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Status of British Columbia's Long-term Silvicultural Systems Research Trials



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Alan M. Wiensczyk



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Executive Summary

Today's society demands a greater array of values from our forests. These include the traditional values such as timber, recreation, water, aesthetics, cultural and spiritual, and non-timber forest products, as well as new values such as bio-energy and bio-fuels, and ecological services such as carbon storage (Morford and Hollstedt 2007; Working Roundtable on Forestry 2009). In order to provide these values, natural resource management professionals need access to information on the various silvicultural systems and on how the use of these different systems will influence these values, especially in light of climate change.

In the province of British Columbia there has been a significant investment in both money and time in the establishment, maintenance, and measurement of a multitude of long-term silvicultural systems research trials. There are currently 23 large-scale trials and 11 small-scale/demonstration areas located throughout the province. These trials have been established in a wide variety of ecosystems and encompass the full range of silvicultural systems. Most of these trials are multidisciplinary and consider a number of values in addition to timber. They are also cooperative and involve a variety of different groups including provincial and federal governments, academia, forest licensees, and the consultant community. All of the large-scale trials and seven of the 12 small-scale trials/demonstration areas are still active, with data being collected on various aspects of the trials as funding permits.

This report is the first phase of a project to identify and synthesize the key lessons learned from these long-term silvicultural system research trials. The goal of this report is to summarize the current status of these trials in British Columbia and to identify opportunities for how these trials may help address some of our current forest management challenges.

These trials have generated a wealth of published literature on the impacts of the various silvicultural systems on a wide variety of values and concerns, and have played a critical role in informing and modifying forest policy and practices. They have provided research support for the shift to variable retention as part of the ecosystem-based management paradigm on the Coast as well as for managing for wildlife habitat in the Central Interior. The results from these research trials have also helped to alleviate some of the environmental concerns regarding clearcutting, have shown how other concerns may be mitigated, and have provided information on the responses of other components of forest ecosystems to various harvesting practices and silvicultural systems.

The trials also have a critical role to play in the forecasted changes in climate. Changes in growing conditions (e.g., drought, frost, etc.) may result in the increased use of alternative silvicultural systems in forest management and it is critical that natural resource managers have research information that will not only allow them to select the most appropriate system for their area and the tree species they manage, but that will also tell them both the short- and long-term implications of that system on tree growth and yield, windthrow, insects and diseases, and on other values such as biodiversity and wildlife. In addition, climate change is

also likely to lead to increases in the frequency and severity of natural disturbances and we will need to integrate complexity into our management prescriptions in order to enhance the resiliency and adaptability of our managed forests. The silvicultural systems trials provide an ideal opportunity to conduct research and demonstrate how different silvicultural systems can contribute to our management of forests as complex adaptive systems. The trials also provide opportunities for research on other relevant issues at the research trial sites due to their infrastructure and design, instrumentation, and inclusion of unharvested controls.

The silvicultural systems research trials in British Columbia have made a significant contribution to the development of forest policy and practices in the province and have the potential to contribute much more in the future. It is imperative that these trials continue to receive the necessary funding for trial maintenance and remeasurement to ensure this critical research legacy is not lost.

KEYWORDS: Silvicultural systems; British Columbia; large scale research trials; demonstration areas; university research forests; trial status; shelterwood; seed-tree; single-tree selection; group selection; clearcut; modified clearcut.

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1 Introduction

Today's society demands a greater array of values from our forests. These include the traditional values such as timber, recreation, water, aesthetics, cultural and spiritual, and non-timber forest products, as well as new values such as bioenergy and biofuels, and ecological services such as carbon storage (Morford & Hollstedt 2007; Working Roundtable on Forestry 2009). In order to provide these values, natural resource management professionals need access to information on the various silvicultural systems and on how the use of these different systems will influence these values, especially in light of climate change.

In British Columbia there has been a significant investment in both money and time in the establishment, maintenance, and measurement of a multitude of long-term silvicultural systems research trials (e.g., Montane Alternative Silviculture Systems Trial [MASS], Itcha-Ilgachuz Alternative Silvicultural Systems Trial, and the Date Creek Research Forest). These trials have been established in a variety of different ecosystems throughout the province and have generated a wealth of data and information on the impacts of the various silvicultural systems (e.g., shelterwood, single-tree and group selection, clearcut, etc.) on harvesting costs, growth and survival of planted and naturally regenerated seedlings, advanced regeneration, and residual trees, as well as wildlife values, biodiversity and coarse woody debris, levels of vegetative competition, and forest health agents (insects and diseases).

This report is the first phase of a project to identify and synthesize the key lessons learned from these long-term silvicultural system research trials. The goal of this report is to summarize the current status of these trials in British Columbia and to identify opportunities for how these trials may help address some of our current forest management challenges.

2 Silvicultural Systems Research Trials in British Columbia

Many of the existing silvicultural systems research trials in British Columbia were established under the auspices of the Silvicultural Systems Program. This program was initiated in 1990 with the goal of developing and studying alternatives to conventional clearcutting and saw the investment of approximately \$17 million over its eight-year existence (Vyse et al. 2005). Funding sources during that time period included the Canada-British Columbia Partnership Agreement on Forest Resource Development (FRDA) (1991–1995) (Vyse et al. 2005), and Forest Renewal BC (FRBC) (1994–2002) (Ministry of Forests, Lands, and Natural Resources 2002). Continued funding for the maintenance and remeasurement of some of these trials has been provided through the Forest Innovation Investment (FII) (2002–03), Forest Science Board (2003–2009), and the Forest Investment Account–Forest Science Program (FIA-FSP) (2009 to present) (Swift 2010). Under the FIA-FSP Program, just over \$4 million was spent from 2004–2009 on 39 research projects classified under the

Timber Growth and Value (TGV) theme “design and analysis of silvicultural systems” with another \$3.5 million spent on 37 projects classified under the TGV theme “basic research on

tree growth and stand development” (Swift 2010). As evident in these figures, funding levels have decreased significantly over the past few years and this reduction is expected to continue.

There are currently 34 silvicultural systems research trials and demonstration areas scattered throughout British Columbia. Of those I have classified 21 as integrated, controlled, and replicated silvicultural systems research trials (Table 1). The trials were classified as such if they assessed multiple values, covered large geographic areas, or had replicated treatment units on the same site.

Geographically there are four integrated, controlled, and replicated trials located in the Northern Interior, 11 in the Southern Interior, and six on the Coast (Table 1). The general location of these trials is shown in Figure 1. Ecosystems represented include Interior Douglas-fir (IDF) (six trials), Coastal Western Hemlock (CWH) (five trials), Interior Cedar Hemlock (ICH) (four trials), Engelmann Spruce–Subalpine Fir (ESSF) (three trials), Montane Spruce (MS) (three trials), Sub-boreal Spruce (SBS) (two trials), Coastal Douglas-fir (CDF) (one trial), Boreal White and Black Spruce (BWBS) (one trial), and Sub-Boreal Pine-Spruce (SBPS) (one trial) biogeoclimatic zones. A number of trials represent more than one zone.

Silvicultural systems studied as part of the integrated, controlled, and replicated trials encompass the entire range and include clearcuts, modified clearcuts, modified patch cuts with a range of opening sizes (1.0–10 ha), seed tree, shelterwood (uniform, irregular, and group), single tree selection and group selection systems as well as unharvested controls. In addition, one trial has varied levels of basal area (BA) retained with two Q-values.

Most of these trials are multidisciplinary and consider a number of values in addition to timber. They are also cooperative and involve a variety of different groups including provincial and federal governments, academia, forest licensees, and the consultant community. Almost all of these trials are still active, with data being collected on various aspects of the trials, to the extent that the trials’ funding allows. One exception is the Summit Lake trial, which is dormant, although efforts are currently under way to revitalize this trial.

For more details on these trials, including the trial objectives, contact information, tree species, and trial status, as well as a list of the publications generated from them please refer to Appendices 1–21.

Table 1 *Integrated, controlled, and replicated long-term silvicultural systems research trials in British Columbia*

Trial name		Estab. year	General location	Ecological zone	Silvicultural system
Northern Interior					
1	Fort Nelson Mixedwoods	1996	Fort Nelson	BWBS	<ul style="list-style-type: none"> • Group shelterwood • 0.13 and 1 ha openings
2	Date Creek Research Forest	1991	Hazleton	ICH	<ul style="list-style-type: none"> • Clearcut • Light (30%) and heavy (60%) removal • Canopy opening size range from single tree to 0.5 ha

Status of British Columbia's Long-term Silvicultural Systems Research Trials

Trial name		Estab. year	General location	Ecological zone	Silvicultural system
3	Northern Wetbelt Trials - Lucille Mountain - Pinkerton Mountain - Bearpaw Ridge - East Twin, Minnow, Lunate Creeks - Fleet Creek - Isaiah Creek	1991 1998 1999 2000/01 1994 2006	Cariboo and Rocky Mountains East of Prince George	ESSF ICH	<ul style="list-style-type: none"> • Clearcut • Group retention – 0.01–0.1 ha • Group selection/patch 0.02 ha • Irregular shelterwood • Single tree selection • Uncut control
4	Summit Lake	1991	Prince George	SBS	<ul style="list-style-type: none"> • 10 m²/ha residual basal area • 20 m²/ha residual basal area • Uncut control
Southern Interior					
5	Quesnel Highland/Mt Tom Alternative Silvicultural Systems	1990	Williams Lake	ESSF	<ul style="list-style-type: none"> • Clearcut • Group selection with 0.03 ha to 1.0 ha openings
6	Viewland Mountain	1996	Williams Lake	ICH	<ul style="list-style-type: none"> • Group selection • Patch cut • Various opening sizes (0.25–2.0 ha) and orientation.
7	Uniform Shelterwood Trial	1990	Williams Lake	SBS	<ul style="list-style-type: none"> • Uniform shelterwood – Five levels of BA retention (15, 20, 30, 40, 60 m²) • Clearcut • Uncut control
8	Itcha-Ilgachuz Alternative Silvicultural Systems Trial	1994	Alexis Creek	SBPS/MS	<ul style="list-style-type: none"> • Clearcut • Irregular group shelterwood – stem-only harvesting (50% area retention) • Irregular group shelterwood – whole tree harvesting (50% area retention) • Group selection (70% area retention) • No-harvest controls
9	Opax Mountain Silviculture Systems Research Project	1991	Kamloops	IDF	<ul style="list-style-type: none"> • 80% and 50% retention • Aggregated and dispersed • Openings 0.1, 0.4 and 1.6 ha
10	Isobel Lake Research Trial	2002	Kamloops	IDF	<ul style="list-style-type: none"> • 50–60% removal • 75–80% removal • Single tree to 10m² openings created • No harvest control
11	Westwold	1993	Kamloops	IDF	<ul style="list-style-type: none"> • 15, 20, 25 m² basal area retained • 2 Q-values
12	Sicamous Creek Silvicultural Systems Research Project	1992	Sicamous	ESSF	<ul style="list-style-type: none"> • Single tree selection – 33% removal • Group Selection – 0.1, 1.0 ha • Patch cut – 10.0 ha • No harvest control
13	Mount Seven/Ice Road Partial Cutting Research Trials	1993	Golden/Nakusp	MS/ICH	<ul style="list-style-type: none"> • Irregular Uniform Shelterwood • Patch cut – 4 levels of BA retention (zero, light, heavy and full)

Trial name		Estab. year	General location	Ecological zone	Silvicultural system
14	St Mary's Residual Basal Area Study	1993	Cranbrook	IDF	<ul style="list-style-type: none"> • Single tree selection • 4 levels of residual basal area (8, 16, 24, 37 m²)
15	Beetle proofing mature Lodgepole pine	1992	Cranbrook	IDF/MS	<ul style="list-style-type: none"> • Clearcut • Thinning to 4m and 5m spacing
Coast					
16	HyP ³ Project	1997	Prince Rupert	CWH	<ul style="list-style-type: none"> • Diameter limit logging
17	Rennell Sound Silviculture Systems Trial	1996	Queen Charlotte Island	CWH	<ul style="list-style-type: none"> • Clearcut • 25 and 50% removal as group selection • 25% removal as single tree selection • No harvest control
18	Silviculture Treatments for Ecosystem Management in the Sayward (STEMS)	2000–2007	Campbell River	CDF/CWH	<ul style="list-style-type: none"> • Extended Rotation (uncut control) • Extended Rotation with commercial thinning • Clearcut with reserves • Modified patch cut • Group selection • Aggregate retention • Dispersed retention
19	Montane Alternate Silviculture Systems Trial (MASS)	1991	Campbell River	CWH	<ul style="list-style-type: none"> • Clearcut • Patch cut – 1.5–2.0 ha • Green tree retention (25 trees per hectare retained) • Shelterwood (30% retention) • Old growth control
20	Robert's Creek Study Forest	1992	Sechelt	CWH	<ul style="list-style-type: none"> • 10% dispersed retention • 50% aggregated retention • Clearcut with reserves • Strip shelterwood
21	Boston Bar silvicultural systems trial	1991	Boston Bar	IDF	<ul style="list-style-type: none"> • Clearcut • Seed tree • Shelterwood

Two additional larger trials have been categorized as multi-site integrated adaptive management studies. These trials differ from the ones in Table 1 in that there is no on-site replication of treatments, but are similar to the Table 1 trials in that the areas treated were large and treatments were applied at an operational scale. The IDF Mule Deer Winter Range study is located at several sites in the Central Interior near Williams Lake. This study is currently dormant, although the trial may be reactivated for the 2nd harvest year entry (year 20). The Variable Retention Adaptive Monitoring (VRAM) project is a coastal study with locations at several sites on Vancouver and the Queen Charlotte Islands as well as near Powell River (Table 2). It is still actively being monitored. Further details regarding these two trials can also be found in Appendices 22 and 23.

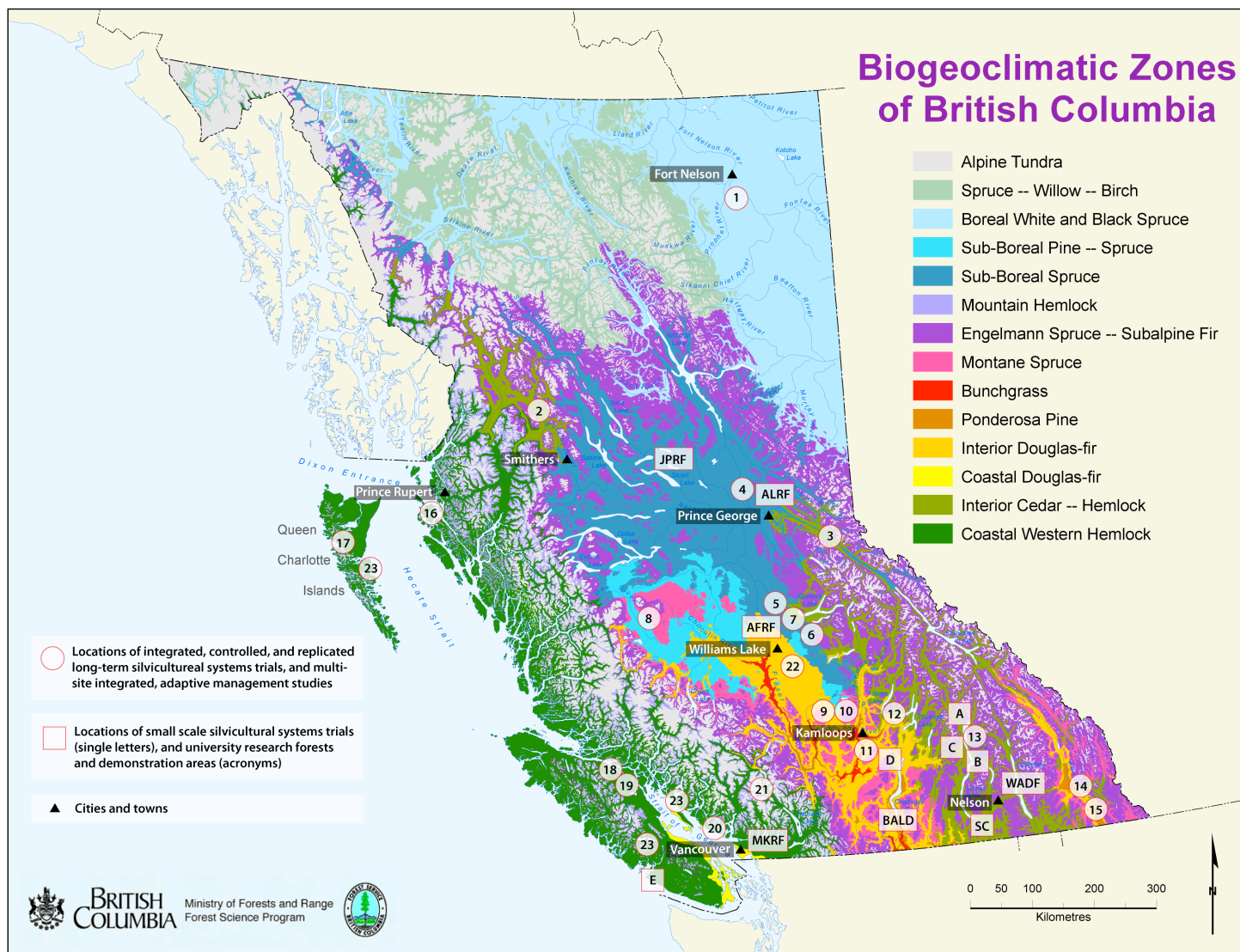


Figure 1 Location of integrated, controlled, and replicated silvicultural systems research trials, multi-site integrated adaptive management studies, small silvicultural systems research trials, and university research forests and demonstration areas in British Columbia. (Map key: Circled numbers on the map correspond to the integrated, controlled, and replicated trial numbers in Table 1 and multi-site integrated adaptive management study numbers in Table 2. Letters in squares on the map correspond to small trial letters in Table 3, and the acronyms in the squares refer to the university research forests and demonstration areas in Table 4. The location of the Bald Range retrospective study area has also been noted.)

Table 2 Multi-site integrated adaptive management studies

Trial name		Estab. year	General location	Ecological zone	Silvicultural system
Southern Interior					
22	IDF Mule Deer Winter Range	1983	Williams Lake	IDF	<ul style="list-style-type: none"> • Single tree selection • No harvest control • Understory spacing
Coast					
23	Variable Retention Adaptive Management Trials	2001–2005	Various locations: Vancouver Island, Queen Charlotte Islands, and Powell River	CWH/ CDF/ MH	<ul style="list-style-type: none"> • Group retention • Dispersed retention • Riparian retention • Group removal • Clearcut • No harvest control

There are also five small silvicultural systems trials that exist throughout the province (Table 3). These small trials typically cover a small area and operational applicability of the treatments is limited. The trials are often designed to assess only a few specific values. Two of the trials have on-site replication of the treatments while the remaining three have no treatment replication. Of these five trials, four are located in the Southern Interior, and one on the Coast (Figure 1). There are none in the Northern Interior. Two of the trials were established several decades ago. The Bolean Lake study was established in 1951 but was abandoned in the 1970s. The Fosthall Creek Road study was established in 1957 with measurements taken as recently as 1997 but it is currently inactive. The Wetask Lake site is also currently dormant. Both the Burton Creek and Cats Ears Creek studies are considered active.

Table 3 Small silvicultural systems research trials

Trial name		Estab. Year	General Location	Ecological Zone	Silvicultural System
Southern Interior					
A	Wetask Lake	1992	Revelstoke	ICH	<ul style="list-style-type: none"> • Patch clearcut • No replication
B	Burton Creek partial cutting	1994	Nakusp	ICH	<ul style="list-style-type: none"> • Patch cut (0.75 ha) • Replication
C	Fosthall Creek Rd Trial	1957	Nakusp	ICH	<ul style="list-style-type: none"> • Diameter limit cut • Salvage cut • Improvement cut • No harvest control • Replication
D	Bolean Lake	1951	Falkland	ESSF	<ul style="list-style-type: none"> • Clearcut • Strip cutting – 50% retention • Group selection • Single tree selection • No replication
Coast					
E	Cats Ears Creek	1992	Port Alberni	CWH	<ul style="list-style-type: none"> • 75% dispersed retention • Aggregated retention with 0.15, 0.3, and 1.4 ha openings • No replication

As with the integrated, controlled, and replicated silvicultural systems research trials and multi-site integrated adaptive management studies, a number of different ecosystems and silvicultural systems are represented. The ICH zone has the most small trials (three), with one each for the ESSF and CWH biogeoclimatic zones.

Silvicultural systems represented include clearcut, patch cuts, shelterwood and group and single tree selection. For detailed information on these trials refer to Appendices 24–28.

In addition to the established research and adaptive management trials there are also a number of university research forests and demonstration areas where various silvicultural systems have been applied and are being monitored. These forests provide research and teaching opportunities as well as illustrative examples of the application of different silvicultural systems. The university research forests have an explicit education and research mandate that is completely unlike any other form of tenure and this mandate has driven their experimentation with and demonstration of various alternative silvicultural systems. Also, these tenure areas are large enough (9000–15 000 ha) to allow the university research forests to test the applicability of alternative silvicultural systems in an operational, area-based/landscape level context. There are two university research forests in the Northern Interior, one university research forest, a college woodlot, and a demonstration area in the Southern Interior, and one university research forest on the Coast (Table 4). Ecosystems represented include the SBS (three trials), ICH (three trials), IDF (one trial) and CWH (one trial). Silvicultural systems tested include clearcut, patch cut, uniform, group and irregular shelterwoods, group and single tree selection, and commercial thinning. All of the research forests and the college woodlot are active while the West Arm Demonstration Forest is currently dormant. For more details on the four research forests, the college woodlot, and the demonstration area refer to Appendices 29–34.

The Aleza Lake Research Forest was established as a BC Forest Service Experiment Station in 1924 and has a large number of permanent sample plots within several different silvicultural systems trials that have been re-measured continuously for nearly 80 years (see Aleza Lake Research Forest 2011). The Alex Fraser Research Forest has provided sites for two of the silvicultural systems trials included in Table 1 and 2. One of the treatment blocks of the Uniform Shelterwood Trial is located on the Gavin Lake unit, while a treatment block for the IDF Mule Deer Winter Range study is located on the Knife Creek unit of the research forest.

Table 4 University research forests and demonstration areas

Trial name		Estab. year	General location	Ecological zone	Silvicultural system
Northern Interior					
ALRF	Aleza Lake Research Forest	1930–1950	Prince George	SBS	<ul style="list-style-type: none"> • Clearcut • Shelterwood • Strip cutting
JPRF	John Prince Research Forest	1999	Fort St James	SBS	<ul style="list-style-type: none"> • Seed tree • Patch Cut • Strip cutting

Southern Interior					
Trial name		Estab. year	General location	Ecological zone	Silvicultural system
AFRF	Alex Fraser Research Forest	1987	Williams Lake	ICH SBS IDF	<ul style="list-style-type: none"> • Uniform shelterwood • Irregular shelterwood • Single tree selection • Commercial and pre-commercial thinning • Clearcut
WADF	West Arm Demonstration Forest	1992	Nelson	ICH	<ul style="list-style-type: none"> • Group selection • Patch cut • Various opening sizes (0.25–2.0 ha) and orientation.
SC	Selkirk College Woodlot	1994–1996	Castlegar	ICH	<ul style="list-style-type: none"> • Natural shelterwood with overstory retention • Group selection (0.5–0.9 ha)
Coast					
MKRF	Malcolm Knapp Research Forest	1949	Maple Ridge	CWH	<ul style="list-style-type: none"> • Group selection • Shelterwood (uniform and irregular) • Clearcut and clearcut with reserves • Commercial thinning • Patch cut

In addition to the trials, university research forests, and demonstration areas there are also a number of case studies that were conducted between 1995 and 2001 (Table 5). These operational trials, all of which are located in the southeastern part of the province, were documented in a collection of extension notes or research summaries produced by the Nelson Forest Region. Of these nine trials, five were conducted within the Revelstoke Community Forest. Two additional case studies, not included in Table 3, were conducted in demonstration forests. Information on these can be found in the attached appendices for the West Arm Demonstration Forest (Appendix 32) and the Selkirk College woodlot (Appendix 33).

Table 5 Operational case studies

Trial name	Estab. year	Location	Ecosystem	Silvicultural system
Nelson Irregular Shelterwood	1995	Nelson	ICH	<ul style="list-style-type: none"> • Irregular strip shelterwood – 10m wide strips radiating from central point
Clay, C. 1998. Case study: Irregular strip shelterwood cutting in a viewscape. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-037. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN037.pdf (Accessed December 2011).				
Whitetail Brook (Invermere Enhanced Forest Management Pilot)	1996	Invermere	IDF	<ul style="list-style-type: none"> • Single tree selection • Group selection (0.1 ha)
Saceniaks, K. & H. Pinnell. 1998. Case study: Harvesting operations in highly constrained IDF stands in the Rocky Mountain Trench. Whitetail Brook, Invermere Enhanced Forest Management Pilot Project Area. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-038. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN038.pdf (Accessed December 2011).				

