomplete, to understand the trends. I am learning how to use Leaf Area Index LAI data through this process, as I have never used this type of data before. I believe his dry run will help me have a better understanding of the data types before proceeding to my final set up of the experiment next year (2014).

#### These students worked at EMEND under Other Funding Projects:

#### Rodrigo Campus—Ph.D Candidate with Soung Ryu—Fire induced tree mortality dynamics

Fire is a key recurring event governing the structure and processes of boreal forests, therefore, fire has been used widely and effectively in Canadian boreal forest management as an ecologically sound tool to reduce fire danger by reducing fuel loading (e.g., slash burning after logging).

However, we have limited understanding on how alternative fire severities and intensities influence tree mortality and how vegetation types interact with anthropogenic fires. This information is critical as many of the surviving trees act as the source of propagules for regeneration of the forest. The objective of this research is to improve our understanding of the interactions between vegetation type, fire severity, fire intensity, and tree survival ten years after slash burns. At our research at the ecosystem management emulating natural disturbance (EMEND) project we assessed the survival of trees after fire was prescribed, in 2003 and 2005, to 14 compartments comprising four vegetation types with slash treatments in a stripped retention pattern (10% residual): conifer tree dominant (COD), deciduous tree dominant (DED), deciduous trees with conifer understory (DCU), and mixed (MIX).

For each burn, average fire intensity (AI), maximum fire intensity (MI), rate of spread (ROS), depth of burn (DB) and burn time (BT) were recorded. In 2008 survival was registered for the trees located in the permanent plots (5 per compartment). Confirmation of observed survival was performed on August 2013. Using modeling and statistical analysis I assessed all variables to pin point the most influential variable to tree mortality and survival.

Further research is needed in order to recognize the main drivers of tree survival in slash burn treatments due to the combined influence of fire related factors (fuel and weather) and species involved. The results obtained will improve our understanding on the response of boreal species to slash burning and will facilitate sustainable forest management in boreal ecosystems.

# Colin Bergeron—Post Doctorate Fellow with John Spence—Local carbon dynamics associated with coarse woody debris

In 2002 as a doctoral student I felled representative trees in a grid across the entire EMEND landscape. The initial purpose was to collect the basal discs for a dendrochronological reconstruction of fire history and historical growth patterns. The boles were left *in situ* as logs after the sample disks were collected. In the late summer season of 2013 a representative number of these logs were collected (basal and crown discs) as a follow-up analysis of biomass and carbon and nutrient content in comparison to the original discs. This volunteer time and work led to the development of a Post-Doctoral assessment of the local carbon dynamics associated with CWD and funding for the project under the FRIA FRIP Funding.

#### 2013 also saw the Completion of One Project:

#### Marla Schwarzfeld – Ph.D – The Ichneumonidae of EMEND

Ichneumonidae are parasitic wasps (parasitoids) that lay their eggs in or on other arthropods. As such, they play an important role in the population regulation of a wide variety of species, particularly among Lepidoptera and Symphyta. In this study, I collected Ichneumonidae from a range of treatments in decidous-dominated stands at EMEND (control, 50% retention, 20% retention, clearcut), 8 years post-harvest. I identified over 47,000 specimens to subfamily, and then focused on three subfamilies (Pimplinae, Poemeniinae, and Rhyssinae) for species-level identifications. In 2012, I published a contribution to the EMEND Insights series: "Gatekeepers of the forest: the ichneumonids of EMEND" by Schwarzfeld and Sperling.

I collected an average of 66 specimens of Ichneumonidae per trap-day; this is one of the highest abundances of Ichneumonidae recorded from Malaise traps. I estimate that there are well over 500 species of Ichneumonidae at EMEND, however taxonomic difficulties (lack of identification resources, undescribed species, etc.) render many of them very difficult to identify. From the three target subfamilies, I identified 64 species (3,878 individuals), all of which are newly recorded from the EMEND landbase. Thirteen species are new records for Alberta.

There was an overall increase of Ichneumonidae as green-tree retention increased. This pattern was strongest in three subfamilies (Ichneumonidae, Pimplinae and Cylloceriinae), and in one species of Pimplinae (*Dreisbachia slossonae*). Some of the remaining subfamilies and species showed a similar pattern, while others varied randomly with respect to treatment. No species or subfamily showed the reverse pattern (i.e. a greater affinity for clear cuts). This study indicates that green-tree retention can be a valuable tool for maintaining parasitoid.

### b. Grad Studies Activities Financials- 2013

Funding support for the 2013 grad student activities at EMEND came in the form of a NSERC-CRD agreement with cash contributions and in-kind support from Daishowa Marubeni International and in-kind support from Canfor. It should also be noted that Colin Bergeron donated the time needed to start the data collection of his past work which was then grounds for the FRIA-FRIP funding being received for 2014.

