Ecosystem Management Emulating Natural Disturbance Project

Interim Progress Report to the Forest Resource Improvement Association of Alberta (FRIAA)

1 January 2007 – 31 October 2007

John Spence[1], Jason Edwards[1], Charlene Hahn[1], Jan Volney[2]

[1]Department of Renewable Resources
University of Alberta, Edmonton, Alberta

[2]Northern Forestry Centre
Canadian Forestry Service, Edmonton, Alberta

EMEND Interim Report Contents

1. Executive Summary

This report provides details on the EMEND Project research and infrastructure activities directly and indirectly supported through funding from the Forest Resource Improvement Association of Alberta (FRIAA). Financial support provided by FRIAA is aimed primarily at research activities focusing on the EMEND central question of how much forest structure is required to maintain healthy forest ecosystems. FRIAA funding also supports a vast array of more focused ecosystem questions through assisting with EMEND research infrastructure costs. Here we provide specifics on EMEND Core Crew activities, EMEND Research Facility usage, and EMEND Vehicle Use from 1 January – 31 October 2007. We also summarize non-Core research activities that have occurred during this same time period.

2. EMEND Project Background

Many forest companies operating in the boreal forest have recently adopted harvesting practices based on the natural disturbance model. This model has led away from extensive clear-cutting and toward retention of unharvested residual trees as stand and landscape elements and as a basis for biodiversity conservation and forest regeneration. Although effects of size and distribution of residual patches have been well studied, the important question of "how much residual structure is enough to protect critical aspects of ecosystem function" has received little attention.

The Ecosystem Management Emulating Natural Disturbance (EMEND) experimental forest area, located near Peace River, Alberta, (figure 1), is a large-scale variable retention harvest experiment designed to test effects of residual structure on ecosystem integrity and forest regeneration at the stand-level. EMEND is a long-term project that began in 1997 and is forecasted to run for one stand rotation, or approximately 80-100 years.

The overall objectives of the EMEND Project are: 1) To determine which forest harvest and regenerative practices best maintain biotic communities, spatial patterns of forest structure, and functional ecosystem integrity in comparison with mixed-wood landscapes that have originated through wildfire and other natural disturbances; and 2) To employ economic and social analyses to evaluate these practices in terms of economic viability, sustainability and social acceptability. These objectives are addressed through intensive field research at the EMEND research site.

There are two principal components to EMEND field research: 1) collection of experiment-wide or "Core" data, done primarily by the centralized research group ("Core Crew"), as required to ensure that comparisons of all treatments can be made over all 4 forest types; and 2) research planned and executed by researchers interested in using the EMEND site as a template for their work. Work carried out under category 2 is comprised mostly of projects by graduate students and by research scientists interested in questions other than the experiment-wide questions addressed in the core research.

Support provided by the Forest Research Improvement Association of Alberta (FRIAA) is aimed mainly at the Core work although limited financial support is provided for category 2 projects through i) Core Crew assistance to individual projects, ii) provision of the majority of camp costs, and iii) a number of small top-up grants for researchers working at EMEND to encourage a full research profile. FRIAA support is the essential basis for the experiment-wide work at EMEND but it also encourages an extensive range of category 2 work at our site.

3. Core Personnel

The EMEND "Core Crew" is responsible for the collection, organization, and analysis of experiment-wide data as well as the coordination and administration of research at EMEND. The crew consists of the EMEND Field Coordinator, the EMEND Data Manager (full-time positions), and a temporary summer staff of undergraduate university and college students. The summer Core Crew positions remain highly sought after positions and this year there were applications from students in Alberta, British Columbia, Ontario, Quebec and New Brunswick. The number of summer positions offered is directly related to the work load determined at the spring EMEND management committee meeting.

Since no experiment-wide studies were undertaken this summer, the 2007 Core Crew consisted of only four personnel. Jason Edwards served a seventh year as EMEND Field Coordinator and Charlene Hahn carried out her sixth year as EMEND Data Coordinator. The two summer Core Crew assistants were Courtney Baldo (Concordia University, Montreal) and Jonathon St. Onge (University of Alberta). Due to the limited work load this summer no high school students were accepted for the work experience program through the Boreal Forest Research Centre. EMEND hopes to continue the work experience program next summer.

3.1. EMEND Field Coordinator Activities

The full-time EMEND Field Coordinator position is currently supported through the EMEND FRIAA budget. Jason Edwards has held the position of EMEND Field Coordinator since 2001. This position is responsible for supervising the summer Core Crew, for the day-to-day administration of the EMEND Project, managing the EMEND Research Facility, and for representing EMEND at conferences and meetings.

Approximately 55% of Edwards' time from 1 January to 30 September was spent on tasks related to fieldwork. These tasks included supervising the summer Core Crew, maintaining field equipment, and conducting field surveys (see section 3. Summer Core Crew Activities for survey details).

Approximately 30% of Edwards' time was allocated to EMEND Project administration tasks. These tasks included meetings, workshops, hiring Core Crew, summer fieldwork preparations, map updates, website updates, report writing, and grant development.

The remaining 15% of Edwards' time was dedicated the management of the EMEND Research Facility. Most of this time was allocated to securing the summer operating contract and purchasing and maintaining equipment for the facility.

3.2. EMEND Data Manager Activities

The full-time EMEND Data Manager position is also currently supported through the EMEND FRIAA budget. The Data Manager is primarily responsible for compiling and validating all data collected by the summer Core Crew and is also responsible for assisting the Field Coordinator with field surveys, hiring and supervising the summer Core Crew, organizing the annual EMEND workshop, and running and maintaining the EMEND Research Facility. Charlene Hahn has held this position since 2002.

Approximately 42% of Hahn's time from 1 January to 31 October was allocated to data-related activities. These activities included field work data preparation, data entry, validation of data, and data documentation (metadata).

Roughly 38% of Hahn's time was dedicated to assisting the field coordinator. Hahn assisted the field coordinator with the following activities: camp management and maintenance, orientation/training/safety for the core crew and all camp users, hiring of the core crew, preparations for the EMEND annual workshop, and summer field work preparations.

The remaining 20% of Hahn's time was committed to fieldwork. Fieldwork included time Hahn spent collecting data as well as training/supervising the core crew as they collected data.

4. Summer Core Crew Activities (1 May 2007 – 31 August 2007)

No experiment-wide surveys were scheduled for this past summer as it was in-between the fifth and ten year re-measurement cycles. As such, Core Crew 2007 was able to catch up on some outstanding data issues and to resurrect the Aspen Regeneration Study installed by Ken Greenway *et al.* in 2000.

The summer Core Crew worked a total of 326 person-days at the EMEND site during 2007. This time was spread among several activities including site orientation, safety training, working on experiment-wide projects, and assisting with category 2 research. The following three sections describe the Core Crew activities for summer 2007.

4.1. Experiment-wide (Category 1) Research.

i) Deciduous Regeneration Study

The EMEND deciduous regeneration survey has not been completed since Dr. Ken Greenway left the project in 2001. As such, the Core Crew attempted to resurrect the project. Hahn received the aspen regeneration data from CFS in the spring 2007 but upon inspection of the data realized it was full of errors (duplicated entries, missing data, unmatched plot types and number of plots, etc.). Many of the issues could not be resolved with the information provided and therefore no valid analyses could be made. Edwards and Hahn decided to re-establish the regeneration transects and get a list of existing plots per compartment before collecting any data. As such, Core Crew 2007 spent 67 person-days remarking and cross-referencing plots in the field to plots listed in the data. No regeneration data was collected. All compartments except 934, 898, and 902 have been inspected (no plots could be found in 902).

