



Interim Progress Report on the EMEND Project

1 April 2002 - 30 December 2002

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Executive Summary.

The past 6 months of research conducted by the EMEND Core Crew have focused on the following tasks: i) continuation of shrub biomass data collection and harvest of shrubs in association with the forest productivity estimates (began in summer 2001); ii) continuation of the coarse woody debris re-assessment initiated in summer 2001; iii) collection of tree plot mortality data in the prescribed burn compartments; iv) provision of assistance to research projects being conducted by graduate students and Canadian Forest Service personnel; v) working closely with CFS and ALFS personnel to attempt more experimental burns. In addition to data collected by Core Crew, data has been collected and processed by other researchers involved in experiment-wide studies of fire ecology, hydrology, silviculture, soils and nutrient cycling, and climate. This report provides details on the work conducted by the Core Crew during summer 2002 and updates any EMEND related activities.

1. Overview of EMEND Research 2002.

There are two principal components to field research at the EMEND site: 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 (this year's work summarized in Table 1); and 2) research planned and executed by researchers interested in using EMEND as a template for their work. Work done 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 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 (Table 2), 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 work at our site.

Overall, 8 principal researchers and 22 associated research personnel (including 4 graduate students, and 17 technicians, volunteers or visitors) used the EMEND facilities during the past summer (Tables 3a,b) in addition to the 7 people comprising the Core Crew. A majority of projects in phase I of EMEND did not involve extensive fieldwork during 2002 as they have reached the synthesis phase. Thus, the total number of EMEND camp users was down c. 50% from the number of users last year. Overall, 836 camp nights were used, down c. 48% from 2001. There were also a number of people who used the camp facilities during tours of EMEND (Tables 4a,b).

Although there has been a reduction in the number of researchers using the camp, research falling under category 2 continues to span a wide range of projects, including plant and animal diversity, silviculture, fire studies, hydrology, forest genetics, forest health and climate. Work done this year represented the fourth year of post-harvest data collection for most projects. Now that the initial milestone of pre- and post-harvest data collection has been completed, most researchers will be entering an analysis and reporting phase. In the absence of fires, only a modest amount of post-harvest core work and several graduate projects required active fieldwork in 2002. Renewed field activity, involving large numbers of researchers, will follow completion of experimental burns or will be initiated for the next round of periodic post-harvest assessment anticipated for 2003.

A total of 4 graduate students conducted fieldwork at EMEND during 2002. Many students have successfully completed the data collection phase of their projects and are currently writing their theses or have recently defended (see Table 6 for the status of EMEND graduate students). Two new PhD. students, Kirsten Hannam (University of Alberta) and Lucie Jerabkova (University of British Columbia), have initiated research at the EMEND project this past summer. Their projects are described in section 5. **New Research.** Dr. Sylvie Quideau (University of Alberta) and Dr. Cindy Prescott (University of British Columbia) have joined the EMEND project as supervisors of Kirsten Hannam and Lucie Jerabkova respectively. They will also be collaborating with Dr. Barbara Kishchuk (Canadian Forest Service) on soils and nutrient dynamics research.

2. Core Crew Activities.

Core Crew spent a total of 474.5 person-days at the EMEND site during summer 2002. 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 of this report describe Core Crew activity for summer 2002.

2.1. Experiment-wide Projects. The majority of Core Crew time (approximately 84%) during summer 2002 was spent working on 4 experiment-wide projects. All of these projects were the continuation and completion of projects began last summer (2001). No new experiment-wide projects were begun by Core Crew 2002. Below are descriptions of the work completed on these projects. For more detailed protocols please refer to the EMEND Interim Report 2001: 1 April – 30 September.

i. *Forest Productivity Estimates.*

During summer 2001 Core Crew began collection of above ground shrub biomass data within the 40m x 2m tree mensuration plots. Deciduous and coniferous dominated compartments were completed in 2001 (300 plots). This summer, the mixedwood and deciduous with conifer understory compartments were assessed (the remaining 300 tree plots). In total, 14502 shrub stems from 17 species have been measured in the 600 tree mensuration plots at EMEND.

In continuation of the shrub harvest component of the Forest Productivity Estimates experiment (50 shrubs harvested September 2001), Core Crew 2002 harvested both above ground and below ground biomass of 72 shrub specimens (consisting of 12 species). Shrub specimens were selected from the range of diameters measured during the above ground data collection and were taken from the buffer areas surrounding EMEND compartments. The stem, twigs and leaves were separated and packaged in the field. Roots projecting up to 50cm radius from the stem base were removed from the ground using shovels and garden trowels. A crew of four could harvest between 2 and 5 shrubs in a day. All harvested shrubs were brought back to Edmonton for further measurements this fall.