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Trial name	Estab. year	Location	Ecosystem	Silvicultural system
East Kootenay Trench	1996	Cranbrook	IDF	• Single tree selection/thinning
Hawe, A. & D. DeLong 1997. Case Study: Partial cutting to restore old-growth forest conditions in the east Kootenay trench. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-032. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN032.pdf (Accessed December 2011).				
Rover Creek	2000	Nelson	ICH	<ul style="list-style-type: none"> • Group selection • Patch cuts • Single tree selection • Irregular shelterwood • Clearcut with reserves
Andrews, C. 2001. Case study: Using partial-cutting timber-harvesting methods in a sensitive watershed in southeastern British Columbia. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Extension Note No. 56. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/ENN056.pdf (Accessed December 2011).				
Keystone Patch Cut	1995	Revelstoke Community Forest	ICH	<ul style="list-style-type: none"> • Group selection system (patch cuts) • 16 patches - 1.06–2.02 ha in size
Waters, L. 1996. Case study: Patch cutting in old-growth to maintain early winter caribou habitat. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-029 http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN029.pdf (Accessed December 2011). Waters, L. & H. Quesnel. 2001. Case study: Patch cutting in old-growth forests to maintain caribou habitat, 1997–99 research results. B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 54 http://www.for.gov.bc.ca/rsi/research/nextnotes/En054.htm (Accessed December 2011).				
Bigmouth Forest Service Road (FSR)	1996	Revelstoke Community Forest	ICH	• Strip clearcut – cable
Waters, L. 1997. Case study: Cable harvesting on a strip clearcut on steep slopes in an old-growth interior cedar hemlock forest. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-034 http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN034.pdf (Accessed December 2011).				
Goldstream Valley/Lookout Mountain	1997	Revelstoke Community Forest	ICH	<ul style="list-style-type: none"> • Group selection system • 1.0 ha openings
Waters, L. 1997. Case study: Patch cutting in old-growth to address concerns about wildlife habitat and clearcut adjacency. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Research Summary RS-036 http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/RSN036.pdf (Accessed December 2011).				
Illecillewaet River	1999	Revelstoke Community Forest	ICH	<ul style="list-style-type: none"> • Group shelterwood • Commercial thin • Patch cuts • Helicopter, cable, horse, and conventional harvesting
Gribbon, P., L. Waters, & D. DeLong. 2001. Using alternatives to clearcutting in viewsapes: Case study in the Columbia Forest District in Southeastern British Columbia. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Extension Note No. 53. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/ENN053.pdf (Accessed December 2011).				
Single tree selection	2000	Revelstoke Community Forest	ICH	• Single tree selection
Waters, L. 2001. Case study: Application of a selection silvicultural system in the ICHwk1 of the Columbia Forest District. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Extension Note No. 58. http://www.for.gov.bc.ca/hfd/pubs/RSI/FSP/Nelson/ENN058.pdf (Accessed December 2011).				

Finally, several retrospective studies have been conducted on partial cutting throughout the province. Hawe (1996) conducted a background analysis of the use of partial cutting by both licensees and the Small Business Forest Enterprise Program (SBFEP) in each district in the Nelson Forest Region from 1988 to 1996. Butt and Bancroft (1990) documented regeneration success following partial cutting in the Interior Cedar-Hemlock dry warm (ICHdw) and the moist warm (Shuswap variant) (ICHmw2) subzones in the Kootenay Lake and Arrow Forest Districts. Delong (1994) conducted a similar assessment in the Interior Cedar-Hemlock moist warm (Golden variant) (ICHmw1) and the moist cool (Kootenay variant) (ICHmk1) subzones in the Golden Forest District and also reported on the success of advanced western red cedar regeneration in three Interior Cedar-Hemlock subzones in the Nelson Forest Region (Delong 1995). A fourth study from the Nelson Forest Region was conducted by Saceniaks (1999) and Saceniaks and Thompson (2001) who looked at regeneration success for partially cut Douglas-fir stands in the Kootenay variant of the Interior Douglas-fir dry mild subzone (IDFdm2) in the Rocky Mountain Trench. In the Cariboo forest region, Waterhouse (1998) similarly reported on natural regeneration in uneven-aged Douglas-fir for the Fraser variant of the Interior Douglas-fir dry cool subzone as well as the Interior Douglas-fir very dry mild (IDFxm) and very dry warm (IDFwx) subzones. The research site at Bald Range (Appendix 35) is also a retrospective study looking at the effects of retained structures following harvesting on large and small mammals, vegetation, and coarse woody debris dynamics.

3 Discussion and Conclusions

Silvicultural systems research trials have generated a wealth of published literature on the impacts of the various silvicultural systems on a wide variety of values and concerns, and have played a critical role in informing and modifying forest policy and practices. This was especially evident on the Coast where variable retention harvesting has replaced clearcutting as the harvest method of choice due in part to the shift to the ecosystem-based management paradigm (Butt & McMillan 2009). Results from the Montane Alternative Silvicultural Systems (MASS) project were instrumental in providing the scientific support for this change in silvicultural systems (Vyse et al. 2005). Of the eight elements identified by the Ecological Society of America (1996) as required for successful implementation of the ecosystem-based management model, silvicultural systems research trials can be used to address at least five of them: use of “sound ecological models and understanding” when making management decisions, understanding the “complexity and connectedness” of ecosystems, as well as “the dynamic character of ecosystems,” knowledge of the “context and scale” at which ecosystem processes operate, and ensuring that our management efforts exhibit “adaptability and accountability” through research and monitoring programs.

Another example of changes to forestry practices and policies is in the Central Interior where operational practices in caribou habitat have been altered due to results from the Quesnel Highland and Itcha-Ilgachuz alternative silvicultural systems trials (Vyse et al. 2005). According to Vyse et al. (2005), silvicultural systems trials have also helped to alleviate some of the environmental concerns regarding clearcutting (e.g., regeneration), have shown how some of the other concerns may be mitigated (e.g., edge effects, windthrow), and have also

provided information on the response of other little-studied components of forested ecosystems (e.g., small mammals, invertebrates, soil organisms) to the various forest harvesting practices and silvicultural systems. However, although these trials have shown how these concerns and values may be addressed in the short-term it is imperative that the trials continue to be monitored to assess how the trees, and other values (e.g. wildlife, biodiversity, etc.) respond to different silvicultural systems in different ecosystems over a rotation.

All of the integrated, controlled, and replicated long-term silvicultural systems research trials, the multi-site integrated adaptive management studies, and trials located within the university research forests were designed to ensure their long-term continuity and operational applicability as described by Curtis et al. (2004) and de Montigny (2004). The trials cover a wide area and are representative of major portions of the forested landbase. They involve large treatment units and so can tolerate some damage and (or) mortality due to natural disturbances without compromising the statistical validity of the trial as well as providing an opportunity to assess treatment response to the disturbances. In addition, the large treatment areas allow for the assessment of some non-timber values such as wildlife habitat which require larger experimental units than are required for timber values, as well as allowing for operational issues such as harvesting productivity, costs, and equipment limitations to be assessed at an operational scale. Some of the trials also incorporate a wide range of options to allow researchers to address changes in societal needs and desires and forest conditions should they occur. Many of the trials also involve multiple disciplines and organizations, including partnerships with the forest industry.

In addition, these trials, research forests, and demonstration areas are a valuable extension and teaching resource and have been the subject of a number of conferences and field tours. According to adult education principles, most people only retain approximately 20% of what they hear but retain approximately 50% of what they see *and* hear so the use of these areas for field tours is a key resource to help researchers communicate their study results from these trials to natural resource managers which, in turn, increases the likelihood that the results will be adopted into operational practices.

The natural resources sector is facing many new challenges and climate change is one of the most critical of these. In a recent survey of natural resource management practitioners, 65% of survey respondents felt that they did not have enough information on how climate change may affect their choice of silvicultural system. Survey respondents raised questions about leave-tree survival, temperature extremes (hot and cold), and how silvicultural systems could be used to mitigate the effects of climate change (Wiensczyk 2011). Based on climate change projections, it is expected that in some areas of British Columbia there will be an increased frequency and intensity of drought (Williamson et al. 2009). In ecosystems where growing conditions become warmer and drier it is highly likely that it will become more difficult to regenerate these areas using traditional clearcut and plant approaches. Alternative silvicultural systems will need to be used and it is critical that natural resource managers have the research information that will not only allow them to select the most appropriate system for their area and the tree species that they are managing but that will also tell them both the short- and long-term implications of that system on tree growth and yield, windthrow, insects and diseases, and on other values such as biodiversity and wildlife. This research information is currently being provided by the alternative silvicultural systems research trials and demonstration areas described in this report.

It is also expected that as the climate changes there will be an increase in the frequency and severity of natural disturbances such as wildfire, insect outbreaks, and extreme weather events in North America (Intergovernmental Panel on Climate Change 2007) and our British Columbia forests will likely be exposed to a new and different set of disturbances (Puettmann et al. 2008). In order to enhance the resilience and adaptability of our managed forests to these disturbances we will need to integrate complexity into our management prescriptions (Puettmann et al. 2008). The silvicultural systems trials provide an ideal opportunity to conduct research and demonstrate how different silvicultural systems can contribute to our management of forests as complex adaptive systems.

In addition to contributing to our knowledge of silvicultural systems and climate change these trial areas also provide opportunities for research on other relevant issues (e.g., non-timber forest products, wildlife habitat, growth and yield) due to their infrastructure and design, instrumentation, and inclusion of unharvested control areas that represent pre-harvest or background conditions (Bruce Rogers, pers. comm., February 25, 2011).

Continued silvicultural systems research and extension is needed to ensure the health and resiliency of our forests so that they continue to provide the range of timber and non-timber forest products and ecosystem services demanded by society (de Montigny & Nigh 2009).

This report is the first step in a project to synthesize the lessons learned from the long-term alternative silvicultural systems research trials in British Columbia. Future efforts in this project include the development of a silvicultural systems research knowledge network and a series of extension activities (workshops, webinars, reports) designed to extend the lessons learned from these trials to the natural resource management community as well as the potential development of an internet-based one-stop source of information on silvicultural systems.

These trials have made a significant contribution to the development of forest policy and practices in British Columbia and have the potential to contribute much more into the future. It is imperative that these trials continue to receive the necessary funding for trial maintenance and remeasurement to ensure this critical research legacy is not lost.

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APPENDIX 1: FORT NELSON MIXEDWOODS

Trial name: Fort Nelson Mixedwoods Silvicultural Systems Trial							
Trial website: None							
Contact	Estab. Year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last Measurement Date
Richard Kabzems Richard.Kabzems@gov.bc.ca	1996	BWBSmw2	Trembling aspen White spruce	Group shelterwood – 0.13 ha and 1 ha opening sizes Uncut control	- Tree regeneration - Light - Vegetation - Snags and coarse woody debris	None	2000
General publications: <ul style="list-style-type: none">Kabzems, R. 1998. Regenerating boreal mixedwoods: Initial results of a group shelterwood silvicultural system in trembling aspen – white spruce stands. B.C. Ministry of Forests, Prince George Forest Region, Forest Resources and Practices Team. Extension Note PG-15. http://www.for.gov.bc.ca/rni/research/Extension_Notes/PG15_mixedwoods.pdf (Accessed January 2012).							
Comments: Still active but have been unable to secure funding for a remeasurement. No Experimental Project (EP) number for this trial. FRBC reference number – OP96062/RE – SCBC reference number (FR-96/97-071).							

Researchers involved	Values assessed	Publications
Kabzems, R.	Multiple values <ul style="list-style-type: none">- Regeneration- Snags and coarse woody debris	• Kabzems, R. 1998. Regenerating boreal mixedwoods: Initial results of a group shelterwood silvicultural system in trembling aspen – white spruce stands . B.C. Ministry of Forests, Prince George Forest Region, Forest Resources and Practices Team. Extension Note PG-15. (Accessed January 2012).
Kabzems, R.	Multiple values <ul style="list-style-type: none">- Regeneration- Snags and coarse woody debris- Light- Vegetation	• Kabzems, R. 2001. Regenerating boreal mixedwoods: Three-year results of a group shelterwood silviculture system in trembling aspen – white spruce stands . B.C. Ministry of Forests, Prince George Forest Region, Forest Resources and Practices Team. Extension Note PG-24. (Accessed January 2012).
Kabzems, R. Comeau, P.	- Light	• Comeau, P. & R. Kabzems. 2001, The influence of group shelterwood harvesting in boreal mixedwood stand on understory light levels and growth of regenerating white spruce. Unpublished Report.

APPENDIX 2: DATE CREEK

Trial name: Date Creek Research Forest (EP1219)							
Trial website: http://www.for.gov.bc.ca/rni/research/date_creek/date_creek.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Dave Coates Dave.Coates@gov.bc.ca Phil LePage Phil.LePage@gov.bc.ca	1991	ICHmc2	Western hemlock Western red cedar Subalpine fir Lodgepole pine Hybrid spruce Paper birch Trembling aspen Black cottonwood	Clearcut Light (30%) and heavy (60%) removal Canopy opening size range from single tree to 0.5 ha 4 replications	How ecosystems function, how they change over time, and impacts of timber harvesting on: <ul style="list-style-type: none">- Soil and soil organisms- Tree regeneration- Arboreal lichen- Vegetation- Sporocarps- Birds, bats, amphibians, small mammals- Water- Windthrow	None	2010
<p>General publications:</p> <ul style="list-style-type: none">• Coates, K.D., A. Banner, J.D. Steventon, P. LePage, & P. Bartemucci. 1997. The Date Creek Silvicultural Systems study in the Interior Cedar-Hemlock forests of Northwestern British Columbia. Overview and Treatment Summaries. B.C. Ministry of Forests, Research Program. Land Management Handbook 38. (Accessed January 2012).• LePage, P. 1998. The Date Creek Research Forest – Extension Trail Brochure: A self-guided tour.• Coates, K.D. & P. LePage. 2009. The Date Creek Experiment: Ecology and management of northern temperate forests of British Columbia – Publication Summary. Bulkley Valley Research Centre, Smithers, B.C. (Accessed January 2012).							
Comments:							

Researchers involved	Values assessed	Publications
Thibodeau, D. Krag, R. Hedin, I.	Harvesting costs and productivity	<ul style="list-style-type: none">• Thibodeau, E.D., R.K. Krag, & I.B. Hedin. 1996. Date Creek silvicultural systems trial: performance and productivity of ground-based harvesting systems in the Interior Cedar–Hemlock ecosystem of the Prince Rupert Forest Region. FERIC Rep. SR-114. Abstract available (Accessed January 2012).
Maloney, D. Wilford, D. Loedel, M. Beaudry, P. Patchke, S.	Hydrology	<ul style="list-style-type: none">• Loedel, M. & P. Beaudry. 1993. A study of forest interception at the Date Creek silvicultural systems study. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished.• Patchke, S. 1995. Comparison of soil moisture between a forested site and two silviculture treatment sites at the Date Creek research forest. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished.
Coates, K.D.	Windthrow	<ul style="list-style-type: none">• Coates, K.D. 1997. Windthrow damage 2 years after partial cutting at the Date Creek silvicultural systems study in the Interior Cedar–Hemlock forests of northwestern British Columbia. Canadian Journal of Forest Research 27:1695–1701. (Accessed January 2012).

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Steventon, D. Coates, K.D. LePage, P. Burton, P.J. Bartemucci, P. Harper, K.A. Wright, E.F.	Stand structure, gap dynamics	<ul style="list-style-type: none"> Coates, K.D. & P.J. Burton. 1997. A gap-based approach for development of silvicultural systems to address ecosystem management objectives. Forest Ecology and Management 99:337–354. Coates, K.D. 2002. Tree recruitment in gaps of various size, clearcuts and undisturbed mixed forest of interior British Columbia, Canada. Forest Ecology and Management 155:387–398. Bartemucci, P., K.D. Coates, K.A. Harper, & E.F. Wright. 2002. Gap disturbances in northern old-growth forests of British Columbia, Canada. Journal of Vegetation Science 13(5):685–696.
Coates, K.D. Wright, E. LePage, P. Neumann, J. Wright, E.F. Bartemucci, P. Canham, C.D. Greene, D.F.	Regeneration	<ul style="list-style-type: none"> Neumann, J. & Wright, E. 1996. Regeneration mechanisms of shrubs and herbs. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished File Report. Wright, E.F., K.D. Coates, & P. Bartemucci. 1998. Regeneration from seed of 6 tree species in the interior cedar-hemlock forests of British Columbia as affected by substrate and canopy gap position. Canadian Journal of Forest Research 28(9):1352–1364. (Accessed April 2011). Coates, K.D. 2000. Conifer seedling response to northern temperate forest gaps. Forest Ecology and Management 127:249–269. (Accessed April 2011). LePage, P., C.D. Canham, K.D. Coates, & P. Bartemucci. 2000. Seed abundance versus substrate limitation of seedling recruitment in northern temperate forests of British Columbia. Canadian Journal of Forest Research 30(3):415–427. (Accessed April 2011). Coates, K.D. 2002. Tree recruitment in gaps of various size, clearcuts and undisturbed mixed forest of interior British Columbia, Canada. Forest Ecology and Management 155:387–398. Greene, D.F., C.D. Canham, K.D. Coates, & P. LePage. 2004. An evaluation of alternative dispersal functions for trees. Journal of Ecology 92:758–766.
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Coates, K.D. Kobe, R.K. LePage, P.T. Wright, E.F. Canham, C.D. Bartemucci, P. Quaglia, S. Burton, P.J.	Growth and yield	<ul style="list-style-type: none"> LePage, P. 1997. Stand structure and height growth patterns of mature, mixed-species forest stands in the ICH Zone. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Extension Note No. 22. Kobe, R.K. & K.D. Coates. 1997. Models of sapling mortality as a function of growth to characterize interspecific variation in shade tolerance of eight tree species of northwestern British Columbia. Canadian Journal of Forest Research 27(2):227–236. (Accessed April 2011). Wright, E.F., K.D. Coates, C.D. Canham, & P. Bartemucci. 1998. Species variability in growth response to light across a climatic gradient in northwestern British Columbia. Canadian Journal of Forest Research 28:871–886. (Accessed April 2011). Canham, C.D., K.D. Coates, P. Bartemucci, & S. Quaglia. 1999. Measurement and modeling of spatially-explicit variation in light transmission through Interior Cedar-Hemlock forests of British Columbia. Canadian Journal of Forest Research 29(11):1775–1783. (Accessed April 2011).

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Goward, T. Burgess, D. Banner, A. Miege, D. Goffinet, B.	Lichen	<ul style="list-style-type: none"> Goward, T. & D. Burgess. 1996. Epiphytic macrolichens as indicators of forest antiquity in the Kispiox Valley (ICHmc zone), with recommendations for the designation of special management areas. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished Contract Report. Goward, T. & D. Miege. 1996. Notes on the distributional ecology of epiphytic macrolichens in the Kispiox and Nass valleys, with special reference to species of old-growth forests. Part 1: The interior cedar–hemlock zone (moist cold subzone). B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished contract report. Goward, T. & B. Goffinet. 1993. <i>Nephroma silvaevetris</i>, a new lichen (Ascomytina) from the Pacific Northwest of North America. The Bryologist 96(2):242–243. Goward, T. 1995. <i>Nephroma occultum</i> and the maintenance of lichen diversity in British Columbia. Mitteilungen der Eidgenössischen Forschungsanstalt für Wald, Schnee und Landschaft 70:93–101. Goward, T. 1994. Notes on old growth-dependent epiphytic macrolichens in inland British Columbia, Canada. Acta Botanica Fennica 150:31–8. Goward, T. 1993. Date Creek study: Epiphytic lichen diversity. Progress report. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished contract report.
Kranabetter, M. Jones, M.D. Durall, D.M. Wright, E.F. Wylie, T. Kroeger, P. Hayden, S. Coates, K.D.	Ectomycorrhizae	<ul style="list-style-type: none"> Jones, M. 1994. Diversity of ectomycorrhizal fungi at Date Creek. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished. Jones, M. 1995. The effect of gap size on the fungal community at Date Creek: Ectomycorrhizae and sporocarps. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished contract report. Durall, D. 1995. The effect of gap size on the fungal community at Date Creek: A preliminary survey of ectomycorrhizal epigeous sporocarps. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished contract report. Durall, D. 1996. The effect of gap size on the fungal community at Date Creek: Year 2. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished contract report. Kroeger, P. 1997. Forest mushrooms of Date Creek: Some key field characteristics of ectomycorrhizal fruitbodies documented in July and August, 1996. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished. Kranabetter, M. 1997. The effects of timber harvesting on mushrooms and mycorrhizae of the Date Creek Research Forest. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Extension Note No. 25. Kranabetter, M. & T. Wylie. 1998. Ectomycorrhizal community structure across forest openings on naturally regenerated western hemlock seedlings. Canadian Journal of Botany 76:189–196. Kranabetter, J.M., S. Hayden, & E.F. Wright. 1999. A comparison of ectomycorrhiza communities from three conifer species planted on forest gap edges. Canadian Journal of Botany 77:1193–1198. Kranabetter, J.M. 1999. The effect of refuge trees on a paper birch ectomycorrhiza community. Canadian Journal of Botany 77:1523–1528. Durall, D.M., M.D. Jones, E.F. Wright, E.F., P. Kroeger, & K.D. Coates. 1999. Species richness of ectomycorrhizal fungi in cutblocks of different sizes in the

		<p>interior cedar-hemlock forests of northwestern British Columbia: Sporocarps and ectomycorrhizae. Canadian Journal of Forest Research 29(9):1322–1332. (Accessed April 2011).</p> <ul style="list-style-type: none"> • Kranabetter, J.M. & P. Kroeger. 2001. Ectomycorrhizal mushroom response to partial cutting in a western hemlock/western red cedar forest. Canadian Journal of Forest Research 31(6):978–987. (Accessed April 2011). • Kranabetter, J.M. & J. Friesen. 2002. Ectomycorrhizal community structure on western hemlock (<i>Tsuga heterophylla</i>) seedlings transplanted from forests into openings. Canadian Journal of Botany 80:861–868. • Kranabetter, J.M. 2004. Ectomycorrhizal community effects on hybrid spruce seedling growth and nutrition in clearcuts. Canadian Journal of Botany 82:983–991. • Kranabetter, J.M. 2005. Understory conifer seedling response to a gradient of root and ectomycorrhizal fungal contact. Canadian Journal of Botany 83:638–646.
Mahon, T. Steventon, D. Mackenzie, K.	Small mammals	<ul style="list-style-type: none"> • Steventon, J.D., K. Mackenzie, & T. Mahon. 1998. Response of small mammals and birds to partial cutting vs. clearcutting in northwest British Columbia. Forestry Chronicle 74:703–713.
MacKenzie, K. Steventon, D. Ott, P.K. Martin, K. Mahon, C. LeMay, V.	Birds	<ul style="list-style-type: none"> • Steventon, J.D., P.K. Ott, & K. MacKenzie. 1999. Effect of partial cutting on predation risk to artificial bird nests. Canadian Journal of Forest Research 29(12):1911–1915. (Accessed April 2011). • Mahon, C.L. & K. Martin. 2006. Nest survival of chickadees in managed forests: Habitat, predator, and year effects. Journal of Wildlife Management 70(5):1257–1265. • Mahon, C.L., K. Martin, & J.D. Steventon. 2007. Habitat attributes and Chestnut-backed Chickadee nest site selection in uncut and partial-cut forests. Canadian Journal of Forest Research 37:1272–1285. • Mahon, C.L., K. Martin, & V. LeMay. 2008. Do cross-scale correlations confound analysis of nest selection for Chestnut-backed Chickadees? The Condor 110(3):563–568. • Mahon, C.L., J.D. Steventon, & K. Martin 2008. Cavity and bark nesting bird response to partial cutting in northern conifer forests. Forest Ecology and Management 256(12):2145–2153.
Steventon, D. Patterson, D.A. Perdue, M.	Bats and amphibians	<ul style="list-style-type: none"> • Patterson, D.A. & J.D. Steventon. 1993. Amphibians of the Date Creek research area. B.C. Ministry of Forests, Forest Science Section, Smithers, B.C. Unpublished file report. • Perdue, M. 1996. Comparison of bat activity in four forest management regimes. BSc. thesis. University of British Columbia. Vancouver, B.C. • Perdue, M. & J.D. Steventon. 1996. Partial cutting and bats: A pilot study. In: Bats and Forest Symposium, October 19–21, 1995, Victoria, B.C. R.M.R. Barclay & R.M. Bingham (editors). Ministry of Forests, Research Branch, Victoria, B.C. Working Paper 23/1996. pp. 273–276.
Ashton, P.M.S. Olander, L.P. Beryln, G.P. Thadani, R. Cameron, I.R. Richardson, A.D. Temesgen, H. Weiskittel, A.R.	Tree biology	<ul style="list-style-type: none"> • Ashton, P.M.S., L.P. Olander, G.P. Berlyn, R. Thadani, & I.R. Cameron. 1998. Changes in leaf structure in relation to crown position and tree size of <i>Betula papyrifera</i> within fire origin stands of interior cedar-hemlock. Canadian Journal of Botany 76:1180–1187. • Richardson, A.D., G.P. Berlyn, P.M.S. Ashton, R. Thadani, & I.R. Cameron. 2000. Foliar plasticity of hybrid spruce in relation to crown position and stand age. Canadian Journal of Botany 78(3):305–317. • Temesgen, H. & A.R. Weiskittel. 2006. Leaf mass per area relationships across light gradients in hybrid spruce crowns. Trees 20:522–530.