In mid-July, Vic Lieffers, Derek Sidders, and Tomasz Gradowski initiated their own experiment-wide deciduous regeneration study located on the EMEND permanent sample plots. Consequently, Edwards halted the Core Crew regeneration study with the two compartments remaining to be re-marked and checked in order to avoid duplication of effort. None of the plot information collected has been entered into the EMEND database.

ii) Hydrology

The EMEND hydrology program has been continued under the direction of Dr. David van Everdingen of the Alberta Research Council (ARC) after the project was dropped by John Diwuu (ARC) in 2005. The Core Crew assisted van Everdingen with bi-weekly water level measurements of the hydrology well sites located in blocks 917 – 921. Approximately 20 person-days were allocated to the well measurements.

iii) Moth Diversity

The fifth-year post-harvest moth biodiversity study was continued this summer under direction from Esther Kamunya (PhD student, UofA). Core Crew provided Kamunya with 12 person-days of assistance with setting and collecting light traps. Core Crew provides assistance for the light

trapping portion of Kamunya's thesis as this study provides baseline, experiment-wide biodiversity data. Light trapping across the EMEND experiment is very time consuming and without the help of Core Crew, Kamunya would be forced to survey a very select number of compartments. Core Crew assistance permits light trapping in a greater number of treatments and stand types.

iv) Post-fire assessments (compartments 883 and 891)
All experiment-wide surveys were conducted this summer in the two compartments burnt last summer (883 and 891) in order to capture the first-year post-treatment data. Core Crew spent 36 person-days to complete the following surveys: forest health and mensuration, snags, coarse woody debris, vegetation, and shrub biomass. These two compartments will be resurveyed during the next scheduled assessment period (i.e. forest health and mensuration in 2008, shrub biomass in 2010).

v) Fire Ecology
The weather and forest conditions were continuously monitored again this year by the Core Crew and ASRD. Unfortunately, it was a wet season and burn prescription conditions were never met.

4.2. Category 2 Research Assistance
Occasionally Category 2 researchers require extra assistance to complete portions of their field work. A small portion of Core Crew time is allocated for this purpose. Researchers' needs for Core Crew time are dealt with on an as-needed basis and time allocations to each project are at the discretion of the EMEND Field Coordinator. Category 2 researchers are encouraged to return the favor by assisting Core Crew whenever possible.

Core Crew assisted with Category 2 research with 42 person-days of work. All Core Crew time allocated to Category 2 research was for assisting graduate students with their field work. Details on Core Crew assistance to Category 2 research are provided below and the time allocations to each project are summarized in Table 2.

i) Arthropod Studies
Core Crew 2007 spent 32 assisting various graduate students conducting research on arthropod diversity. Many of these studies involve labor intensive setup and take-down of trapping equipment. Additionally, Core Crew assisted the Spence lab with a canopy arthropod study (see Jaime Pinzon's summary in the Category 2 Research Summaries section). This study involved falling large trees onto a tarp and manually searching all leaves and branches for arthropods.

ii) White Spruce Genetics
Core Crew assisted Manphool Fagaria for 8 person-days of collecting natural white spruce seedlings from conifer and mixedwood compartments for use in Om Rajora's White Spruce Genetics study.

iii) Aspen Genetics
Edwards assisted DMI with the installation of an aspen genetics trial in compartment 861. The trial was established as part of a larger DMI study to develop aspen clones best suited for growth under changing climates.

4.3. Other Core Crew Tasks

i) Training, Orientation, and Infrastructure Activities
Approximately 11 person-days were allocated to training EMEND core employees for working in the remote northern areas of Alberta. Training included site orientation, defensive driving courses, ATV certification, bear awareness, and monthly safety meetings. See Section 8 for details on the EMEND Safety Program.

Approximately 77 person-days were allocated to infrastructure related activities. Core Crew spent 3 days at the start of May preparing the research facility for use. The Crew spent 4 days at the end of summer packing equipment and cleaning the research facility. Approximately 8 person-days were allocated to making new compartment identification signs. These signs will be displayed along forest access roads to help researchers orient themselves. Edwards and Hahn spent approximately 40 person-days on infrastructure related activities. The majority of this time was for travel to Peace River for quad and vehicle maintenance as well as for field and research facility equipment purchases. A small portion of this time was for general research facility maintenance.

Over the past few years, many of the compartment boundaries have become difficult to determine due to fading paint and flagging. Core Crew 2007 spent 11 person-days remarking some of the worst boundaries (around compartment 853 and 880 and between compartments 859/860/863, 879/880/881, 881/882, and 883/891). It is highly recommended that considerable time be set aside next summer to adequately remark all compartment boundaries.

ii) Office Work
Over 34 person-days of Core Crew time were allocated to office work. This time is limited to Hahn's efforts to manage incoming data from the summer fieldwork and Edwards' efforts in managing the camp facilities.

5. EMEND Research Personnel

5.1. Senior Researchers

EMEND is pleased to welcome Dr. Tomasz Gradowski (University of Alberta) to the research team. Dr. Gradowski is pursuing a Post-Doctoral Fellowship with Dr. Vic Lieffers and is assessing aspen regeneration at EMEND.

5.2. Graduate students

EMEND is a world-class training site for graduate students. Students from around the world continue to eagerly seek out graduate research programs at the EMEND site. Six students began their programs this summer. Charlene Wood (University of Alberta) is studying coarse woody debris and associated saproxylic beetle and fungi communities. All of her research plots were located off the EMEND land-base. Felix Longpré (Université du Québéc a Montréal) is a masters student studying trophic interactions among carabid beetles. Suzanne Abele (University of Alberta), a 2006 Core Crew member, began a study of snail and slug diversity at EMEND. Chris Pengelly (University of Cagary), is conducting a follow-up study of the pollinator community at EMEND. Marla Schwartzfield (University of Alberta) is working with Fangliang He on parasitic wasp diversity in the EMEND area. Manphool Fagaria (University of New Brunswick) is studying the genetics of white spruce natural regeneration following harvesting at EMEND. A number of graduate students are nearing completion of their studies. A summary of the status of EMEND graduate students is found in tables 8 and 9.

6. Graduate Student and Category 2 Research Updates.

The following sections provide updates to a number of on-going research projects at EMEND. The list of projects is not inclusive as updates are provided only for those researchers who submitted them.

6.1. Gastropod diversity in the boreal mixedwood forest of northern Alberta - variation among forest types and response to partial harvesting.

Suzanne Abele[1], MSc. Student
Dr. Ellen Macdonald[1] and Dr. John Spence[1], Supervisors

[1]Department of Renewable Resources, University of Alberta, Edmonton, AB.

Gastropods comprise an important part of forest faunal diversity. They are the only terrestrial representatives of the class Mollusca and therefore contribute a unique functional aspect to forests. The harvesting of forests, specifically the boreal mixedwood forest, may have implications for gastropod fauna and their role in the ecosystem. This study aims to describe gastropod assemblages in undisturbed stands, and relate these assemblages to those found in variable retention harvest treatments. Gastropod microhabitat will be examined by relating gastropod fauna to bryophyte diversity and cover within each of the treatments.

