Forest Science Program Full Proposal 2006/07 *New Research Projects*

Full Proposal: Y07-1075

Stand Level Vegetation Indicators for Boreal Mixedwood Forests

Section 1: Proponent Information

Proponent Name: Dr. Sybille Haeussler
Proponent Organization: Bulkley Valley Centre for Natural Resources Research and Management (BV Research Centre)
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Section 2: Project Information

Project Title: Stand Level Vegetation Indicators for Boreal Mixedwood Forests
Keywords: SFM indicators, biodiversity, plant communities, succession, silviculture, natural disturbance

Project Description:
Indicators of sustainable forest management must provide unambiguous information about the state of the ecosystem and its response to forest management. The monitoring systems used to measure those indicators must be scientifically-based and both technically feasible and cost-effective to implement. Finding indicators to monitor each of the 11 values identified by the BC Forest and Range Practices Act (FRPA) is more difficult than it initially seemed and early efforts to develop local level indicators have tended to become bogged down in the complexity of the task. In the case of vegetation indicators proposed for monitoring the status of plant communities and plant biodiversity, many proposed indicators are either too vague to be adapted to local ecological conditions or too difficult to measure (see for example, Canadian Model Forest Network 2000). The first draft of a field sampling protocol for stand level biodiversity indicators prepared under the FRPA Resource Evaluation Program (FREP 2005) does not include vegetation other than retention trees and invasive alien species, despite the fact that plants are identified both in the FRPA and the BC Biodiversity Guidebook (1995) as essential resource values requiring monitoring for sustainability.

During the 1980s, the BC Ministry of Forests and Range (MOFR) and Canadian Forest Service established a series of very well replicated silvicultural trials in the Boreal White and Black Spruce Zone of northeastern B.C. (BWBmw1 biogeoclimatic variant) to test alternative methods of chemical, mechanical and manual site preparation and stand tending for the regeneration of white spruce plantations. Several of these trials, Inga Lake, Iron Creek and Wonowon, now approximately 20 years of age, have been maintained to the present-day and are some of the oldest, best documented silvicultural site preparation trials in Canada. Sybille Haeussler has conducted research on the response of forest plant communities on these trial sites since the 1990s and published a series of peer-reviewed scientific papers (Haeussler et al. 1999, 2002, 2004; Boateng et al. 2000) that document the development of plant community structure, diversity, and composition over time across gradients of

silvicultural disturbance severity. The papers, notably Haeussler et al. (2002), assess risks to plant biodiversity from conventional clearcutting and associated site preparation and early stand tending practices and make recommendations for appropriate vegetation indicators for monitoring sustainability and biodiversity. None of these recommendations have been implemented in the study region and they have not been incorporated into the proposed FREP monitoring protocol (Nancy Densmore, FREP biodiversity coordinator, pers. comm. Dec. 2005). In our opinion, there are two primary limitations that have prevented the results presented in these scientific papers from being incorporated into operational sustainability monitoring:

(1) lack of comparative benchmark data from comparable naturally disturbed ecosystems of the same age. Although the trials show how plant community structure, diversity and composition changes with increasing severity of silvicultural treatments, there are no comparable data from naturally disturbed sites (post-wildfire, post-insect outbreak, windthrow) to define the natural range of variability and determine what might be acceptable levels for the indicator variables of interest.
(2) lack of clearly specified indicator variables and monitoring techniques for specific forest ecosystems (BEC site series).

We propose to address these two limitations by undertaking the necessary fieldwork, data analysis and synthesis to produce a list of operational vegetation indicators and targets for monitoring plant community development and biodiversity on more-or-less mesic White Spruce – Trembling Aspen mixedwood sites in the Boreal White and Black Spruce Biogeoclimatic Zone for the first 20 years after disturbance. We will adapt the methodology developed by Haeussler and Bergeron (2004) to pair the MOFR experimental trial sites with naturally disturbed sites of the same BEC site series and with similar predisturbance composition. We will carry out vegetation and soil sampling to ensure that the ecosystems are comparable and to measure the range of variability in selected indicators of plant community structure, diversity and composition with an emphasis on indicator species and groups shown to be most affected by conventional silvicultural practices (Haeussler et al. 2002). To produce the list of priority indicators, we will complement these data with results from the boreal aspen long term soil productivity study data (Haeussler and Kabzems 2005, Kabzems and Haeussler 2005) and compare our results to data from similar wildfire/clearcutting and ecosystem management studies conducted in Alberta by the Alberta Research Council (Song 2002) and Sustainable Forest Management Network (Macdonald and Fenniak, *in review*).