To date, all tree and shrub biomass samples collected in 2000 and 2001 have been analyzed for specific gravity and volume. Once these data have been collected for the samples harvested this summer a complete biomass data analysis will be initiated.

ii. *Ungulate Browsing Survey.*

Some areas around the EMEND site were observed to be heavily browsed by ungulates (moose and deer). As such, a survey, done in conjunction with the shrub biomass project, was conducted to estimate the amount of ungulate browsing at the EMEND site. Core Crew 2002 completed the 300 remaining plots in the mixedwood and deciduous with spruce understory compartments remaining to be assessed from the 2001 Core work. Each shrub measured in the shrub biomass study (shrubs of diameter greater than or equal to 1.00 cm at 30cm above ground) was assessed for any indication of browsing. Browsing was defined as any twig or branch that appeared cleanly snapped off.

iii. Fate of Snags and Dynamics of Coarse Woody Debris (CWD).

The coarse woody debris study consists of three aspects: a) standing coarse woody debris (snags) assessment, b) "nearest neighbor" snag assessment, and c) downed CWD survey. All three study aspects are combined to help develop an understanding of the fate and function of residual material left in the wake of harvests or natural disturbances, a central focus of the EMEND project. David Langor and Daryl Williams of the Canadian Forest Service supervise this work.

For summer 2002, Core Crew continued the downed CWD and nearest neighbor snag analysis work initiated in 2001 (snag assessment was completed in 2001). All 300 plots in the mixedwood and deciduous with conifer understory stands were assessed.

iv. Tree Mortality (burn compartments only).

The status of the numbered trees was assessed in each of the 40m by 2m permanent tree plots located within the compartments selected to be burnt. Each tree was recorded as live, dead, or fallen. These data will be used as the pre-harvest tree status data for the slash-burn compartments.

2.2. Assistance for Category 2 Research. About 16% of Core Crew time was spent assisting category 2 projects. Time commitments for each project are summarized in Table 2. Below are descriptions of the assistance provided to category 2 research projects by the Core Crew.

i. Hydrology.

Assistance to the CFS hydrology group (G. Hillman, CFS) was provided in a number of ways. Primarily, Core Crew was responsible for collection of hydrologic well data. It took two core personnel approximately 3/4 of a day once per week to collect the data. Core Crew also assisted with the measurement of hydrology's 250 soil moisture stations and with the installation of a large boardwalk system in the wetland adjacent compartment 922.

ii. Moth Biodiversity.

Core Crew 2002 was responsible for the collection of moth biodiversity data this summer. Traps were set up and collected approximately every 12 days from the start of May to the end of August.

iii. White Spruce Regeneration Study (Silviculture research group).

Core crew 2002 assisted the silviculture research group (Jim Stewart, Canadian Forest Service and Dan Gilmore, University of Minnesota) in collection of spruce seed traps located throughout the EMEND experiment.

iv. Graduate Student / Postdoctoral Research Assistance.

Assistance by the Core Crew was given to a number of graduate students conducting research at the EMEND site. Colin Bergeron (MSc. candidate, University of Alberta) required assistance for data collection and to aid in falling trees for fire and insect outbreak

history analysis. Tim Work (Postdoctoral Fellow, University of Alberta) required assistance for the collection of a number of pitfall traps located throughout the EMEND experiment.

2.3 Other Core Crew Tasks. In addition to conducting experiment-wide projects and assisting other researchers, Core Crew re-painted the fading paint in the six 40m by 2m tree plots within each of the clearcut, 10%, and 20% compartments and GPSed the start and end of the corner snag plots established in 2000. These activities were deemed necessary to aid the Core Crew and other researchers navigate within the EMEND compartments.

Core Crew 2002 also spent time correcting tree species identification and tree status errors from the 40m x 2m tree mensuration plots. These errors were detected during preliminary analysis of tree plot data and through the initial steps of the Core database creation. With these corrections, the tree plot data sets are now error free and ready for analysis.

Additionally, two person days were utilized to assist Dan Lysyk (undergraduate student, University of Alberta) in the set up and take down of window traps he was using for an honors project on saproxylic beetle colonization of bracket fungus.

3. Core Personnel.

Christine Loiselle completed her work term as associate coordinator and data manager in April 2001. Charlene Hahn has taken over the position. Julie Bliss (a high school student from Peace River) joined the Core Crew for approximately three weeks in July. Julie's position was created to help develop awareness of the EMEND project in the surrounding communities of Northwest Alberta. Brad Tomm, Canadian Forest Service, joined the EMEND team as database manager in April 2002. Brad is supervised by Jan Volney and will be responsible for the creation and management of the EMEND database.

i) Details on EMEND Coordinator activities for 2002.

In the spring of 2002, Jason Edwards created a pamphlet that outlines the EMEND project. This pamphlet was published (1000 copies) in late April and has been made available to all EMEND researchers for distribution. Jason also updates and adds to the EMEND website on a continual basis.