### c. Planned Grad Studies Activities- 2014

2014 will see an assortment of students in the EMEND graduate student mix thanks to the DMI/Canfor/ NSERC collaborative research development grant; the WAM Strategic Grant; as well as individual study projects taking place at EMEND. We look forward to bringing on new students to work on the biodiversity, wildlife, soils, fire, and social dimensions of the EMEND project as well as remote sensing and landscape scale management planning. These funding grants 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. 2014 looks to be a very busy year for graduate students with a potential of 10-15 graduate students working at EMEND this summer. A short summary on these projects can be found below.

#### **NSERC-CRD Grant**

- 1. Seung-II Lee—PhD Candidate (Spence)—Early Colonization of white spruce dead wood by saproxylic beetles in mixed stands. Seung-II will finish any final identification and data analysis that is needed to complete the writing of his thesis. His thesis defense is proposed for mid-2014. Seung-II's funding through the NSERC-CRD expires mid-2014.
- 2. Sonya Odsen—MSc Candidate (Spence)—Boreal bird response to variable retention harvest over time. Sonya will be finishing her data analysis and continuing with the writing of her thesis. Her thesis defense is proposed for mid-2014. Sonya's NSERC-CRD funding expires mid-2014.
- 3. Jared Amos—MSc Candidate (Spence)—The effect of retention harvesting on pollinator population assemblages in the boreal forest of Alberta. Jared will be continuing to identify his specimen, analyze data and write his thesis. Jared will potentially defend his thesis mid-2014. Jared's NSERC-CRD funding expires mid-2014.

- 4. Hosen Alam—PhD Candidate (Ryu)—Duff Moisture Dynamics. Hosen will be starting his first field season at EMEND. After having colleagues complete his initial trial of the sensors and loggers at 4 sites at EMEND. Hosen will be compiling data within a number of other sites on the EMEND field site. Hosen's funding is coming from the NSERC CRD Grant. He will have one field assistant.
- 5. Caroline Franklin--PhD Candidate (Macdonald)—Thresholds of resilience and recovery for understory plants. This will be Caroline's first season at EMEND. This student was originally scheduled to start in 2013 but due to our inability to find a suitable candidate on schedule she will start in January 2014. Caroline's funding is through the NSERC-CRD Grant. She will have one field assistant. Caroline will also be assisting with the fur bearers project under the NSERC CRD with Scott Nielsen.
- 6. Cassandra MacKenzie--M.Sc. Candidate (Quideau)—Forest floor processes response to variable retention harvesting. Cassandra will not technically start her MSc until 2015 (as she is a undergraduate student. However she intends to spend time at EMEND this summer getting preliminary data to start her project. Cassandra will be studying soil characteristics on the EMEND site under the NSERC CRD Grant. She will have one field assistant.
- 7. Matthew Robinson--M. Sc. Candidate (Nielsen)—Variable retention forestry's effect on amphibian populations. Matthew will technically start his MSc in September. However he will be doing his first season of field work this summer. Matt will be studying amphibian populations on the EMEND landscape under the NSERC-CRD. He will have one field assistant.
- 8. M.Sc. Candidate (Nielsen)—How do fur bearers use landscapes harvested by variable retention? The individual for this position is still being recruited. Their potential first field season at EMEND will occur during the winter of 2014-2015. They will be studying eight species of fur bearers on the EMEND landscape under the NSERC-CRD. They will most likely have one field assistant and help from Caroline Franklin.
- 9. Kristen Whitbeck—PhD Cadidate (Macdonald)-- Thresholds of resilience and recovery for understory plants. This will be Kris' first field season at EMEND. This position was originally intended to start in 2013, but due to our inability to find a suitable candidate on shechedule she will be starting in February 2014. Kris' funding is through the NSERC-CRD Grand, she will have on field assistant. Kris will also be assisting on the Bryophyte study under the NSERC-Strategic WAM grant (Macdonald)

#### **FRIAA-FRIP Grant**

10. Colin Bergeron—Post Doctorate Fellow (Spence)—Local carbon dynamics associated with coarse woody debris. Colin will be returning for a second season of field sampling of course woody debris of logs that were cut in 2002. Colin's funding is through the FRIAA FRIP Fund. Colin will have one field assistant.

#### **NSERC-Strategic Grant--WAM**

11. Wiebe Nijland—Post Doctoral Fellow (Coops), University of British Columbia—Assessment of forest structure metrics modeling using LiDAR and LANDSAT datasets. Wiebe will be working from the University of British Columbia. He will be looking at the characterization of vegetation structure and productivity from LiDAR and optical satellite images. The metrics he generates will be used to evaluate the effects of forest productivity and structure on ecosystem development.