In the summer of 2007, sampling was focused within the uncut control compartments of all four cover types found on the EMEND landscape. A combination of sampling methods were used to conduct an overall diversity and abundance survey of the gastropod fauna at EMEND. These methods included searches of logs of varying decay classes, board trapping, and the collection of litter samples which will later be sorted for shells. Environmental variables including vegetation cover, coarse woody debris cover, tree basal area of conifer and broad-leaved trees, and canopy cover, were measured at each litter sampling site so that they could be related to the present gastropod fauna. As well, bryophyte cover by species was estimated at each litter sampling point. This work will establish a basis from which to examine the harvest treatments which will be sampled in the summer of 2008.

There are many areas of Alberta in which the gastropod fauna have never been surveyed, including the EMEND study site. This research will increase our understanding of gastropod responses to forest harvesting and help inform strategies for sustainable forest management. This work will also provide the groundwork for future gastropod studies at EMEND.

6.2. Patterns of bryophyte diversity in harvested mixedwood boreal forests.

Richard Caners, PhD Candidate
Ellen Macdonald and René Belland, Co-supervisors

751 General Services Building, Department of Renewable Resources, University of Alberta, T6G 2H1

Background: My research is examining the effects of partial-cut forest harvesting on bryophyte (moss and liverwort) diversity in mixedwood boreal forests of northwest Alberta. Bryophytes constitute an important yet often overlooked component of understory plant diversity in mixedwood forests and are key to a variety of ecosystem functions. In these forests, bryophyte diversity is largely determined by the numbers, types and properties of substrates available for

colonization on the forest floor, and species-specific life-history strategy. Since many bryophytes are shown to have specific habitat requirements and are presumed to have limited dispersal capabilities, forest harvesting in Alberta's mixedwood region may have long-term implications for the persistence of certain species over large areas.

Study objectives: This study is examining the mechanisms driving the response and reassembly of bryophytes after partial-cut harvesting across different forest canopy types (mixed-deciduous, coniferous) and intensities of harvest (10, 50, 75, 100 percent canopy retention). Data were collected from 2004-2006 at the Ecosystem Management Emulating Natural Disturbance (EMEND) experimental area in northwest Alberta. Specific objectives are to determine the following: 1) the effects of forest harvesting on the availability of substrates important for bryophyte persistence and the species traits most susceptible to changes in forest conditions, 2) the role of buried propagules in establishing bryophyte communities and their sensitivity to forest harvesting, 3) the effects of varying levels of green tree retention on the growth response of epiphytic (tree colonizing) and terricolous (ground colonizing) bryophytes, and 4) the influence of environmental factors on the spatial organization of forest floor bryophytes. Results will provide valuable information on the response of bryophytes to changes in habitat conditions and help determine the best strategies for protecting bryophyte populations in harvested mixedwood ecosystems.

Current results: Results to date show that the upper mineral soil horizons in mixedwood forests contain a persistent propagule bank capable of germinating under suitable growing conditions (Objective 2). These buried propagules may play an important role in the development of species assemblages in forests after disturbances that expose mineral soil (e.g., fire, tree blowdown, fossorial rodent activity). Growth cabinet experiments show that both light intensity and soil properties have a significant influence on the composition of germinated species. In comparison, forest canopy type and past logging intensity are not significant descriptors of germinated species.

Results also demonstrate that the persistence of epiphytic (tree colonizing) bryophytes and growth of terricolous (ground colonizing) bryophytes is dependent the amount of tree retention remaining after harvest (Objective 3). Reduced numbers of canopy trees are shown in the literature to result in increased air turbulence, and ground insolation and temperatures, which results in the loss of moisture through increased evaporation. This study shows that forest harvesting has direct negative effects on the survival of epiphytic meta-communities growing on aspen boles and on the annual growth of the ground-dwelling moss *Hylocomium splendens*. These measured responses are considered to be excellent indicators of local growing conditions in harvested forests.

Results pertaining to the effects of forest harvesting on bryophyte diversity (Objective 1) are currently being examined, with preliminary trends suggesting that the highest levels of harvest intensity have the greatest impacts on bryophyte community composition. Liverworts are particularly affected by canopy removal because of their documented sensitivity to desiccation. In mixedwood forests, sites with the greatest number of microhabitats (e.g., decayed logs and stumps, tree bases) and high moisture availability typically exhibit the greatest diversity and are therefore important for the conservation of species on harvested landscapes. Remaining results (Objective 4) will describe how species and their functional groupings (e.g., life-history strategy, substrate affinity) are patterned on the forest floor and at what spatial scales to infer processes that shape community composition. Preliminary results show that forest floor species assemblages are most similar in terms of their composition at small distances (a few meters), becoming significantly dissimilar with increasing distance. Also, unique groups of species are

found to co-occur at multiple spatial scales on the forest floor, likely as a result of their substrate preferences and capacity for dispersal.

Research will advance current theory on the mechanisms responsible for the structuring of species assemblages in mixedwood forests and highlight the propensity for species to persist and recolonize sites across a range of disturbance intensities.

6.3. Effects of varying intensities of green tree retention harvesting on understory plant communities in the boreal mixedwood forest.

Ashley Craig, MSc. Student
Dr. S. Ellen Macdonald, Supervisor

751 General Services Building, Department of Renewable Resources, University of Alberta, T6G 2H1

The field work for this project took place between June 14-August 11 2006 and was carried out at the EMEND (Ecosystem Management Emulating Natural Disturbance) experimental site. To describe and quantify the effects of partial harvesting treatments in mixedwood forests on understory vegetation, this study examines the species richness, species diversity, percent cover, and species turnover (β diversity) of the understory plant community. Plots were established in each of 6 treatment types (75, 50, 20, and 10% retention as well as clearcut and control treatments) in mixedwood forest stands. Within each compartment, plots were located in the residual strips as well as in the corridors used by the harvesting equipment. Visual estimates of percent cover were made for all species of herbs and shrubs in a 2x2 m plot to measure species richness and diversity.

Preliminary results are showing that harvesting results in greater sapling abundance, greater cover and richness of understory plants, and changes in community composition. Machine corridors and plots that received more intense harvesting generally showed a greater difference from the control areas than did the retention strips and the treatments with higher retention levels. For example, the control compartments had significantly less cover of understory vegetation than the clearcut and 10% retention treatments. Machine corridors had a significantly greater percent cover of understory vegetation than did retention strips. Richness per plot was generally higher in the machine corridors than in the retention strips. The 10 % retention treatment had the highest overall richness per plot but differences among treatments were small. The total number of saplings per plot increased significantly as the percentage of residual trees decreased. Species composition is significantly different in each harvesting treatment.

6.4. White Spruce Genetics.

Manphool Fageria, PhD Student
Om Rajora, Supervisor

Forest Genomics Lab, Faculty of Forestry, UNB, E-mail: j2y1r@unb.ca

Objective: To determine the effects of experimental harvesting on genomic diversity and population structure of white spruce as it occurs in conifer dominated and mixed-wood forests, using both neutral and selective markers.