Jason spent most of April preparing for the 2002 summer field activities. These activities included making camp arrangements, equipment maintenance and purchasing, interviewing and hiring of the 2002 Core Crew, and preparing a due diligence safety manual for all EMEND personnel using the EMEND site. Jason also organized the 2002 EMEND Workshop held May 2-3 in Edmonton.

From the start of May through the end of August Jason ran and operated the EMEND research camp and supervised the Core Crew work. Much time was spent delegating tasks for the Core Crew and maintaining and repairing quads. Jason also spent many days in the field collecting data.

In September, Jason assisted the data manager in entering and proofing the summer's data in addition to preparing the text of this report and preparing the budget for the Canadian Foundation for Innovation (CFI) grant. Jason also updated the EMEND maps with GPS data collected during the summer.

ii) *Details on EMEND data manager activities for 2002.*

Starting in April, Charlene Hahn worked primarily on preparations for the 2002 summer field season. Charlene compiled the data required for the field work and created appropriate data collection sheets required for summer data collection. She also assisted Jason in organizing the 2002 EMEND Workshop and in the purchase of field equipment required for the summer.

For May through August Charlene spent many days collecting, entering and proofing data at the EMEND field research site. Charlene was also responsible for keeping a running tally of camp users and the work completed by Core Crew. Charlene completed numerous other tasks as assigned by the EMEND coordinator.

During September Charlene continued to enter and proof data collected during the summer. She also analysed the data for errors that will be corrected during a fall trip to EMEND or during next year's field season.

4. Status of the burns.

To date only three burns have been attempted: 1) Conifer dominated compartment 926 on 19 July 1999, 2) Deciduous dominated compartment 943 on 26 April 2000, and 3) Deciduous dominated compartment 856 on 12 May 2001. Burn conditions at the EMEND site were monitored continuously by CFS and ALFS personnel throughout the 2002 summer. So far, the conditions have not been appropriate for a safe or successful controlled burn. We remain hopeful for fall 2002.

5. Changes to the project design and methodology.

In 2001 the number of standing timber burn compartments was reduced from 28 to 14. After much discussion about the lack of fire at EMEND, the 14 compartments removed from standing timber burn status have been assigned to a new slash burn treatment. This treatment calls for the selected stands to be harvested to 10% retention with a uniform distribution of slash throughout the compartment. One half of each of the harvested 10 hectare compartments will be burnt while the other half will be left as a control. The current timeline is to have all harvesting completed this fall (October 2002) and to burn the slash in late summer of 2003 (weather permitting). Project leaders, industry representatives, Alberta Sustainable Resource Development officers, and Canadian Forest Service personnel are currently discussing details of the harvests and slash burns. Standing timber burns are still scheduled for 14 compartments.

6. New Research.

6.1 Kirsten Hannam (PhD Candidate, University of Alberta).

Linking changes in the soil microbial community with changes in soil C (carbon) chemistry following timber harvesting in the boreal mixedwood forests of northwestern Alberta.

Timber harvesting can alter patterns of nutrient cycling, ultimately affecting long-term site productivity. Results from recent studies suggest that timber harvesting can cause soil microbial activity to decline by reducing the availability of labile C in the soil. Despite increasing support for this hypothesis, changes in the soil microbial community following timber harvesting have not been well-described, nor has the link between soil C chemistry and the soil microbial community been explicitly examined. The EMEND site is an excellent setting in which to study these questions because it includes forests of varied tree species composition and harvesting intensity (i.e. these forest soils receive a variety of litter types and litter quantities). Samples of foliage and forest floor will be collected for microbial community analysis and C chemistry determination. Relationships between C chemistry, microbial community structure, and environmental variables measured in the field will be examined using canonical correspondence analysis. The findings of this study will provide much-needed information about the link between soil C chemistry and the soil microbial community, and will address the hypothesis that changes in soil C chemistry following timber harvesting can alter nutrient cycling patterns in the soil.

6.2 Lucie Jerabkova (PhD Candidate, University of British Columbia)
Nitrogen (N) transformations in boreal mixedwoods.

This study will assess the cover type and harvesting effect on nitrogen dynamic by comparing both nitrogen pools and nitrogen turnover rates across the sites.

Forest floor and top mineral soil samples are collected from clear-cuts, 10 % and 50 % retention and control plots in aspen, spruce and mixed cover types. Variables measured include total N, mineral N, dissolved organic N, microbial N, N mineralization rates.

Litter input and decomposition rates together with other forest floor and mineral soil chemical and physical properties will also be measured to explain what are the actual driving forces of nitrogen dynamic on the sites.

Gross mineralization rates will be studied in detail using ^{15}N labelling technique.