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- 12. PhD Candidate (Quideau)—The relation and underlying processes of soil ecosystems to terrain gradients and vegetation cover. The individual for this position is still being recruited. This individual will potentially have their first field season at EMEND during 2014 where they will be studying vascular plants under the WAM Strategic Grant. They will most likely have one field assistant.
- 13. Silvia Ronzani—Ph. D Candidate (Spence)—Using epigaeic beetles as a function of the predicator variables of landscape management. This will be Silvia's first season at EMEND they will be collecting epigaeic beetle samples throughout the EMEND Site. Silvia's funding is through the WAM Strategic Grant.
- 14. M.Sc. Candidate (Macdonald)—Assessing the predictability of remote sensed predictor variable and vascular plants. A candidate has been chosen and is currently being pursued by Ellen Macdonald. This individual will potentially have their first field season at EMEND during 2014 where they will be studying vascular plants under the WAM Strategic Grant. They will most likely have one field assistant.
- **15.** M.Sc. Candidate (Macdonald)—Assessing the predictability of remote sensed predictor variables and patterns of bryophyte diversity. The individual for this position is still being recruited. This individual will potentially have their first field season at EMEND during 2014 where they will be collecting bryophyte samples under the WAM Strategic Grant. They will most likely have one field assistant. Kris Whitbeck will be assisting with the identification of specimens.

#### **Other Students, Other Funding**

- **16.** *Rodrigo Campus—Ph.D Candidate (Ryu)—Fire induced tree mortality dynamics*. Rodrigo hopes to continue his research on fire dynamics on tree mortality within the burn and slash burn compartments at EMEND. Rodrigo's work is dependent on future funding.
- **17.** Linhao Wu—Ph.D. Candidate (Spence)—Incorporating Succession into Temporal Variation. Linhao will be starting his first field season at EMEND. He will be attempting partition year-to-year variation in biodiversity data between effects of succession and annual variation in climate through on the ground research with carabid beetles. Linhao's work will also ensure that the data necessary for the year 15 reassessment of epigaeic arthropods are collected.
- **18. Additional Students:** Other projects not associated completely to EMEND strategic funding will be studying varying topics across the EMEND landscape.

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. It is with this in mind that partner-graduate engagement opportunities are being developed for 2014.

# 6) Knowledge Exchange Activities- 2013

2013 saw a reduced level of communications activity, however, a number of key outcomes were still achieved. One 'EMEND Insights' was produced profiling the work or Dr. Jamie Pinzon and his analyses that will be used in the EMEND 10 year synthesis report. It is a very interesting read that tells an interesting story about the work that has been conducted at EMEND to date.

In addition to this, EMEND was profiled in the Department of Renewable Resources Newsletter 'Renew' and this publication received over 1500 views by partners, students and academics associated with the Department of Renewable Resources.

We also held two high profile field tours for Assistant Deputy Ministers of both the federal and provincial governments. These tours were well organized and helped to raise the profile of EMEND and its value to resource management science. Follow-up reports on the tours suggested that all participants were very impressed by the work going on at EMEND and the partnerships in place, and were keen to explore ways to ensure the future viability of EMEND.

In October 2013, NRC and the University of Alberta collaborated with DMI to conduct a tour of delegates attending the 2013 International Boreal Forest Research Association conference hosted in Edmonton. Attendants were from various circum-boreal nations among them: Sweden, Russia, Slovakia, USA and eastern Canada.

# 7) EMEND Infrastructure and Capital Investments

EMEND partners and researchers benefit from a range of infrastructure representing capital investments that support field activities and promotion. These include a University funded 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.

## **Camp Facilities**

Thanks to the University of Alberta's CFI Infrastructure and Resources funding, 5 new tents were purchased to replace the well-used existing tents. The Core Crew invested time in maintaining the wood structures of the tent frames at camp by cleaning and painting the interiors of each. User fees, based on person days (through catering contract), were again assigned for users of the camp facilities. In future years camp costs may need to incorporate all camp expenses, moving the camp to a self-sustaining model, this will unfortunately cause camp costs to rise from \$124/day to \$144/day.

Additional work will be needed in 2014 to complete the exteriors of the tent structures. All the necessary supplies for this have been purchased. A few other infrastructural areas were identified as potential topics to be addressed in 2014: (1) the replacement of the tent tarp for the water tank structure; (2) removal of the water/hazardous waste from under the gas tank (should consider putting a roof over this structure); (3) more lab space/ATV storage is needed on site, (4) removal of junk piles from the field beside camp and from around camp; (5) control of the noxious invasive weeds at camp; (6) camp night lighting enhancement or motion sensor to capture site incursions from the roadway beyond the gravel pad; and, (7) proper hazardous material storage facilities (properly bermed and chemical resistant). Also, with a higher volume of students and staff coming on board in the coming years more accommodations may be needed.