Target Audience/End User

The end user of the list of stand level indicators will be MOFR personnel and forest licensees or their contractors working in the BWBSmw1 as well as Nancy Densmore, BC MOFR FREP Biodiversity specialist. They will use the project results to meet FRPA and Certification requirements for SFM local level biodiversity monitoring.

Project Objectives:

1. To contrast < 20 year vegetation successional patterns on experimental sites exposed to a gradient of silvicultural disturbance to those on comparable naturally disturbed ecosystems of the same age.
2. To produce a list of priority vegetation indicators for monitoring the status of plant communities and plant biodiversity after logging in circum-mesic boreal mixedwood forests of BWBSmw1 biogeoclimatic variant in northeastern B.C.

Experimental Design and Methods:

The study design is centred around four MOFR experimental sites for which short and medium-term vegetation succession data following clearcut logging or stand clearing for conifer rehabilitation are available. These trial sites, (1) Wonowon, established in 1984 (Boateng et al. 2000); (2) Iron Creek, established in 1986,(Boateng et al. 2000, Haeussler et al. 2004), (3) Inga Lake, established in 1987 (Haeussler et al. 1999, 2004),and the boreal aspen Long Term Site Productivity (LTSP) study site at Kiskatinaw River (Kabzems and Haeussler 2005, Haeussler and Kabzems 2005) are all replicated experiments with 3 – 6 replications per treatment. All are located within the Peace variant, Moist Warm subzone of the Boreal White and Black Spruce biogeoclimatic zone (BWBSmw1) on gently sloping glacial till soils with mesic to subhygric soil moisture regimes and average to moderately nutrient-rich soil nutrient regimes (BWBSmw1/01 White Spruce – Trembling Aspen moss site series and BWBSmw1/06 White Spruce – currant – bluebells site series). The BWBSmw1 is the largest, most uniform biogeoclimatic unit with important commercial timber values in British Columbia. These essentially zonal sites are thus highly representative of the most important timber-producing ecosystems in northeastern BC, and are also very representative of ecological conditions across the border in the adjacent timber-producing areas of northwestern Alberta. Table 1a. summarizes the experimental design and the vegetation succession data available at each experimental site.

Table 1. Vegetation succession data available from the Peace region trial sites(a) and (b) fire dates needed to assemble a wildfire chronosequence that has equivalent stand ages in 2006.

Study Site	year logged	year treated	Vegetation Succession Assessment Completed							
			pre-logging	yr 2	yr 4	yr 10	yr 12	yr 15	yr 16	yr 19
a) Experimental Sites										
Wonowon	1977	1984	--				1996			
Iron Creek	1977	1986	--			1996			2002	
Inga Lake	1986[a]	1987	--			1997		2002		2006
Kiskatinaw River	1994	1995	1994	1996	1998					
	1997	1998	1997	1999	2001					
	1998	1999	1997	2000	2002					
b) Wildfire year needed to get comparably-aged data in 2006:				2004	2002	1996	1994	1991	1990	1987

[a]Inga Lake was an understocked "backlog" area that was mechanically cleared rather than logged prior to treatment

The BWBWmw1 is the second most active region in British Columbia for forest fires, with many relatively recent wildifres (Steve Taylor, Canadian Forest Service, pers. comm., Dec. 2005). It is thus an ideal location for contrasting vegetation succession after clearcutting and silvicultural interventions with post-wildfire succession. Figure 1. shows mapped wildfires in the BWBSmw1 from 1920 to 2000, and also shows the location of the four experimental sites. Data on each wildfire are available from the MOFR Protection Branch and the Canadian Forest Service natural disturbance database. Table 1b. indicates the wildfire dates needed to construct a chronosequence that matches the vegetation succession data available from the experimental sites.

Haeussler and Bergeron (2004) developed an unbiased procedure for pairing clearcut logged areas with wildfires of the same ecosystem and time-since-disturbance. We will modify this procedure to locate a chronosequence of wildfires that can be paired with the successional data available from the trial sites (Table 1). Forest cover maps and aerial photos dating from before the wildfires will be used to locate sampling sites with similar pre-disturbance composition and stand age to experimental trial sites. In the field, physiography, soils and vegetation characteristics wil be used match site conditions within the

wildfires to site conditions at the experimental sites. Soil samples will be taken at each wildfire location and analysed for basic physico/chemical properties already available for the experimental sites.