Hypothesis: Changes in genetic structure can occur when a new population is established from an older population due to the effects of harvesting and fire. I hypothesize that intensive forest harvesting and forest fires will cause population bottlenecks which may lead to inbreeding and genetic drift. This would suggest that a greater intensity of harvesting and fire will result in reduced genetic diversity. Additionally, I hypothesize that intense harvesting will have a greater impact on genetic diversity than burn treatment, due to the assumption that trees have co-evolved with wildfire for millions of years and so might have developed adaptive strategies.

Population sampling: The samples were collected from EMEND (Ecosystem Management Emulating Natural Disturbance) experimental site, located in the boreal forest in northern Alberta, approximately 90 km northwest of Peace River (approximate coordinates for the project centre: 56^0 46'13"N, 118^0 22'28"W). (http://www.emend.rr.ualberta.ca). The study involved two replications in two forest cover types that are conifer dominated (> 70%) and mixed wood (conifer and deciduous composition each 35-65%). Approximately thirty five seedlings, and trees (in case of control) were sampled randomly at a minimum distance of approximately 30m from each of six harvesting treatments (10% residual, 20% residual, 50% residual, 75% residual, clearcut and control), and one burn treatment. We sampled populations from both the forest types because we think that these harvesting will be having more impact in case of mixed wood than conifer dominated one. So we expect interaction between these two forests and experimental harvestings.
DNA preparation and genotyping: High –throughput technique (QIAGEN, Valencia, CA) will be used for isolation of genomic DNA from needle tissue and high-throughput DNA sequencer for genotyping.

Interpretation of data and results, and conclusions: Allele nos., heterozygosity, polymorphism information content, exclusive allele no., and shared alleles will be calculated. The Nei genetic distances will be computed by the software package of Phylip3.63, and the evolutionary tree based on Neighbor-Joining method of Saitou and Nei (1987) will be drawn using the MEGA3.0 software. Microsatellites and SNPs will be compared and their patterns will be interpreted. We will compare the genetic diversity impacts of experimental harvesting and conclude which is best one in terms of long term survival of white spruce.

6.5. Composition and structure of epigeaic, understory and canopy spider assemblages in mixedwood forest cover-types after variable retention harvest

Jaime Pinzon, PhD Student

Department of Renewable Resources, University of Alberta, Edmonton.

Spiders are among the most ubiquitous and diverse groups of terrestrial arthropods and play important functional roles in many terrestrial ecosystems. Slight changes in habitat configuration may cause positive or negative shifts in spider community structure and therefore prey community composition affecting the balance of density dependent interactions among insect herbivores, predator, parasitoids and detritivores. For this reason, spiders have high potential as ecological indicators of system function and as key components in conservation issues.Few studies have been conducted in Canada about the impact of disturbances on spider

communities or the differences of spider composition between forest types . Furthermore, information about habitat or microhabitat affinities is scarce and representative for just some localities (former references) or families. All these studies are focused mainly on ground dwelling species and almost nothing is known about the spider assemblages found on forest foliage in Canada, their vertical distribution or the effects of forest cover and disturbance on assemblages in higher strata of the forest.

I propose to assess the community structure of spiders associated to the foliage and ground-litter under the four different forest cover-types included in the EMEND experiment and to establish post-harvest effects of variable retention on species composition, diversity and richness. The results of this research will provide insight into how differences in habitat/microhabitat structure affect the composition of spider assemblages associated with forest litter, understory and canopy in mixedwood forests. It will provide basic ecological data on the structure of the overall boreal spider community taking into account differences in successional stages of the forest (deciduous-mixedwood-coniferous) and forest strata (litter-understory-canopy).

During this second field season (summer 2007), spiders were collected from the canopy of deciduous and conifer dominated control and 20% retention stands. On each stand, two selected trees were cut over 30 x 50 feet tarps and all arthropods were collected from branches, bole and tarp using aspirators. This activity was carried out during June 2007 with the help of EMEND core crew and members from the Spence Lab (University of Alberta).

Following 2006 field work, spiders from tree trunks were collected using arboreal pitfall traps (designed and tested the previous summer). Eight trees were selected from each of the conifer and deciduous control stands; on each tree two traps were placed (96 traps in total) and spiders were collected 4 times in three-week intervals. In addition, on the same sites used last year for collecting ground-dwelling spiders (effects of retention patches), the following environmental variables were recorded as follows:

One 5m circular plot per site (60 plots), canopy cover, tree density/basal area, coarse woody debris, and snag density/basal area were recorded.

Three 1 x 1m plots per site (180 plots, each corresponding to the specific location of the pitfall trap used last year) were used to record plant species percent cover (forbs, shrubs, dwarf shrubs).

6.6. Controlled burning influence on forest floor processes.

Mathew Swallow[1] (MSc Student)

Supervisors: Sylvie Quideau[1] and Barbara Kishchuk[2]
[1] Department of Renewable Resources, University of Alberta, Edmonton.
[2] Canadian Forest Service, Northern Forestry Centre, Edmonton.

The initial aim of this study was to compare the microbial communities found in the forest floors of slash and slash burn sites. I found that slash burn sites supported smaller sized microbial communities. However, slash and slash burn sites shared microbial communities that were functionally and structurally similar. Pre-harvest stand composition appeared to have a long lasting influence upon microbial community structure and function. An unexpected finding was

the strong influence local topography had on microbial community structure. The next part of this project will be to study microbial communities found in upland and lowland positions. In addition, I will examine the functional roles different members of the microbial community have in forest floor carbon cycling and how those roles are influenced by microclimate.

Last year, I volunteered for the Forest Explorers 2006 held in Peace River. It was attended by approximately 500 junior and senior high school students of the Peace River area with over 40 researchers participating. In June of 2007, I attended and presented a poster highlighting some of my work at the Canadian Society of Soil Science annual conference in Quebec. This winter I will test how dissolved organic matter from forest floors alters soil microbial communities.

6.7. Saproxylic beetle - coarse woody debris habitat associations

Charlene Wood, MSc. Student

University of Alberta, Department of Renewable Resources, 751 GSB, University of Alberta
Edmonton, Alberta, Canada, T6G 2H1
From EMEND Database, *Last Updated: 2007-11-14 10:26:19*

Participants: Charlene Wood (primary investigator), Charlene Wood, David Langor, John Spence, James Hammond

Background: Dead and dying wood plays a critical role in the boreal forest. Dead trees contribute to forest ecosystem structure and function by providing habitat for saproxylic (dead wood dependent) organisms and substrate for cryptogam (moss, lichen, fungus) and vascular plant germination. In addition, dead wood contributes to long-term matter, energy and nutrient inputs and soil stability. Dead wood is a dynamic resource, decaying over time as a result of arthropod and cryptogam colonization events, influencing a characteristic succession of associated biota. Coarse (>7cm diameter) fragments of dead wood, or "coarse-woody debris" (CWD) are largely undervalued by forest managers as a vital forest element. The view of CWD as "waste" is leading to increased interest in utilizing CWD as a renewable energy source, despite studies from Europe, which reveal catastrophic implications to biodiversity in response to dead wood removal (1,2). Saproxylic beetles are influenced by various wood qualities such as decay stage, size, orientation, species, presence of fungi, and proximity to forest edges (1). Recent studies in Alberta have supplemented our understanding of the saproxylic beetle fauna (3,4), yet specific CWD microhabitats required by the diverse saproxylic community have yet to be determined. Because saproxylic organisms are highly sensitive to declines in CWD, dead wood microhabitats must be further studied and an ecologically-based CWD measurement protocol for Populus wood should be constructed. Literature Cited: 1. Siitonen. 2001. Ecol. Bull. 49:11–41. 2 Siitonen et al. 1994. Scand. J. For. Res. 9:185-191. 3 Hammond et al. 2001. Can. J. For. Res. 31(7): 1175-1183. 4 Jacobs et al.2006. Agric. Forest Entomol. 9: 3-16.