As with previous years, EMEND Contracted a catering company in 2013 to supply camp with a cook, food, cleaning services, water, waste disposal, and start-up and shut-down assistance. In future the EMC may want to consider exploring alternative contract arrangements or contractors as a pack-up plan in the event current contractor disengages.

### **Field Infrastructure**

This past year saw the renewal of 2 bridges in EMEND. With the help of the local Junior Forest Rangers the bridges were built in place to replace the derelict bridge in F and to help alleviate the degradation of a stream and hill in A. Trees and fallen logs were also removed from trails to make areas more accessible and to increase line of site along the trails in F and A. 2013 also saw the commencement of the rebuilding of the visitor staging site (gazebo). This was made possible through the CanFor FRIP funding proposal. After a number of snags and hick-ups in regards to the blue prints and structural look of the building and the quick arrival of snow only footings have been poured as of yet. The project looks to be completed in mid-2014.





Trail and bridge maintenance should be considered areas of concern to be addressed in 2014 and future years. Many of the ATV trail in EMEND are becoming quite degraded (especially in wet areas). Solutions (ex. Hardening or moving) to this need to be considered in the near future or some sites may become inaccessible by ATV. There are a number of areas where bridges are needed to reduce the degradation of small wet hollow areas along the trails as well as the safety concerns of our users. Trail sign upgrades would also be helpful for new staff and graduate cohort.



The second area of concern raised by many participants was communication issues. Two-Way Radios are a great mode of communication. Unfortunately, on a site as large as EMEND, with its topographical features, it almost impossible to communicate with others when there is any distance between them. A potential fix for this is to put a repeater antenna up (my suggestion is the carbon tower structure) at old camp. This should allow radio access to all of the EMEND field site as well as the potential to have camp to the site radio communication. A third area to consider is the spread of prohibited noxious and noxious weeds at the EMEND site. Canada Thistle, Scentless Chamomile, and Knapweed have all been sighted at EMEND and all have the ability to take over a disturbed site quite quickly. A final item that should be considering for the future is creating a small removable "camp" up at old camp with a parked fifth-wheel camper (for example) and fencing for summer ATV and trailer storage. The fifth-wheel could be used by early to rise or late to stay field teams as an alternative to having to do too much driving during dusk/dawn or in the dark.

## **EMEND Core Field Equipment**

Two new ATVs were purchased, during the 2013 year, thanks to the University of Alberta's VP one time support (\$26,000) for core and shared resources. For the most part EMEND field equipment was not used excessively for the 2013 field season, ATVs are the only exception to this with both the core crew and some graduate students using the core atv fleet. Chainsaws were used by trained staff for clearing large trees off trails and to aid in bridge building and brush clearing. One GPS was purchased for use by the core crew as all other GPS devices were missing from any of the storage areas at EMEND camp facilities, on Campus, or at NRCan-NoFC.

Туре	Brand	Year	Description	Colour	Serial #
Quad	Honda	2013	TRX420FPE	Red	1HFTE35L0D4600279
Quad	Honda	2013	TRX420FPE	Red	1HFTE35L2D4600302
Quad	Honda	2005	TRX500FES	Yellow	1HFTE318254000771
Quad	Honda	2005	TRX500FES	Yellow	1HFTE318354000729
Quad	Honda	2005	TRX500FES	Yellow	1HFTE318354000259
Quad	Honda	2005	TRX500FES	Yellow	1HFTE318654000286
Quad	Honda	2004	TE2564 (DMI Donated)	Red	478TE256X4A400986
Quad	Honda	2004	TE2564 (DMI Donated)	Red	478TE226144502180
Trailer	RT Trailers	2005	ATV trailer, 16' Long (4 ATV)	Black	2R9AS52A85W682296
Trailer	Scona	1997	10' ATV Trailer (2 ATV)	Black	V023
Truck	Chevrolet	2008	Chevrolet Silverado 2500 HD 4x4	White	1GCHK23KX8F151135
Truck	GMC	2005	GMC Yukon XL SLE 2500 4x4	White	1GKGK26U65R232138

For the 2014 season at least 4 new handheld GPS devices will need to be purchased, as well as compasses and chainsaw PPE (saw pants, helmet with visor, muffs). All other field gear appears to be in good shape and ready to be used in the 2014 field season. We may want to purchase a brush-saw in the near future as it is easier for trail maintenance. A member of the core crew also suggested having small digital cameras with the core crews; these could be used to document samples, and have an image of PSP through time, group photos, etc. It is also important to keep the renewal of the Core Crew ATV and truck fleet on your radars as the fleet is aging and over the coming years will need to be replaced EMENDs current ATV resources are adequate un number and maintenance for core crew activities only in the coming years. Graduate student researchers are required to arrange their own resources.