Data on vegetation structure, composition and diversity will collected at each wildfire site using the same procedure used by Dr. Haeussler at Inga Lake, Iron Creek and Wonowon. Three vegetation assessment plots will be randomly established within a uniform wildfire polygon (analogous to an experimental unit). Each vegetation assessment plot consists of set of nested quadrats: (1) tall shrubs and trees > 2 m height (5 x 5 m quadrat); (2) low shrubs and trees < 2 m height (3 x 3 m subplot); (3) herbs and dwarf shrubs (1 x 1 m subplot); (4) mosses, liverworts and non-crustose macrolichens < 1.3 m in height above ground (33 cm x 3 m). Additional 19-yr succession and soils data will be collected at the Inga Lake study site using the same methodology. No new field data will be collected at Iron Creek, Wonowon or Kiskatinaw River in 2006, however, prior data will be used in the analysis.

The key question for data analysis will be: Which readily measurable indicators of vegetation structure, diversity and composition differ most after wildfire and silvicultural disturbance?
Stand structural and species diversity will be calculated at 3 spatial scales (plot, stand, site) using the indices and procedures previously documented by Haeussler et al. 2004, in review) The range of variability in composition, structure and diversity will be compared between wildfire and experimental treatment sites and across gradients of silvicultural diversity using procedures modified from Haeussler and Bergeron (2004). Statistical techniques used to derive the SFM vegetation indicators will include mainly univariate and multivariate ANOVA and ANCOVA and t-tests.

A list of easy-to-measure SFM indicators of vegetation compostion, structure and diversity will be prepared from the more detailed scientific data analysis. The range of variability of these indicators within wildfire-disturbed and silviculturally treated stands will be presented in a format that can readily interpreted by field workers without advanced statistical training, such as a box-and-whisker plot or frequency histogram. Procedures for measuring the indicators on operational field sites will be described. These procedures are less intensive than the methods used to collect the data in a research setting, and the objective is to produce indices that can be collected by field staff without advanced botanical training.