This data should give important information about the species effect on the soil processes and the effect of different harvesting intensities on the nitrogen dynamic and availability.

7. Administrative and Organizational Items.

7.1. Awards. Many Canadian Forest Service researchers and technicians were awarded the Canadian Forest Service Merit Award for their exceptional work at the EMEND research area. EMEND project leaders and Canadian Forest Service researchers and technicians were nationally recognized with the Natural Resources Canada Partnership and Collaboration Award for their outstanding work on the EMEND project. EMEND was also a final nominee for the Emerald Award for Industry and Research Collaboration.

7.2. Annual EMEND Workshop. The annual EMEND Workshop was held on 2-3

May 2002 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. This year many researchers and graduate students presented the progress they have made with their projects. Discussions on an upcoming EMEND book and future camp facilities were also held.

7.3. Technology Transfer Activities.

i) EMEND Tours.

EMEND continued to gain international exposure this summer as a number of on-site tours were provided for individuals from the Congo basin, Japan, Finland, and the United States. On 9 August 2002 Neree Onguene Awana and Nibert Ganga of the Congo basin joined Bill Mattson, (USDA Forest Service), Jari Kouki (University of Joensuu), Kelvin Hirsch (Canadian Forest Service), and Ed Banfield (Canadian Forest Service) for a tour of the EMEND research site. Markku Larjavaara (University of Helsinki) visited the EMEND site for a few days in August.

A number of Alberta government and University of Alberta officials participated in tours as well. Bob Fessenden (deputy minister, Alberta Sustainable Resource Development) and Doug Sklar (Alberta Sustainable Resource Development) visited EMEND on 19 July 2002. On 12 August 2002 Dr. Rod Fraser (president, University of Alberta) and Bradley Anderson (an Alberta Chamber of Resources director) participated in a tour of EMEND.

ii) Status of the EMEND Web Site.

The EMEND website is operated and maintained by EMEND Field Coordinator, Jason Edwards. The website was redesigned with a new format this past winter. Updates and new features are being added to the website on a continual basis. The website continues to be one of the project's prominent methods of information distribution. The EMEND website address is as follows: <http://www.biology.ualberta.ca/emend/index.htm>

iii) EMEND Compendium and Pamphlet.

Derek Sidders (Canadian Forest Service) is currently working on a new EMEND compendium and updated Research and Study Guide. The compendium will include updated project descriptions, summaries of preliminary results, and any other information useful to aid in the transfer of technology to EMEND partners. The compendium will be distributed to all researchers and partners involved with EMEND and is expected to be available by mid-October. Jason Edwards and Derek Sidders have also created an EMEND pamphlet that outlines the project. 1000 copies of this pamphlet were printed in April and can be made available to all EMEND research and industry partners upon request to Jason.

7.4. Oral Presentations (1 January 2001 – 30 December 2002).

Bergeron, C, J Edwards & T Work. 2002. A frigid caterpillar hunter. 50th Annual Meeting of the Entomological Society of Alberta, Lethbridge, 24-26 October 2002.

- Buddle, C, DW Langor, JR Spence & GR Pohl. 2002. Successional trajectories of arthropod assemblages following wildfire and harvesting in boreal *Populus* forests. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Frey, B. 2002. Impacts of forest floor disturbance on vegetation and nutrient dynamics in clear cut and partial cut stands, M.Sc. thesis seminar, University of Alberta, Edmonton, AB, Canada, 23 August 2002.
- Jacobs, J & JR Spence. 2002. Diversity of saproxylic beetles along a forest succession pathway: from wildfire to old-growth to harvesting. Annual meeting of the Entomological Society of Canada, Winnipeg, Manitoba, 5-9 Oct 2002.
- Jacobs, J & JR Spence. 2002. Effects of forest harvest on saproxylic beetle assemblages. 50th Annual Meeting of the Entomological Society of Alberta, Lethbridge, 24-26 October 2002.
- Jacobs, J, JR Spence & DW Langor. 2002. Distribution of eipgaeic beetles in a burned forest. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Lazaruk, LW, SE Macdonald & PD Khasa. The effect of alternative harvesting on the abundance and diversity of white spruce ectomycorrhizae in a boreal forest ecosystem, Canadian Botanical Association Annual Meeting, Kelowna, B.C., 23-27 June 2001.
- Macdonald, SE & T Fenniak. 2002. Understanding disturbance effects on forest understory plant communities: lessons from the EMEND experiment. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Macdonald, S.E., J.R. Spence, W.J.A. Volney, D. Johnson, F.K.A. Schmiegelow, D.W. Langor, and T.T. Work. 2002. Leaky lifeboats and forest management options: the initial biotic responses to green-tree retention harvests at EMEND. Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Mills, SE, SE Macdonald & DH Vitt. 2001. Predicting bryophyte species richness at small scales in the boreal forest. Canadian Botanical Association Annual Meeting, Kelowna, B.C., 23-27 June 2001.
- Morneau, L. Partial cutting impacts on moths and lepidopteran defoliators in a boreal mixedwood forest of Alberta. M.Sc. thesis seminar, University of Alberta, Edmonton, AB, Canada, 28 January 2002.
- Phillips, E. and D. Sidders. 2002. EMEND study: harvesting efficiency and silviculture systems response in 10,20,50, and 75 percent retention treatments and clearcuts. Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Shorthouse, DP, JJ Jacobs & TT Work. 2002. Dr. Spence's lonely heart's club band: dealing with singletons and doubletons. 50th Annual Meeting of the Entomological Society of Alberta, Lethbridge, 24-26 October 2002.
- Shorthouse, DP, JR Spence & WJA Volney. 2002. Spider wanderings as correlated random walk. Annual meeting of the Entomological Society of Canada, Winnipeg, Manitoba, 5-9 Oct 2002.