## **EMEND PNT (Research Site Integrity Project)**

The enhanced protection of the research forest lands (7000ha) and collective EMEND research investments in this site has remained an important action item that Alberta SRD (J. Stadt) has continued to pursue in 2013. Thankfully, due to the perseverance of J. Stadt and D. Bakker, a stricture larger PNT has been secured. The enhanced protection does not assure a solution for pre-existing sub-surface rights holders, however all surface land applications received by Alberta on the EMEND landscape will now see initial screening by Edmonton ESRD staff. It is relevant to discuss whether we will pursue stricter protection rights.

# 8) Health and Safety Program

2013 saw the drafting and implementation of the new EMEND Safety Plan. This plan was the collaboration of Mr. Gord Winkle, Matthew Pyper, Dr. John Spence, and Amanda Hayden. The plan addresses Cardinal Rules, Required Work Practices, Critical Procedures, Certification and Training, Standard Operating Procedures, Referenced Procedures as well as numerous appendices related to safety at EMEND. This plan standardizes all Safety Protocols and ensures that all staff, students and users of the EMEND Site and Camp have the knowledge required to work safely and be prepared.

This plan was well reviewed and followed by the 2013 cohort of staff, students, and users. All staff and students willingly brought any near misses/incidents that occurred to the attention of the Field Program Manager at the time or soon there after it occurred. Forty-one documented near misses and/or incidents occurred at the EMEND Site or Camp Facilities, most minor in nature and all appeared to be dealt with appropriately at the time of the incident by those involved. For example, folks who encountered bears while on ATVs or foot all had bear spray available and ready; all proceeded to make more noise while backing off and giving the animal space. If the animal didn't look to be moving on all groups moved onto their next targeted area and came back at a later date. Defensive driving courses ensured that a driver who lost control of their vehicle due to bad road conditions gained control and ensured no damage came to people and vehicle. All driving incidents this year were connected to road conditions, yet it is unclear the root cause of the incidents. Please see the below chart and the attached appendix for all near misses/incidents that were reported to the Field Program Manager. It was suggested by a core crew member that a safety orientation video may be helpful in ensuring all staff, students, visitors and other users have the same briefing (quality control). The EMC feels that it would be of significant value for the field-coordinator to be formally trained in Incident investigation and root cause determination techniques which are commonly available.



#### 2013 EMEND Safety Incidents/Near Misses Chart

Transportation of ATVs includes the hauling, loading, unloading and strapping of ATVs; Infrastructure/Equipment Failure includes bridges breaking, ATVs breaking, radios malfunctioning, and SAT phones not working; Other includes extreme weather and a minor spill of anti-freeze from its storage container. It is important to note that while 41 near misses/incidents occurred at EMEND in 2013 management is taking steps to mitigate these things occurring in the future. Consistent monthly review of reported near misses and incidents helped the field program coordinator direct Safety Meeting conversations and lessons. After the yearly assessment of the Safety Program and near misses/incidents Management has committed to a number of changes including but not limited to:

- not only requiring ATV safe rider training and defensive driving for drivers but to also incorporate EMEND based training opportunities during orientation to provide employees and researchers an opportunity to learn different techniques required for the differences in their original training grounds and the conditions at EMEND. (eye lead time, mapping routes, maneuvering in mud, etc.)
- clarification of extreme weather incidents,
- implementation of a "communications" board (will be used to inform on issues on the site, changes to the safety plan, and other pertinent information) for crews that are different schedules,
- tailored safety meetings to noted trends in near misses and incidents
- investigation of repeater antenna instillation,
- desire to turn the Safety Plan material into other mediums besides a conversation (movie, power point, etc), as well as have up-dated copies on the website,
- proposed changes to the EMEND maps,
- up-dating of ATV PPE (helmets),
- proposal for ATV storage at Camp Facilities,
- implementation of stricter Safety checks on vehicles and ATVs,
- suggestions for purchasing hazardous material storage,
- suggestion for motion sensored lights or better lighting in parking lot at EMEND camp facilities

Relative to 2012 some evidence in proportional comparisons suggest the EMEND program is seeing reduced dominance of driving related incidents and general fieldwork incidents (although this could be a product of improved level of reporting diligence among a culture of engaged field staff). Relative to 2012, the charting suggests a couple of potential focal points identified by the EMEND partners worth considering during 2014 delivery of the health and safety program.



i. Wildlife encounters remain notable, and will potentially increase with increased staff and students on site during the 2014 field season. History has shown a routine of wildlife encounters and observations throughout the summer seasons.

ii. ATV incidents appear to remain notably present. (it is interesting to note that a majority (64%) of the ATV incidents revolve around one individual in 2013, even after continual attempting to be addressed by field program manager)

Going forward the EMEND management partners see value in a couple of enhancements:

- i. Inclusion of a root causes roll-up chart in the 2014 yearend report to supplement the above chart categorization of incidents/accidents, as well as a column on "rot cause" within the Appendix 2 details.
- ii. The university should consider engaging some forma of annual 3<sup>rd</sup>-party audit of the Health and Safety Program to enable continual improvement cycle and arms-length assessment of its implementation and the documentation and field-evidence level. Such audits are a standard-ofpractice assisting credibility and due diligence.
- iii. In the coming years start compiling the near miss/incident information into a table that tracks incidents (including per capita) so as to be able to better identify changing trends.
- iv. Re-initiate the Emergency Response plan testing with assessment and feedback.