APPENDIX 3: NORTHERN WETBELT

Trial name: Northern Wetbelt Series of sites (Lucille Mountain, Pinkerton Mountain, East Twin, Minnow and Lunate, Fleet Creek, Isaiah Creek)							
Trial website: http://wetbelt.unbc.ca (Accessed January 2012).							
Contacts	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Lucille Mountain EP 1119.01 Mike Jull jullm@unbc.ca Bruce Rogers Bruce.Rogers@gov.bc.ca	1991	ESSFmm1	Engelmann spruce Sub-alpine fir	Clearcut Group retention – 0.01–0.1 ha Group selection/patch 0.02 ha Irregular shelterwood Single tree selection	To better understand how forest management affects the following attributes of these wet mountain forests: - Microclimate - Understory plant succession - Vegetation competition - conifer regeneration - Windthrow - Arboreal lichen - Organic matter decomposition	None	2005 (climate measurements 1991 to present)
Pinkerton Mountain EP 1119.02 Mike Jull Bruce Rogers	1998	ESSFwc3	Sub-alpine fir Hybrid spruce	Group selection/patch cut – 0.1–0.3ha Single tree selection Uncut control	Determine effect of partial cutting on mountain caribou habitat, specifically in relation to: - Arboreal lichens - Regeneration - Vegetation - Sand structure - CWD (coarse woody debris) - Wildlife trees	None	2009 (climate measurements 1999–2006 approx)
Bearpaw Ridge EP 1119.03 Mike Jull Bruce Rogers	1999	ESSFwk2	Hybrid spruce Sub-alpine fir Western hemlock	Group selection/patch cut – 0.1–0.3ha Single tree selection Patch cut – 0.5–1.0ha Uncut control	Examine effects of silvicultural systems on: - Stand structure, productivity, regeneration, understory, and damage agents - Biodiversity attributes, especially wildlife trees and CWD	None	1999 (preharvest measurements only; block was not logged)
Northern Wetbelt Silvicultural Systems Project: East Twin, Minnow and Lunate study areas EP 1119.03 Mike Jull	2000–01	ICHwk3 ICHvk2	Western red cedar Western hemlock Hybrid spruce Sub-alpine fir	Clearcut Group retention – 30% post harvest retention Group selection – 70% post harvest retention	Examine effects of silvicultural systems on: - Stand structure, productivity, regeneration, understory, and damage agents - Biodiversity attributes, especially	None	2002 (CWD and PSP assessments) 2007 (regeneration assessments)

Bruce Rogers					wildlife trees and CWD		Climate measurements East Twin: 2001–2006; Minnow: 2002–2010; Lunate 2002–present
Fleet Creek EP 1119.02 Mike Jull Bruce Rogers	1994	ICHwk3	Western red cedar Western hemlock Sub-alpine fir Interior spruce Douglas-fir	Group selection – 0.24 ha	Test feasibility of group selection partial-cutting in wet-belt cedar hemlock forests in relation to: - Mountain caribou - Arboreal lichen - Snow interception - Ground vegetation - Regeneration	None	2004
Isaiah Creek EP1104.04 Susan Stevenson sksteven@telus.net Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca	2006	ICHwk2	Western red cedar Western hemlock Douglas-fir Hybrid spruce Subalpine fir	Group selection 33% removal – 0.3–0.9 ha Unharvested control	Test the feasibility of group selection partial cutting in wet-belt cedar hemlock forests in relation to: - Mountain caribou habitat protection - Wildlife trees - Stand structure - Logging productivity and costs - Arboreal lichens - Regeneration - Windthrow - Vegetation response - Canopy microarthropods	None	2010
<p>General publications:</p> <ul style="list-style-type: none">Jull, M., S.K. Stevenson, B. Rogers, P. Sanborn, A. Eastham, B. Sagar, & L Beaudry. 2001. Establishment report (first approximation): Summary of initial pre-harvest conditions and harvest treatments. University of Northern British Columbia. MoF E.P. 1119.03 (Pending). FRBC Project Number: OP96081–RE April, 2001. (Accessed March 2011).Jull, M., S.K. Stevenson, B. Rogers, P. Sanborn, A. Eastham, B. Sagar, & L Beaudry. 2002. Establishment report (second approximation): Summary of harvest treatments, monitoring installations, and overview of pre- and post-harvest conditions. University of Northern British Columbia Forest Renewal B.C. Research Project Number: OP96081–RE (1996–2001) and OPR02006-09 (2001/02). (Accessed March 2011).Stevenson, S.K., B.Bancroft, & M. Jull. 1993. Robson Valley partial-cutting project: Alternative silvicultural systems in the ICHwk3 subzone - problem analysis and working plan. Unpublished report prepared for the B.C. Ministry of Environment, Northern Interior Sub-region. Silvicultural Systems Project SS054.Stevenson, S., M. Jull, & B. Rogers. 2000. Field data collection protocol manual (second approximation) - For internal use by the Northern Wetbelt Silviculture Systems Project; Developed for use in biogeoclimatic subzone variants: ICHwk3, ICHvk2, ESSFwk3 and ESSFwk2. (Accessed March 2011).Stevenson, Susan K., J. Heineman. E. Phillips, & D. Coxson. 2009. Group selection in low elevation mountain caribou habitat in the Quesnel Highland: Isaiah Creek Project. Establishment Report. EP 1104.04. Unpublished report prepared for West Fraser Timber and B.C. Ministry of Forests and Lands.Beaudry, L. 1999. Ecological description of silviculture systems research sites in the Prince George Forest Region. Contract Report with maps and appendices. December 1999. Madrone Consultants, Prince George,							

<p>B.C. Completed as part of the Northern Rockies ICH-ESSF Silvicultural Systems Project, Phase III. Forest Renewal B.C., Research Project OP96081–RE. (Accessed March 2011).</p> <ul style="list-style-type: none">• DeLong, C., M. Osberg, D. Coopersmith, & W. Hays. 1991. Working plan: Comparison of forest management techniques for high-elevation forests: The Lucille Mountain project. Working Plan for Experimental Project (EP) 1119, B.C. Ministry of Forests. Prince George Forest Region / Research Branch. Victoria, B.C. Unpublished report.• Jull, M., S.K. Stevenson, A. Eastham, & P. Sanborn. 2000. Working Plan: The Northern Wetbelt Silvicultural Systems Project - A study of alternative silvicultural systems in northern wetbelt ICH and ESSF forests. Working Plan for Forest Renewal B.C. Research Project OP96081–RE. (Accessed March 2011).
Comments:

Researchers involved	Values assessed	Publications
Jull, M.D. Coxson, D.S. Stevenson, S.K. Lousier, D. Sagar, B Armleder, H.M. Arsenault, A. DeLong, S.C.	Publications that cover multiple values	<ul style="list-style-type: none">• Jull, M., D. Coxson, S. Stevenson, D. Lousier, & M. Walters (compilers). 1998. Ecosystem dynamics and silvicultural systems in Interior Wetbelt ESSF and ICH forests. Workshop Proceedings, June 10–12, 1997. 21 papers given at the Wetbelt ESSF and ICH workshop, University of Northern British Columbia, Prince George, B.C. UNBC Press, Prince George, B.C. (Accessed March 2011).• Jull, M., S. Stevenson, & B. Sagar. 1999. Group selection in old cedar hemlock forests: Five-year results of the Fleet Creek partial-cutting trial. B.C. Ministry of Forests, Prince George Forest Region, Research Note PG-20. (Accessed March 2011).• Jull, M.J. & S.K. Stevenson (editors). 2001. The Lucille Mountain Study: 8-year results of a silvicultural systems trial in the Engelmann Spruce-Subalpine Fir Zone. B.C. Ministry of Forests Working Paper 59. Victoria, B.C. (Accessed March 2011)• Stevenson, S.K., H.M. Armleder, A. Arsenault, D.S. Coxson, C. DeLong, & M.J. Jull. 2011. British Columbia's Inland Rainforest: Ecology, conservation, and management. UBC Press, Vancouver.
Armleder, H.M. Stevenson, S.K. Jull, M.J. King, D.G. McLellan, B.N. Coxson, D.S.	Mountain caribou	<ul style="list-style-type: none">• Armleder, H.M. & S.K. Stevenson. 1996. Using alternative silvicultural systems to integrate mountain caribou and timber management in British Columbia. Rangifer Special Issue No 9:141–149.• Stevenson, S.K., H.M. Armleder, M.J. Jull, D.G. King, B.N. McLellan, & D.S. Coxson. 2001. Mountain caribou in managed forests: Recommendations for managers: Second Edition. B.C. Ministry of Environment, Lands, and Parks, Victoria, B.C. Wildlife Report No. R-26.
Coxson, D.S. Stevenson, S.K. Benson, S. Campbell, J.	Lichen	<ul style="list-style-type: none">• Stevenson, S.K. & D.S. Coxson. 2000. Effects of partial cutting on arboreal lichens used by mountain caribou. In: Proceedings, biology and management of species and habitats at risk, Kamloops, B.C., February 15–19, 1999. L.M. Darling. (editor). B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. and University College of the Cariboo, Kamloops, B.C. pp. 663–664,• Bensen, S. & D.S. Coxson. 2002. Lichen colonization and gap structure in wet-temperate rainforests of northern interior British Columbia. The Bryologist 105(4):673–692. (Accessed March 2011).• Coxson, D.S., S.K. Stevenson, & J. Campbell. 2003. Short-term impacts of partial cutting on lichen retention and canopy microclimate in an Engelmann Spruce-Subalpine fir forest in north-central British Columbia. Canadian Journal of Forest Research 33:830–841. (Accessed March 2011).• Stevenson, S.K. & D.S. Coxson. 2004. Short-term effects of partial cutting on arboreal forage lichens at Pinkerton Mountain. Biology Program, University of Northern British Columbia Forest Research Update NR-3. Prince George, B.C. (Accessed March 2011).• Coxson, D.S. & S.K. Stevenson. 2005. Retention of canopy lichens after partial-cut harvesting in wet-belt interior cedar-hemlock forests, British Columbia, Canada. Forest Ecology and Management 204:99–114. (Accessed March 2011).• Coxson, D.S. & S.K. Stevenson. 2007. Influence of high-contrast and low-contrast forest edges on growth rates of <i>Lobaria pulmonaria</i> in the inland rainforest, British Columbia. Forest Ecology and Management 253:103–111.• Coxson, D.S. & S.K. Stevenson. 2007. Growth rate responses of <i>Lobaria pulmonaria</i> to canopy structure in even-aged and old-growth cedar-hemlock forests of central-interior British Columbia, Canada. Forest Ecology and Management 242:5–16. (Accessed March 2011).• Stevenson, S.K. & D.S. Coxson. 2003. Litterfall, growth and turnover of arboreal lichens after partial cutting in an Engelmann spruce-subalpine fir forest in north-central British Columbia. Canadian Journal of Forest Research 33:2306–2320. (Accessed March 2011).

		<ul style="list-style-type: none"> Stevenson, S.K. & D.S. Coxson. 2007. Arboreal forage lichens in partial cuts - a synthesis of research results from British Columbia, Canada. Rangifer 17:155–165. (Accessed March 2011). Stevenson, S.K. & D.S. Coxson. 2008. Growth responses of <i>Lobaria retigera</i> to forest edge and canopy structure in the inland temperate rainforest, British Columbia. Forest Ecology and Management 256:618–223. Stevenson, S.K. & D.S. Coxson. 2009. Effects of partial cutting on forage lichens for caribou in a subalpine forest: The Pinkerton Mountain Silvicultural Systems Trial revisited 10 years after harvesting. Natural Resources and Environmental Studies Institute Research Extension Note No. 3, University of Northern British Columbia, Prince George, B.C., Canada. (Accessed March 2011).
Eastham, A.M. Jull, M.J. Lajzerowicz, C.C.	Regeneration	<ul style="list-style-type: none"> Eastham, A.M. & M.J. Jull. 1999. Factors affecting natural regeneration of <i>Abies lasiocarpa</i> and <i>Picea engelmannii</i> in a subalpine silvicultural systems trial. Canadian Journal of Forest Research 29:1847–1855. (Accessed March 2011). Eastham, A.M. & M.J. Jull. 2003. Natural regeneration of Engelmann spruce and subalpine fir 9-years after seedbed treatment in three harvest treatments. In: Proceedings Regeneration Issues in Partial Cutting, FERIC workshop, October 30, 2003. University of Northern British Columbia, Prince George, B.C. (Accessed March 2011). Lajzerowicz, C.C., A. Vyse, M.Jull, & T. Newsome. 2006. Performance of planted Engelmann spruce and subalpine fir seedlings in British Columbia's southern mountains. Forestry Chronicle 82:82–94.
Stevenson, S.K. Lindo, Z.	Canopy microarthropods	<ul style="list-style-type: none"> Lindo, Z. & S.K. Stevenson. 2007. Diversity and distribution of oribatid mites (Acari: Oribatida) associated with arboreal and terrestrial habitats in Interior Cedar-Hemlock forests, British Columbia, Canada. Northwest Science 81:305–315.
Stevenson, S.K. Keisker, D.G. Phillips, E. Rogers, B.J. Jull, M.J.	Coarse woody debris and wildlife trees	<ul style="list-style-type: none"> Stevenson, S.K. & D.G. Keisker. 2002. Evaluating the effects of partial cutting on wildlife trees and coarse woody debris. In: Proceedings, ecology and management of dead wood in Western Forests, Reno, Nevada, November 24, 1999. W.F. Jr. Laudenslayer, P.J. Shea, B.E. Valentine, C.P. Weatherspoon, & T.E. Lisle (technical coordinators). USDA Forest Service General Technical Report PSW-GTR-181. Albany, C.A. pp. 753–763. Stevenson, S.K., M.J. Jull, & B.J. Rogers 2006. Abundance and attributes of wildlife trees and coarse woody debris at three silvicultural systems study areas in the Interior Cedar-Hemlock Zone, British Columbia. Forest Ecology and Management 233:176–191. Stevenson, S.K & E. Phillips. 2009. Pre-harvest stand structure and wildlife habitat attributes at a group selection site in the Interior Cedar-Hemlock Zone. Natural Resources and Environmental Studies Institute Research Extension Note No. 4, University of Northern British Columbia, Prince George, B.C.
Renzie, C. Han, H. Phillips, E.	Harvesting costs	<ul style="list-style-type: none"> Renzie, C. & H. Han. 2000. Operational analysis of partial cut and clearcut harvesting methods in north-central Interior ICH/ESSF forests (Part 1 - East Twin). Final Report to the Robson Valley Enhanced Forest Management Pilot Project (EFMPP). Forestry Program, University of Northern British Columbia. (Accessed March 2011). Renzie, C. & H. Han. 2002. Operational analysis of partial cut and clearcut harvesting methods in north-central Interior ICH mountain forests, Part 2 (Minnow Creek). Final Report to the Robson Valley Enhanced Forest Management Pilot Project (EFMPP). Forestry Program, University of Northern British Columbia, and Department of Forest Products, University of Idaho. (Accessed March 2011). Renzie, C. & H.-S. Han. 2008. Harvesting productivity and cost of clearcut and partial cut in interior British Columbia. Journal of Forest Science 24:1–14. Phillips, E. 2010. Cost and productivity of alternative harvesting in BC's interior wet-belt designed to maintain caribou habitat. FPInnovations FERIC Advantage 11(27). (Accessed January 2012). Renzie, C. & H.-S. Han. n.d. A comparison of harvesting productivity and cost between partial cut and clearcut treatments in old cedar-hemlock forests in central British Columbia. (Accessed March 29, 2011).

APPENDIX 4: SUMMIT LAKE

Trial name: Summit Lake Residual Basal Area Density Study (EP1162)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Mike Jull jullm@unbc.ca	1991	SBSmk1	White spruce Sub-alpine fir Douglas-fir Lodgepole pine	10 m ² /ha residual basal area 20 m ² /ha residual basal area Uncut control	- Stand growth and development - Natural regeneration - Mortality and windthrow - Logging damage	- Post-harvest sanitation felling of damaged stems - Post-harvest planting of spruce seedlings	2009
General publications: • Jull, M. 1992. Summit Lake Project Working Plan: Silvicultural systems research project SS015. B.C. Ministry of Forests, Prince George Forest Region, Forest Sciences Section. Unpublished report.							
Comments: Still active but have been unable to secure funding for remeasurement.							

APPENDIX 5: QUESNEL HIGHLAND

Trial name: Group selection systems for high elevation forests (ESSFwc3) to maintain caribou habitat in the Cariboo Region (EP1104.02) (aka Quesnel Highland Alternative Silvicultural Systems)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca Teresa Newsome Teresa.Newsome@gov.bc.ca	1990	ESSFwc3	- Engelmann spruce - Subalpine fir - Lodgepole pine	- Clearcut - Group selection with 0.03 ha to 1.0 ha openings 3 phases of project development: - Pilot block - Replicated trial - Adaptive management trial (aka Mount Tom)	- Maintain mountain caribou habitat and old growth characteristics in managed forests (lichen response) - Measure tree regeneration and growth response (planted stock and natural regeneration) - Measure the vegetation development - Measure stand structure and stability - Monitor microclimate - Document the incidence of forest health problems in group selection - Measure snow accumulation and melt - Measure wildlife response (caribou, small mammal, and bird populations)	The group selection treatments based on opening size. Planted stock studies: microsites (mounding, stump, rotten wood) Vegetation, microclimate and planted stock- distance from opening/forest edge.	2010
<p>General publications:</p> <ul style="list-style-type: none">• Armleder, H.M., S.K. Stevenson, & S.D. Walker. 1992. Estimating the abundance of arboreal forage lichens. B.C. Ministry of Forests, Victoria, B.C. Land Management Handbook Field Guide Insert 7. (Accessed Feburary 2011).• Armleder, H.M. & S.K. Stevenson. 1995. Silviculture systems to maintain caribou habitat in managed British Columbia forests. In: Innovative silviculture systems in boreal forests symposium, October 2–8, 1994, Edmonton, Alberta. C.R. Bamsey. (editor). Natural Resources Canada, Canadian Forest Service, Edmonton, A.B. pp 83–87. (Accessed Feburary 2011).• Armleder, H.M. & S.K. Stevenson. 1996. Using alternative silvicultural systems to integrate mountain caribou and timber management in British Columbia. Rangifer Special Issue 9:141–148.• Armleder, H.M., J.A. Young, & J.A. Youds. 2000. A management strategy for mountain caribou: The Cariboo Region example. In: Proceedings of a conference on the biology and management of species and habitats at risk, Kamloops, B.C., February 15–19, 1999. Volume Two. B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. and University College of the Cariboo, Kamloops, B.C. pp. 645–651.• Armleder, H.M. 2002. A 21st century approach to forest management for mountain caribou. In: Proceedings of Mountain caribou in 21st century ecosystems. Columbia Mountains Institute of Applied Ecology. Revelstoke, B.C. October 16–18, 2002. http://www.cmiae.org/ PDF/Caribou_2002-summary.pdf(Accessed Feburary 2011).• Armleder, H.A., M.J. Waterhouse, T. Newsome, P. Teti, K. Soneff, L. Gardner, P. Andrews, & J. Young. 2002. Mount Tom adaptive management project overview. B.C. Ministry of Forests, Cariboo Forest Region, Williams Lake, B.C. Extension Note No. 37.• Armleder, H.M. & M.J. Waterhouse. 2010. Planning for mountain caribou: Habitat management for a species at risk. B.C. Forest Professional 17(1):20–21. (Accessed Feburary 2011).• Perry, J. 1993. Group selection systems for high elevation forests in the Cariboo Forest Region. B.C. Ministry of Forests, Cariboo Forest Region, Williams Lake, B.C. Extension Note No. 9. (Accessed Feburary 2011).• Ministry of Forests, Lands, and Natural Resource Operations. 2005. Annual technical report 2004-05. (Accessed Feburary 2011). [Note: This source has links to other projects and publications.]• Stevenson, S.K., H.M. Armleder, M.J. Jull, D.G. King, E.L. Terry, G.S. Watts, B.N. McLellan, & K.N. Child. 1996. Mountain caribou in managed forests: Preliminary recommendations for managers. B.C. Ministry of							

<p>Forests, Forest Science Program, Victoria, B.C. Miscellaneous report 30. Accessed February 2011).</p> <ul style="list-style-type: none"> Stevenson, S.K., A.N. Lance, & H.M. Armleder. 1998. Estimating the abundance of arboreal forage lichens: User's guide. B.C. Ministry of Forests, Victoria, B.C. Land Management Handbook 43. (Accessed February 2011). Stevenson, S.K., H.M. Armleder, M.J. Jull, D.G. King, B.N. McLellan, & D.S. Coxson. 2001. Mountain caribou in managed forests: Recommendations for managers - second edition. B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. Wildlife Report R-26. (Accessed February 2011). Waterhouse, M. & K. Soneff. 1997. Progress report on group selection systems for high elevation forests in the Cariboo Forest Region. B.C. Ministry of Forests, Cariboo Forest Region, Williams Lake, B.C. Extension Note No. 22. (Accessed February 2011). Waterhouse, M.J. (editor). 2011. Group selection silvicultural systems for high elevation forests (ESSFwc3) to maintain caribou habitat in the Cariboo Region: Mount Tom adaptive management trial establishment report. B.C. Ministry of Forests and Range, Victoria, B.C. Technical Report 64. (Accessed February 2011). Wiensczyk, A. & M. Waterhouse. 2005. Using group selection systems to maintain caribou habitat. LINK 7(1):9. (Accessed February 2011). Youds, J., J. Young, H.M. Armleder, M. Lloyd, M. Pelchat, M. Folkema, C. Bauditz, & R. Hoffos. 2000. Cariboo Chilcotin land use plan: Mountain caribou strategy. Cariboo Mid-coast Interagency Management Committee. Special Report. Williams Lake, B.C. (Accessed February 2011).
Comments:

Researchers involved	Values assessed	Publications
Newsome, T. Armleder, H.M. Waterhouse, M.J. Steen, O. Coupé, R.A.	Regeneration – planted and natural	<ul style="list-style-type: none"> Newsome, T., H. Armleder, M. Waterhouse, & O. Steen, 2000. Fifth year results from group selection harvesting in the ESSFwc3 on windthrow, artificial and natural regeneration. Cariboo Forest Region, Research Section, Williams Lake, B.C. Extension Note No.30. (Accessed February 2011). Lajzerowicz, C., A. Vyse, M. Jull, & T. Newsome. 2006. Performance of planted Engelmann spruce and subalpine fir seedlings in British Columbia's southern mountains. The Forestry Chronicle 82:84–94. (Accessed February 2011). Steen, O.A., R.A. Coupé, & M.J. Waterhouse. 2008. Natural regeneration of subalpine fir and Engelmann spruce in partially harvested high-elevation stands in east-central British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Research Report No. 28. (Accessed February 2011).
Waterhouse, M.J. Armleder, H.M. Ransome, D.B. Lindgren, P.M.F. Sullivan, T.P.	Small mammal response Wildlife diversity	<ul style="list-style-type: none"> Armleder, H.M. & M.J. Waterhouse. 1994. Wildlife diversity in managed high elevation forests. B.C. Ministry of Forests Cariboo Forest Region Extension Note No. 14. (Accessed February 2011). Waterhouse, M.J., R. B. Catton, & H.M. Armleder. 2004. Small mammal response to group selection silvicultural systems in Engelmann spruce – subalpine fir forests. B.C. Journal of Ecosystems and Management 3(2):1–15. (Accessed February 2011). Ransome, D.B., P.M.F. Lindgren, M.J. Waterhouse, H.M. Armleder, & T.P. Sullivan. 2009. Small-mammal response to group-selection silvicultural systems in Engelmann spruce – subalpine fir forests 14 years postharvest. Canadian Journal of Forest Research 39:1698–1708. (Accessed February 2011).
Davis, L.R. Waterhouse, M.J. Armleder, H.M.	Birds	<ul style="list-style-type: none"> Davis, L.R., M.J. Waterhouse, & H.M. Armleder. 1999. A comparison of breeding bird communities in seral stages of the Engelmann Spruce–Subalpine Fir zone in east central British Columbia. B.C. Ministry of Forests, Victoria, B.C. Working paper No. 39. (Accessed February 2011).
Armleder, H.M. Waterhouse, M.J.	Arboreal lichens Stand stability	<ul style="list-style-type: none"> Waterhouse, M.J., H.M. Armleder, & A.F.L. Nemec. 2007. Arboreal forage lichen response to partial cutting of high elevation mountain caribou range in the Quesnel Highland of east-central British Columbia. Rangifer Special Issue 17:141–153.
Steen, O. Coupe, R.A. Armleder, H.M. Dawson, R.	Stand structure	<ul style="list-style-type: none"> Steen, O., R. Coupé, H. Armleder, & R. Dawson. 2005. Development and structure of three high elevation old spruce – fir stands in the Quesnel Highland of east central British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Research Report No. 26. (Accessed February 2011).