Hypothesis: Hypothesis 1 - CWD characteristics such as fungus, lichen, and bryophyte species, large crevices and cavities will influence the presence of specialist saproxylic species (which may be useful as indicators). Hypothesis 2 - Large diameter snags and logs will exhibit the highest diversity of saproxylic species. Hypothesis 3 - Position of CWD (ground, raised, vertical) will significantly influence associated beetle, fungus, lichen, and bryophyte communities. Hypothesis 4 - Distinctive beetle community turnovers will occur throughout the CWD decay profile from freshly dead to nearly humified.

Objectives: My objectives are to: i) examine saproxylic assemblages in CWD ranging from freshly dead to well decayed, ii) determine specific habitat associations of saproxylic arthropods with biotic and abiotic wood characteristics and iii) develop an ecologically sound hardwood CWD classification system.

Technical Description: Field work will be conducted from April to September (2007 and 2008) in deciduous dominated stands in northern Alberta. Emergence traps will be used to sample saproxylic taxa as they exit from 100 snags (standing dead trees) and 150 logs (downed wood). Emergence traps enclose the dead wood, ensuring the closest habitat association possible and is essential in collecting data directly relating saproxylic species to dead wood. Emergence traps have never been used in previous saproxylic studies in Alberta. I will focus on trapped beetles as current taxonomic knowledge allows for species-level identification of specimens. Specimens of other invertebrate orders will be numerated for community- level analyses. Tree species and number of years since death will be determined when possible for all CWD sampled. Particular wood qualities (diameter, volume, age since death, wood texture, bark remaining, crevice dimensions, cryptogam species, moisture, light exposure) will also be recorded to assess species and community associations with downed wood characteristics. Data analysis will include multivariate regression, rarefaction and indicator species analyses to infer beetle community and species associations with dead wood qualities.

Key Results: In Progress. [Update October 2007: Summer 2007 field work complete. Collected samples from 150 logs and 100 snags every 1-2 weeks from June 7 through August 19. Started site preparation for next year at the end of September. Preparing for an additional trip mid-late October, 2007. I am currently enrolled in coursework at the University of Alberta, processing samples and entering CWD characteristics and stand data.]

Implications:
The data collected in this research project will form the basis for the development of a new CWD classification and measurement protocol for Populus wood which could be used by pulp producers. The design and implementation of systems that maintain critical habitat qualities associated with dead wood will aid in conserving critical forest biodiversity. This project will also improve our understanding of complex multi-trophic community interactions existing within dead wood, thus contributing to enhanced community ecology and forest biology knowledge.

7. EMEND Research Infrastructure

7.1. Research Facility

The EMEND Research Facility is located 10km west of Dixonville, Alberta along the Sulphur Lake Road and approximately 40km away from the EMEND research site. The University of Alberta owned facility can accommodate up to 30 researchers but optimal capacity is around 15 people. The summer of 2007 was the second summer of full-time operations at the new facility.

The facility operating costs are covered primarily through FRIAA funding to the EMEND project. The FRIAA contributions cover the accommodation costs for all researchers working at the EMEND research site on projects approved by the EMEND management committee. All costs exceeding those outlined in the EMEND FRIAA budget are cost-shared by the individual researchers based on their facility use. Occasionally researchers not working on the EMEND project wish to use the EMEND facility. These researchers are assessed a cost-recovery plus 15% fee for their use of the research facilities.

Whitemud Catering Ltd. of Peace River, AB was contracted for facility catering and operating services from 1 May through to 31 October, 2007. Whitemud Catering provided all food and cleaning services, potable water delivery as well as all sewer and garbage disposal services. EMEND was charged a daily per-person rate of $64.19 up to 1100 person-days of use for these services. The daily rate dropped to $35.20 for every person-day of use after 1100. Non-EMEND researchers were assessed a daily per-person rate of $75.00.

The new facility was used by 41 EMEND associated researchers and research assistants for a total of 1499 person-days, an increase of 161 person-days from 2006. Category 1 researchers accounted for 349 person-days of use while Category 2 researchers used the facility for 1015 person-days (tables 3 and 4). The facility was used for 135 person-days by researchers not affiliated with EMEND (table 5). The only non-EMEND use was by a research team from the Alberta Research Council (ARC) conducting a study on amphibians in riparian areas for DMI.

7.2. Vehicles

The Core Crew used two vehicles this summer; a 4x4 truck owned by the Department of Renewable Resources and allocated to EMEND (UofA 290), and one passenger van that was rented from the University of Alberta Vehicle pool. The truck was primarily used to transport Core staff between the research facility and the research site while the van was used to transport Core personnel between Edmonton and the research facility. EMEND core vehicle use is summarized in table 6.

Core Crew 2007 used seven ATV's this summer. Four ATV's are owned by the Department of Renewable Resources and allocated to EMEND, three are owned by DMI, and two are owned by Canfor. Two ATV's, Canfor Red 400 and DMI Yellow 350, were wrecked during the DMI ATV safety training course. These two ATVs were in the repair shop for the summer and thus were not used by EMEND this summer. EMEND Core ATV use is summarized in table 6.

The new research facility has a large gasoline tank on site for researchers to use in their ATV's and vehicles. Funding from FRIAA covers all gasoline costs associated with ATV use at the EMEND research site (for both Category 1 and Category 2 research) as well as EMEND Core vehicle use. All fuel usage is summarized by research group in table 7.

8. EMEND Safety Program

The EMEND Project places a high priority on maintaining a safe workplace since the research site is situated in a remote location over 40 minutes from the nearest emergency assistance. Over the past few years the EMEND Project has developed a safety program consisting of due diligence guides and emergency response plans that all researchers using the EMEND research site and facilities are required to follow. The adoption of a strong safety focus has led to reduced work related injuries and a positive attitude towards safety at the EMEND research site.

A well-developed emergency response plan and forest protection plan has been created with the assistance of DMI and Canfor. These plans include specific instructions on how to plan for and react to certain emergency situations such as medical emergencies, overdue/loss persons, and forest fires. All researchers are responsible for bringing their own required safety supplies

and researchers are not allowed to work on the site without them. The EMEND Field Coordinator works closely with DMI and Canfor representatives to enforce these plans at the EMEND site.

Due to the small Core Crew this summer, the live emergency response drill was not held. It is expected that the live exercise will continue next summer since a larger crew will be required. Furthermore, Dianne Perreault of Estabrook Logging was not contracted this summer to oversee the safety program at EMEND. The EMEND staff worked directly with DMI Health and Safety officers instead. The need to hire Dianne will be reviewed by the EMEND Management Committee this winter.