Appendix 1: Graduate	e Student and C	Core Crew Scheduling
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	Supervisor	Туре	Name	2012	2013	2014	2015	2016
	Spence/Acorn	MSc	Sonya	VR Harvesting and Birds				
	Macdonald	PDF	Kris		Understory Plants			
	Macdonald	PhD	Caroline			Thresholds of understo	ry plants	
	Quideau	MSc				Forest Floor Processes	and VR Harvesting	
	Spence/Langor	MSc	Jared	VR Harvesting and Pollir	ators			
c-CRD	Spence/Langor	PhD	Seung-II	Deadwood and Beetle d	versity			2
	Ryu	PhD	Hosen		Fire	resilient Landscapes		
ER	Nielsen	MSc				VH Harvesting	and Fur bearer use	
NS	Nielsen/Eaton	MSc	Matthew			VH Harvesting and Am	phibians	
	He/Spence	PhD	Linhao		VH Harvesting	and Landscape Biodivers	ity	
	Armstrong	PhD			Trade-Offs—Biodiversity	and Wood Products		
	Spence/Langor/He	PDF	Jaime	10 Year Synthesis				
	Spence	PM	Matthew/ Amy	EMEND Project Coordin	ation			
	Coops (UBC)	PDF	Wiebe			Forest Structure Matrix		
gic-	Nielsen/Macdonald	PDF				Terrain Modeling		
rate M	Dyck/Quideau	PhD				Soils and Underlying P	rocesses	
-Sti NA	Spence/Langor	PhD	Silvia			Beetles and predictor va	riables	
- RC	Macdonald, Spence	MSc				Vascular Plants & Remo	ote Sensing	
NSE	Macdonald, Caners	PhD				Bryophytes & Remote S	ensing	
	Nielsen/He	PDF						Modeling/trade-offs
÷	Spence	PDF	Colin			Coarse Woody Materials		
RIA/ FRIF	Spence	LFA	Zoltan			Productivity and Silvicult	ure	
4	Spence	CCFA				Productivity and Silvicul	ure	
	Spence	PDF	Jaime			Lab Technician and 10	ear Synthesis	
MN	Spence	LFA				Biodiversity	,	
on r	Spence	CCFA				Biodiversity		
Unl Jing	Spence	LFA				Biodiversity		
iune iune	Spence	CCFA				Biodiversity		
sen	Spence	LFA				Biodiversity		
Pre	Spence	CCFA				Biodiversity		
	Spence	PM	Amy			EMEND Project Coordir	ation	

## **Appendix 2: Proposed EMEND Projects/ Costs**

#### **Camp Facilities:**

- The replacement of the tent tarp for the water tank structure;
- Removal of the water/hazardous waste from under the gas tank (should consider putting a roof over this structure);
- More lab space/ATV storage is needed on site;
- Removal of junk piles from the field beside camp and from around camp;
- Control of the noxious invasive weeds at camp; and,
- Camp night lighting enhancement or motion sensor to capture site incursions from the roadway beyond the gravel pad
- Increased accommodations for increasing number of graduate student needs
- Consider exploring alternative contract arrangements, or contractors as a pack-up plan in the event current contractor disengages
- Proper hazardous material storage facilities (properly bermed and chemical resistant)

#### Field Infrastructure:

- Trail and bridge maintenance
- Better trail signage
- Repeater antenna up (my suggestion is the carbon tower structure) at old camp to allow radio access to all of the EMEND field site as well as the potential to have camp to the site radio communication.
- Spread of prohibited noxious and noxious weeds at the EMEND site. Canada Thistle, Scentless Chamomile, and Knapweed have all been sighted at EMEND and all have the ability to take over a disturbed site quite quickly.
- Creating a small removable "camp" up at old camp with a parked fifth-wheel camper (for example) and fencing for summer ATV and trailer storage. The fifth-wheel could be used by early to rise or late to stay field teams as an alternative to having to do too much driving during dusk/dawn or in the dark.