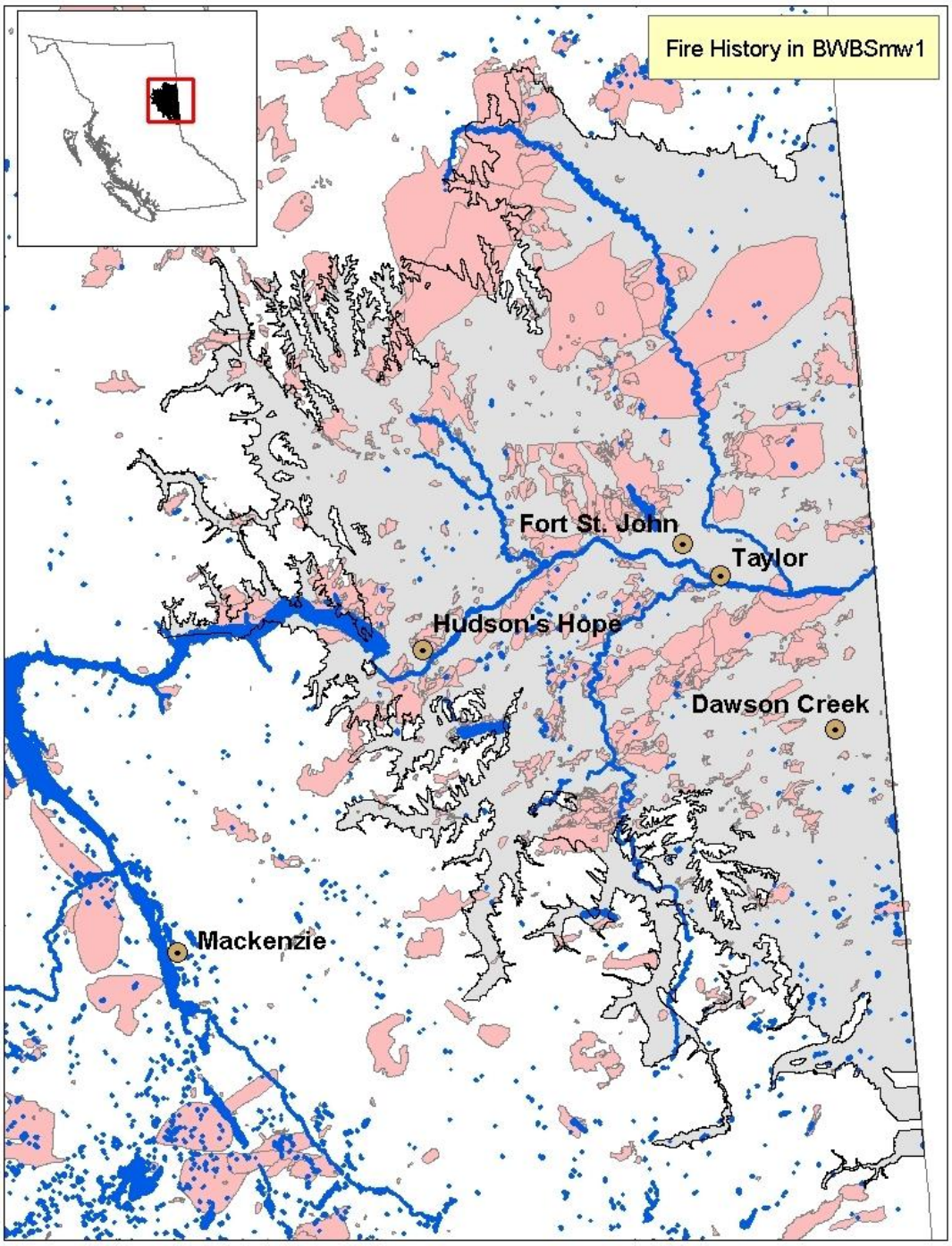

Figure 1. Wildfires in the BWBSmw1 variant, 1920 – 2000.

To give one concrete example, our past research in the area and on contrasting clearcuts and wildfires in northeastern Ontario and the work done in Alberta leads us to believe that clearcutting and conventional silvicultural practises lead to an increase in rhizomatous grasses (principally *Calamagrostis canadensis*) and a correponding decrease in berry producing, mid- and late seral shrubs that are important for many wildlife species, relative to what is found after wildfire on BWBSmw1/01 and /06 sites of the same age. We need local scientific benchmarks from wildfires to establish the range of variability in grass and berry-producing shrub cover at various successional stages. A monitoring procedure whereby field crews record the abundance of grasses and shrubs of concern on linear transects using the line intercept method (less subjective and more quickly encompasses the full range of soil conditions than an ocular estimate on a circular plot) would be simple, cost-effective, and objective.

Linkages

Measurement and maintenance of the Kiskatinaw River boreal aspen LTSP site is funded under FSP continuing project Y073084 and new Long Term Research Installation (LTRI) programme Project Proposal L077003 lead by Dr. Shannon Berch, BC MOFR Research Branch. The Inga Lake, Iron Creek and Wonowon are not funded under FSP, but are maintained by MOFR through budget allocations to the Forest Practices Branch, the Northern Interior Forest Region, with some support from Canfor Ltd. This research project forms a portion of a post-doctoral research project on ecosystem resilience and restoration carried out by Dr. Haeussler in the Department of Forest Science, University of British Columbia and funded by NSERC and Killam postdoctoral research fellowships to Dr. Haeussler.

2006/2007 Schedule of Work –see Y071075.xls

Section 3: Extensions and Deliverables

The outcome of this project will be a list of vegetation indicators suitable for use in monitoring stand-level biodiversity in broadly mesic ecosystems of the Boreal White and Black Spruce biogeoclimatic zone of northeastern BC, with estimates of the range of variability of these indicators in 10-20-yr old clearcuts and wildfires.

Extension Plan:

As this is a modest funding request, we do not propose an ambitious extension plan. At the end of FY 2006-07, the list of stand level biodiversity indicators and recommended monitoring procedures will be described in a BV Research Centre Extension Note (50 hard copies published), available on the BV Research Centre website (www.bvcentre.ca) and linked to the FORREX website (www.forrex.org). The target audience are MOFR and MOE Branch, Regional and Ministry personnel, industrial foresters and consultants responsible for planning and implementing FREP effectiveness monitoring under FRPA or SFM monitoring under an external Certification program. Target audience will work mainly within the Peace River region but also in other parts of British Columbia where a similar approach can be taken to developing a meaningful set of vegetation indicators.