Teti, P.	Snow	<ul style="list-style-type: none">• Teti, P. 2001. A new instrument for measuring shade provided by overhead vegetation. Cariboo Forest Region, Research Section, Williams Lake, B.C. Extension Note No.34. (Accessed February 2011).• Teti, P. 2003. The effects of group selection on peak snow accumulation in the ESSF. B.C.. Ministry of Forests, Southern Interior Region, Williams Lake, B.C. Extension Note No. 38.• Teti, P. 2003. Relations between peak snow accumulation and canopy density. The Forestry Chronicle 79(2):307–312. (Accessed February 2011).• Teti, P. 2004. Effects of small logged openings on snow ablation during a high snow year. In: Proceedings of the Western Snow Conference 72 Annual Meeting, Richmond, B.C. April 19–22, 2004. K. Elder. & B. McGurk (editors). (Accessed January 2012).
Stathers, R.J. Newsome, T. Waterhouse, M.J. Sutherland, C.	Microclimate	<ul style="list-style-type: none">• Stathers, R.J., T. Newsome, M.J. Waterhouse, & C. Sutherland. Microclimate studies on a group selection silviculture system in a high-elevation ESSFwc3 forest in the Cariboo Forest Region. Forest Science Program, B.C. Ministry of Forests, Victoria, B.C. Working Paper 58/2001. (Accessed February 2011).
Sambo, S.M.	Logging costs Damage to residual trees	<ul style="list-style-type: none">• Sambo, S.M. 2003. Using a group selection silvicultural system to maintain caribou habitat in southern British Columbia. FERIC Advantage Report 4(4):15.

APPENDIX 6: VIEWLAND MOUNTAIN

Trial name: Silvicultural systems for Douglas-fir stands on very deep snowfall Mule Deer Winter Ranges in the Cariboo Forest Region (EP1212) (aka Viewland Mountain)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Teresa Newsome Teresa.Newsome@gov.bc.ca Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca	1996	ICHmk3	Douglas-fir	Group selection Patch cut Various opening sizes (0.25–2.0 ha) and orientation.	To study impacts of partial cutting on: - Douglas-fir regeneration and growth - Vegetation response - Snowpack deep and density - Mule deer use - Stand stability	Site preparation	2007
General publications: • Waterhouse, M.J. 1998. Silvicultural systems for Douglas-fir stands on very deep snowfall Mule Deer Winter Ranges . B.C. Ministry of Forests, Cariboo Forest Region, Research Extension Note No. 23. (Accessed February 2011). • Dawson, R.J., H.M. Armleder, B.A. Bings, & D.E. Peel. 2006. Management strategy for Mule Deer Winter Ranges in the Cariboo-Chilcotin – Part 1B: Management plan for transition and deep snowpack zones . B.C. Ministry of Forests Range, Research Branch, Victoria, B.C. Land Management Handbook 59. (Accessed February 2011).							
Comments:							

Researchers involved	Values assessed	Publications
Waterhouse, M.J. Dawson, R.J.	Regeneration Vegetation Mule deer use Snowpack depth and density Treefall	• Waterhouse, M.J. 2009. Silvicultural systems on a deep snowpack, Mule Deer Winter Range in the central interior of British Columbia: 10 year update . B.C. Ministry of Forests and Range, Forest Science Program, Victoria, B.C. Extension Note No. 89. (Accessed February 2011).
Waterhouse, M.J. Eastham, A. Daintith, N.	Regeneration and vegetation	• Waterhouse, M.J. & A. Eastham. 2005 Assessment of silvicultural systems developed for deep snowpack, Mule Deer Winter Range in the central interior of British Columbia; regeneration and vegetation components . B.C. Ministry of Forests, Research Branch, Victoria, B.C. Technical Report No. 21. (Accessed February 2011).
Chapman, B. Xiao, G. Myers, S.	Root disease	• Chapman, B. Xiao, G, & S. Myers. 2004. Early results from field trials using <i>Hypholoma fasciculare</i> to reduce <i>Armillaria ostoyae</i> root disease . Canadian Journal of Botany 82:962–969. (Accessed February 2011).
Mitchell, J.	Harvesting costs	• Mitchell, J. 2000. Feasibility of harvesting timber from small canopy openings in wetbelt Douglas-fir stands. FERIC Advantage 1(2).

APPENDIX 7: UNIFORM SHELTERWOOD

Trial name: Uniform shelterwood systems for even-aged Douglas-fir and lodgepole pine stands in the Sub Boreal Spruce (dry warm) subzones in the Cariboo Forest Region (EP1104.01) (aka Uniform Shelterwood Trial)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse michaela.waterhouse@gov.bc.ca Teresa Newsome teresa.newsome@gov.bc.ca Ken Day ken.day@ubc.ca	1990	SBSdw1	Douglas-fir Lodgepole pine	Uniform shelterwood using preparation cuts, regeneration cuts, second regeneration cuts and no-harvest and clearcut controls	Can Douglas-fir be successfully regenerated using partial retention to reduce frost damage? Can growth of the residual trees be used to offset mid-term timber supply? To study the impact of silviculture systems on: <ul style="list-style-type: none">- Microclimate (frost)- Tree regeneration density and growth (natural and planted)- Seedfall periodicity- Stand stability- Vegetation response- Small mammal use- Overstory tree growth	<ul style="list-style-type: none">- First entry – 1991 – 2 levels of basal area retention (30 and 40 m²) and 2 harvesting methods (feller buncher / hand falling)- Second entry – 2001- Five levels of BA retention (15, 20, 30 ,40, 60 m²)	2010
General trial publications: <ul style="list-style-type: none">• Sutherland, C. 1994. Uniform shelterwood systems for Douglas-fir/lodgepole pine stands. Research Section, Cariboo Forest Region, B.C. Ministry of Forests. Extension Note No. 11. (Accessed February 2011).• Waterhouse, M.J. 2001. Silvicultural systems research in the Cariboo Forest Region (Uniform shelterwood systems for even-aged Douglas-fir/lodgepole pine stands in the SBSdw1 subzone). Forest Renewal B.C. Research Program Final Report – CC927-RE/A FR-96/97-705. (Accessed February 2011).• Waterhouse, M.J. 2005. Shelterwood silvicultural systems to address integrated resource management issues. Forest Investment Account (FIA) Annual Technical Report 2004/05. Project Y051043. (Accessed February 2011).• Wiensczyk, A. & M. Waterhouse. 2005. Shelterwood silviculture trials address resource issues. LINK 7(1):24–25. (Accessed February 2011).• Waterhouse, M.J., T.A. Newsome, & A. Arsenault. 2006. Shelterwood silvicultural systems to address integrated resource management issues – Executive Summary 2005/06. FIA Annual Report Project Y062043. (Accessed February 2011).							
Comments: Some challenges with Mountain Pine Beetle.							

Researchers involved	Values assessed	Publications
Waterhouse, M.J. Newsome, T.A. Burton, P.J. Daintith, N.M. Sutherland, D.C.	Multiple values including: <ul style="list-style-type: none">- Seedfall, predation, germination, and survival- Vegetation- Natural regeneration densities and growth- Planted stock- Tree fall- Microclimate- Stand structure- Bark beetles	<ul style="list-style-type: none">• Waterhouse, M.J. 1999. Uniform shelterwood systems for Douglas-fir and lodgepole pine stands. Update–Year 8. Research Section, Cariboo Forest Region, B.C. Ministry of Forests. Extension Note No. 28. (Accessed February 2011).• Burton, P.J., D.C. Sutherland, N.M. Daintith, M.J. Waterhouse, & T.A. Newsome. 2000. Factors influencing the density of natural regeneration in uniform shelterwoods dominated by Douglas-fir in the Sub-Boreal Spruce zone. B.C.Ministry of Forests, Working Paper No. 47. (Accessed February 2011).• Waterhouse, M.J. & T.A. Newsome. 2006. Uniform shelterwood systems in the Sub-boreal spruce zone: Update for Year 15 (phase 2). B.C. Ministry of Forests Range, Southern Interior Forest Region, Kamloops, B.C. Extension Note No. 03. (Accessed February 2011).
Mitchell, J.L. Hedin, I.B.	Harvesting costs Damage to regeneration Damage to residual trees	<ul style="list-style-type: none">• Mitchell, J.L. & I.B. Hedin. 2002. Shelterwood harvesting in interior Douglas-fir: Second entry of a three-entry system. FERIC Advantage Report 3(22):12.
Mitchell, S.J.	Overstory response	<ul style="list-style-type: none">• Mitchell, S.J. 2001. Summary of shelterwood codominant ten year response in 50% BA removal treatment. Alex Fraser Research Forest Quicksheet No. 17.
von Treba, C. Sullivan, T.P.	Small mammals	<ul style="list-style-type: none">• von Treba, C., D.P. Lavender, & T.P. Sullivan. 1998. Relations of small mammal populations to even-aged shelterwood systems in sub-boreal spruce forest. Journal of Wildlife Management 62(2):630–642.• von Treba, C.D. 1994. Relationship of small mammal populations to uniform even-aged shelterwood systems. MSc thesis. University of British Columbia, Vancouver, B.C.
Mitchell, S.J.	Windthrow	<ul style="list-style-type: none">• Mitchell, S.J. 1995. Windthrow assessment EP 1104.01 – Shelterwoods. Cariboo Forest Region – Research Section. Unpublished report.

APPENDIX 8: ITCHA-ILGACHUZ

Trial name: Silvicultural systems to maintain northern caribou habitat in lodgepole pine forests in the MSxv and SBPSxc subzones in the Cariboo Region (EP1208) (aka Itcha-Ilgachuz Alternative Silvicultural Systems trial)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca	1994	SBPSxc MSxv	Lodgepole pine Hybrid spruce Subalpine fir	Clearcut Irregular group shelterwood – stem-only harvesting (50% area retention) Irregular group shelterwood – whole tree harvesting (50% area retention) Group selection (70% area retention) No-harvest controls In 3 phases: - Pilot block - Replicated trial - Adaptive management trial	To test the impact of partial cutting and Mountain Pine Beetle on: - Lichen (caribou forage) - Vegetation - Birds - Commercial mushrooms - Regeneration (natural and planted) - Microclimate - Stand stability - Long-term site productivity	None	2010
General publications: <ul style="list-style-type: none">• Armleder, H. & M. Waterhouse. 1994. Demonstration of alternative silvicultural systems for lodgepole pine. B.C. Ministry of Forests, Cariboo Forest Region, Williams Lake, B.C. Extension Note No. 12. (Accessed February 2011).• B.C. Ministry of Forests. 1996. Silvicultural systems for lodgepole pine and Northern Caribou. B.C. Ministry of Forests, Cariboo Forest Region, Research Section, Williams Lake, B.C. Extension Note No. 19. (Accessed February 2011).• Waterhouse, M. & H. Armleder. 2005. Itcha-Ilgachuz alternative silvicultural systems project 1995-2005: Research update. B.C. Ministry of Forests, Southern Interior Region, Extension Note No. 02. (Accessed February 2011).• Wiensczyk, A. & M. Waterhouse. 2005. Lodgepole pine forests in central British Columbia: Silvicultural systems to address integrated management issues. LINK 7(1):8. (Accessed February 2011).• Youds, J., J. Young, H. Armleder, M. Folkema, M. Pelchat, R. Hoffos, C. Bauditz, & M. Lloyd. 2002. Cariboo-Chilcotin land-use plan: Northern caribou strategy. Cariboo Mid-Coast Interagency Management Committee, Williams Lake, B.C. Special Report.							
Comments: This trial has become more complex with the Mountain Pine Beetle killing 60% of the overstorey trees by 2008.							

Status of British Columbia's Long-term Silvicultural Systems Research Trials

Researchers involved	Values assessed	Publications
Armleder, H.M. Waterhouse, M.J.	Caribou	<ul style="list-style-type: none"> Armleder, H. & M. Waterhouse. 2008. Mountain pine beetle and northern caribou: The Itcha-Ilgachuz experience. In: Mountain Pine Beetle: From Lessons Learned to Community-based Solutions Conference Proceedings, June 10–11, 2008. B.C. Journal of Ecosystems and Management 9(3):102–105. (Accessed February 2011).
Waterhouse, M.J. Daintith, N. Steen, O. Armleder, H.M.	Regeneration	<ul style="list-style-type: none"> Waterhouse, M.J., N. Daintith, & O. Steen. 2001. Itcha-Ilgachuz Alternative Silvicultural Systems Project: Microclimate, planted stock and natural regeneration. B.C. Ministry of Forests, Cariboo Forest Region, Research Section, Williams Lake, B.C. Extension Note No. 35. (Accessed February 2011). Daintith, N., M. Waterhouse, & H. Armleder. 2005. Seedling response following partial cutting in lodgepole pine forests on caribou winter range in west-central British Columbia. The Forestry Chronicle 81:409–417. Steen, O.A., M.J. Waterhouse, H.M. Armleder, & N.M. Daintith. 2007. Natural regeneration of lodgepole pine following partial harvesting on northern caribou winter range in west-central British Columbia. B.C. Journal of Ecosystems and Management. 8(1):61–74. (Accessed February 2011). Waterhouse, M.J., E.C. Wallich, N.M. Daintith, & H.M. Armleder. 2010. Planted stock performance 10-years after partial cutting in west- central British Columbia. The Forestry Chronicle 86(1):118–129.
Waterhouse, M.J. Armleder, H.M. Miège, D.J., Goward, T.	Lichen	<ul style="list-style-type: none"> Miège, D., T. Goward, H. Armleder, M. Waterhouse, & D. Burgess. 2000. Impact of partial cutting on lichen diversity in lodgepole pine forests on the Chilcotin Plateau in British Columbia. B.C. Ministry of Forests, Research Branch ,Victoria, B.C. Working Paper No. 55. (Accessed February 2011). Miège, D., H. Armleder, M. Waterhouse, & T. Goward. 2001. A pilot study of silvicultural systems for northern caribou winter range: Lichen response. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Working Paper No. 56. (Accessed February 2011). Waterhouse, M.J., H.M. Armleder, & A.F.L. Nemec. 2011. Terrestrial lichen response to partial cutting in lodgepole pine forests on caribou winter range in west-central British Columbia. Rangifer 19:119–134.
Sagar, R.M. Waterhouse, M.J. Chapman, B.	Microclimate	<ul style="list-style-type: none"> Sagar, R.M., M.J. Waterhouse, & B. Chapman. 2005. Microclimate studies in silvicultural systems on the Chilcotin Plateau of British Columbia: The Itcha-Ilgachuz project (1997-2003). B.C. Ministry of Forests. Research Branch, Victoria, B.C. Technical Report No. 22. (Accessed February 2011).
Waterhouse, M.J. Armleder, H.M.	Stand stability	<ul style="list-style-type: none"> Waterhouse, M.J. & H.M. Armleder. 2004. Windthrow in partially cut lodgepole pine forests in West-Central British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Extension Note No. 70. (Accessed February 2011).
Waterhouse, M.J. Armleder, H.M.	Birds	<ul style="list-style-type: none"> Waterhouse, M.J. & H.M. Armleder. 2007. Forest bird response to partial cutting in lodgepole pine forests on caribou winter range in west-central British Columbia. B.C. Journal of Ecosystems and Management 8(1):75–90. (Accessed February 2011).
Wei, X. Liu, W. Waterhouse, M.J. Armleder, H.M.	Long-term site productivity	<ul style="list-style-type: none"> Wei, X., W. Liu, M. Waterhouse, & H. Armleder. 2000. Simulations on impacts of different management strategies on long-term site productivity in lodgepole pine forests of the central interior of British Columbia. Forest Ecology and Management 133:217–229.

APPENDIX 9: OPAX MOUNTAIN

Trial name: Opax Mountain Silvicultural Systems Research Project (EP1295)							
Trial website: http://www.for.gov.bc.ca/rsi/research/opax/index.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Walt Klenner Walt.Klenner@gov.bc.ca	1991	IDFdk2 IDFhx2	Douglas-fir Lodgepole pine Trembling aspen Hybrid spruce Paper birch	80% and 50% retention Aggregated and dispersed Openings 0.1, 0.4 and 1.6 ha 2 replications	To study the effects of silvicultural systems on: <ul style="list-style-type: none">- Microclimate- Soil and soil organisms- Coarse woody debris- Tree regeneration and growth- Arboreal lichens- Ground arthropods- Vegetation- Sporocarps- Songbirds, woodpeckers- Small mammals- Snow- Windthrow	None	2010
<p>General publications:</p> <ul style="list-style-type: none">• Klenner, W. & A. Vyse. 1998. The Opax Mountain Silvicultural Systems Project: Evaluating alternative approaches to managing dry Douglas-fir forests. In: Managing the dry Douglas-fir forests of the southern interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests Research Program. Victoria, B.C. pp. 128–135.• B.C. Ministry of Forests. 1997. New information for the management of dry Douglas-fir forests: The dry Douglas-fir workshop. In: The dry Douglas-fir workshop. April 29–30, 1997. Kamloops, B.C., B.C. Ministry of Forests.• B.C. Ministry of Forests. n.d. Opax Mountain interpretive trail. B.C. Ministry of Forests. Kamloops Forest District, B.C. [Brochure].• Huggard, D.J., A. Arsenault, A. Vyse, & W. Klenner. 2005. The Opax mountain silvicultural systems project: Preliminary results for managing complex, dry interior Douglas-fir forests. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Extension Note No. 72. (Accessed February 2011).• Klenner, W. & A. Arsenault. 2006. Forest management options for the interior dry forest ecosystems: The Opax Mt. and Isobel Research Trials. B.C. Ministry of Forests, Southern Interior Forest Region, Extension Note No. 05. (Accessed February 2011).							
Comments:							

Researchers involved	Values assessed	Publications
Bealle-Statland, C. Klenner, W. Miège, D. Lloyd, D. Arsenault, A.	Stand structure	<ul style="list-style-type: none">• Bealle-Statland, C. 1998. Stand structure and growth estimates for the Opax mountain silvicultural systems trial. In: Managing the dry Douglas-fir forests of the southern interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests Research Program. Victoria, B.C. pp. 136–148. (Accessed February 2011).• Klenner, W. 2003. Harvesting and site preparation treatments to develop and maintain open crown closure conditions in dry-belt Douglas-fir forests. B.C. Ministry of Forests, Forest Services, Southern Interior Forest Region, Kamloops, B.C. Unpublished report.

		<ul style="list-style-type: none"> • Miège, D., D. Lloyd, & A. Arsenault. 2002. Canopy gap characteristics of partial cutting in Douglas-fir forests of Interior British Columbia. B.C. Ministry of Forests, Kamloops Region, Kamloops, B.C. Unpublished report.
Vyse, A. Kaipainen, J. Puttonen, P. Heineman, J.L. Simard, S.W. Lloyd, D.L. Doney, M. Ferguson, C. Miede, D.J.	Regeneration	<ul style="list-style-type: none"> • Kaipainen, J, P. Puttonen, & A. Vyse. 1998. Advanced regeneration of interior Douglas-fir forests following uniform partial-cut and small patch-cut logging at Opax Mountain. In: Managing the dry Douglas-fir forests of the southern interior: Workshop Proceedings. April 29–30, 1997. Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests Research Program. Victoria, B.C. pp. 149–160. (Accessed February 2011). • Heineman, J.L., G.D. Hope, S.W. Simard, A. Vyse, D.L. Lloyd, & D.J. Miede. 2003. The effects of site preparation and harvesting practices on planted seedling productivity and microenvironment in southern interior dry, grassy, IDF forests. B.C. Ministry of Forests, Forest Science Program, Technical Report TR-009. (Accessed February 2011). • Doney, M. & D. Lloyd. 2001. Natural and artificial regeneration in the IDFdk1 and IDFxh2 at the Opax Mountain silvicultural Research site. B.C. Ministry of Forests, Kamloops Region, Kamloops, B.C. Unpublished report. • Vyse, A., C. Ferguson, S.W. Simard, T. Kano, & P. Puttonen. 2006. Growth of Douglas- fir, lodgepole pine, and ponderosa pine seedlings underplanted in a partially-cut, dry Douglas-fir stand in south-central British Columbia. The Forestry Chronicle 82:723–732.
MacLauchlan, L. Miller, D	Insects	<ul style="list-style-type: none"> • Miller, D. & L. MacLauchlan. 1998. Assessment of forest insect conditions at Opax Mountain silviculture trial. In: Managing the Dry Douglas-fir Forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 161–185.
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Huggard, D.J. Klenner, W. Ferguson, C. Waterhouse, M.J.	Wildlife	<ul style="list-style-type: none"> • Huggard, D.J. & M.J. Waterhouse. 1997. Wildlife responses to forest management practices in the interior Douglas-fir zone. In: Silvicultural systems workshop. November 4–6, 1997. Richmond, B.C. • Huggard, D.J. 1997. Opax mountain silvicultural systems project: Insectivores – habitat and landscape relationships, & the effects of silvicultural systems. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-374. • Huggard, D.J. 1997. Opax mountain silvicultural systems project: Small carnivores and ungulates in winter – habitat and landscape relationships, & the effects of silvicultural systems. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-380. • Klenner, W. 1997. Opax mountain silvicultural systems project: Sciurids - habitat and landscape relationships, & the effects of silvicultural systems. B.C. Ministry of Forests - Kamloops Forest Region, Year End Technical Report. FR-96/97-375. • Klenner, W. 1997. Opax mountain silvicultural systems project: Mice and voles – effects of silvicultural systems, & habitat and landscape relationships. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-376. • Klenner, W. 1997. Opax mountain silvicultural systems project: Relationships between small mammals and downed wood. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-382. • Ferguson, C. 1998. Impacts of forest harvesting on the long-toed salamander (<i>Ambystoma macrodactylum</i>) at Opax Mountain. In: Managing the dry Douglas-fir forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 246–254. • Huggard, D. J. & W. Klenner. 1998. Winter use of the Opax Mountain silvicultural systems site by ungulates, squirrels, hares and grouse. In: Managing the Dry Douglas-fir Forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 292–299. • Huggard, D. J. & W. Klenner. 1998. Effects of harvest type and edges on shrews at the Opax Mountain silvicultural systems site. In: Managing the dry Douglas-

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Huggard, D.J. Walton, R. Klenner, W.	Snow	<ul style="list-style-type: none"> • Huggard, D. J., R. Walton, & W. Klenner. 1998. Depth and duration of snow at the Opax Mountain Silviculture systems site. In: Managing the dry Douglas-fir forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 186–194.
Klenner, W. Huggard, D.J. Dickenson, T.	Birds	<ul style="list-style-type: none"> • Klenner, W. 1997. Opax mountain silvicultural systems project: Cavity nesters - habitat and landscape relationships, & the effects of silvicultural systems at Opax Mt. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-380. • Klenner, W. & D. J. Huggard. 1998. Nesting and foraging habitat requirements of woodpeckers in relation to experimental harvesting treatments at Opax Mountain. In: Managing the dry Douglas-fir forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 277–291.
Lloyd, D. Miege, D. Arsenault, A. Brand, N. Doney, M.	Vegetation	<ul style="list-style-type: none"> • Lloyd, D. & N. Brand. n.d. The effect of light on herbaceous forage biomass at the Opax Mountain research site. Research article. • Miege, D., D. Lloyd, & A. Arsenault. 1998. Spatial and temporal response of vegetation to silvicultural practices in Interior Douglas-fir forests. In: Managing the dry Douglas-fir forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 211–225. • Brand, N. & D. Lloyd. 2001. Vegetation response to clearcut edges in the IDF at the Opax Mountain Silvicultural research site. B.C. Ministry of Forests, Kamloops Region, Kamloops, B.C. Unpublished report. • Miège, D., D. Lloyd, M. Doney, & N. Brand. 2001. Vegetation response to partial cutting and site preparation in Douglas-fir forests of Interior British Columbia. B.C. Ministry of Forests, Kamloops Region, Kamloops, B.C. Unpublished report.
Hope, G. Prescott, C.E. Bissonnette, D. Blevins, L.L.	Soils	<ul style="list-style-type: none"> • Prescott, C. E. & G. Hope. 1998. Net nitrogen mineralization and nitrification in the forest floor and mineral soil at the Opax Mountain silvicultural systems trial. In: Managing the dry Douglas-fir forests of the Southern Interior: Workshop Proceedings. April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). Research Branch, B.C. Ministry of Forests, Victoria, B.C. Working Paper No. 34. pp. 195–201. • Bissonnette, D. & D. Lloyd. 1999. Soil temperature response to cutblock edges at the Opax Silvicultural Systems research site. B.C. Ministry of Forests, Kamloops Region, Kamloops, B.C. Unpublished report. • Hope, G. & C. Prescott. 2001. Opax Mountain Silvicultural Systems Project: Effect of silvicultural systems on soil productivity in the IDF zone: Impacts on soil organic matter and soil nitrogen. Science Council of British Columbia, Burnaby, B.C. Unpublished report. • Hope, G.D., C.E. Prescott, & L.L. Blevins. 2003. Responses of available soil nitrogen and litter decomposition to openings of different sizes in dry interior Douglas-fir forests in British Columbia. Forest Ecology and Management 186:33–46.