9. Administrative and Organizational Items

9.1. Annual Workshop

The annual EMEND Workshop was held on 26-27 April 2007 at the Northern Forestry Centre, Edmonton, Alberta. This workshop brings together all the researchers, graduate students, and industry personnel involved in the EMEND project to discuss important matters regarding the EMEND project. The workshop this year provided a forum for current researchers and graduate students to present their research results and for new researchers to propose research projects. It also provided an opportunity for EMEND partners to present current issues in forest management where results from EMEND research may prove useful. Two EMEND partner presentations were provided along with twelve research presentations. Approximately 40 people attended the workshop.

9.2. Technology Transfer Activities

i) Tours.

EMEND conducts numerous tours of the research area each year for a diverse array of interested groups from the general public to professionally trained foresters. All active researchers are encouraged to attend the tours to provide information relating to their research interest. Two tours were provided this summer: the Junior Forest Rangers were given a tour and a "short-course" in forest ecology research on and EMEND industry partner personnel were given a tour highlighting EMEND research.

ii) EMEND Website

The EMEND website (www.emend.rr.ualberta.ca) is operated and maintained by the EMEND Field Coordinator, Jason Edwards. Updates and new features are being added to the website on a continual basis. This fall, Edwards plans to integrate the website with the EMEND Database thus allowing content to be dynamically updated on a continual basis.

iii) Signage.

Derek Sidders added signage to the new tour trail located in from compartments 878 to 896. Sidders will be working on completing this task throughout the winter months and next spring.

9.3. EMEND Database Report.

Brad Tomm

Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, 5320 122 street , Edmonton, Alberta, T6H 3S5. Phone: (780) 435-7331. Email:

btomm@nrcan.gc.ca.

The EMEND Database continues to operate and provide researchers with the opportunity to archive and distribute scientific data with other participants in the EMEND project. Online access to the EMEND Database, available to all EMEND participants, provides researchers with the tools to access and maintain their contact, study, publication and presentation information. Links on the participant profiles page have been updated to provide a complete listing of all EMEND related studies, publications and presentation that a participant is involved in. A link has also been established to provide a complete detailed overview for each individual. Participants can stay current with the progress and information being generated from the various studies being conducted at EMEND. A file upload and management tool has been created to allow for JPEG images and PDF versions of study methods, publications or presentations to be uploaded to the database. Additional enhancements have also been made to support the administration and management of the EMEND project.

Currently, there are 20 registered users for the EMEND Database. Of these 20 individuals, researchers account for 14 users, industry has 2 users, provincial government has 1 user and database administration/management has 3 users. EMEND participants who would like an account can contact the EMEND Database administrator at the address above.

As of October 22, 2007, the EMEND Database is 58 MB in size and consists of 375,246 records found in 76 tables. Since the commencement of the EMEND project 257 participants, 75 studies, 61 publications and 101 presentations have been entered into the database. Fifteen datasets and the associated metadata have been incorporated into the EMEND Database. The data owning agents of each dataset retain control of the data they have submitted to the database. Eight of the datasets have been classified as "core" datasets and summaries of the data are available once the conditions of a data use agreement have been met.

Since the implementation of the EMEND Data Use Agreement there has been 22 agreements submitted and approved. Four new requests to access core data summaries were received and approved in 2007 as of October 22, 2007. Users with approved access to core research datasets have the ability to customize the online query builder to produce compartmental summaries tailored to their specific requirements. Users are able to download the query results and incorporate them into the analysis of their research.

9.4. EMEND Publications and Theses

Debaive, Nicolas. 2007. Effects of Natural Disturbances on Polypore Diversity. Undergraduate Thesis Report, Institut Supérieur d'Agriculture, France.

Hannam, K.D., S.A. Quideau, B.E. Kishchuk. 2007. The microbial communities of aspen and spruce forest floors are resistant to changes in litter inputs and microclimate. Applied Soil Ecology 35 (2007) 635–647.

Jacobs, Joshua M., John R. Spence and David W. Langor. 2007. Influence of boreal forest succession and dead wood qualities on saproxylic beetles. Agricultural and Forest Entomology 9: 3-16.

Jacobs, Joshua, M., John R. Spence, and David W. Langor. 2007. Variable retention harvest of

white spruce stands and saproxylic beetle assemblages. Canadian Journal of Forest Research 37(9): 1631–1642.

Jerabkova, Lucie and Cindy E. Prescott. 2007. Post-harvest soil nitrate dynamics in aspen- and spruce-dominated boreal forests. Forest Ecology and Management 242: 209–216.

Macdonald, S.E. and T.E. Fenniak. 2007. Understory plant communities of boreal mixedwood forests in western Canada: natural patterns and response to variable-retention harvesting. Forest Ecology and Management 242: 34-48.

Park, J., Reid, M.L.. 2007. Distribution of a bark beetle, Trypodendron lineatum, in a harvested landscape. Forest Ecology and Management 242: 236-242.

9.5. Talks of Interest and Poster Presentations.

Abele, Suzanne, S. Ellen Macdonald, John Spence. 2007. Gastropod diversity in the boreal mixedwood forest of Alberta: variation among forest types and response to partial harvesting. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada. 26-27 April 2007.

Archibald, Tom. 2007. The EMEND Prescribed Burn Program. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada. 26-27 April 2007.

Bergeron, C., J. Spence, and J. Volney. 2007. Fire History, Insect Outbreaks and Tree Rings in North Western Alberta. 6th North American Forest Ecology Workshop. Vancouver, British Columbia.

Bergeron, Colin, John Spence, and Jan Volney. 2007. Landscape Ecology and Conservation of Carabid Beetles. XIII European Carabidologist's Meeting. Blagoevgrad, Bulgaria .

Bodeux, Brett and Laura Gray. 2007. Size does matter: tree diameter distributions and successional patterns in Alberta's boreal forest. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Caners, Richard. 2007. Regulation of bryophyte diaspore bank composition in mixedwood boreal forests. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Craig, Ashley, S. Ellen Macdonald. 2007. Effects of varying intensities of green tree retention harvesting on understory plant communities in the boreal mixedwood forest. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada. 26-27 April 2007.

Edwards, Jason, John Spence, Jan Volney, on behalf of EMEND Partners and Participants. 2007. Implementing forest ecosystem science: issues, a case study, and recommendations. FORREX Science to Management Forum: Overcoming Obstacles to Variable Retention in Forest Management. September 25-27, 2007. Prince George, British Columbia.

Gradowski, Tomasz. 2007. The influence of canopy composition, overstory retention level and

site preparation treatment on survival and growth of planted white spruce. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada. 26-27 April 2007.

He, Fangliang. 2007. Stand Structure, Spatial Pattern, and Dynamics of the Boreal Mixedwood Forests of Alberta. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Jacobs, Josh and John Spence. 2007. Adding fire to harvested compartments: is this a better emulation of natural disturbance?. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Jacobs, J., J. Spence, and D. Langor. 2007. Decaying Wood: The Rise and Fall of Beetle Empires. 6th North American Forest Ecology Workshop. Vancouver, British Columbia.

Jacobs, Josh, and John R. Spence. 2007. Adding Fire to Harvested Areas in the Boreal Forest: Is This a Better Emulation of Natural Wildfire?. XIII European Carabidologist's Meeting. Blagoevgrad, Bulgaria .