#### **EMEND Core Field Equipment:**

- Purchase of at least 4 new handheld GPS devices, compasses and chainsaw PPE (saw pants, helmet with visor, muffs).
- May want to purchase a brush-saw in the near future as it is easier for trail maintenance.
- Small digital cameras for the documentation of samples, and have an image of PSP through time, group photos, etc.
- Renewal of the Core Crew ATV and truck fleet as the fleet is aging and over the coming years will need to be replaced.
- Winch kits for trucks and atvs (have all the tools needed to successfully use the winches)

#### Safety:

- Creation of a safety video or other medium to standardize participants orientation experience
- Having the Program Manager/Field Program Manager take an incident investigation course

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# Appendix 3: Documented Near Misses / Incidents 2013

#	Date	Grouping	Near Miss / Incident	Those involved	Ways to decrease/eliminate
1	22-May-13	Transporting ATVs	Strap lost off atv while in transport on trailer straps had been checked less than an hour prior to event	A. Hayden, K. Rieter, H. Feng, K. Winters	Check straps more often
2	22-May-13	Transporting ATVs	Strap popped loose between camp and old camp on trailer with quads. Safety check occurred prior to leaving site	S. Odsen, Z. Domahidi	Check straps more often, enroll in a course on how to load and strap atvs.
3	27-May-13	Wildlife Encounters	Encountered M. Bear with cubs up a tree. Removed self from scene, got bear spray ready in case he need to use it	Z. Domahidi	Make more noise to warn bearseems like he was ready for this and made all the right decisions
4	27-May-13	ATV	Stuck ATV	Z. Domahidi	plan out routes
5	29-May-13	Transporting ATVs	Loosening ratchet strap had to be tightened at Dixionville as it had come quite loose.	A. Hayden (driver), S. Odsen	Straps need to be tested. Better training for staff on appropriate use of ratchet straps on ATVs
6	4-Jun-13	Driving	Truck was getting a flat tire as we arrived at Old Camp, we could hear the air escaping from the front right (passenger) tire. Tire safety check had been done prior to trip. Had tire kit and spare tire	Core crew and Bee Crew	Good!
7	8-Jun-13	Driving	Truck went off road into ditch in a controlled skid. Diver was going 55km/h road had been ok up to this point, slightly wet and slick in some areas	Driver A. Hayden, passengers H. Feng, K. Rieter	Reduce speeds while roads are wet
8	8-Jun-13	Wildlife Encounters	Encountered mother moose and young moose on road to old camp. Coasted to bottom carefully, made noise and waited quite a while to allow them to clear out. One rider went up slowly making lots of noise and when all clear other riders joined her. Continued to make noise until they were safely in vehicles	A. Hayden, K. Rieter, H. Feng	good stuff
9	10-Jun-13	ATV	ATV got very stuck in mud in A where trail forks around small pond	H. Feng (ATVer), A. Hayden, K. Rieter	teach assessment of trails, remind folks to look at the trail and change course if need be
10	11-Jun-13	ATV	ATV stuck on tree over trail, 2 tires on either side. Bucked up the tree to get atv off	A. Hayden (ATVer), K. Rieter, H. Feng	Go over how perform safe atv maneuvers.
11	12-Jun-13	Camp Activities	Cut finger on knife while cooking	R. Baird	Take more care and caution when using sharp objects
12	13-Jun-13	Camp Activities	Cut finger on bathroom paper towel dispenser	M. Pyper	Take more care and caution when using sharp objects

13	20-Jun-13	ATV	ATV stuck in mud hole and steep hill	K. Rieter (ATVer), A. Hayden, H. Feng	Learn to map out proper runs. Proper inspection of atvs before taking out in morning. ATV 4WD did not work properly
14	20-Jun-13	Camp Activities	Found Tent heater still running		Check tents after tenants have moved out.
15	21-Jun-13	Infrastructure / Equipment Failure	Old bridge collapsed after ATV rider rode over it stranding two atv riders on the other side	H. Feng (ATVer), A. Hayden, K. Rieter	bridges need to be assessed and fixed on a yearly basis
16	22-Jun-13	ATV	ATV stuck in mud	K. Rieter (ATVer), A. Hayden, H. Feng	Learn to map out proper runs
17	22-Jun-13	General Field Work	"lost" in swamp. Following Baseline, it ended attempted to create using a compass bearing but we did not end up in right place. As we were marking where we went it was easy to retrace our steps	A. Hayden, K. Rieter, H. Feng	Get better GIS data available
18	22-Jun-13	Camp Activities	Awoke to texts from R. in camper claiming to have heard footsteps (potentially bear or human), shouting and loud dog barking as if they were close by. Looked out windows could not see anything in vicinity, opened windows, could hear dogs but far away (next door), did not hear shouting or other animal noises. Texted Jared and Sonya who were both in tents to warn them of potential animals or people on camp property. Did quick search with flash light from between lab and main camp building and saw no signs of unwanted humans or animals. I calmed R. down and eventually all settled down	R. Baird, A. Hayden	Motion sensor lights? Locking vehicle doors at night, locking out building doors at night. R. has air horn in camper and will use if necessary
19	25-Jun-13	General Field Work	Was climbing over a fallen log when my slightly wet fee slipped on the loose bark and wet wood. Fell backwards off the tree into some shrubs. Bruised the back of my arm	A. Hayden, H. Feng, K. Rieter	Take more care when moving around in wet forests.
20	25-Jun-13	ATV	Stuck ATV in deep swamp water and muck. Had to winch her out.	H. Feng (ATVer), A. Hayden, K. Rieter	Attempting to teach her how to scan her environment before going full boar into unknown areas. Do not let lead again until this skill is mastered
21	1-Jul-13	Wildlife Encounters	Ran into bear and mother on Trial. Backed off and waited while they departed	H. Feng (ATVer), J. Amos, K. Winters	Good!