APPENDIX 10: ISOBEL LAKE

Trial name: Isobel Lake Research Trial (EP1328)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Walt Klenner Walt.Klenner@gov.bc.ca	2002	IDFxh	Douglas-fir Ponderosa pine Lodgepole pine	50–60% removal 75–80% removal Single tree to 10 m ² openings created No harvest control 4 replications	<ul style="list-style-type: none">- Maintain open canopy conditions in dry Douglas-fir forests- Balance timber, forage and ecological values- Timber productivity- Vegetation- Forage- Fuels- Ecological conditions	Livestock fencing	2010
General publications: <ul style="list-style-type: none">• Klenner, W. & A. Arsenault. 2006. Forest management options for interior dry forest ecosystems: The Opax Mt and Isobel research trials. B.C. Ministry of Forests, Southern Interior Forest Region, Extension Note No. 05. (Accessed February 2011).							
Comments:							

APPENDIX 11: WESTWOLD

Trial name: Selection harvesting of dry-belt Douglas-fir (EP 987.04) (aka Westwold)							
Trial website: http://www.for.gov.bc.ca/hre/standman/ep/ep098704.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Catherine Bealle-Statland Catherine.BealleStatland@gov.bc.ca	1993	IDFdk2	Douglas-fir	Single tree selection: Basal area retention – 15, 20 and 25 m ² /ha 2 Q values Unharvested control	Determine the effects of different levels of residual growing stock and stand structure on the growth and yield and natural regeneration of dry-belt Douglas-fir following single tree selection harvesting.	None	2008
General publications: • Johnstone, W.D. 2000. Growth following selection harvesting of dry-belt Douglas-fir: Establishment and progress report. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Unpublished EP987.04 File report.							
Comments:							

Researchers involved	Values assessed	Publications
Bealle Statland, C. Johnstone, W.	Growth and yield	<ul style="list-style-type: none">• Bealle Statland, C. & W.D. Johnstone. 2004. Natural regeneration 10 years after partial cutting in a dry-interior Douglas-fir stand. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Extension Note No. 68. (Accessed April 2011).• Bealle Statland, C. & W.D. Johnstone. 2010. Stand growth and natural regeneration development following selection harvesting of dry-belt Douglas-fir – 15 year results. Forest Investment Account – Forest Science Program Y102033. Final Technical Report. (Accessed April 2011).

APPENDIX 12: SICAMOUS CREEK

Trial name: Sicamous Creek Silvicultural Systems Research Project (EP1317)							
Trial website: http://www.mountainforests.net/sicamous/siccreek.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Establishment and post-establishment treatments	Last measurement date
Alan Vyse vyse@telus.net	1992	ESSFwc2	Engelmann spruce Subalpine fir	Single tree selection – 33% removal Group Selection – 0.1, 1.0 ha Patch cut - 10.0 ha Control – no removal	To study ecology of high elevation forests in the southern interior To study the effects of silvicultural system on: <ul style="list-style-type: none">- Microclimate- Soil and soil organisms- Coarse woody debris- Tree regeneration and growth- Arboreal lichens- Vegetation- Sporocarps- Ground arthropods- Songbirds, woodpeckers, spruce grouse- Small mammals- Watershed processes- Windthrow- Insects- Harvesting costs	<ul style="list-style-type: none">- Logged – winter 1994–1995- Site prep (1995)- No site prep- Mechanical Site Preparation (MSP) – scalping- MSP - Mounding- Burning- Planted – summer (1996)	2010
<p>General publications:</p> <ul style="list-style-type: none">• Huggard, D.J. & A. Vyse. 2002. Comparing clearcutting and alternatives in a high-elevation forest: Early results from Sicamous Creek. B.C. Ministry of Forests and Range, Research Branch, Victoria, B.C. Extension Note No. 63. (Accessed February 2011).• C. Hollstedt & A. Vyse (editors). 1997. Sicamous Creek Silvicultural Systems Project: Workshop Proceedings. April 24–25, 1996. Kamloops, British Columbia. B.C. Ministry of Forests and Range, Research Branch, Victoria, B.C. Working Paper 24/1997. (Accessed February 2011).• Vyse, A. & D. Huggard. 2006. Progress at the Sicamous Creek Silvicultural Systems research project 1992-2006. (Accessed February 2011).							
Comments:							

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Researchers involved	Values assessed	Publications
Vyse, A. Klenner, W. Arsenault, A. Puttonen, P. Murphy, B.	General info, trial establishment info	<ul style="list-style-type: none"> Vyse, A. 1997. The Sicamous Creek Silvicultural Systems Project: How the project came to be and what it aims to accomplish. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 4–14. Puttonen, P. & Murphy, B. 1997. Developing silvicultural systems for sustainable forestry in British Columbia. Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April, 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 1–3. Klenner, W. & A. Vyse. 1999. Interdisciplinary research approaches to address complex forest management issues. The Forestry Chronicle 75(3):473–476. Vyse, A. 1999. Is everything all right up there? A long term interdisciplinary silvicultural systems project in a high elevation fir–spruce forest at Sicamous Creek, B.C. The Forestry Chronicle 75:467–472.
Novak, M.D. Orchansky, A.L. Black, T.A. Stathers, R.J. Huggard, D.J. Moore, J.R. Mitchell, S.J. Quine, C.P. Novak, M.D. Phaneuf, T.J. Jackson, P.L. Wang, Y-Q.	Windthrow	<ul style="list-style-type: none"> Huggard, D.J., W. Klenner, & A. Vyse. 1999. Windthrow following four harvest treatments in an Engelmann spruce – subalpine fir forest in southern interior British Columbia, Canada. Canadian Journal of Forest Research 29:1547–1556. (Accessed February 2011). Moore, J.R, S.J. Mitchell, D.A. Maguire, & C.P. Quine. 2003. Wind damage in alternative silvicultural systems: Review and synthesis of previous studies. International conference “Wind effects on trees” September 16–18, 2003. In: B.Ruck, B, C. Kottmeier, C. Mattheck, C. Quine, & G. Wilhelm (editors). University of Karlsruhe, Germany. pp. 191–198. (Accessed February 2011). Vyse, A., C. Ferguson, & D.J. Huggard. 2008. Wind and snow damage nine years following four harvest treatments in a subalpine fir – Engelmann spruce forest at Sicamous Creek in southern interior British Columbia, Canada. The Forestry Chronicle 84:401–409. Phaneuf, T.J., P.L. Jackson, Y-Q. Wang, & M.D. Novak. 2004. Two and three dimensional numerical airflow modeling along forest edges. 26th conference on Agricultural and Forest Meteorology. August 22–26, 2004. Vancouver, B.C.
Dickinson, T.E. Flood, N.J. Leupin, E. Martin, K.	Song birds	<ul style="list-style-type: none"> Dickinson, T. & E. Leupin. 1997. The effects of alternative silvicultural practices on the songbird communities at Sicamous Creek and in other Engelmann spruce - subalpine fir forests in Sicamous Creek Silvicultural Systems Project. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 254–271. Leupin, E.E., T.E. Dickinson, & K. Martin. 2004. Resistance of forest songbirds to habitat perforation in high-elevation conifer forests. Canadian Journal of Forest Research 34:1919–1928. (Accessed February 2011).
Klenner, W. Huggard, D. Sullivan, T. Craig, V. Mayden, J.S.	Small mammals Cavity nesting birds Snags	<ul style="list-style-type: none"> Craig, V., W. Klenner, & T. Sullivan. 1997. Relationships between small mammals and downed wood at Sicamous Creek In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 243–253. Huggard, D. & W. Klenner. 1997. Terrestrial arthropod sampling at Sicamous Creek: Progress report. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 195–199. Huggard, D. & W. Klenner. 1997. Initial effects of harvesting on shrews, immature rodents and forest floor habitat at Sicamous Creek. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 200–208.

	<ul style="list-style-type: none">• Huggard, D. & W. Klenner. 1997. Small carnivores in winter at Sicamous Creek: A pilot study. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 209–213.• Huggard, D. 1997. Spruce grouse distribution and habitat use at Sicamous Creek. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 214–223.• Huggard, D.J. 1997. Fall-down rates of subalpine fir snags at Sicamous Creek: Implications for worker safety and habitat supply. B.C. Ministry of Forests, Extension Note No. 16. (Accessed February 2011).• Huggard, D.J. 1997. Sicamous creek silvicultural systems project: Small carnivores in winter - habitat and landscape relationships, and the effects of silvicultural systems. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-405.• Huggard, D.J. 1997. Sicamous creek silvicultural systems project: Spruce grouse - habitat and landscape relationships, and the effects of silvicultural systems. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-408.• Huggard, D.J. 1997. Sicamous creek silvicultural systems project: Insectivores - habitat and landscape relationships, and the effects of silvicultural systems. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96-97-409.• Klenner, W. & D. Huggard. 1997. Three-toed woodpecker nesting and foraging at Sicamous Creek. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 224–233.• Klenner, W. 1997. Effects of harvest treatments on the abundance of small mammals at Sicamous Creek. In: Sicamous Creek Silvicultural Systems Project. Workshop Proceedings, April 24–25, 1996, Kamloops, B.C. C. Hollstedt & A. Vyse (editors). B.C. Ministry of Forests, Victoria, B.C. Working Paper. No. 24/1997. pp. 234–242.• Klenner, W. 1997. Sicamous creek silvicultural systems project: Mice and voles - effects of silvicultural systems, and habitat and landscape relationships. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-404.• Klenner, W. 1997. Sicamous Creek silvicultural systems project: Relationships between small mammals and downed wood. B.C. Ministry of Forests, Kamloops Forest Region, Year End Technical Report. FR-96/97-423.• Huggard, D.J. 1999. Marten use of different harvesting treatments in high-elevation forest at Sicamous Creek. British Columbia Ministry of Forests, Research Program, Victoria, B.C. Research Report No. 17.• Maydan, J.S. 1999. Fine-scale population structure of masked shrews (<i>Sorex sinereus</i>) in an experimentally fragmented forest. MSc thesis, Department of Genetics, University of British Columbia, Vancouver, B.C. (Accessed February 2011).• Huggard, D.J., W. Klenner, & A. Vyse. 2000. Identifying and managing fauna sensitive to forest management: Examples from Sicamous Creek and Opax mountain silvicultural systems sites. In: Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, February 15–19, 1999, Kamloops, B.C. Volume One. L.M. Darling (editor). B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. and University College of the Cariboo, Kamloops, B.C. pp. 235–239. (Accessed February 2011).• Huggard, D.J. 2000. Developing animal-habitat models for management of high elevation forests. PhD thesis, Faculty of Forestry, University of British Columbia, Vancouver, B.C. (Accessed February 2011).• Klenner W. & T.P. Sullivan. 2003. Partial and clear-cut harvesting of high-elevation spruce-fir forests: implications for small mammal communities. Canadian Journal Of Forest Research 33:2283–2296. (Accessed February 2011).• Huggard, D.J. 2003. Use of habitat features, edges and harvest treatments by spruce grouse in subalpine forest. Forest Ecology and Management 175(1–3):531–544.• Huggard, D.J. & W. Klenner. 2003. Grylloblatids in managed forests of South-central British Columbia. Northwest Science 77(1):12–18 (Accessed February 2011).
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	Synthesis papers that mention Sicamous creek study	<ul style="list-style-type: none"> • Pawson, S.M., E.G. Brockeroff, D.A. Norton, & R.K. Didham. 2006. Clear-fell harvest impacts on biodiversity: Past research and the search for harvest size thresholds. Canadian Journal of Forest Research. 36:1035–1046 (Accessed February 2011). • Mitchell, A.K., A. Vyse, D.J. Huggard and W.J. Beese. 2004. Long-term silviculture experiments contribute to science-based forest management in British Columbia's public forests. Journal of Forest Snow and Landscape Research 78(1/2):139–150. (Accessed February 2011). • Heinrichs, M.L., J.A. Antos, R.B. Hebda, & G.B. Allen. 2002. <i>Abies lasiocarpa</i> (Hook.) Nutt. in the late-glacial and early Holocene vegetation of British Columbia, Canada and adjacent regions in Washington, U.S.A. Review of Paleobotany and Palynology 120:107–122. • Stathers R.J., T.P. Rollerson, & S.J. Mitchell. 1994. Windthrow handbook for British Columbia forests. Ministry of Forests, Victoria, B.C. Working Paper No. 01.

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APPENDIX 13: ICE ROAD/MOUNT SEVEN

Trial name: Partial cutting systems research in Armillaria root rot infected stands (EP 1186) (aka Ice Road & Mount Seven)							
Trial website: http://www.for.gov.bc.ca/rsi/research/nsites/eb1186ir.htm ; http://www.for.gov.bc.ca/rsi/research/nsites/eb1186ms.htm (Accessed January 2012).							
Contacts	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Teresa Newsome Teresa.Newsome@gov.bc.ca Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca Phil Comeau Phil.Comeau@ales.ualberta.ca	1993	ICHmw2 MSdk	Douglas-fir Western larch Hybrid spruce Western red cedar Western hemlock	Irregular Uniform Shelterwood Patch cut – 4 levels of BA retention (zero, light, heavy and full) Two harvest methods – push-over and conventional hand falling	- Measure planted stock and natural regeneration response - Measure overstory residual tree response - Measure the relationship between light and tree growth - Monitor the vegetation development - Measure soil properties in response to harvesting method - Measure root disease (<i>Armillaria ostoyae</i> and <i>Inonotus tomentosus</i>) and impact on regeneration	None	2009
General publications:							
Comments:							

Researchers involved	Values assessed	Publications
DeLong, D. Hawe, A.	Multiple values	<ul style="list-style-type: none">• DeLong, D. 1995. Shelterwoods in root disease infected stands: Preliminary results EP 1186. Forest Sciences Section, Nelson Forest Region, B.C. Ministry of Forests. Extension Note RS-023. (Accessed March 2011).• Hawe, A. 1996. Shelterwood harvesting in root disease infected stands: EP1186 Preliminary results Ice Road Site. Forest Sciences Section, Nelson Forest Region, B.C. Ministry of Forests. Extension Note RS-030. (Accessed March 2011).• DeLong, D., P. Comeau, & C. Prescott. 2000. Partial cutting in root disease infected stands in the Interior Cedar–Hemlock biogeoclimatic zone. In: Proceedings from science to management and back: A science forum for southern interior ecosystems of British Columbia. C. Hollstedt, K. Sutherland, & T. Innes (editors). Southern Interior Forest Extension and Research Partnership, Kamloops, B.C. pp. 105–112. (Accessed March 2011).• DeLong, D., P. Comeau, & C. Prescott. 2000. Shelterwood harvesting in root disease infected stands in Southeastern British Columbia: Three year results–EP1186. Forest Sciences Section, B.C. Ministry of Forests, Nelson Forest Region, B.C. Extension Note RS-051. (Accessed March 2011).
Curran, M. Quesnel, H.	Soils	<ul style="list-style-type: none">• Quesnel, H. & M. Curran. 1999. Shelterwood harvesting in root disease infected stands in Southeastern British Columbia: Post-harvest soil disturbance–EP1186. Forest Sciences Section, Nelson Forest Region, B.C. Ministry of Forests. Extension Note RS-043. (Accessed March 2011).• Quesnel, H. & M. Curran. 2000. Shelterwood harvesting in root disease infected stands in Southeastern British Columbia: Post-harvest soil compaction–EP1186. Forest Sciences Section, Nelson Forest Region, B.C. Ministry of Forests. Extension Note RS-048 (Accessed March 2011).• Quesnel, H.J. & M.P. Curran. 2000. Shelterwood harvesting in root-disease infected stands—post-harvest soil disturbance and compaction. Forest Ecology and Management 133:89–113.

		<ul style="list-style-type: none">• Prescott, C.E., L.L. Blevins, & C.L. Staley. 2000. Effects of clear-cutting on decomposition rates of litter and forest floor in forests of British Columbia. Canadian Journal of Forest Research 30(11):1751–1757.
DeLong, D.L. Simard, S.W. Comeau, P.G. Dykstra, P.R. Mitchell, S.J.	Regeneration	<ul style="list-style-type: none">• DeLong, D.L., S.W. Simard, P.G. Comeau, P.R. Dykstra, & S.J. Mitchell. 2005. Survival and growth response of seedlings in root disease infected partial cuts in the Interior Cedar–Hemlock zone of southeastern British Columbia. Forest Ecology and Management 206:365–379.• Newsome, T.A., J.L. Heineman, A.F.L. Nemec, P.G. Comeau, A. Arsenault, & M. Waterhouse. 2010. Ten-year regeneration responses to varying levels of overstory retention in two productive southern British Columbia ecosystems. Forest Ecology and Management 260:132–145.
Comeau, P.G. Thomas, K.	Light	<ul style="list-style-type: none">• Comeau, P. & K. Thomas. 1998. Evaluation of understory light conditions using fisheye photography at Ice Road (EP1186). B.C. Ministry of Forests, Research Branch, Victoria, B.C. Draft report.

APPENDIX 14: ST. MARY’S

Trial name: St. Mary’s Residual Basal Area Study in a Mixed Conifer Stand (EP 1365) (aka St. Mary’s)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca Teresa Newsome Teresa.Newsome@gov.bc.ca	1993	IDFdm2	Douglas-fir Lodgepole pine Western larch	Single tree selection with 4 levels of residual basal area - BA retention (8, 16, 24, 37 m²)	How does the overstory and understory regeneration response to the level of residual basal area? - Tree regeneration density and growth (natural and planted) - Light studies - Stand stability - Vegetation response - Ungulate use	None	2009
General Trial publications: • Waterhouse, M.J., T.A. Newsome, P. Comeau, & H. Armleder. 2008. St. Mary River single tree selection study in the Rocky Mountain Trench . B.C. Ministry of Forests and Range, Southern Interior Forest Region, Kamloops, B.C. Extension Note No. 08. (Accessed March 2011). • Waterhouse, M.J. 2008. St. Mary’s residual basal area study in a mixed conifer stand . Forest Investment Account Forest Science Program Project Y081143 – Executive Summary 2007/08. (Accessed March 2011). • Waterhouse, M.J., T.A. Newsome, A.A. Arsenault, H.M. Armleder, & P.G. Comeau. 2009. St. Mary’s residual basal area study in a mixed conifer stand . Forest Investment Account – Forest Science Program, Project Y092143. Executive Summary 2008/09. (Accessed March 2011).							
Comments: Some challenges with Mountain Pine Beetle.							
Researchers involved	Values assessed		Publications				
Lochhead, K. Comeau, P. Newsome, T.	Understory light Microclimate Regeneration Vegetation		Lockhead, K. 2011. The influence of forest structure on light and regeneration in complex coniferous stands. MSc Thesis. University of Alberta, Edmonton, A.B.				

APPENDIX 15: BEETLE PROOFING

Trial name: Beetle proofing mature lodgepole pine							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Roger Whitehead Roger.Whitehead@nrcan-rncan.gc.ca	1992	MSdk (Rocky Mtn. Trench) IDFdk3 (100 Mile House) SBSdw2 (Quesnel)	Lodgepole pine	Clearcut Thinned to 4 m and 5 m spacing	- Reduce susceptibility to Mountain Pine Beetle	Fertilization	2006
General publications:							
Comments:							

Researchers involved	Values assessed	Publications
Whitehead, R.J. Russo, G.L.	Insect (MPB) response	<ul style="list-style-type: none">Whitehead, R.J. & G.L. Russo. 2005. Beetle-proofed” lodgepole pine stands in interior British Columbia have less damage from mountain pine beetle. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, B.C. Information Report BC-X-402. (Accessed April 2011).Safranyik, L.,T.L. Shore, A.L. Carroll, & D.A. Linton. 2004. Bark beetle (Coleoptera: scolytidae) diversity in spaced and unmanaged mature lodgepole pine (Pinaceae) in southeastern British Columbia. Forest Ecology and Management 200:23–38. (Accessed April 2011).Whitehead, R.J., L. Safranyik, G.L. Russo, T.L. Shore, & A.L. Carroll. 2004. Silviculture to reduce landscape and stand susceptibility to the mountain pine beetle. In: Mountain Pine Beetle Symposium: Challenges and Solutions, October 30–31, 2003, Kelowna, British Columbia, Canada. T.L. Shore, J.E. Brooks, & J.E. Stone (editors). Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia, Information Report BC-X-399. pp. 233–244. (Accessed April 2011).Whitehead, R.J., P. Martin, & A. Powellson. 2001. Reducing stand and landscape susceptibility to Mountain Pine Beetle. [SDMD Booklet]. B.C. Ministry of Forests Forest Practices Branch. Victoria, B.C. (Accessed April 2011).Safranyik, L., T.L. Shore, & D.A. Linton 1999. Attack by bark beetles (Coleoptera: Scolytidae) following spacing of mature lodgepole pine (Pinaceae) stands. The Canadian Entomologist 131:671–685. (Accessed April 2011).Whitehead, R.J., G. Richardson, E. Begin, & D. DeLong 1999. Case study: Using partial cutting to reduce susceptibility of mature lodgepole pine to mountain pine beetle attack – beetle proofing. B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 39. (Accessed April 2011).
Mitchell, J.L.	Logging costs	<ul style="list-style-type: none">Mitchell, J. L. 1994. Commercial thinning of mature lodgepole pine to reduce susceptibility to mountain pine beetle. Canadian Forest Service/B.C. Ministry of Forests, FRDA Report 224. Victoria, B.C. (Accessed April 2011).
Allen, E. White, T.	Logging injuries	<ul style="list-style-type: none">Allen, E. & T. White. 1997. Decay associated with logging injuries in western larch, Larix occidentalis, and in lodgepole pine, Pinus contorta. Canadian Forest Service, Pacific Forestry Centre, Technology Transfer Note No. 7. (Accessed April 2011).
Safranyik, L. Shore, T.L. Linton, D.A.	Insects (secondary)	<ul style="list-style-type: none">Safranyik, L.,T.L. Shore, D.A. Linton. 1997. Attack by secondary bark beetles (Coleoptera: Scolytidae) in spaced mature lodgepole pine stands in the east Kootenays of British Columbia. Canadian Forest Service, Pacific Forestry Centre. File Report P58001–97–02.

Whitehead, R.J. Brown, B.N.	Windthrow	<ul style="list-style-type: none">• Whitehead, R.J. & B.N. Brown. 1997. Windthrow after commercial thinning in mature lodgepole pine. Canadian Forest Service, Pacific Forestry Centre. File Report P58001–97-01.
Whitehead, R.J. Russo, G. Hawkes, B.C. Taylor, S.W. Brown, B.N. Armitage, O.B. Barclay, H.J. Benton, R.A.	Fuel moisture and fire behaviour	<ul style="list-style-type: none">• Whitehead, R.J., G. Russo, B.C. Hawkes, S.W. Taylor, B.N. Brown, H.J. Barclay, & R.A. Benton 2006. Effect of a spaced thinning in mature lodgepole pine on within-stand microclimate and fine fuel moisture content. In: Fuels Management - How to Measure Success: Conference Proceedings, March 28–30, 2006, Portland, O.R. Andrews, P.L. & B.W. Butler (compilers). USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado, Proceedings RMRS-P- 41. pp. 523–536 (Accessed April 2011).• Whitehead, R.J., G. Russo, B.C. Hawkes, S.W. Taylor, B.N. Brown, O.B. Armitage, H.J. Barclay, & R.A. Benton. 2008. Effect of commercial thinning on within-stand microclimate and fine fuel moisture conditions in a mature lodgepole pine stand in southeastern British Columbia. Natural Resources Canada, Canadian Forest Service, Canadian Wood Fibre Centre, Victoria, British Columbia. Information Report FI-X-004. (Accessed April 2011).
Whitehead, R.J. Russo, G. Hawkes, B.C. Armitage, O.B.	Silvicultural efficacy	<ul style="list-style-type: none">• Whitehead, R.J., G. Russo, B.C. Hawkes, & O.B. Armitage. 2007. A silvicultural assessment of 10 lodgepole pine stands after partial cutting to reduce susceptibility to mountain pine beetle. Natural Resources Canada, Canadian Wood Fibre Centre, Victoria, B.C. Information Report FI-X-001. (Accessed April 2011).

APPENDIX 16: HYP3

Trial name: HyP ³ Project: Pattern, Process, and Productivity in Hypermaritime forests of coastal British Columbia							
Trial website: http://www.for.gov.bc.ca/rni/research/HyP3/hyp3-pg1.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Phil LePage Phil.Lepage@gov.bc.ca	1998	CWHvh2	Western hemlock Western red cedar Yellow cedar Mountain hemlock Sitka spruce Shore pine	Diameter limit logging – all western red cedar and yellow cedar between 17.5–150 cm dbh felled. All hemlock and shore pine felled.	To study the effects of silvicultural systems on: <ul style="list-style-type: none">- Harvesting feasibility- Fertilization and site preparation effects- Tree regeneration and growth- Timber quality, end-product recovery, and utilization rates	<ul style="list-style-type: none">- Site preparation- Fertilization- Seedling protectors	2008
General publications: <ul style="list-style-type: none">• Banner, A. 1999. Pattern, process and productivity in hypermaritime forests: The HyP³ Project. B.C. Ministry of Forests, Forest Sciences, Prince Rupert Forest Region. Extension Note No. 38. (Accessed May 2011).							
Comments:							

Researchers involved	Values assessed	Publications
Banner, A. Kranabetter, M. LePage, P. Maloney, D. McKeown, K. Moran, J. Pojar, J.	Multiple values	<ul style="list-style-type: none">• Banner, A, P. LePage, J. Moran, & A. de Groot (compilers). 2005. The HyP³ Project: Pattern, process, and productivity in hypermaritime forests of coastal British Columbia: A synthesis of 7 year results. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Special Report 10. (Accessed May 2011).
Banner, A. Shaw, J.	Site preparation	<ul style="list-style-type: none">• Shaw, J. & A. Banner. 2001a. Excavator mounding to enhance productivity in hypermaritime forests: Preliminary results. B.C. Ministry of Forests, Research Section, Smithers, B.C. Extension Note No. 44. (Accessed May 2011).• Shaw, J. & A. Banner. 2001b. Effects of soil mixing and mounding on seedling nutrition in hypermaritime cedar–hemlock forests, north-coastal British Columbia: Preliminary results. B.C. Ministry of Forests, Research Section, Smithers, B.C. Extension Note No. 45. (Accessed May 2011).
Asada, T. Warner, B.G. Banner, A.	Vegetation	<ul style="list-style-type: none">• Asada, T., B.G. Warner, & A. Banner. 2004. Sphagnum invasion after clear-cutting and excavator mounding in a hypermaritime forest of British Columbia. Canadian Journal of Forest Research 34:1730–1746.
Kranabetter, M. Banner, A. Shaw, J. de Groot, A.	Site fertility	<ul style="list-style-type: none">• Kranabetter, J.M., A. Banner, & J. Shaw. 2003. Growth and nutrition of three conifer species across site gradients of north coastal British Columbia. Canadian Journal of Forest Research 33:313–324.• Kranabetter, J.M., A. Banner, & A. de Groot. 2005. An assessment of phosphorus limitations to soil nitrogen availability across forest ecosystems of north coastal British Columbia. Canadian Journal of Forest Research 35:530–540.