Keddy, Tim and Derek Sidders. 2007. Establishing white spruce under various mixedwood overstory retention levels using container seedlings on natural and created microsites. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Pengelly, Chris and Ralph Cartar. 2007. Impacts of forestry on the bumble bee-influenced pollination community. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada. 26-27 April 2007.

Pinzon, Jaime and John Spence. 2007. Effects of Harvesting on Spider Assemblages in the Canopy of Aspen (Populus tremuloides) and White Spruce (Picea glauca) Stands in the Boreal Forest. Entomological Society of Canada / Entomological Society of Saskatchewan Joint Annual Meeting. Saskatoon, Saskatchewan.

Pinzon, Jaime, John Spence and David Langor. 2007. Retained forest patches as important structural features for spider conservation after harvesting in the Boreal Forest. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, Alberta, Canada.

Pyper, M.P., J.R. Spence, and D.W. Langor. 2007. Beta-diversity as a supplement to single species indicators of biodiversity conservation within managed forests. 17th Annual General Meeting of the Alberta Chapter of the Wildlife Society. Canmore, Alberta.

Pyper, M.P., D.W. Langor, and J.R. Spence. 2007. Understanding edge effects: using carabid and staphylinid communities as indicators of biodiversity responses to forest fragmentation. 54th Annual Meeting of the Entomological Society of Alberta. Lethbridge, Alberta.

Pyper, M.P., J.R. Spence, D.W. Langor, and F. He. 2007. Does quantity constitute quality: Implementing sustainable applications of aggregated retention in managed boreal forests. 6th North American Forest Ecology Workshop. Vancouver, British Columbia.

Spence, John R., Joshua M. Jacobs, and Timothy T. Work.. 2007. Recovery of Boreal Carabid Assemblages Subsequent to Variable Retention Harvesting: Early Results from the Emend Experiment. XIII European Carabidologist\'s Meeting. Blagoevgrad, Bulgaria .

Swallow, Mathew, Sylvie Quideau, and Derek Mackenzie. 2007. Prescribed burning: Effects upon microbial communities within boreal forest floors. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Vinge, Tim and Tim Barker. 2007. Forest Industry Perspectives, DMI. EMEND Annual Workshop 2007. Northern Forestry Centre, Edmonton, AB. 26-27 April 2007.

Appendix 1: Tables

Table 1. Summary of EMEND core crew work completed for core (Category 1) activities from May 7 – August 31, 2007.

Project	Work Description	Total Number of Person Days of Core Crew Activity	% of Total Category 1 Person Days	% of Total Person Days
Infrastructure/ Equipment Maintenance and Other	- Quad maintenance, vehicle maintenance, equipment purchases and maintenance, - Camp maintenance/set-up and take-down - Field-site maintenance (trail clearing/ sign making etc.) - Tours of EMEND	76.75	27.0	23.5
Aspen Regeneration (Silviculture)	- Remarking plots	67.0	23.6	20.6
Office Work	- Camp management/administration - Data management	34.5	12.1	10.6
Hydrology (van Everdingen)	- Piezometer and well measurements	20.75	7.3	6.4
Tree Plot and Compartment Maintenance	- Remarking compartment boundaries	17.0	6.0	5.2
Moth Diversity (Spence)	- Light trap collections	12.0	4.2	3.7
Snags	- First year post-burn data collection	12.0	4.2	3.7
Training, Orientation and Safety	- Bear awareness - Quad safety course - Orientations - Data collection training	11.0	3.9	3.4
Coarse Woody Debris	- First year post-burn data collection	8.0	2.8	2.5
Vegetation	- First year post-burn data collection	8.0	2.8	2.5
Shrub Biomass and Productivity	- First year post-burn data collection	8.0	2.8	2.5
Forest Health and Mensuration	- First year post-burn data collection	8.0	2.8	2.5
Fire Ecology	- Checking burn compartments for conditions	1.0	0.4	0.3
	Total:	**284.0**	**100.0**	**87.1**

Table 2. Summary of EMEND core crew assistance provided for non-core (Category 2) research from May 7 – August 31, 2007.

Project	Work Description	Total Number of Person Days of Core Crew Activity	% of Total Category 2 Person Days	% of Total Person Days
Arthropods (S. Abele, E. Kamunya, F. Longpré, C. Pengelly, J. Pinzon, C. Wood)	- Canopy arthropods collection - pitfall trap collection - Bee surveys - Gastropods collection - Trap removal	32.0	76.2	9.8
White Spruce Genetics (Fagaria)	- White spruce sample collection	8.0	19.0	2.5
Aspen Genetics (DMI)	- site selection for aspen planting	2.0	4.8	0.6
	Total :	**42.0**	**100.0**	**12.9**

Table 3. Number of person-days EMEND camp was used by individuals involved in core (Category 1) research from May 7 – August 31, 2007.

				Number of Days at EMEND Camp				
Project	**Camp User**	**Affiliation**	**Title**	**May**	**Jun**	**Jul**	**Aug**	**Total**
Core Crew	Baldo, Courtney	Concordia University	Core Crew	20	20	23	25	88
	Edwards, Jason	U of A	Field Coordinator	21	30	23	25	99
	Hahn, Charlene	U of A	Data Manager	20	20	20	25	85
	St. Onge, Jonathon	U of A	Core Crew	9	20	23	25	77
		Category 1 Research Projects - Totals:		**70**	**90**	**89**	**100**	**349**

Table 4. Number of person-days EMEND camp was used by individuals involved in non-core (category 2) research from May 7 – August 31, 2007.

				Number of Days at EMEND Camp				
Project	**Camp User**	**Affiliation**	**Title**	**May**	**Jun**	**Jul**	**Aug**	**Total**
Arthropods and Invertebrates (Langor/ Spence/ He/ Macdonald/ Sperling/ Cartar)	Abele, Suzanne	U of A	MSc Student	0	21	18	19	**58**
	Bergeron, Colin	U of A	PhD Candidate	2	0	4	0	**6**
	Bodeux, Brett	U of A	MSc Student	17	11	19	17	**64**
	Esch, Evan	U of A	Research Assistant	0	7	7	0	**14**
	Fitzpatrick, Jeremy	U of A	Research Assistant	17	11	21	17	**66**
	Gray, Laura	U of A	MSc Student	15	11	0	0	**26**
	Hammond, Jim	CFS	Technician	0	4	0	3	**7**
	He, Fangliang	U of A	Researcher	2	0	2	0	**4**
	Jacobs, Josh	U of A	Technician	0	7	0	0	**7**
	Jimmo, Amy	CFS	Research Assistant	11	6	1	27	**45**
	Johnson, Wallis	U of A	Research Assistant	11	15	11	9	**46**
	Kamunya, Esther	U of A	PhD Student	0	25	3	10	**38**
	Langor, David	CFS	Researcher	2	0	0	5	**7**
	Longpré, Felix	UQAM	MSc Student	0	13	26	0	**39**
	Morrison, Stuart	U of A	Research Assistant	0	5	3	0	**8**
	Pengelly, Chris	U of C	MSc Student	0	0	31	20	**51**
	Pinzon, Jaime	U of A	MSc Student	0	25	16	9	**50**
	Pueyo, Salvador	U of A	Visitor	0	0	3	0	**3**
	Pyper, Matthew	U of A	MSc Student	11	15	11	14	**51**
	Schwarzfield, Marla	U of A	MSc Student	2	11	9	3	**25**
	Spence, John	U of A	Researcher	0	3	4	0	**7**
	Stang, Kim	U of A	Research Assistant	0	23	6	4	**33**
	Turton, Emily	U of A	Research Assistant	0	25	16	15	**56**
	Van Engelhardt, Melanie	U of A	Research Assistant	0	20	23	0	**43**
	Volney, Jan	CFS	Researcher	0	0	3	0	**3**
	White, Peter	U McGill	PhD Student	0	0	10	7	**17**
	Wizniuk, Penny	U of A	Research Assistant	0	21	18	19	**58**
	Wood, Charlene	U of A	MSc Student	11	25	24	27	**87**
							Subtotal :	**919**