22	15-21-Jun- 13	Other	Jared got back to camp to find his antifreeze containers had leaked 25- 35L into the soil where he was storing them near the lab trailer	J. Amos	Get bermed containers to store all toxic chemicals for shed, lab and outdoors.
23	July 1 2013	General Field Work	Leaned against a dead tree and the tree fell over. (no one hurt)	H. Feng (ATVer), J. Amos, K. Winters	Discussed assessing trees before leaning on, or working near them.
24	On going	Infrastructure / Equipment	failing radios	All staff	Repeater tower?, better radios? Keep frequencies the same
25	On going	Infrastructure / Equipment Failure	failing SAT Phone	Core Crew	get new phone. It must be too old now. Borrow Sonya's
26	16-Jul-13	Wildlife Encounters	"grouse attack"	Bees (Jared)	beware of all wildlife
27	19-Jul-13	Infrastructure / Equipment Failure	Flat tire on a quad in the fieldhad hand pump and fix kit on them	J. Amos, K. Winters	check tires regularly to ensure slow leaks are maintained
28	20-Jul-13	Infrastructure / Equipment Failure	As Kyle was driving down the trail in G he went over a large bump, then found he could not turn/correct his ATV. He camp to a stop safely and assessed the ATV. It became apparent that he could not continue using this atv so he called in to camp using his sat phone to request assistance. I immediately loaded the ramps into the back of my truck, grabbed another atv key and headed out. Kyle and Kim Proceeded to attempt to push the atv out onto the road to where I could pick it up. He was able to temporarily fix the issue to make it easier to push and get onto the truck. We Kim on her ATV and Kyle and I in the truck proceeded back to Old camp to get Kyle a new atv.		Implement Daily equipment checks to ensure everything is in working order
30	25-Jul-13	Wildlife Encounters	dragonfly inside helmet		Full faced helmets?
31	3-Aug-13	Camp Activities	cut finger while cooking	N. Ellison	be more aware of what you are doing
32	9-Aug-13	Wildlife Encounters	driving to old camp at 11:30pm a wolf ran across the road in front of us. Kyle reacted well and reduced speed safely without any incident	K. Winter, J. Amos, A. Hayden	Reduce speed in the dark
	19-Aug-13	Wildlife Encounters	Bear wandered really close to core crew as they were working in the field doing shrub data recording	A. Hayden, H. Feng, K. Rieter	make more noise, taking air horn into field with usblasts every once and a while
33	Aug	Extreme Weather	bad weather approached quickly	All staff	need to have better
34	Aug	Extreme Weather	thunder with clear blue skies		extreme weather

35	Aug	Extreme Weather	bad weather approached , but wasn't sure if it was coming in their direction, left when sky got dark		need to have better policy on thunder and extreme weather
36	27-Aug-13	ATV	atv stuck in the mud 4 times in one day	H. Feng (ATVer), A. Hayden, K. Reiter	Discussed above.
37	29-Aug-13	Transporting ATVs	Loose strap on atv trailerwiggled a little loose	ATV Training	take strapping course
38	Sep-13	Infrastructure / Equipment Failure	Flat tire on 2 quad trailer. Was notified by people in cars passing them that they had a flat tire on the trailer as they were taking it to George Lake	S. Odsen, J. Amos	Safety checks need to happenperhaps a form?
39	11-Sep-13	Infrastructure / Equipment Failure	When we went to get the 4 quad trailer at Ellerslie we discovered it had a very flat tire. We pumped it up with the hand pump and then took it to the gas station to fill up. We checked at every stop along the way and the pressure remained good.	A. Hayden, D. Wagner	
40	13-Sep-13	Infrastructure / Equipment Failure	When we were returning to Edmonton with atvs on the trailer, the tire looked like it was losing air again. We checked the pressure and decided to fill the tire again in P. River. Filled the tire and checked at every stop along the way	A. Hayden, D. Wagner	Will discuss having the tire fixed when I get the vehicle pool
41	30-Oct-13	Infrastructure / Equipment Failure	Went to go get trailer from Ellerslie to have it serviced and the tire had gone flat again.	A. Hayden	