LePage, P. Banner, A. de Groot, A. Shaw, J.	Harvesting	<ul style="list-style-type: none">• LePage, P., A. Banner, A. deGroot, & J. Shaw. 2002. The Oona River Operational Research Trial. B.C. Ministry of Forests, Research Section, Smithers, B.C. Extension Note No. 48. (Accessed May 2011).
LePage, P. Banner, A.	Seedling survival and growth	<ul style="list-style-type: none">• LePage, P. & A. Banner. 2005. Seedling browse guard trial on the north coast of British Columbia. B.C. Ministry of Forests, Research Section, Smithers, B.C. Extension Note No. 56. (Accessed May 2011).
Lortie, S.L. Maloney, D. Bennett, S.	Hydrology	<ul style="list-style-type: none">• Lortie, S.L. 2002. A pre-harvest investigation of groundwater–surface water interactions in a hypermaritime catchment using hydrogeological and geochemical tools. MSc thesis. Department of Earth Sciences, University of Waterloo, Waterloo, O.N.• Maloney, D. & S. Bennett. 2002. Streamflow and water balance for two watersheds in the CWH near Prince Rupert, B.C. B.C. Ministry of Forests, Research Section, Smithers, B.C. Unpublished report.

APPENDIX 17: RENNELL SOUND

Trial name: Rennell Sound Silvicultural Systems Trial (EP862.34)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Rod Negrave Roderick.Negrave@gov.bc.ca	1992	CWHvh2	Western hemlock Sitka spruce Western red cedar	Clearcut 25 and 50% removal as group selection 25% removal as single tree selection No harvest control	To study the effects of silvicultural systems on: - Residual stand structure and growth - Natural regeneration - Regeneration (planted and natural) growth - Hydrology and geomorphology	None	2007
<p>General publications:</p> <ul style="list-style-type: none">• D’Anjou, B. 2000. Alternative silvicultural systems on steep-sloped old-growth forests on the Queen Charlotte Islands – project overview and regeneration development. South Moresby Forest Replacement Account: Research and Demonstration. Final Report Project 13.3 – EP862.34. B.C. Ministry of Forests, Research Section, Vancouver Forest Region, Nanaimo, B.C. (Accessed April 2011).• Negrave, R.W. 2008 Preliminary 15-year results from the Rennell Sound silviculture systems trial. Presentation slides from the Timber Growth and Value Conference, February 6–7, 2008. Smithers, B.C. (Accessed April 2011).• Negrave, R.W. 2008. Preliminary 15 year results from the Rennell Sound silviculture systems trial - Abstract. In: Proceedings of the Timber Growth and Value Conference, February 6–7, 2008. Smithers, B.C. Bulkley Valley Centre for Natural Resources Research and Management, Smithers, B.C. pp. 21–22. (Accessed April 2011).							
Comments:							

Researchers involved	Values assessed	Publications
Krag, R.	Harvesting costs	• Krag, R. 1998. Productivities, costs and site and stand impacts of helicopter-logging in clearcuts, patch cuts, and single-tree selection cuts: Rennell Sound Trials . In: Carnation Creek and Queen Charlotte Islands Fish/Forestry Workshop: Applying 20 years of coast research to management solutions. Queen Charlotte City, 1994. D.L. Hogan, P.J. Tschaplinski, & S. Chatwin (editors). B.C. Ministry of Forests, Research Branch, Victoria, B.C. Land Management Handbook No. 41. pp. 201–214. (Accessed April 2011).
Millard, T. Floyd, B.	Geomorphology	• Millard, T. & S. Chatwin. 2001. Using helicopter harvesting on steep slopes to reduce erosion, preliminary results: Case study on Queen Charlotte Islands, British Columbia . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 10. (Accessed April 2011).
D’Anjou, B.	Regeneration	• D’Anjou, B. 2000. Alternative silvicultural systems on steep-sloped old-growth forests on the Queen Charlotte Islands – Project overview and regeneration development . South Moresby Forest Replacement Account: Research and Demonstration. B.C. Ministry of Forests, Research Section, Vancouver Forest Region, Nanaimo, B.C. Final Report Project 13.3 – EP862.34. (Accessed April 2011).

APPENDIX 18: STEMS

Trial name: Silviculture Treatments for Ecosystem Management in the Sayward (STEMS) (EP1213)							
Trial website: http://www.for.gov.bc.ca/hre/stems/ (Accessed January 2012).							
Contact	Estab. Year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Louise de Montigny Louise.deMontigny@gov.bc.ca	2000	CWHxm1–STEMS1	Douglas-fir Western hemlock Western red cedar (2 nd growth)	Clearcut with reserves	To study the effects of various silvicultural systems on: - Growth and yield - Regeneration and light availability - Windthrow - Coarse woody debris - Harvest costs, productivity, soil disturbance, tree damage - Other values - Public perception - Demonstration area	Return intervals for modified patch cut, Group selections and extended rotation with commercial thinning varies by replication: 10 to 20 years.	2010
	2003	Snowden CWHxm2 - STEMS 2 –		Modified patch cut Group selection Aggregate retention Uniform dispersed retention			2010
	2007	Elk Bay CWHxm1–STEMS3 Gray Lake		Extended rotation with commercial thinning Extended rotation 3 replications			2010
<p>General publications:</p> <ul style="list-style-type: none">• B.C. Ministry of Forests. 2003. STEMS: Silviculture treatments for ecosystem management in the Sayward. B.C. Ministry of Forests, Research Branch, Victoria, B.C. (Accessed April 2011).• de Montigny, L. 2004. Silviculture treatments for ecosystem management in the Sayward (STEMS): Establishment report for STEMS 1, Snowden Demonstration Forest. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Technical report No. 017. (Accessed April 2011).• de Montigny, L. 2005. Silviculture treatments for ecosystem management in the Sayward – The STEMS experiment. In: Balancing ecosystem values: Innovative experiments for sustainable forestry: Proceedings of a conference. August 15–20, 2004, Portland, O.R. C.E. Preston & D.A. Maguire (editors). USDA Forest Service, Pacific Northwest Research Station, Portland, O.R. General Technical Report PNW-GTR-635. pp. 89–98. (Accessed April 2011).• de Montigny, L. & G. Nigh. 2009. Silviculture treatments for ecosystem management in the Sayward (STEMS): Establishment report for STEMS 2, Elk Bay. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Technical Report No. 049. (Accessed April 2011).							
Comments:							

Researchers involved	Values assessed	Publications
De Montigny, L.	Regeneration	• de Montigny, L. 2010. Early survival and growth of natural regeneration and planted seedlings under seven silvicultural systems on the Coast . Forest Science Program, Project Report No. Y103279. (Accessed April 2011).
Evans, C. de Montigny, L. Phillips, E.	Harvesting costs, productivity, soil disturbance, and tree damage	• Evans, C., L. de Montigny, & E. Phillips. 2003. Silviculture treatments for ecosystem management in the Sayward: Costs and productivity of harvesting . FERIC Advantage 4(38). (Accessed April 2011).
Marc, J.	Public response	• B.C. Ministry of Forests and Range. 2006. The public response to harvest practices in British Columbia at the landscape and stand level . B.C. Ministry of Forests Range, Forest Practices Branch, Victoria, B.C. (Accessed April 2011).

Mitchell, S.J. Di Lucca, C.M. Byrne, K.E.	Windthrow	<ul style="list-style-type: none">• Di Lucca, C.M., S.J. Mitchell, & K.E. Byrne. 2006. Using TIPSy to evaluate windthrow effects on regeneration in variable retention harvests. B.C. Ministry of Forests and Range, Research Branch, Victoria, B.C. Extension Note No. 77. (Accessed April 2011).• Scott, R.E. 2005. Modelling windthrow risks in coastal variable retention using tree, neighbourhood, and stand attributes. MSc Thesis, University of British Columbia, Vancouver, B.C. (Accessed April 2011).• Gardiner, B., K. Byrne, S. Hale, K. Kamimura, S.J. Mitchell, H. Peltola, & J-C. Ruel. 2008. A review of mechanistic modelling of wind damage risk to forests. <i>Forestry</i> 81(3):447–463.• Byrne, K.E. 2011. Mechanistic modelling of windthrow in spatially complex mixed species stands in British Columbia. PhD Thesis, University of British Columbia, Vancouver, B.C. (Accessed April 2011).
Fielder, P.P.	Growth and yield	<ul style="list-style-type: none">• Fielder, P.P. 2007. Light as a factor in the growth and survival of four planted conifer species across forest gaps. Project Number: Y071038. B.C. Ministry of Forests Range, Research Branch, Victoria, B.C. (Accessed April 2011).
Grayston, S.J.	Soil function, coarse woody debris	<ul style="list-style-type: none">• Grayston, S.J. 2007. Green tree retention: A tool to maintain ecosystem health and function. Project Number: Y073049. Department of Forest Science, University of British Columbia, Vancouver, B.C. (Accessed April 2011).• Grayston, S.J., J.A. Addison, S.M. Berch, L.E. de Montigny, D.M. Durall, K.N. Egger, M.D. Jones, R. Modesto, W.W. Mohn, T.S. Panesar, C.E. Prescott, & D. S. Srivastava. 2006. Green tree retention: A tool to maintain soil function after harvest. Extended Abstract presented at the Variable Retention Forestry Science Forum, April 21–22, 2004. <i>B.C. Journal of Ecosystems and Management</i> 7(1):9–12. (Accessed April 2011).

APPENDIX 19: MASS

Trial name: Montane Alternative Silviculture Systems (MASS) trial							
Trial website: http://cfs.nrcan.gc.ca/projects/104 (Accessed January 2012)							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Bill Beese Bill.Beese@viu.ca	1991	CWHmm2	Western red cedar Yellow cedar Western hemlock Amabilis fir	Clearcut Patch cut – 1.5–2.0 ha Green tree retention (25 trees per hectare retained) Shelterwood (30% retention) Old growth control	- Test alternative silvicultural systems for coastal montane forests - Document the operational costs and feasibility - Study the biological and silvicultural impacts	Fertilization experimental treatments	2008
Comments: There are 21 integrated research studies investigating many aspects of this long-term experiment, including: feasibility and economics, soil disturbance and productivity, decomposition, leaching and nutrition, microclimate, ecophysiology of conifers, natural and planted regeneration, seedling response to competition and nutrition, vegetation succession and forest structure, growth and yield, forest bird and canopy insect diversity, forest health, and the genetic consequences of alternative silvicultural systems.							
<p>General publications:</p> <ul style="list-style-type: none">• Beese, W.J. 1994. Montane alternative silvicultural systems (MASS) project at Iron River. Abstract. In: Winter Workshop, Coastal Silviculture Committee, Parksville, B.C., February 9–10, 1994.• Beese, W.J. 1995. Alternatives to clearcutting for Montane forests in coastal B.C. In: Preprint Book Technical Paper, Woodlands Section, Canadian Pulp and Paper Association, 76th Annual Meeting, Montreal, Q.C., March 1995. pp. E43–E46.• Arnott, J.T., W. J. Beese, A.K. Mitchell, & J. Peterson (editors). 1995. Proceedings of Montane Alternative Silviculture Systems (MASS) Workshop, Courtenay, B.C., June 7–8, 1995. Canadian Forest Service and British Columbia Ministry of Forests, Victoria, B.C., FRDA Report 238 (Accessed January 2012).• Beese, W.J. 1995a. Clearcut alternatives in Coastal montane forests. Canadian Forest Industries September. pp 28–31.• Beese, W.J. 1995b. Montane Alternative Silviculture Systems(MASS): Introduction and objectives. In: Montane Alternative Silviculture Systems (MASS): Proceedings of a workshop held June 7–8, 1995. Courtenay, B.C. J.T. Arnott, W.J. Beese, A.K. Mitchell, & J. Peterson (editors). Canadian Forest Service and British Columbia Ministry of Forests, Victoria, B.C. FRDA Report 238:3–8.• Whitehead, R.J. 1995. The Montane Alternative Silviculture Systems Project: A research and operations partnership. In: Montane Alternative Silviculture Systems (MASS): Proceedings of a workshop held June 7–8, 1995. Courtenay, B.C. J.T. Arnott, W.J. Beese, A.K. Mitchell, & J. Peterson (editors). Canadian Forest Service and British Columbia Ministry of Forests, Victoria, B.C. FRDA Report 238:1–2. (Accessed February 2011).• Anonymous. 1996. MASS study of alternative harvesting systems for montane forests in its fifth year. Business Logger July 1996. p 16.• Arnott, J.T. & W. J. Beese. 1996. The Montane Alternative Silvicultural Systems (MASS) Partnership. Abstract. In: Proceedings of the 14th North American Forest Biology Workshop, June 16–20, 1996. University of Laval, Quebec City, Q.C.• Beese, W.J. 1996. Early results from the Montane Alternative Silvicultural Systems project. FERIC Silvicultural Operations Newsletter (FERIC) 9(1):5–6.• Arnott, J.T. & W.J. Beese. 1997. Alternatives to clearcutting in BC Coastal Montane Forests. The Forestry Chronicle 73(6):670–678. (Accessed February 2011).• Anon. 1998. Alternatives to clearcutting - early results of a long-term study. Information Forestry ISSN 0706-9413, Natural Resources Canada, Canadian Forest Service, Victoria, B.C.• Arnott, J.T. & W.J. Beese. 1998. Montane Alternative Silvicultural Systems (MASS). Field Tour Handbook. Pacific Forestry Centre, Canadian Forest Service, Victoria, B.C. File Report. 72/31P.• Beese, W.J. & J. T. Arnott. 1998. Montane alternative silvicultural systems (MASS): Establishing and managing a multi-disciplinary, multi-partner research site. Abstract. In: Long-term silvicultural research sites workshop Promoting the concept - protecting the investment, October 25–28, 1998. Victoria, B.C. p. 37.• Benton, R.A. & K.M. Petterson. 1998. Automated environmental monitoring and database management: Fantasies and realities. Abstract. In: Long-term silvicultural research sites workshop Promoting the concept - protecting the investment, October 25–28, 1998. Victoria, B.C. p. 38.							

- Thomson, A.J. & A. Mitchell, 1999. [Collaborative knowledge management for long-term research sites](#). The Forestry Chronicle 75(3):491–496. (Accessed January 2012).
- Beese, W.J. & J.T Arnott. 1999. Montane Alternative Silvicultural Systems (MASS): Establishing and managing a multi-disciplinary, multi-partner research site. The Forestry Chronicle 75(3):413–416.
- Mitchell, S.J. & W.J Beese. 2002. The retention system: Reconciling variable retention with the principles of silvicultural systems. The Forestry Chronicle 78(3):397–403.
- Mitchell, A.K., A. Vyse, D.J. Huggard, & W.J. Beese. 2004. Long-term silvicultural experiments contribute to science-based forest management in British Columbia’s public forests. Forest Snow and Landscape Research 78 (1/2):139–150.
- Swift, K. 2003. Montane Alternative Silvicultural Systems: 10 years of data collected for some research projects. LINK 4(3).
- Mitchell A.K. & B. Beese. 2004. Montane Alternative Silvicultural Systems (MASS) designing experiments for the future. Abstract. In: Balancing Ecosystem Values: Innovative experiments for sustainable forestry: Proceedings of a conference. C.E. Peterson & D.A. Maguire (editors). USDA Forest Service, Pacific Northwest Research Station, Portland O.R. General Technical Report PNW-GTR-635. p. 98.

Researchers involved	Values assessed	Publications
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Bryant, A.A. Dunsworth, G. Beese, W.J. El-Kassaby, Y.	Biodiversity	<ul style="list-style-type: none"> • Beese, W.J. & A.A. Bryant 1997. Assessing the impacts of silvicultural systems on forest dynamics and biodiversity in montane forests of coastal BC, Canada. Biodiversity in managed forests: Concepts and solutions, Uppsala, Sweden. Voluntary Paper. • Dunsworth, G., W.J. Beese, A. Bryant, & Y. El-Kassaby. 2001. Effect of alternative silvicultural systems on biological diversity in coastal montane forests at MASS: Vegetation, bird diversity and conifer genetics. In: Montane Alternative Silvicultural Systems (MASS) Workshop February 7–8, 2001 Nanaimo, B.C. p. 5.
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Askin, R.W. Dragunas, V.P.	Hydrology	<ul style="list-style-type: none">• Askin, R.W. & V.P. Dragunas. 1995. MASS: Snow hydrology pilot study. In: Montane Alternative Silviculture Systems (MASS): Proceedings of a workshop held June 7–8, 1995. Courtenay, B.C. J.T. Arnott, W.J. Beese, A.K. Mitchell, & J. Peterson (editors). Canadian Forest Service and British Columbia Ministry of Forests, Victoria, B.C. FRDA Report 238:37–40. (Accessed January 2012).

APPENDIX 20: ROBERTS CREEK

Trial name: Roberts Creek Study Forest (EP1256)							
Trial website: http://www.for.gov.bc.ca/rco/research/projects/RCSE/RCSE.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Rod Negrave Roderick.Negrave@gov.bc.ca Melissa Todd Melissa.Todd@gov.bc.ca	1992	CWHdm	Douglas-fir Western hemlock Western red cedar	10% dispersed retention 50% aggregate retention Clearcut with reserves Strip Shelterwood	<ul style="list-style-type: none">- Planted and natural regeneration growth and development- Monitor effects on local hydrology and water quality- Monitor windthrow- Harvesting Economics	<ul style="list-style-type: none">- Planting – 1994 Douglas-fir and western red cedar- 2nd harvest entry - 1999	Ongoing
General publications: <ul style="list-style-type: none">• B.C. Ministry of Forests. 2001. Roberts Creek Study Forest – General information pamphlet. (Accessed January 2012).							
Comments:							

Researchers involved	Values assessed	Publications
D’Anjou, B.	Multiple values discussed	D’Anjou, B. 2001. Roberts Creek Study Forest. Effects of dispersed retention harvesting on stand structure and regeneration in a coastal mixed-conifer forest: Summary of year 6 results . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report No 06. (Accessed January 2012). D’Anjou, B. 2001. Roberts Creek Study Forest: Effects of alternative silvicultural systems on windthrow and conifer regeneration in a coastal Douglas-fir dominated forest: Summary of year 3 results . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report No. 07 (Accessed April 2011). D’Anjou, B. 2002. Roberts Creek Study Forest: Harvesting, windthrow and conifer regeneration within alternative silvicultural systems in Douglas-fir dominated forests on the Sunshine Coast . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report No. 18. (Accessed April 2011). D’Anjou, B. 2006. Windthrow and conifer regeneration amongst a range of retention patterns within the Roberts Creek Study Forest . Extended Abstract presented at the Variable Retention Forestry Science Forum, April 21–22, 2004. B.C. Journal of Ecosystems and Management 7(1):17–22. (Accessed April 2011).
Hudson, R.O.	Water quality	Hudson, R.O. & B. D’Anjou. 2001. Roberts Creek Study Forest: The effects of shelterwood harvesting and blowdown on sediment production in a small zero-order creek . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 04. (Accessed April 2011). Hudson, R. 2001 Roberts Creek Study Forest: Preliminary effects of partial harvesting on peak streamflow in two S6 creeks . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 07. (Accessed April 2011). Hudson, R.O. & J. Fraser. 2001. Roberts Creek Study Forest: Pre-harvest chemical characteristics of three S6 creeks, Flume Creek Experimental Watershed . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report TR-013. (Accessed April 2011). Hudson, R. & L. Tolland. 2002. Roberts Creek Study Forest: Effects of partial retention harvesting on nitrate concentrations in two S6 creeks three years after harvesting . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report No. 19. (Accessed April 2011).

Fogarty, F.W. Berch, S. D’Anjou, B.	Forest fungi	Fogarty, F.W., S. Berch, & B. D’Anjou. 2001. Effects of alternative silviculture treatments on the diversity of forest fungi in the Roberts Creek Study Forest . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 06. (Accessed April 2011).
Dupuis, L.A. Waterhouse, F.L.	Amphibians	Dupuis, L.A. & F.L. Waterhouse. 2001. Response of amphibians to partial cutting in a coastal mixed-conifer forest: Management practices for retaining amphibian habitat in the Vancouver Forest Region . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 05. (Accessed April 2011).
Nuszdorfer, F. D’Anjou, B.	Worker safety	Nuszdorfer, F. & B. D’Anjou. 2001. Roberts Creek Study Forest: Worker safety in partial harvesting silvicultural experiments and operations . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Extension Note No. 03. (Accessed April 2011).
Waterhouse, F. L. Harestad, A.S.	Birds	Waterhouse, F.L. & A.S. Harestad. 2002. Roberts Creek Study Forest: Habitat use of a dispersed retention area by breeding winter wrens . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical Report No. 20. (Accessed April 2011).
Wong, A.B.	Public perceptions	Wong, A.B. 1994. Alternative silvicultural systems and forest management in the Roberts Creek—Mount Elphinstone forest: Public attitudes and perceptions . Master of Natural Resources Management and Master of Business Administration thesis. Simon Fraser University, Burnaby, B.C. (Accessed January 2012).

APPENDIX 21: BOSTON BAR

Trial name: Boston Bar Silvicultural Systems Trial (EP1151)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Rod Negrave Roderick.Negrave@gov.bc.ca	1991	IDFww	Douglas-fir	Clearcut Seed tree Shelterwood 2 replications	To study the effects of silvicultural systems on: - Climate - Soil - Tree regeneration - Vegetation - Windthrow - Harvesting costs	None	2005
General publications: • D’Anjou. 1998. Partial Cutting in the coast-interior transition: Seedfall, regeneration and stand structure changes . In: Managing the dry Douglas-fir forests of the southern interior: Workshop Proceedings. April 29–30, 1997. Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests Research Program. Victoria, B.C. pp. 21–28. (Accessed April 2011).							
Comments: Windthrow events in 1991 and 1994; Douglas-fir bark beetle infestation; escaped campfire 1995 reduced residual stand densities in upper block since harvest.							

Researchers involved	Values assessed	Publications
D’Anjou, B.	Seedfall, regeneration, stand structure changes	• D’Anjou. 1998. Partial Cutting in the coast-interior transition: Seedfall, regeneration and stand structure changes . In: Managing the dry Douglas-fir forests of the southern interior: Workshop Proceedings. April 29–30, 1997. Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests Research Program, Victoria, B.C. pp. 21–28. (Accessed April 2011).
Antos, J. Nigh, G. Parish, R. D’Anjou, B.	Regeneration	• D’Anjou, B. 2006. Regeneration among a range of dispersed retention densities in the Coast-Interior transition . FIA Project #40IV094. Forest Investment Account. Forest Science Program, Victoria, B.C. Project Report. (Accessed April 2011). • Antos, J., G. Nigh, R. Parish, & B. D’Anjou. 2006. Early height growth of Douglas-fir on a dispersed retention sites in the Coast-Interior transition of British Columbia, Canada . FIA Project #40IV094. Forest Investment Account - Forest Science Program, Victoria, B.C. Project Report. (Accessed April 2011).
D’Anjou, B.	Stand structure	• D’Anjou, B. 2006. Dispersed retention in the Coast-Interior transition: Stand structure 15 years after harvest . FIA Project #40IV094. Forest Investment Account – Forest Science Program, Victoria, B.C. Project Report. (Accessed April 2011).