Later, final results from the project will be included in a peer-reviewed research paper to be published as part of Dr. Haeussler's post-doctoral fellowship (estimated 2008 or 2009) and incorporated into scientific and technical presentations and field training activities. Target audience for these publications will be the forest science research community in Canada and internationally.

Dr. Haeussler will be available in future fiscal years to assist MOFR and interested forest industry personnel or consultants in incorporating these results into improvement of field monitoring procedures such as the FREP.

Section 3: Project Team

Project Team:

Project Leader: Sybille Haeussler, PhD RPF is currently a Killam (Honorary) and NSERC post-doctoral research fellow in the Forest Sciences Department at UBC and President of the BV Research Centre. Dr. Haeussler has 27 years experience in ecology and silviculture of northern BC with experience in all phases of experimental design and installation, field sampling, data analysis, report writing and extension and an excellent record of successful completion of research contracts. She has published 6 peer-reviewed journal papers and several extension notes describing earlier results from the experimental sites in question and has given 10 oral presentations on findings from these sites at forestry and academic meetings. Her PhD included a comparison of the range of variability of boreal mixedwood stand level biodiversity indicators after wildfire and clearcutting. Estimated time commitment to project: 100 days, UBC salary–in kind contribution. (see attached Partner Contribution Form)

Richard Kabzems, MSc, P Ag, RPF is Research Silviculturist with the BC Ministry of Forests and Range for the Northern Interior Region and is based in Dawson Creek. Richard is responsible for the Inga Lake, Iron Creek and Wonowon research trials and the boreal aspen Long Term Soil Productivity Study. He has 20 years experience in boreal forest silviculture, soils and ecology research and extension. Estimated time commitment to project: 5 days, logistical and administrative support, one field trip, review/input into extension note and publication. BCMOFR salary – in-kind contribution (see attached Partner Contribution Form).

Student Assistant. Project funding will support the BV Research Centre in hiring a university coop student to assist Dr. Haeussler with field sampling, data entry and sample processing. The project will provide valuable training and mentoring in research methods, field ecology and silviculture. Estimated time commitment: 28 days FSP-funded.

Project Partners:

BC MOFR Forest Practices Branch – Lorne Bedford RPF, Jacob Boateng PhD RPF, John McLarnon RPF. Will supply tree, soils and microclimatic data from the Inga Lake, Iron Creek and Wonowon trial sites, one joint field trip to site, technical review of extension note and later publications. Estimated time commitment to project: 5 days. MCMOFR – in-kind contribution (see attached Partner Contribution Form)

Section 4: Project Costs and Funding

Cost/benefit Description: This project represents a modest, but very cost-effective proposal for translating scientific data that was acquired at considerable cost to the taxpayer (establishment, maintenance, and measurement of trial sites) and currently sits mostly unused, into results that can be directly applied by government agencies, forest licensees and other stakeholders as operational SFM indicators of the status of early seral plant communities.

References:

Boateng, J., S. Haeussler and L. Bedford. 2000. Boreal plant community diversity 10 years after glyphosate treatment. W. J. Appl. For. 15(1): 15-26.

Canadian Model Forest Network. 2000. A user's guide to local level indicators of sustainable forest management: experiences from the Canadian Model Forest Network. Natural Resources Canada, Canadian Forest Service. Ottawa, ON.

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Haeussler, S., P. Bartemucci, and L. Bedford. 2004. Succession and resilience in boreal mixedwood plant communities 15-16 years after silvicultural site preparation. For. Ecol Manage. 199(2-3): 349-370.

Haeussler, S., L. Bedford, J.O. Boateng and A. MacKinnon. 1999. Plant community responses to mechanical site preparation in northern interior British Columbia. Can. J. For. Res. 29(7):1084-1100.

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Song, S. (editor). 2002. Ecological basis for stand management: A synthesis of ecological responses to wildfire and harvesting. Alberta Research Council Inc., Vegreville, AB.

Section 7: Appendices

Sybille Haeussler
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2029 – 2424 Main Mall, Vancouver, BC V6W
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Specialization and Research Interests

My research addresses the conservation, restoration and resilience of plant communities and ecosystems, mainly in managed forests and grasslands; the application of ecological and conservation biology principles to improved forestry and ecosystem management; short- and long-term response of plants, plant communities, ecosystems and landscapes to human intervention; description and maintenance of biodiversity; crop and non-crop plant interactions; forest vegetation management.