- Spence, J, Jan Volney, Derek Sidders, Steve Luchkow, Tim Vinge, Frank Oberle, Dan Gilmore, J. P. Bielech, Pat Wearmouth, Jason Edwards, Peter Bothwell, David Shorthouse, Dan Wilkinson, and Suzanne Brais. 2002. The EMEND Experience. Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Spence, J & WJA Volney. 2002. A large-scale experiment about forestry and biodiversity: the good, the bad and the useful. SFMN Variable Retention Workshop, Montreal, Quebec, 15-16 February 2002. (Invited talk) (Audience: c. 120)
- Spence, J. 2002. Managing risk to arthropod populations with unharvested reserves. BorNet International Conference on Biodiversity Conservation in Boreal Forests, Uppsala, Sweden, 27-28 May 2002. (Invited talk) (Audience: c. 120)
- Spence, J & WJA Volney. 2002. EMEND, Entomology and Evangelism. Seminar, Department of Entomology, Swedish University of Agricultural Sciences, Uppsala, Sweden, 3 June 2002.
- Spence, JR, WJA Volney, B Kishchuk, DW Langor, SE Macdonald, D Sidders and TT Work. 2002. The EMEND Experiment: the basin view of a growing data ocean. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Volney, WJA & JR Spence. 2002. Insects as disturbance agents in boreal forests. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Wesley, J. 2002. The impacts of variable retention harvesting on phytophagous insects and their parasitoids in the boreal forest, M.Sc. thesis seminar, University of Alberta, Edmonton, AB, Canada, 22 September 2002.
- Work, TT, JR Spence, DP Shorthouse & K Cryer. 2002. Retention thresholds for carabid beetle communities in boreal forests. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Work, TT, JR Spence, WJA Volney & K Cryer. 2002. Habitat composition versus habitat structure: evaluating coarse filter strategies for maintaining invertebrates in boreal forests. Annual meeting of the Entomological Society of Canada, Winnipeg, Manitoba, 5-9 Oct 2002.
- Work, TT, D Shorthouse, JR Spence & WJA Volney. 2002. Impact of six intensities of forest harvest on rove beetle communities in western boreal forests. 50th Annual Meeting of the Entomological Society of Alberta, Lethbridge, 24-26 October 2002.

7.5. Poster Presentations (1 January 2001 – 30 December 2002).

- Bergeron, Colin, J. Spence and W.J.A Volney. 2002. Fire, insect outbreak and stand dynamics on EMEND landscape. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Bothwell, P.M., W.J. de Groot, and C. McGuinty. 2002. Using prescribed fire in boreal ecosystems: The EMEND experience. Poster presented at the *Emulating Natural*

- Forest Landscape Disturbances: Concepts and Applications. An International Science Symposium.* May 11-16, 2002. Sault Ste. Marie, Ontario.
- Fenniak, T and SE Macdonald. 2001. Understory vascular plant regeneration and environmental response with varied canopy removal at the EMEND site, northern Alberta. 'Partners in Conservation' Conference, Alberta Conservation Association, Feb. 2001, Nisku, AB.
- Harrison, Bruce and Fiona Schmiegelow. 2002. The stand-level response of boreal forest songbirds to experimental partial-cut harvest in northwestern Alberta. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Jacobs, J. and J.R. Spence. 2002. Distribution of saproxylic beetles along a successional gradient. 4th Int Workshop on Disturbance Dynamics in Boreal Forests, Prince George, B.C. 9-14 Aug 2002.
- Lazaruk, L & SE Macdonald. 2001. The impact of alternative harvesting practices on the diversity of ectomycorrhizal fine roots in a boreal forest. 'Partners in Conservation' Conference, Alberta Conservation Association, Feb. 2001, Nisku, AB.
- Lindo, Z and S. Visser. 2002. Forest floor nutrient availability, microarthropod abundance and biological properties following partial- and clear-cut harvesting in conifer and deciduous stands. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Park, Jane S., E. Crone, and M.L. Reid. 2002. Landscape level influences on dispersal by pest insects in managed forests. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Shorthouse, D.P., T.T. Work, and J.R. Spence. 2002. Multiple-scale linkages of boreal forest spiders to habitat structure modifications. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.
- Stewart, J., R. Hurdle, D. Sidders, and T. Jones. 2002. White spruce regeneration in relation to microenvironmental modification by harvest and silvicultural activities. Poster presented at Sustainable Forest Management Network Conference, "Advances in Forest Management: From Knowledge to Practice", 13-15 November 2002, Shaw Conference Centre, Edmonton, Alberta.