APPENDIX 22: IDF MULE DEER WINTER RANGE

Trial name: IDF Mule Deer Winter Range Single Tree Selection Systems Trial (EP903)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca Ken Day Ken.Day@ubc.ca	1984	IDFdk3	Douglas-fir Lodgepole pine	Single tree selection – 16–20% volume removal. Spacing (clumpy and standard) Intertree distance Leaving unspaced strips of various widths	- Retain equivalent use by mule deer in single tree selection and no harvest controls. - Growth and yield in managed stands.	None	2003
General publications: <ul style="list-style-type: none">• Armleder, H.M. & R.N. Thomson. 1984. Habitat relationships of mule deer in the Interior Douglas-fir zone of central British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Wildlife Habitat Research Report No.14. (Accessed April 2011).• Armleder, H.M. & R.N. Thomson. 1984. Experimental harvesting of dry-belt Douglas-fir on a Mule Deer Winter Range at Knife Creek: Working plan and progress report. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Wildlife Habitat Research No. 17. (Accessed April 2011).• Wiensczyk, A.M. 2004. Growth and yield after pre-commercial thinning of Douglas-fir in the IDF. LINK 7(1):16.							
Comments: Dormant – may be reactivated for the 2 nd harvest entry (year 20).							

Researchers involved	Values assessed	Publications
Day, J.K. Dawson, R.J. Armleder, H.M. Waterhouse, M.J. Peel, D. Bings, B.	Mule Deer Winter Range	<ul style="list-style-type: none">• Armleder, H.M., R.J. Dawson, & R.N. Thomson. 1986. Handbook for timber and mule deer management coordination on winter ranges in the Cariboo Forest Region. B.C. Ministry of Forests, Research Branch, Land Management Handbook No. 13. (Accessed April 2011).• Waterhouse, M.J., R.J. Dawson, H.M. Armleder, & P. Belliveau. 1988. A preliminary study of the effects of juvenile spacing on wildlife habitat use during winter in the interior Douglas-fir zone of British Columbia. B.C. Ministry of Forests, Research Report 88002-CA. (Accessed April 2011).• Dawson, R.J., H.M. Armleder, & M.J. Waterhouse. 1990. Preferences of mule deer for Douglas-fir foliage from different sized trees. Journal of Wildlife Management 54(3):378–382.• Waterhouse, M.J., R.J. Dawson, & H.M. Armleder. 1990. The effects of juvenile spacing on wildlife habitat use during winter in the Interior Douglas-fir zone of British Columbia. B.C. Ministry of Forests. Research Report RR89003-CA. (Accessed April 2011).• Waterhouse, M.J., H.M. Armleder, & R.J. Dawson. 1991a. Forage litterfall in Douglas-fir forests in the Central Interior of British Columbia. B.C. Ministry of Forests. Research Note No. 108. (Accessed April 2011).• Waterhouse, M.J., R.J. Dawson, & H.M. Armleder. 1991b. Chemical composition of Douglas-fir foliage on Mule Deer Winter Range. B.C. Ministry of Forests. Research Report RR91003-CA. (Accessed April 2011).• Armleder, H.M. & R.J. Dawson. 1992. Logging on Mule Deer Winter Range: An integrated management approach. The Forestry Chronicle 68(1):132–137.• Armleder, H.M., M.J. Waterhouse, D.G. Keisker, & R.J. Dawson. 1994. Winter habitat use by mule deer in the central interior of British

		<p>Columbia. Canadian Journal of Zoology 72:1721–1725. (Accessed April 2011).</p> <ul style="list-style-type: none">• Waterhouse, M.J., H.M. Armleder, & R.J. Dawson. 1994. Winter food habits of mule deer in the Central Interior of British Columbia. B.C. Ministry of Forests. Research Note No. 113. (Accessed April 2011).• Day, J.K. 1998. Selection management of interior Douglas-fir for Mule Deer Winter Range. Master of Forestry Thesis, University of British Columbia, Faculty of Forestry, Vancouver, B.C. (Accessed April 2011).• Armleder, H.M., M.J. Waterhouse, R.J. Dawson, & K.E. Iverson. 1998. Mule deer response to low-volume partial cutting on winter ranges in Central interior British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Research Report RR16. (Accessed April 2011).• Armleder, H.M., B. Penny, B. Bings, & K. Day. 1999. Clumpy spacing: Juvenile spacing Douglas-fir into clumps to imitate natural stand structure. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Extension Note No. 32. (Accessed April 2011).• Dawson, R. & H.M. Armleder. 2000. Structural definitions for management of Mule Deer Winter Range habitat in the interior Douglas-fir zone. B.C. Ministry of Forests, Cariboo Forest Region Research Section. Extension Note No. 25A. (Accessed April 2011).• Koot, C. & J.K. Day. 2003. Commercial thinning of Mule Deer Winter Range. Alex Fraser Research Forest, University of British Columbia, University Research Forests Extension Note Series. Quicksheet No. 21. (Accessed April 2011).• Dawson, R., H.M. Armleder, B. Bings, & D. Peel. 2007. Management strategy for Mule Deer Winter Ranges in the Cariboo-Chilcotin. Part 1a: Management plan for shallow and moderate snowpack zones. B.C. Ministry of Forests and Range, Forest Science Program. Land Management Handbook – LMH-60. (Accessed April 2011).
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APPENDIX 23: VARIABLE RETENTION ADAPTIVE MANAGEMENT

Trial name: Variable retention adaptive management trials (Tsitika, Horseshoe Lake, Goat Island, Memekay, Port McNeill, Klanawa, Lewis Lake, Stillwater, Moakwa)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Annette van Niejenhuis AVanniejenhuis@westernforest.com William J. (Bill) Beese Bill.Beese@viu.ca Glen Dunsworth browntrout@shaw.ca	2001–2005	CWHxm CWHmm/dm CWHvm/vh CWHwh1 CDFmm MHmm1	Western hemlock Western red cedar Douglas-fir	Group retention (10, 20 and 30% retention in 0.2–0.5 ha patches) Dispersed retention (5, 10 and 15% retention) Group removal (69% retention – removal in 4 patch sizes – 1.0, 0.5, 0.25 and 0.1 ha) Group size (15% retention – 3 distributions – dispersed, 0.2–0.5 ha patches, and 0.8–1.2 ha patches) Riparian retention Clearcut control Unharvested control	To study effects of silvicultural systems on: - Growth and yield - Birds - Bryophytes - Canopy epiphytes - Carabid beetles - Frogs and salamanders - Gastropods - Lichens - Mycorrhizal fungi - Squirrels - Vascular plants	None	2010
<p>General publications:</p> <ul style="list-style-type: none">• Beese, W.J., B.G. Dunsworth, & N.J. Smith. 2005. Variable-retention adaptive management experiments: Testing new approaches for managing British Columbia’s Coastal Forests. In: Balancing Ecosystem Values: Innovative experiments for sustainable forestry: Proceedings of a conference. USDA Forest Service, Pacific Northwest Research Station, August 15–29, 2004. Portland, O.R. C.E. Peterson & D.A. Maguire (editors). General Technical Report PNW-GTR-635. pp. 55–64. (Accessed May 2011).• Beese, W.J., B.G. Dunsworth, & N.J. Smith 2005. Variable retention adaptive management experiments: Testing new approaches for managing British Columbia’s Coastal Forests. Balancing Ecosystem Values: Innovative experiments for sustainable forestry conference. August 15–20, 2004, Portland, O.R. [Presentation]. (Accessed May 4, 2011).• Beese, W.J. B.G. Dunsworth, K. Zielke, & B. Bancroft. 2003. Maintaining attributes of old-growth forests in coastal BC through variable retention. The Forestry Chronicle 79(3):570–578.• Houde, I. 2003. Adaptive management to sustain biological diversity on the Weyerhaeuser coastal tenure, British Columbia, Canada. In: Conference Proceedings. BorNet International Conference on Biodiversity conservation in Boreal Forests. May 27–28, 2002. Uppsala, Sweden. Leech, S. C. Whittaker and J. Innes. BorNet Canada, University of British Columbia, Vancouver, B.C. pp. 53–55. (Accessed May 2011).• Beese, W.J. & B.G. Dunsworth. 2011. Western Forest Strategy Adaptive Management Summary. Progress Report 2009/10. Forest Investment Account, Land Based Investment Program, Resource information component – Monitoring Activity Area. Western Forest Products, Campbell River, B.C. (Accessed May 2011). <p>Comments: Silvicultural systems treatments were applied operationally at different sites and different ecosystems across Vancouver Island and Queen Charlotte Islands.</p> <ul style="list-style-type: none">- Group Retention treatments (Goat Island (R1009), Tsitika (R917), and Hoodoo [R1000])- Dispersed Retention treatments (Stillwater) – no replication- Group Removal treatments (Memekay (R1163)) – no replication- Group Size treatments (Klanawa (R1217), Port McNeill (R817))- Riparian Retention treatments (Lewis Lake (R949), Moakwa)							

Researchers involved	Values assessed	Publications
Chan-McLeod, A. Moy, A. Preston, M.I. Harestad, A.S.	Birds	<ul style="list-style-type: none"> Chan-McLeod, A. & A. Moy. 2010. An experimental study of variable-retention harvest methods on forest birds. FIA-FSP Project #Y103156. 2009–10 Final Technical Report. (Accessed May 2011). Preston, M.I. & A.S. Harestad. 2007. Community and species responses by birds to group retention in a coastal temperate forest on Vancouver Island, British Columbia. <i>Forest Ecology and Management</i> 243:156–167. Manning, E.T. 2008. Forest songbird monitoring of WFP TFL37, Woss, B.C. Report by Manning, Cooper and Associates for Western Forest Products Inc., Englewood Division, B.C. Forest Investment Account No. 6654003.
Huggard, D.	Wildlife habitat	<ul style="list-style-type: none"> Huggard, D.J. 2004. Weyerhaeuser BC Variable Retention Adaptive Management Program: Habitat monitoring 1999 to 2004 – Summary and Data Report. FIA LBIP Innovative project. FIA Project 6353003. (Accessed May 2011).
Sandford, J. Rollerson, T.P. Peters, C.M. Beese, W.J.	Windthrow	<ul style="list-style-type: none"> Rollerson, T.P., C.M. Peters, & W.J. Beese. 2009. Variable Retention Windthrow Monitoring project – 2001–2009. Forest Investment Account (FIA) – Land Base Investment Program. FIA Project 6755019. Final Report. (Accessed May 2011).
Paulson, A.	Stream invertebrates	<ul style="list-style-type: none"> Paulson, A. 2007. The effects of clear-cut logging and variable retention on emergent <i>Diptera</i> biodiversity in headwater streams in the Tsitika Valley on Vancouver Island, Undergraduate research project, Bachelor of Science, Malaspina University-College, Nanaimo, B.C.
Smith, N.J.	Regeneration	<ul style="list-style-type: none"> Smith, N.J., K. Iles, K. Raynor, & W.J. Beese. 2010. Effects of variable retention on planted and natural regeneration in Coastal BC. Forest Investment Account – Forest Science Program. FIA project Y102064. Executive Summary 2009/10 (Accessed May 2011). Smith, N.J. 2010. Effect of variable retention on planted and natural regeneration in Coastal BC: Data measurement and analysis. Forest Investment Account – Forest Science Program. FIA project Y103210. Final Technical Report. (Accessed May 2011).
Ovaska, K. Sopuck, L.	Gastropods	<ul style="list-style-type: none"> Ovaska, K. & L. Sopuck. 2000. Evaluation of the potential of terrestrial gastropods (slugs and snails) for monitoring ecological effects of logging practices on forest-floor conditions on Vancouver Island, British Columbia. A pilot study, October-November 1999. Report prepared by Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2001. Potential of terrestrial gastropods and salamanders as indicators for monitoring ecological effects of variable-retention logging practices. A pilot study, in the North Island Timberlands, May-November, 2000. Report prepared Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2002. Terrestrial gastropods and salamanders as indicators for monitoring ecological effects of variable-retention logging practices. A pilot study, May-October, 2001. Report prepared by Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2003. Terrestrial gastropods as indicators for monitoring ecological effects of variable-retention logging practices. Pre-disturbance surveys at experimental sites, May-October 2002. Report prepared by Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2004. Terrestrial gastropods as indicators for monitoring ecological effects of variable-retention logging practices. Pre-disturbance surveys at experimental sites, May-November 2003. Report prepared by Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2005. Terrestrial gastropods as indicators for monitoring ecological effects of variable-retention logging practices. Synthesis of field data, fall 1999–2003. Report prepared by Biolinx Environmental Research Ltd for Weyerhaeuser Company Ltd, Nanaimo, B.C. Ovaska, K. & L. Sopuck. 2006. Terrestrial gastropods as indicators for monitoring ecological effects of variable-retention logging practices. (2005 field season). Report prepared by Biolinx Environmental Research Ltd for Cascadia Forest Products, Nanaimo, B.C.

		<ul style="list-style-type: none"> • Ovaska, K. & L. Sopuck. 2007. Terrestrial gastropods as focal species for monitoring ecological effects of variable-retention logging practices. (2006 field season). Report prepared by Biolinx Environmental Research Ltd for Western Forest Products, Campbell River, B.C. • Ovaska, K. & L. Sopuck. 2008. Terrestrial gastropods as focal species for monitoring ecological effects of variable-retention logging practices: Synopsis of the complete project and detailed results for the 2007 field season. Forest Investment Account – Forest Science Program. FIA-FSP Project #Y083030. Final Technical Report. (Accessed May 2011). • Ovaska, K. & L. Sopuck. 2008. Terrestrial gastropods as focal species for monitoring ecological effects of variable-retention logging practices. Final report to Western Forest Products and B.C. Forest Science Program, Biolinx Environmental Research Ltd, Sidney, B.C. • Ovaska, K., L. Sopuck, & W.J. Beese. 2008. Land snails and slugs as ecological indicators of logging practices: Recommendations for adaptive management. Forest Investment Account – Forest Science Program. FSP project Y083030. Summary Report. (Accessed May 2011).
Beese, W.J. Pearsall, I.A.	Carabid beetles	<ul style="list-style-type: none"> • Pearsall, I.A. 2008. Study to assess the efficacy of ground beetles (<i>Coleoptera: Carabidae</i>) as ecological indicators in two variable-retention experimental sites: A temporal comparison. Progress report prepared for the B.C. Forest Science Program, Pearsall Ecological Consulting, Nanaimo, B.C. • Pearsall, I.A. 2009. Effect of stand-Level structures and configurations on carabid beetles in Coastal B.C. VR sites: Comparison of Riparian retention and Group retention VR Methods. FSP Y91065 Technical Summary. • Beese, W.J. & I.A. Pearsall. 2009. Effects of stand-level structures and configurations on Carabid beetles in Coastal BC VR sites: Comparison of riparian retention and group retention VR methods. Forest Investment Account – Forest Science Program. FSP project Y091065. Executive Summary. (Accessed May 2011). • Pearsall, I.A. 2010. Effect of stand-level structures and configurations on Carabid beetles in Coastal BC VR sites: Comparison of group removal VR methods. Forest Investment Account – Forest Science Program. FSP project Y102065. Technical Summary. (Accessed May 2011). • Pearsall, I.A. 2010. Effect of stand-level structures and configurations on carabid beetles in coastal variable retention sites: Comparison of group removal variable retention method. FSP Project Y102065 Report.
Bancroft, B. Zielke, K. Beese, W.J.	Implementation	<ul style="list-style-type: none"> • Beese, W.J., K. Zielke, & B. Bancroft. 2005. Variable retention implementation monitoring (Poster Abstract). In: Balancing Ecosystem Values: Innovative experiments for sustainable forestry: Proceedings of a conference. USDA Forest Service, Pacific Northwest Research Station, August 15029, 2004. Portland, O.R. C.E. Peterson & D.A. Maguire (editors). General Technical Report PNW-GTR-635. pp. 342. (Accessed May 2011).
Trofymow, J.A. Outerbridge, R.A.	Ectomycorrhizae	<ul style="list-style-type: none"> • Outerbridge, R.A. & J.A. Trofymow. 2004. Diversity of ectomycorrhizae on experimentally planted Douglas- fir seedlings in variable retention forestry sites on southern Vancouver Island. Canadian Journal of Botany 82(11):1671–1681. • Outerbridge, R.A. & J.A. Trofymow. 2008. How do different levels of green tree retention affect the survival of ectomycorrhizae on the southern coast of British Columbia. 2007–08 Progress report prepared for the B.C. Forest Science Program, Canadian Forest Service, Victoria, B.C. • Outerbridge, R.A. & J.A. Trofymow. 2009. Forest management and maintenance of ectomycorrhizae: A case study of green tree retention in south-coastal British Columbia. B.C. Journal of Ecosystems and Management 10(2):59–80. (Accessed May 2011).

APPENDIX 24: WETASK LAKE

Trial name: Comparison of Patch clearcut silviculture systems using push-over and conventional harvesting methods for Armillaria root rot infected stands SX95102 – (aka Wetask Lake)							
Trial website: http://www.for.gov.bc.ca/rsi/research/nsites/sx95102.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Maureen Ketcheson jmj@netidea.com	1992	ICHmw3	Douglas-fir Western larch Paper birch	Patch cut 2 harvest methods – push-over and conventional	To study the effects of patch cutting and harvest methods on: - Forest health - Growth and yield - Regeneration	None	1999 Dormant
General publications: • Ketchison, M.V. 1992. Wetask Lake Silvicultural Systems Demonstration Forest Establishment report. B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. • Bauer, P. & C. Thompson. 2000. Wetask Lake Silvicultural Systems Trial: A seedling trial comparing patch clearcut silvicultural systems using conventional harvesting methods and post-harvest stumping for Armillaria Root Disease infected stands. Final Report submitted to Science Council of B.C. for Project FR-96/97-482.							
Comments: Dormant.							

APPENDIX 25: BURTON CREEK

Trial name: Burton Creek Trial. (EP1191)							
Trial website: http://www.for.gov.bc.ca/rsi/research/nsites/eb119100.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Michaela Waterhouse Michaela.Waterhouse@gov.bc.ca Phil Comeau Phil.Comeau@ales.ualberta.ca	1994	ICHmw2	Douglas-fir Western red cedar Western larch Western white pine Lodgepole pine Ponderosa pine Paper birch Aspen Western hemlock Engelmann spruce Subalpine fir	Patch cuts (0.75 ha)	To monitor: - Growth of 10 tree species across micro-environmental gradients, particularly light - Natural regeneration	None	2000
General publications: <ul style="list-style-type: none">• Comeau, P. & K. Thomas. 1998. Evaluation of understory light conditions using fisheye photography at Burton Creek. B.C. Ministry of Forests, Victoria, B.C. Unpublished report.• Simpson, D.G. 1999. At the forest edge: Light effects on photosynthesis of seven evergreen conifers. B.C. Ministry of Forests, Vernon, B.C. Unpublished report.• Delong, D., P. Comeau, I. Cameron, D. Simpson, R. Adams, & E. Fanjoy. 2000. How light conditions affect tree seedling performance in the Interior Cedar-Hemlock subzone: Preliminary results – EP1191. B.C. Ministry of Forests, Forest Sciences, Nelson Forest Region, Nelson, B.C. Extension Note No. 50. (Accessed January 2012).• Hossain, K, & P. Comeau. 2009. Growth of Douglas-fir, western hemlock and Engelmann spruce in relation to location and microclimate in openings created using a strip shelterwood system. University of Alberta, Stand Dynamics Research Update #2009-1. (Accessed January 2012).							
Comments: Active.							

APPENDIX 26: FOSTHALL CREEK ROAD

Trial name: Partial Cutting in the Columbia Forest Zone. (EP370b) (aka Fosthall Creek Road Trial)							
Trial website: http://www.for.gov.bc.ca/rsi/research/nsites/ep370b.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Wayne Johnstone Louise de Montigny Louise.deMontigny@gov.bc.ca	1957	ICHmw2	Western red cedar Western hemlock Western larch Douglas-fir Lodgepole pine Western white pine Hybrid spruce Subalpine fir	Improvement cut (thinning) Diameter limit cut Salvage cut No harvest control Five replicates of each treatment	To study impact of silvicultural systems on: - Growth and yield - Forest health	None	1997 Dormant
General publications:							
Comments: Summer 1989 – one plot destroyed by logging. Dormant.							

Researchers involved	Values assessed	Publications
Stewart, M.	Harvesting costs	• Stewart, M. 1956. Cost study of partial cutting treatments in interior wet belt of British Columbia. B.C. Forest Service. Research Note No. 32.
Thompson, C. Johnstone, W.D.	Growth and yield	• Thompson, C. 1977. Partial cutting in a mixed wet-belt type. B.C. Forest Service. Research Note No. 78. • Johnstone, W.D. 2002. Growth and development following partial cutting of a complex stand in the Interior Cedar-Hemlock zone of British Columbia: 40 year results . B.C. Ministry of Forests, Research Branch, Victoria, B.C. Research Report No. 22. (Accessed January 2012).
Schulting, J. Schulting, M.	Forest health	• Schulting, J. & M. Schulting. 1998. Root disease assessment of EP370b, 40 years post-treatment. B.C. Ministry of Forests, Nelson Forest Region, Draft Report.

APPENDIX 27: BOLEAN LAKE

Trial name: Bolean Lake (EP371)							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
None	1951	ESSFdc2	Engelmann spruce Sub-alpine fir	Clearcut 50% retention in strip cuts Group selection Single tree selection	To study effects of silvicultural systems on: - Tree regeneration and growth - Bark beetles - Windthrow	- Prescribed fire - Bulldozer scarification	Project terminated in the 1970s
<p>Publications:</p> <p>Smith, J.H.G. 1954. A cooperative study of Engelmann spruce – Alpine fir silviculture and management. Northwest Science 28(4):157–164. (Accessed May 2011).</p> <p>Smith, J.H.G. & M.B. Clark. 1960. Growth and survival of Engelmann spruce and alpine fir on seed spots at Bolean Lake, B.C. 1954–1959. The Forestry Chronicle 36(1):46–49.</p> <p>Smith, J.H.G. & M.B. Clark. 1974. Results of methods of cutting and related studies initiated in the ESSF forests near Bolean Lake, B.C. Presented at North West Scientific Association meeting, Vancouver, B.C. May 1974 [Presentation].</p> <p>Herring, L.J. 1977. Studies of advance subalpine fir in the Kamloops forest district. B.C. Ministry of Forests, Research Branch, Research Note RN-80. (Accessed May 2011).</p> <p>Mather, J. 1987. Assessment of silvicultural practices in the Engelmann Spruce – Subalpine fir zone in the Kamloops Forest Region. B.C. Ministry of Forests and Lands, Silviculture Section, Kamloops, B.C. (Accessed May 2011).</p> <p>Mather, J. 1991. A comparison of silvicultural systems in the ESSFdc2 subzone at Bolean Lake 38 years after logging. BC Forest Service, Kamloops Forest Region, Kamloops, B.C.</p>							
Comments: Project terminated in the early 1970s.							

APPENDIX 28: CATS EARS CREEK

Trial name: Cats Ears Creek							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Rod Negrave Roderick.Negrave@gov.bc.ca	1992	CWHvm1 CWHvm2	Western hemlock Amabilis fir Western red cedar Yellow cedar Douglas-fir	Single tree selection – 75% dispersed retention Group selection – 0.15, 0.3, and 1.4 ha openings Unharvested control	To study: - Operational application - Growth of regeneration - Windthrow	None	2002
Publications: D’Anjou, B. 2003. Single-tree and group selection harvesting in an old-growth forest on the west coast of Vancouver Island, British Columbia . B.C. Ministry of Forests, Vancouver Forest Region, Nanaimo, B.C. Technical report No. 24. (Accessed April 2011).							
Comments:							

APPENDIX 29: JOHN PRINCE RESEARCH FOREST

Trial name: John Prince Research Forest (University of Northern British Columbia)							
Trial website: http://researchforest.unbc.ca/jprf/jprf.htm ; http://cura.unbc.ca/jprf.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Dexter Hodder dexter@johnprinceresearchforest.com	1999	SBSdw3 SBSdk SBSmk1	White spruce Sub-alpine fir Douglas-fir Lodgepole pine	Seed tree Patch cut Strip cutting		None	Unknown
General publications:							
Comments:							

Researchers involved	Values assessed	Publications
Jull, M. Sagar, B. Rogers, B. Hawkins, C.	Windthrow Leave tree survival and dynamics	<ul style="list-style-type: none">• Jull, M. & B. Rogers. (completed manuscript) A long-term study of the post-harvest population dynamics, development, and emergent characteristics of mature Douglas-fir leave-trees on sub-boreal sites in Central Interior. In progress.• Rogers, B. 2006. An investigation of Douglas-fir leave-tree mortality in the sub-boreal spruce zone: A temporal and spatial assessment of water relations under pre and post harvest conditions. MSc Thesis, Natural Resource and Environmental Studies, University of Northern British Columbia, Prince George, B.C.

APPENDIX 30: ALEZA LAKE RESEARCH FOREST

Trial name: Aleza Lake Research Forest							
Trial website: http://web.unbc.ca/~aleza/ (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Mike Jull jullm@unbc.ca	1930–1950	SBSwk1	Hybrid spruce Sub-alpine fir Douglas-fir Paper birch Trembling aspen Black cottonwood Black spruce Lodgepole pine	Shelterwood Clearcut Diameter limit partial cutting Single tree selection Also have many growth and yield permanent sample plots in these areas as well as in unharvested stands.	To study impacts of silvicultural systems on: <ul style="list-style-type: none">- Growth and yield- Regeneration- Windthrow- Forest health- Stand structure and biodiversity	None	2010
General publications: <ul style="list-style-type: none">• Jull, M. 2005. Aleza Lake Research Forest Management plan #2 2005-2010. Aleza Lake Research Forest Society, University of Northern British Columbia, Prince George, B.C.							
Comments: <ul style="list-style-type: none">• Contains Experimental Projects (EP’s) 103, 106, 107, 112, 113, 115, 150, 291, and 292 (long-term monitoring plots in old-growth or partial cut stands).• Also contains Silvicultural systems project SS018 – Sx uniform shelterwood trial.• Approximately 800 ha of historical partial cuts with approximately 100 embedded monitoring plots.							