Education

B.S.F. Forest Biology (Hons.) 1974 – 1980	Faculty of Forestry University of British Columbia (UBC)
M.Sc. Forest Ecology 1985 – 1987	Department of Forest Science Oregon State University (OSU)
Ph.D. écologie forestière (Hons.) 1999 – 2004	Institut en Sciences de l'Environnement Université du Québec à Montréal (UQAM)

Recent Work Experience

2005-2007	Post-doctoral fellow Research topic:	Forest Science Dept., University of British Columbia Role of self-organization in resilience & restoration success of coastal floodplain and boreal mixedwood ecosystems
1983 -2005	Proprietor Nature of work:	Skeena Forestry Consultants, Smithers, B.C. Forest ecology & silviculture research, extension & education
1999 - 2004	Doctoral student Research topic:	Groupe de recherche en écologie forestière interuniversitaire, Université du Québec à Montréal Maintaining plant biodiversity in boreal mixedwoods

Recent and Selected Publications

Haeussler, S. & R. Kabzems. 2005. Aspen plant community response to organic matter removal and soil compaction. Can. J. For. Res. 35: 2030-2044.

Kabzems, R. & S. Haeussler. 2005. Soil properties, aspen and white spruce responses five years after organic matter removal and compaction treatments. Can. J. For. Res. 35: 2045-2055.

Haeussler, S., P. Bartemucci, & L. Bedford. 2004. Succession and resilience in boreal mixedwood plant communities 15-16 years after silvicultural site preparation. For. Ecol Manage. 199(2-3): 349-370.

Haeussler, S. & Y. Bergeron. 2004. Range of variability in boreal aspen plant communities after wildfire and clearcutting. Can. J. For. Res. 34(2): 274-288.

Haeussler, S. & D. Kneeshaw. 2003. Comparing forest management to natural processes. Chap. 9 in P.J. Burton, C. Messier, D.W. Smith, and W.L. Adamowicz. (eds). Towards Sustainable Management of the Boreal Forest. NRC Press. Ottawa. pp. 307-368.

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Coates, K.D., S. Haeussler, S. Lindeburgh, R. Pojar, and A.J. Stock. 1994. Ecology and silviculture of interior spruce in British Columbia. B.C. Min. For. & For. Can., Victoria, B.C., FRDA Rep. 220.

Haeussler, S., D. Coates and J. Mather. 1990. Autecology of common plants in British Columbia: a literature review. 2nd edition. B.C. Min. For. & Forestry Canada, FRDA Report 158 and FRDA Report 001. 272 p.

Consulting (Skeena Forestry Consultants, recent contracts)

Restoration of endangered Bulkley Valley grasslands. BC Parks, BC Habitat Conservation Trust Fund. 2005

BV Research Centre and Kalum Forest District. Restoring ecosystem processes and structures of rare ecological communities of the Skeena River Floodplain. 2004.

BV Research Centre and NSERC-UQAT-UQAM Scientific Chair in Sustainable Forest Management. Simulating Mixedwood Forest Succession. 2004.

Northgate Exploration Ltd.. Rare plant and rare ercological community assessment for the proposed Kemess North pit mine. (in association with Ardea Biological Consulting). 2003-2004

BC MOFR, Research Branch, Victoria, B.C. 10-yr vegetation succession after clearcutting and prescribed burning at 11 studie sites in the central interior of B.C. 2003-2004.

BC MOFR, Northern Interior Region, Dawson Ck., B.C. Vegetation succession on the boreal aspen Long Term Soil Productivity Study. 2003-2004.

BC MOFR Forest Practices Branch and Northern Interior Region. Vegetation response to mechanical and chemical site preparation in northern interior British Columbia. 1996 – 2003.

BC MOFR Research Branch and Prince Rupert Region. Monitoring vegetation response on the Sub-boreal Spruce Long Term Soil Productivity study. 1992 - 2002.

Other Contributions

I frequently give presentations (1 keynote, 5 invited, 3 contributed in 2005) at provincial and international meetings. At the ESA/Intecol conference in Montreal, August 2005, I served as chair of an oral session on "Understory and Epiphytic Vegetation as Indicators of the Integrity of Managed Forests" and am currently guest associate editor of a special issue of Forest Ecology and Management dedicated to that topic. I regularly review scientific manuscripts for Canadian Journal of Forest Research, other peer-reviewed journals, the BC MOFR and the BV Research Centre. I am President and Chair of the non-profit BV Research Centre and have coordinated their website and seminar series. I was a founding member of the Bulkley Valley Community Resources Board and the Skeena Round Table for Sustainable Management and served as an expert witness for the Gitxsan and Wet'suwet'en First Nations in their landmark Dalgaamuuk vs. the Queen land claims trial. I currently volunteer my time to coordinate a conservation, restoration and land acquisition project for endangered Bulkley Valley grasslands.