(Table 4 Continued)

				Number of Days at EMEND Camp				
Project	**Camp User**	**Affiliation**	**Title**	**May**	**Jun**	**Jul**	**Aug**	**Total**
Silviculture	Godwin, Dan	CFS	Research Assistant	0	0	0	4	**4**
(Sidders/ Stewart)	Gradowski, Tomasz	CFS	Post Doctoral Fellow	0	4	0	4	**8**
	Lavallee, Michelle	CFS	Research Assistant	0	0	0	4	**4**
	Mayo, Nancy	CFS	Technician	0	4	0	4	**8**
	Stewart, Jim	CFS	Researcher	0	1	0	4	**5**
	Aubrey, Bonnie	CFS	Technician	0	1	0	4	**5**
						Subtotal:		**34**
Soils	Diaz, Irma	U of A	PhD Student	0	2	22	5	**29**
(Quideau/ Kishchuk)	Hemsley, Tyrel	U of A	Research Assistant	0	2	22	5	**29**
						Subtotal:		**58**
Genetics	Fagaria, Manphool	UNB	PhD Student	0	4	0	0	**4**
						Subtotal:		**4**
	Category 2 Research Projects - Totals:			**101**	**322**	**333**	**259**	**1015**

Table 5. Number of person-days EMEND camp was used by individuals involved in non-EMEND related research from May 7 – August 31, 2007.

Project	Camp User	Affiliation	Title	Number of Nights
Riparian (Herpetology)	Andrusiak, Tara	ARC	Technician	49
	Bradbury, Steve	ARC	Researcher	3
	Eaton, Brian	ARC	Researcher	7
	Nolan, Luke	ARC	Technician	9
	Peleshok, Leonard	ARC	Technician	56
	Wilkinson, Lisa	ASRD	Researcher	2
	Okonkwo, Godwin	ARC	MSc Student	3
	Witiw, Jim	DMI	Industry	*3
			Subtotal:	**132**
Aspen Genetics Trial	Hebrado, Paul	DMI	Industry	1
	Darrah, Amber	DMI	Industry	1
	Oly, Janet	DMI	Industry	1
			Subtotal:	**3**
			Category 2 Research Projects - Total:	**135**

* Lunches only

Table 6. EMEND Core vehicle mileage from May 7 – August 31, 2007.

Vehicle	Total Kilometers
Trucks	
U of A #290 (Yukon)	9362
Rental Van	7973
Quads	
Canfor Green 400	99
Canfor Red 400	0
DMI Red 350 (Lic.# PJ764)	1196
DMI Red 450 (Lic. # PJ766)	1205
DMI Yellow 350 (Lic.# PJ769)	0
U of A Yellow 500 (Lic # US952)	621
U of A Yellow 500 (Lic # US953)	4
U of A Yellow 500 (Lic # US954)	476
U of A Yellow 500 (Lic # US955)	832

Table 7. EMEND camp fuel use by work group.

Work Group	Truck Gasoline (L)	Quad Gasoline (L)	Equipment Gasoline* (L)	Total Gasoline (L)
EMEND Core	599.0	270.5	5.5	875
He	0	581.0	0	581
Spence	0	512.0	0	512.0
Macdonald	224.5	88.0	0	312.5
Quideau	140.0	61.0	0	201.0
Cartar	0	90.0	0	90.0
Langor	20.0	0	0	20.0
Total	**983.5**	**1602.7**	**5.5**	**2591.7**

Note: * Equipment includes chainsaws, lawnmowers etc.

Table 8. EMEND master student project status.

Student	Affiliation / Supervisor	Project Title	Project Status
Abele, Suzanne	University of Alberta - Macdonald / Spence	Gastropod diversity in boreal mixedwood forests of northwestern Alberta.	Data collection
Bodeux, Brett	University of Alberta - He	Spatial patterns of boreal forest moth diversity	Data collection
Craig, Ashley	University of Alberta - Macdonald	Threshold effects of dispersed green tree retention harvesting on understory plant communities in the mixedwood forests at EMEND.	Writing Thesis
Gray, Laura	University of Alberta - He	Developing biodiversity patterns for predicting the effect of management on the boreal mixedwood forests of Alberta	Writing Thesis
Longpré, Félix	Université du Québec à Montréal - Work	Carabidae trophic interactions	Data collection
Pengelly, Chris	University of Calgary - Carter	Impacts of forestry on the bumble bee-influenced pollination community	Data collection
Pyper, Matthew	University of Alberta - Spence / Langor	Clumped retention methods and their importance in conserving biological diversity	Data Collection
Schwarzfeld, Marla	University of Alberta - Sperling / He	Parasitic wasp diversity in the boreal forest	Data Collection
Swallow, Mathew	University of Alberta - Quideau / Kishchuk	Controlled burning influence on forest floor processes.	Data Collection
Wood, Charlene	University of Alberta - Langor / Spence	Saproxylic beetle – coarse woody debris habitat associations	Data Collection

Table 9. EMEND doctoral student project status.

Student	Affiliation / Supervisor	Project Title	Progress
Bergeron, Colin	University of Alberta -Spence	Effect of fire behavior on dynamic associations of insects and plants at the landscape level.	Writing Thesis
Caners, Richard	University of Alberta -Macdonald	Patterns of bryophyte diversity in response to partial harvesting in northern mixedwood boreal forests.	Writing Thesis
Chavez, Virginia	University of Alberta -Macdonald	Patterns and causes of variation in understory plant diversity and composition in the mixed-wood boreal forest of Alberta.	Writing Thesis
Diaz, Irma	University of Alberta -Quideau / Kishchuk	Effects of harvesting, fire and climate change on forest floor mesofauna in the boreal mixedwood forest.	Data Collection
Fagaria, Manphool	University of New Brunswick	White spruce genetics following harvesting in the boreal forest	Data Collection
Kamunya, Esther	University of Alberta -Spence	Dynamics of a Lepidoptera (moth) community in managed boreal forests of North Western Alberta, Canada.	Data collection
Pinzon, Jaime	University of Alberta -Spence	Composition and structure of epigeaic, understory and canopy spider assemblages in mixedwood forest cover-types after variable retention harvest	Data Collection
Shorthouse, David	University of Alberta - Spence	Boreal spiders as bioindicators of forest disturbance and management.	Writing Thesis