7.6. Publications & Theses

- Fenniak, T. 2001. *Response of environmental variables and understory vegetation to various intensities of harvesting at the EMEND site, northern Alberta.* MSc Thesis. University of Alberta. 117 p.
- Frey, B. 2001. *Impacts of forest floor disturbance on vegetation and nutrient dynamics in clear cut and partial cut stands.* MSc Thesis. University of Alberta. 86 p.

- Mills, S. 2001. *Bryophyte species composition and diversity at different scales in conifer-dominated boreal forest stands*. MSc Thesis, University of Alberta. 124 p.
- Morneau, L. 2002. *Partial cutting impacts on moths and lepidopteran defoliators in a boreal mixedwood forest in Alberta*. MSc Thesis, Department of Biological Sciences, University of Alberta, Edmonton. 138 p.
- Park, J. 2002. *The effects of resource distribution and spatial scale on the distribution of two species of bark beetle: Polygraphus rufipennis (Kirby) and Trypodendron lineatum (Olivier) (Coleoptera: Scolytidae)*. MSc Thesis, Department of Biological Sciences, University of Calgary, Calgary. 104p.
- Wesley, J. 2002. *The impacts of variable retention harvesting on phytophagous insects and their parasitoids in the boreal forest*. MSc Thesis, Department of Biological Sciences, University of Alberta, Edmonton. 132 p.

6. Appendix of tables.

Table 1. Summary of core crew work completed for experiment-wide (Category 1) projects from May 1 – August 31, 2002.

Project	Work Description	Total Number of Person Days of Core Crew Activity	% of Total Category 1 Person Days
i. Forest Productivity Estimates (Jan Volney/John Spence)	<ul style="list-style-type: none"> - shrub biomass data collection - shrub harvesting - ungulate browsing survey is also included in this category 	160.5	40
ii. Fate of Snags and Dynamics of Coarse Woody Debris (CWD) (Dave Langor/Daryl Williams)	<ul style="list-style-type: none"> - downed CWD survey - "Nearest Neighbours" snag analysis 	78.25	20
iii. Tree Plot Maintenance	<ul style="list-style-type: none"> - re-painting numbered trees in permanent tree plots - GPS data collection for corner snag plot locations 	59.75	15
iv. Training, Orientation and Infrastructure Activities	<ul style="list-style-type: none"> - bear Awareness course - quad Safety course - orientation - quad maintenance, vehicle maintenance, equipment purchases - tours of EMEND 	55.75	14
v. Office Work	<ul style="list-style-type: none"> - data entry and proofing 	26.5	7
vi. Mortality and Tree Plot Data Corrections	<ul style="list-style-type: none"> - tree plot mortality study - data fix-ups from previous years including live/dead status and species identifications of trees in permanent tree plots. 	19.5	5
Total:		400.25	100

Table 2. Summary of core crew assistance provided for associated research (Category 2) projects from May 1 – August 31, 2002.

Project	Work Description	Total Number of Person Days of Core Crew Activity	% of Total Category 2 Person Days
i. Hydrology (Graham Hillman/Cecilia Feng)	- well and piezometer data collection - soil moisture measurements - boardwalk construction	32.5	44
ii. Moth Diversity (John Spence)	- light trapping	20.5	28
iii. Fire History (Colin Bergeron)	- collecting tree disk/core samples and charcoal samples - collecting pitfall traps	12.5	17
iv. White Spruce Regeneration (Dan Gilmore/Jim Stewart)	- collecting seed traps	5	7
v. Arthropods (Tim Work)	- collecting pitfall traps	2	3
vi. Saproxylic Beetles (Dan Lysyk)	- set up and removal of window traps	2	3
Total:		74.5	100

Table 3 a. Number of person-days EMEND camp was used by individuals involved in Experiment-wide projects from May 1 - August 31, 2002.