Richard Darwin Kabzems, MSc, P.Ag. R.P.F.

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Northern Interior Forest Region, 9000 - 17th St, Dawson Creek, B.C. V1G 4A4
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Research Interests

Richard conducts research in long term soil productivity, plant ecology, alternative silviculture systems, and broadleaf and mixedwood management in the boreal forests of north-eastern B.C. Research results and new technology information are passed on to operational staff from both government and industry through office presentations, field tours, conferences, seminars and a variety of publications.

Education

B.S.A.,	University of Saskatchewan	(Honors Plant Ecology) 1978
B.Sc.	University of Saskatchewan	(Biology) 1979,
M.Sc.	University of British Columbia	(Forest Ecology) 1985

Work Experience (last 10 yrs)

Research Silviculturist, 1991 to present, Northern Interior Forest Region, B.C. Ministry of Forests

Refereed Publications

Macadam, A. and Kabzems, R. 2006. Vegetation management improves early growth of white spruce more than mechanical site preparation treatment. North. J. Appl. For. *In press*.

Kabzems, R. & S. Haeussler. 2005. Soil properties, aspen and white spruce responses five years after organic matter removal and compaction treatments. Can. J. For. Res. 35: 2045-2055.

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Kabzems, R. and O. Garcia. 2004. Structure and dynamics of trembling aspen – white spruce mixed stands near Fort Nelson, B.C. Can. J. For. Res. 34(2):384-395.

Prescott, C.E., L.M. Zabek, C.L. Staley and R. Kabzems. 2000. Decomposition of broadleaf and needle litter in forests of British Columbia: influence of litter type, forest type and litter mixtures. Can. J. For. Res. 30: 1742-1750.

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Fons, J, R.D. Kabzems and K. Klinka. 1998. Humus forms of trembling aspen (Populus tremuloides Michx.) ecosystems in north-eastern British Columbia. Forest Ecology and Management 105: 241-250

Other Publications

Kabzems, R. 2000. Fourth-Year Plant Community Responses: The BWBS Long-Term Soil Productivity Study. B.C. Ministry of Forests, Prince George Forest Region, Prince George. Research Note LTSP-03.

Kabzems, R. 2000. Fourth-Year Responses of Aspen and White Spruce: The BWBS Long-Term Soil Productivity Study. B.C. Ministry of Forests, Prince George Forest Region, Prince George. Research Note LTSP-02.

Kabzems, R. and S. Ogilvie. 1998. Success stories from Fort Nelson. B.C. Ministry of Forests, Forest Practices Branch, Victoria, B.C. Silviculture Systems Program. Notes to the Field, Vol 4.

Kabzems, R. 1998. Regenerating boreal mixedwoods: initial results of a group shelterwood silviculture system in trembling aspen -white spruce stands. B.C. Ministry of Forests, Prince George Forest Region, Prince George. For. Res. Note No. PG-15.

Kabzems, R. R. Negrave, and K. Carroll. 1998. Using Sheep for vegetation management in Boreal White Spruce plantations. B.C. Ministry of Forests, Prince George Forest Region, Prince George. For. Res. Note No. PG-14.

Kabzems, R. 1996. Boreal Long Term Soil Productivity Study. B.C. Ministry of Forests, Prince George Forest Region, Prince George. For. Res. Note No. PG-06

Kabzems, R. 1996. Mixedwood Challenges. IN: C. Farnden (Ed.) Stand Management Prescriptions for Lodgepole Pine. Proceedings of the NSC 1996 Winter Workshop. March 6 & 7, 1996. Prince George , B.C.

Kabzems, R. 1996. Where have all the big pores gone? Impacts of concentrated heavy equipment traffic on aeration porosity and bulk density in an aspen ecosystem. Poster summary IN: P.G. Comeau, G.J. Harper, M.E. Blache, J.O. Boateng, and K.D. Thomas (Eds). Ecology and management of B.C. Hardwoods. Workshop proceedings. Dec. 1 and 2, 1993. Richmond, B.C. FRDA Rep. 255.