Project	Camp User	Affiliation	Title	Number of Days at EMEND Camp					Total
				May	June	July	August	Total	
Core Research	Barnhardt, Ashley	U of A	Core Crew	18	25	16	21	80	
	Chew, Suzelin	U of A	Core Crew	18	27	16	20	81	
	Edwards, Jason	U of A	Coordinator	18	27	16	23	84	
	Hahn, Charlene	U of A	Data Manager	18	27	17	23	85	
	Taerum, Stephen	U of A	Core Crew	18	27	16	11	72	
	Worobetz, Tara	U of A	Core Crew	17	26	16	15	74	
	Bliss, Julie	U of A	Volunteer	0	0	11	0	11	
Total:								487	

Experiment-Wide Research Projects - Monthly Totals:				
May	June	July	August	Total
107	159	108	113	487

Table 3 b. Number of person-days EMEND camp was used by individuals involved in associated research (category 2) projects from May 1 - August 31, 2002.

Project	Camp User	Affiliation	Title	Number of Days at EMEND Camp					Total
				May	June	July	August		
Hydrology	Becker, Travis	CFS	Technician	4	0	7	2		13
	Daniels, Jeroen	CFS	Technician	5	0	0	0		5
	Feng, Cecilia	CFS	Researcher	5	1	4	3		13
	Forbes, Stephen	CFS	Technician	5	1	8	3		17
	Fraser, Colin	CFS	Technician	5	1	5	3		14
	Hillman, Graham	CFS	Researcher	2	0	0	0		2
	Mayo, Nancy	CFS	Technician	0	0	3	0		3
									Subtotal:
Soils and Nutrient Cycling	Blank, Martin	CFS	Technician	0	9	0	0		9
	Hannam, Kirsten	CFS	Ph.D. Candidate	0	9	2	6		17
	Jerabkova, Lucie	CFS	Ph.D. Candidate	0	9	2	6		17
	Kishchuk, Barbara	CFS	Researcher	0	2	0	0		2
	Patterson-Funtin, Laura	U of A	Technician	0	0	2	6		8
	Quideau, Sylvie	CFS	Researcher	0	3	0	0		3
	Staley, Candis	CFS	Technician	0	8	0	0		8
									Subtotal
Silviculture	Dodd, Rebecca	CFS	Technician	6	0	0	4		10
	Jones, Travis	CFS	Technician	6	0	0	0		6
	Aguirre, Martin	CFS	Technician	0	0	0	2		2
	Roth, Patricia	CFS	Technician	6	0	0	2		8
	Snedden, Jessica	CFS	Technician	7	0	0	4		11
	Stewart, Jim	CFS	Researcher	0	0	0	4		4
								Subtotal	41

Table 3 b. (Continued)

Project	Camp User	Affiliation	Title	Number of Days at EMEND Camp					Total
				May	June	July	August		
Arthropods	Lindo, Zoe	U of C	M.Sc. Candidate	0	2	0	0	0	2
	Lund, David	U of C	Technician	0	2	0	0	0	2
	Work, Tim	U of A	Researcher	2	0	0	1	1	3
				Subtotal					7
Fire History	Bergeron, Colin	U of A	M.Sc. Candidate	10	23	24	16	16	73
	Lysyk, Dan	U of A	Technician	23	23	24	16	16	86
				Subtotal					159
Vegetation Structure	Ozeroff, Kim	U of A	Technician	0	2	0	0	0	2
	Stewart, Sherry	U of A	Technician	0	2	0	0	0	2
				Subtotal					4
				May	June	July	August	Total	
				86	97	81	78	342	

Table 4 a. Number of person-days EMEND camp was used by individuals involved in Tours from May 1 - August 31, 2002.

Camp User	Affiliation	Title	Number of Days at EMEND Camp					Total
			May	June	July	August		
Volney, Jan	CFS	Project Leader	0	0	0	1	1	
Hirsch, Kelvin	CFS	Visitor	0	0	0	1	1	
Kouki, Jari	U of Joensuu	Visitor	0	0	0	1	1	
Mattson, Bill	USDA Forest Service	Visitor	0	0	0	1	1	
Spence, John	U of A	Project Leader	0	0	0	1	1	
Larjavaara, Markku	U of Helsinki	Visitor	0	0	0	2	2	
		Total:				7	7	

Tours - Monthly Totals:						
May	June	July	August	Total		
0	0	0	7	7		

Table 4 b. Number of lunches eaten by tour participants at EMEND camp from May 1 - August 31, 2002.

Camp User	Affiliation	Title	Number of Lunches at EMEND Camp					Total
			May	June	July	August	Total	
Anderson, Bradley	AB Chamber of Resources	Visitor	0	0	0	1	1	1
Banfield, Ed	CFS	Visitor	0	0	0	1	1	1
Chris	Canfor (Grand Prairie)	Visitor	0	0	0	1	1	1
Nereee Onguene Awana	Congo basin	Visitor	0	0	0	1	1	1
Nobert Ganga	Congo basin	Visitor	0	0	0	1	1	1
Frasier, Rod	U of A	Visitor	0	0	0	1	1	1
Luchkow, Steve	DMI	Visitor	0	0	0	1	1	1
Mike (DMI Mill Manager?)	DMI	Visitor	0	0	0	1	1	1
Jonathan Thompson	Oregon State University	Visitor	0	0	0	1	1	1
Spence, John	U of A	Visitor	0	0	0	1	1	1
Thorp, Wayne	DMI	Visitor	0	0	0	1	1	1
Volney, Jan	CFS	Visitor	0	0	0	1	1	1
Total:			0	0	0	12	12	12

Tour Lunches - Monthly Totals: May June July August Total
0 0 0 12 12

Table 5. Summary of EMEND camp use.

Number of Person Days at EMEND Camp					
	May	June	July	August	Total
Persons associated with Experiment-Wide Research Projects:	107	159	108	113	487
Persons with Associated Research Projects:	86	97	81	78	342
Persons associated with EMEND Tours:	0	0	0	7	7
Totals:	193	256	189	198	836

Table 6. Status of EMEND graduate students.

Master Students			
Student	Affiliation	Project Title	Project State
Becker, Carrie	University of Minnesota	Modeling early regeneration processes in mixed-species forests of Alberta.	Defended Spring 2002
Bergeron, Colin	University of Alberta	Effect of fire behavior on dynamic associations of insects and plants at the landscape level.	Data collection
Cuthbertson, Lisa	University of Alberta	Spatial patterns of <i>Armillaria</i> .	Defended, 25 September, 2001
Dunlop, Julia	University of Alberta	Effects of forest harvesting on spruce beetle parasitoids.	Defended 19 September, 2002
Fenniak, Treena	University of Alberta	Understory vascular plant regeneration following disturbance.	Defended August 2001
Frey, Brent	University of Alberta	Effects of forest floor disturbance and canopy removal on soil nutrient dynamics and response of <i>Calamagrostis canadensis</i> , <i>Epilobium angustifolium</i> , and <i>Picea glauca</i> seedlings.	Defended September 2001
Harrison, Bruce	University of Alberta	Response of boreal forest birds to experimental harvest and burning.	Defended October 31, 2001
Jacobs, Josh	University of Alberta	Saproxylc beetles and coarse woody debris.	Writing Thesis
Kemmel, Steven	University of Alberta	Spatial patterns of boreal canopies, understory communities, and tree regeneration.	Defended September 2001
Lazaruk, Lance	University of Alberta	The impact of silvicultural practices on the abundance and biodiversity of ectomycorrhizae in a boreal forest ecosystem.	Defended February 2002
Lindo, Zoë	University of Calgary	Harvesting effects on soil mesofauna and decomposition /nutrient cycling processes in aspen and spruce stands of the boreal mixed-wood forest.	Data collection

Table 6. State of EMEND graduate student, continued

Student	Affiliation	Project Title	Progress
Martin, René	University of British Columbia	Reproductive responses of bunchberry (<i>Cornus Canadensis</i>) to disturbance in a managed forest.	Defended 2000
Mills, Suzanne	University of Alberta	Distribution of bryophyte species diversity in relation to microsite and moisture availability at 2 scales within conifer dominated boreal forests.	Defended August 2001
Morneau, Louis	University of Alberta	Lepidoptera diversity following fire and harvesting.	Defended January 2002
Park, Park	University of Calgary	Movement and settlement of bark beetles in a heterogeneous landscape.	Defended Summer 2002
Patriquin, Krista	University of Calgary	Impacts of fire and harvesting on the foraging ecology of forest dwelling bats.	Defended June 2001

Doctoral Students

Student	Affiliation	Project Title	Progress
Hannam, Kirsten	University of Alberta	Linking changes in the soil microbial community with changes in soil C chemistry following timber harvesting in the boreal mixedwood forests of northwestern Alberta.	NEW. Began data collection summer 2002
Jerabkova, Lucie	University of British Columbia	Nitrogen transformations in boreal mixedwoods.	NEW. Began data collection summer 2002
Shorthouse, David	University of Alberta	Boreal spiders as bioindicators of forest disturbance and management	Writing Thesis

Table 7: EMEND Core Crew vehicle usage for May 6 through August 30, 2002.

Vehicle	KM May 6	KM August 30	Total KM	# Days in Use	Fuel Use
UofA Unit #3 (rental van)	109248	116217	6969	-	?
UofA Unit #298 (Suburban)				-	?
DMI quads (all 6 combined)	-	-		400*	?

- Value not recorded.

? Value unknown at time of publication.

* estimated number of days in use based on number of days core crew was in camp.