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Kabzems, R., D. Coopersmith and R. Negrave. 1995. Mixedwoods by Design. IN : C. Farnden (Ed.) Northern Interior Vegetation Management Association (NIVMA) Annual General Meeting January 18 & 19, 1995. Williams Lake, B.C.

Other Contributions

- Manuscripts refereed for Canadian Journal of Forest Research, Canadian Journal of Soil Science, International Poplar Council, as well as for manuscripts published by B.C. Ministry of Forests staff.
- External Examiner, Tracy Sherman 2000 M. Sc. University of Northern British Columbia
- Instructor, Forest Management Institute of BC and Alberta Advanced Forest Management Institute on boreal mixedwood management, and boreal silviculture
- Invited speaker, Northern Silviculture Committee, Alberta Reforestation Technical Committee (Alberta), Ontario Ministry of Natural Resources
- Contributed speaker, 4th International Conference on Boreal Disturbance Dynamics, UNBC 2002.

Please note that this CV may not be completely up-to-date as Richard has been on leave since September 2005 and the CV was updated by SH from an earlier version.

Forest Science Program
2006/07 Full Proposal Submission

Partner Confirmation Form

Project Information

Project No: Y07 - 1075
Title of Project: Stand Level Vegetation Indicators for Boreal Mixedwood Forests
Proponent: Dr. Sybille Haeussler, BV Research Centre

Partner Information

Partner Organisation: Forest Science Department, University of BC
Partner Contact Name and Title: Sybille Haeussler, Post-doctoral Research Fellow
Partner Phone: (250) 847-6082 (Smithers) or (778) 230-9233 (Vancouver cell)
Partner Email: sybille.haeussler@ubc.ca
Partner Address: 2029 Forest Sciences Centre, 2424 Main Mall, Vancouver, BC

In-kind support

Estimated Amount	Details
$11,000	Salary to Sybille Haeussler
$500	Logistical support

Cash Contributions

Amount	Details (please indicate if funds are from another source i.e., NSERC)

Partner Signature:

Date: December 15, 2006

Forest Science Program
2006/07 Full Proposal Submission

Partner Confirmation Form

Project Information

Project No: Y07 - 1075
Title of Project: Stand Level Vegetation Indicators for Boreal Mixedwood Forests
Proponent: Dr. Sybille Haeussler

Partner Information

Partner Organisation: BC Ministry of Forests and Range, Forest Practices Branch
Partner Contact Name and Title: Lorne Bedford, RPF, Manager, Harvesting & Silviculture Section
Partner Phone: (250) 387-8901
Partner Email: Lorne.Bedford@.gov.bc.ca
Partner Address: P.O. Box 9513, Stn Prov Govt, 9th Floor 727 Fisgard Street, Victoria, BC, V8W 9C2

In-kind support

Estimated Amount	Details
$6,500	Access to tree, soils and microclimate data from Inga Lake, Iron Creek
	& Wonowon study site.
$2,400	One joint field trip
$2.000	Technical review of extension note
$11,900 (Total)	

Cash Contributions

Amount	Details (please indicate if funds are from another source i.e., NSERC)

Partner Signature: Lorne Bedford. Original faxed to PwC.

Date: December 14, 2005

Forest Science Program
2006/07 Full Proposal Submission

Partner Confirmation Form

Project Information

Project No: Y07 - 1075
Title of Project: Stand Level Vegetation Indicators for Boreal Mixedwood Forests
Proponent: Bulkley Valley Centre for Natural Resources Research & Management

Partner Information

Partner Organisation: BC Ministry of Forests and Range, Northern Interior Forest Region
Partner Contact Name and Title: Richard Kabzems, Research Silviculturist, Peace/Fort Nelson
Partner Phone: (250) 784-1256
Partner Email: Richard.Kabzems@gems1.gov.bc.ca
Partner Address: Northern Interior Forest Region, 9000 - 17th St, Dawson Creek, B.C., V1G 4A4

In-kind support

Estimated Amount	Details
$2,000	logistical and administrative support,
	one joint field trip (150 km round trip) September 2006
	input to and technical review of extension note.

Cash Contributions

Amount	Details (please indicate if funds are from another source i.e., NSERC)

Partner Signature: Yvonne Parkinson for Richard Kabzems (currently on leave)
(original faxed to PwC).

Date: December 15, 2006