Researchers involved	Values assessed	Publications
Newberry, J.E. Lewis, K.J. Walters, M.	Stand Dynamics	<ul style="list-style-type: none">• Newbery, J.E. 2001. Small scale disturbances and stand dynamics in <i>Inonotus tomentosus</i> infected and uninfected old growth. Master's Thesis, University of Northern BC, Prince George, B.C.• Newberry, J.E., K.J. Lewis, & M. Walters. 2002. Disturbance and succession in sub-boreal forests: Impacts of <i>Inonotus tomentosus</i> and partial cut harvesting. Presentation at the 4th International Workshop on Disturbance Dynamics in Boreal Forests. August 9–14, 2002. Prince George, B.C. [Presentation].• Newbery, J.E., K.J. Lewis, & M. Walters. 2007. <i>Inonotus tomentosus</i> and the dynamics of unmanaged and partial-cut wet sub-boreal spruce-fir forests. Canadian Journal of Forest Research 37(12):2663–2676.
Jull, M. Froese, R. Fletcher, S. Renzie, C.	Harvesting Windthrow Regeneration	<ul style="list-style-type: none">• Jull, M., R. Froese, & S. Fletcher. 1997. Shelterwood partial cutting in Interior white spruce: Two-year results of a case study at Aleza Lake, BC. B.C. Ministry of Forests, Prince George Forest Region, Research Note PG-02. (Accessed May 2011).• Jull, M. & C. Renzie. 2001. Shelterwood partial cutting in interior spruce: Five year results of the Aleza case study. Aleza Lake Research Forest Society, Prince George, B.C. Aleza Field Note No. 1.• Pogue, M. 1946. Regeneration and growth of white spruce after logging. British Columbia Forest Service Report, Research Division, Victoria, B.C.
Farnden, C.	Growth and yield	<ul style="list-style-type: none">• Farnden, C. 1998. Yield curves for uneven-aged management of wet-belt Interior spruce / subalpine fir stands near Prince George, BC. McGregor Model Forest Association (now Resources North Association), Prince George, B.C. Research contract report. (Accessed May 2011).

		<ul style="list-style-type: none">Farnden, C. 1997. Simulated conversion of unmanaged wet-belt Interior spruce / subalpine fir stands to regulated uneven-aged management. McGregor Model Forest Association (now Resources North Association), Prince George, B.C. Research contract report. (Accessed May 2011).
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APPENDIX 31: ALEX FRASER RESEARCH FOREST

Trial name: Alex Fraser Research Forest (UBC)							
Trial website: http://www.forestry.ubc.ca/resfor/afrf/index.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Ken Day Ken.Day@ubc.ca Cathy Koot Cathy.Koot@ubc.ca	1987	SBSdw1 ICHmk3 IDFxm IDFdck3	Hybrid spruce Sub-alpine fir Douglas-fir Lodgepole pine Western red cedar	Uniform shelterwood Irregular shelterwood Single tree selection Commercial and pre-commercial thinning Clearcut	Provide environment for education, research, and demonstration in all aspects of forest resource management	None	2010
General publications: <ul style="list-style-type: none">• Klinka, K., P. Varga, C. Trethewey, C. Koot, M. Rau, J. Macku, & T. Kusbach. 2004. Site units of the University of British Columbia Alex Fraser Research Forest. UBC Alex Fraser Research Forest, Williams Lake, B.C. (Accessed May 2011).• Day, K. 2007. History of the UBC Alex Fraser Research Forest 1987-2007. UBC Alex Fraser Research Forest, Williams Lake, B.C. (Accessed May 2011).• Day, K. 2007. UBC Alex Fraser Research Forest, Forest Stewardship Plan 2007-2012. UBC Alex Fraser Research Forest, Williams Lake, B.C. (Accessed May 2011).• Day, K. 2007. UBC Alex Fraser Research Forest Management and Working Plan #3. UBC Alex Fraser Research Forest, Williams Lake, B.C. (Accessed May 2011).							
Comments: One of the sites for the IDF (Interior Douglas-Fir) Mule Deer Winter Range study (Appendix) was on the Knife Creek block of the Alex Fraser Research Forest. In addition one of the study areas for the Uniform Shelterwood Trial (Appendix) was on the Gavin Lake block of the Research Forest.							

Researchers involved	Values assessed	Publications
Waterhouse, M.J. Armleder, H.M. Dawson, R.	Mule Deer Winter Range	<ul style="list-style-type: none">• Armleder, H.M. & R.N. Thomson. 1984a. Habitat relationships of mule deer in the Interior Douglas-fir zone of central British Columbia. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Wildlife Habitat Research Report No. 14. (Accessed May 2011).• Armleder, H.M. & R.N. Thomson. 1984b. Experimental harvesting of dry-belt Douglas-fir on a Mule Deer Winter Range at Knife Creek: Working plan and progress report. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Wildlife Habitat Research No. WHR-17. (Accessed May 2011).• Day, K. 1997. Interior Douglas-fir and selection management at the UBC/Alex Fraser Research Forest: Forest management for Mule Deer Winter Range. Paper prepared for IUFRO Uneven-aged Silviculture Symposium. September 15–19, 1997. Corvallis, O.R. (Accessed May 2011).• Day, J.K., G. Weckerle, J.L. Mitchell, R.W. Gray, C. Trethewey, & B.A. Atkins. 2003. Commercial thinning in Mule Deer Winter Range: Improving habitat through forest management. UBC Alex Fraser Research Forest, Williams Lake, B.C. Technical Report, Forestry Innovation Investment Contract R2003–0216. (Accessed May 2011).• See Appendix XXV – IDF Mule Deer Winter Range study for more publications.
Day, J.K. Rau, M. Zielke, K. Marshall, P. Koot, C.	Multiple values <ul style="list-style-type: none">- Mule Deer Winter Range- Harvest methods and costs- Stand growth	<ul style="list-style-type: none">• Day, K., M. Rau, & K. Zielke. 2000. Commercial thinning in dry-belt Douglas-fir stands on Mule Deer Winter Range in the Cariboo Forest Region. UBC Alex Fraser Research Forest, Williams Lake, B.C. Contract Report, Ministry of Agriculture and Food Contract GE1-230D. (Accessed May 2011).• Marshall, P., T. Lee, K. Day, & C. Koot. 2005. Summary of the 13 year results of an interior Douglas-fir pre-commercial thinning experiment in the Alex Fraser Research Forest, Williams Lake, British Columbia. FSP Project Y05-1131 Report. (Accessed May 2011).

Lee, T.		<ul style="list-style-type: none">• Marshall, P., T. Lee, K. Day, & C. Koot. 2008. Summary of 16 years of growth of uneven-aged interior Douglas-fir with different stand structures in the Alex Fraser Research Forest, Williams Lake, British Columbia. FIA-FSP Project 88-3 Report. (Accessed May 2011).
Day, J.K. Mitchell, S. Martin, P. Bancroft, B. Peel, K.	Regeneration Growth and yield Stem form Understory development	<ul style="list-style-type: none">• Day, K. 1996. Interior Douglas-fir and selection management. University of British Columbia, Department of Forestry, Vancouver, B.C. Directed Study Report FRST 504. (Accessed May 2011).• Day, J. 1997. Stocking standards for uneven-aged interior Douglas-fir. In: Managing the dry Douglas-fir forests of the southern interior: Workshop proceedings April 29–30, 1997, Kamloops, B.C. A. Vyse, C. Hollstedt, & D. Huggard (editors). B.C. Ministry of Forests, Research Branch, Victoria, B.C. Working Paper No. 34. (Accessed May 2011).• Mitchell, S. 2001. Summary of shelterwood Codominant ten year response in 50% BA removal treatment. Research Project 01-04. UBC Alex Fraser Research Forest Quicksheet No. 17. (Accessed May 2011).• Alex Fraser Research Forest. 2005. 13-year results of an interior Douglas-fir precommercial thinning experiment. Research Project 88-11. UBC Alex Fraser Research Forest. University Research Forests Extension Note Series. Quicksheet No. 22. (Accessed May 2011).• Martin, P., B. Bancroft, K. Day, & K. Peel. 2005. A new basis for understory stocking standards for partially harvested stands in the British Columbia interior. Western Journal of Applied Forestry 20(1):5–12. (Accessed May 2011).

APPENDIX 32: WEST ARM DEMONSTRATION FOREST

Trial name: West Arm Demonstration Forest							
Trial website: http://www.for.gov.bc.ca/rsi/research/wadf/wadf.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Teresa Newsome Teresa.Newsome@gov.bc.ca	1992	ICHdw ICHmw2	Douglas-fir Ponderosa pine Western red cedar Lodgepole pine Western Larch Grand fir	Clearcut Seed tree Shelterwood Patch and single tree Operational trials only – no replication	To study effects of silvicultural systems on: - Climate and snow - Wildlife and birds - Water values - Protect resource values	None	Unknown Dormant
General publications: • Crampton, D. 1992. The West Arm Demonstration Forest . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 03. (Accessed May 2011). • The Western Arm Demonstration Forest (WADF). 1995. The West Arm Demonstration Forest – Research Update . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 18. (Accessed May 2011). • Flett, S., J. Smith, & D. DeLong. 1999. West Arm Demonstration Forests, Strategic Plan: Summary . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 44. (Accessed May 2011). • Smith, J. & D. DeLong. 1999. The West Arm Demonstration Forest – Rising to the challenge. The Forestry Chronicle 75(3):457–459.							
Comments: Dormant.							

Researchers involved	Values assessed	Publications
Delong, D.	Harvesting (Heli-logging for beetle removal)	• Hawe, A. 1996. Case study: Helicopter logging for bark beetle control . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 31. (Accessed May 2011).
Brigham, R.M. Vonhof, M.J. Barclay, R.M.R. Gwilliam, J.C.	Bats	• Vonhof, M. & S. Grindal. 1993. Impacts of harvesting on the distribution, abundance, and foraging and roosting behaviour of bats in the WADF near Nelson, B.C. Unpublished Progress Report for Forestry Canada. • Craig, J. 1994. Bat research in the West Arm Demonstration Forest . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 13. (Accessed May 2011). • Grindal, S.D. 1995. Impacts of forest harvesting on bat foraging activity. MSc thesis. University of Regina, S.K. • Barclay, R.M.R. & R.M. Brigham (editors). 1996. Bats and Forest Symposium. Proceedings of First International Bat-Forest Interactions Symposium. Victoria, B.C., October 19–21, 1995. B.C. Ministry of Forests, Research Branch, Working Paper No. 23/1996. • Vonhof, M.J. & R.M.R. Barclay. 1996. Bats and trees . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 27. (Accessed May 2011). • Grindal, S. 1996. Impact of harvesting on habitat use by foraging bats . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 28. (Accessed May 2011). • Brigham, R.M., M.J. Vonhof, R. M.R. Barclay, & J.C. Gwilliam. 1997. Roosting behavior and roost-site preferences of forest-dwelling California bats (<i>Myotis californicus</i>). Journal of Mammalogy 78(4):1231–1239. • Grindal, S.D. & R.M. Brigham. 1998. Effects of small scale habitat fragmentation on activity by insectivorous bats. Journal of Wildlife Management 62:996–1003.

		<ul style="list-style-type: none"> • Grindal, S.D. & R.M. Brigham. 1999. Impacts of forest harvesting on habitat use by foraging insectivorous bats at different spatial scales. <i>Ecoscience</i> 6:25–34. • Grindal, S.D., J.L. Morissette, & R.M. Brigham. 1999. Concentration of bat activity in riparian habitats over an elevational gradient. <i>Canadian Journal of Zoology</i> 77:972–979.
Steeger, C. Krebs, J. Crampton, D.	Wildlife trees	<ul style="list-style-type: none"> • Steeger, C., J. Krebs, & D. Crampton. 1993. A close look at wildlife trees. B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 11. (Accessed May 2011).
Zielke, K. DeLong, D. Snowden, B. Smith, J.	Growth and yield	<ul style="list-style-type: none"> • Zielke, K., D. DeLong, B. Snowden, & J. Smith. 2002. Using PrognosisBC to analyze partial-cutting options over a rotation. B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 59. (Accessed May 2011).
Crockford, S. Darling, L.M. Summers, K. Teske, I. Lofroth, E.C.	Small mammals	<ul style="list-style-type: none"> • Crockford, S. 1995. Food habits of marten (<i>Martes americana</i>) in the West Arm Demonstration Forest. Report prepared by Pacific Identifications, Victoria, for Wildlife Branch, B.C. Ministry of Environment, Lands, and Parks. Victoria, B.C. • Darling, L.M. & K. Summers. 1997. Monitoring changes in wildlife diversity during silvicultural systems trials - group selection in the West Arm Demonstration Forest. Draft Final Report 1993–1996. Wildlife Branch, B.C. Ministry of Environment, Lands, and Parks, Victoria, B.C. • Darling, L.M., I. Teske, S. Crockford, & E.C. Lofroth. 1995. Impacts of partial cutting silvicultural systems on furbearer distribution and habitat use in the West Arm Demonstration Forest, Nelson Forest Region. Final Report. Report prepared for Forestry Canada, FRDA-II-Research in Sustainable Forest Development Program.
Crampton, D. Lavender, D.P. Harper, G. Whitehead, R. Thompson, C.F. Holmsen, S.D.	Silviculture	<ul style="list-style-type: none"> • Crampton, D. 1989. An ecophysiological study of plantation performance in the ICHa1. Forest Resource Development Agreement Program. Memo No. 119. • Crampton, D. & D.P. Lavender. 1990. Morphological and physiological responses of Douglas-fir, western larch, Engelmann spruce, & lodgepole pine to changes in soil moisture potential and light intensity on a burned, mesic, south-exposed site with two levels of vegetation removal. <i>Northwest Science</i> 64(2):98. • Harper, G., R. Whitehead, & C.F. Thompson. 1998. A comparison of manual brushing treatments in the ICHdw at Redfish Creek: 10 year results from blocks 10-13. B.C. Ministry of Forests Research Program. Extension Note No. 20. (Accessed May 2011).
Jordan, P.	Hydrology	<ul style="list-style-type: none"> • Gluns, D.R., 2001. Snowline pattern during the melt season: Evaluation of the H60 concept. In: Watershed assessment in the Southern Interior of B.C. Proceedings of a workshop, March 9–10, 2000. Penticton, B.C. D.A.A. Toews & S. Chatwin (editors). B.C. Ministry of Forests, Research Branch Land Management Handbook. pp. 68–93. (Accessed January 2012). • Jordan, P. 1996. Turbidity and suspended sediment measurements using OSB meters, West Arm Demonstration Forest Sediment Budget Study. Automatic Water Quality Monitoring Workshop, Richmond, BC February 12–13, 1996. [Presentation]. • Jordan, P. & P. Commandeur. 1998. Sediment Research in the West Arm Demonstration Forest, Nelson, B.C. In: Mountains to Sea: Human interaction with the hydrologic cycle. Proceedings, Canadian Water Resources Association, 51st Annual Conference, June 10–12, 1998, Victoria, B.C. Y. Alila (editor). pp. 348–363. • Jordan, P. 2001. Sediment budgets in the Nelson Forest Region. In: Workshop Proceedings: Watershed assessment in the Southern Interior of British Columbia, Penticton, B.C. March 9–10, 2000. B.C. Ministry of Forests Working Paper 57.
Stock, A.	Insects	<ul style="list-style-type: none"> • Stock, A.J., G. Pohl, W.R. McNee, & Z. MacLeod. 1995. Effects of small clearcuts on ground beetle (Coleoptera: Carabidae) species occurrence in the Interior Cedar-Hemlock biogeoclimatic zone in south-east British Columbia - first year results. B.C. Ministry of Forests, Nelson, B.C. Unpublished Progress Report.
Quesnel, H. Pinnell, H.D.	Natural disturbance patterns	<ul style="list-style-type: none"> • Quesnel, H.J. & H.D. Pinnell. 1998. Natural disturbance patterns, forest health and stand level wildlife - Assessment and integration for forest management in the West Arm Demonstration Forest (WADF). B.C. Ministry of Forests, Nelson, B.C. Unpublished Paper.

		<ul style="list-style-type: none">• Quesnel, H.J. & H.D. Pinnell. 2000. Application of natural disturbance processes to a landscape plan: The dry warm interior cedar-hemlock subzone (ICHdw) near Kootenay Lake, B.C. In: Conference Proceedings. Ecosystem management of forested landscapes: Directions and implementation. October 26–28, 1998. Nelson, B.C. R.G. D'Eon, J.F. Johnson, & E.A. Ferguson (editors). UBC Press, Vancouver, B.C.
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APPENDIX 33: SELKIRK COLLEGE WOODLOT

Trial name: Selkirk College Woodlot Partial Cutting Trial							
Trial website: http://selkirk.ca/programs/rr/landmanagement/crownland/ (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Stu Deverney sdeverney@selkirk.ca	1994–1996	ICHmw2	Western hemlock Douglas-fir Western larch Western white pine Western red cedar Engelmann spruce	Natural shelterwood with overstory retention	To study: - Hydrology - Biodiversity and habitat - Timber production - Visual quality To offer education opportunities.	None	Unknown
General publications: • Deverney, S. & D. DeLong. 1999. Partial cutting options in hemlock-dominated stands in Southeastern British Columbia: The Selkirk College Woodlot experience . B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. Extension Note No. 41. (Accessed May 2011).							
Comments:							

APPENDIX 34: MALCOLM KNAPP RESEARCH FOREST

Trial name: Malcolm Knapp Research Forest (University of British Columbia)							
Trial website: http://www.mkrf.forestry.ubc.ca/general/index.htm (Accessed January 2012).							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Paul Lawson Paul.Lawson@ubc.ca Cheryl Power Cheryl.Power@ubc.ca	1949	CWHdm CWHvm	Douglas-fir Western red cedar Western hemlock	Shelterwood (uniform and irregular) Clearcut and clearcut with reserves Commercial thinning Patch cut Group selection		None	Unknown
General publications:							
Comments:							

Researchers involved	Values assessed	Projects/Publications
Nixon, J. Perry, C. Terebka, A. Kimmins, J.P. Mailly, D. Adamovich, L. Dorey, J. Weetman, G. Power, C. Karakatsoulis, J. Sanders, P. Howard, A.F. Temesgen, H.	Tree growth	<ul style="list-style-type: none">• Adamovich, L. 1968. Systematic thinning study: Project 1968-03.• Dorey, J. & G. Weetman. 1989. Selection management of a hemlock-moss site on the UBC research forest: Project 1980–01.• Karakatsoulis, J., C. Power, & P. Sanders. 1989. Physiological and growth response of western redcedar seedlings following overstory removal: Project 1989–07.• Kimmins, J.P. & D. Mailly. 1993a. Comparative growth performance of Douglas-fir and western hemlock in a shelterwood cut – a trenching experiment: Project 1993-03.• Kimmins, J.P. & D. Mailly. 1993b. Dynamics of seed rain, seed bank and seedlings of Douglas-fir and western hemlock in an alternative silvicultural system: Project 1993-09.• Terebka, A. 2003. Understory growth in partial retention cutblocks: Project 2003-15.• Karakatsoulis, J. 2004. The growth and photosynthetic response of under-planted conifer seedlings to changes in understory light environment. PhD thesis. University of British Columbia, Vancouver, B.C. (Accessed August 2011).• Mailly, D. & J.P. Kimmins. 1997. Growth of Psuedostuga menziesii and Tsuga heterophylla seedlings along a light gradient: Resource allocation and morphological acclimation. Canadian Journal of Botany 75:1424–1435. (Accessed August 2011).• Howard, A.F. & H. Temesgen. 1997. Potential financial returns from alternative silvicultural prescriptions in second-growth stands of coastal British Columbia. Canadian Journal of Forest Research 27:1483–1495.• Mailly, D. 1998. Influence of the disturbance regime on forest succession in the Coastal Western Hemlock drier maritime subzone, British Columbia. Doctor of Philosophy (PhD) thesis. University of British Columbia, Vancouver, B.C.
Minami, Y.	Moss and lichen	<ul style="list-style-type: none">• Minami, Y. 2005. Effects on the epiphytic hanging moss, <i>Isothecium myosuroides</i> by partial harvesting in a second growth coniferous forest: Project 2005-03.
Hinch, S. Winfield, N.	Watersheds/hydrology	<ul style="list-style-type: none">• Winfield, N. 1998. Short-term morphological responses of headwater streams after logging. Master’s thesis. University of British Columbia, Vancouver, B.C.

Parr, B.		<ul style="list-style-type: none">• Winfield, N. 1999. Effect of logging using variable buffer width treatments on channel morphology and pool habitats in the coastal headwater streams of the Malcolm Knapp research forest. In: Proceedings of a large scale experiment at the University of British Columbia Malcolm Knapp Research Forest on ecology and management of riparian stream ecosystems, Department of Forest Sciences, University of British Columbia. M.C. Feller & J.S. Richardson (editors). Vancouver, B.C. pp. 62–64.• Parr, B. 1983. Initial effects of clearcutting and slashburning on stream temperature and sediment: Project 1983-22.
Burton, P.J.	Regeneration	<ul style="list-style-type: none">• Burton, P.J. 1997. Conifer germination on different seedbeds influenced by partially-cut canopies (abstract). Bulletin of the Ecological Society of America 78(4 Suppl.):230.
Van der Kamp, B. Sanders, P.	Forest health	<ul style="list-style-type: none">• Van der Kamp, B.J. & P. Sanders.1985. Report on the establishment of a hemlock dwarf mistletoe demonstration garden. Project 1985-03.
Bryne, K. Mitchell, S.J.	Windthrow	<ul style="list-style-type: none">• Byrne, K.E. 2005. Critical turning moments and drag equations for British Columbia conifers. MSc thesis, University of British Columbia, Vancouver, B.C.• Byrne, K.E. & S.J. Mitchell. 2007. Overturning resistance of western redcedar and western hemlock in mixed-species stands in coastal British Columbia. Canadian Journal of Forest Research 37(5):931–939.

APPENDIX 35: BALD RANGE

Trial name: Bald Range							
Trial website: None							
Contact	Estab. year	Ecosystems represented	Tree species	Silvicultural systems tested	Trial objectives	Post establishment treatments	Last measurement date
Tom Sullivan Tom.Sullivan@ubc.ca	1995	IDFdk MSdm	Douglas-fir Lodgepole pine Hybrid spruce Subalpine fir	Patch cuts (average 0.7 ha) – 33% of area harvested Single seed tree Group seed tree Unharvested control	To study effects of silvicultural systems on: - Large and small mammals - Vegetation - Coarse woody debris	- Fertilization - Pre-commercial thinning	2008
General publications:							
Comments: Active – Retrospective study.							

Researchers involved	Values assessed	Publications
Sullivan, T.P Sullivan, D.S. Lindgren, P.M.F. Ransome, D.B.	Small mammals	<ul style="list-style-type: none">• Sullivan, T.P. 1998. Seed tree systems and wildlife habitat. Applied Mammal Research Institute, Summerland BC [Extension Brochure]. (Accessed January 2012).• Sullivan, T.P., D.S. Sullivan, & P.M.F. Lindgren. 2000. Small mammals and stand structure in young pine, seed-tree and old-growth forest, southwest Canada. Ecological Applications 10(5):1367–1383.• Sullivan, T.P. 2001. Variable retention harvests and wildlife habitat: Stand structure and vegetation, abundance and diversity of small mammals, and habitat use by deer. Applied Mammal Research Institute, Summerland, B.C. [Extension Brochure]. (Accessed May 2011). (Accessed May 2011).• Sullivan, T.P., D.S. Sullivan, P.M.F. Lindgren, & D.B. Ransome. 2006. Influence of repeated fertilization on forest ecosystems: Relative habitat use by snowshoe hares (<i>Lepus americanus</i>). Canadian Journal of Forest Research 36:2080–2089.• Sullivan, T.P., D.S. Sullivan, & P.M.F. Lindgren. 2008. Influence of variable retention harvests on forest ecosystems: Plant and mammal responses up to 8 years post-harvest. Forest Ecology and Management 254:239–254.• Sullivan, T.P., D.S. Sullivan, & P.M.F. Lindgren. 2009. Dry Douglas-fir forests: Stand structure, openings and maintenance of biodiversity using small mammal indicators. Forest Investment Account – Forest Science Program Report.• Sullivan, T.P. 2009. Life after the Beetle. Salvage harvesting of MPB pine and green-tree Retention. A 30-year vision into the future. Applied Mammal Research Institute, Summerland, B.C. [Extension Brochure]. (Accessed May 2011).• Sullivan, T.P. 2009. Dry forests and grasslands. Stand structures, range habitats, and small mammals as indicators of biodiversity. Applied Mammal Research Institute, Summerland, B.C. [Extension Brochure]. (Accessed May 2011).• Sullivan, T.P., D.S. Sullivan, P.M.F. Lindgren, & D.B. Ransome. 2010. Long-term responses of mammalian herbivores to stand thinning and fertilization in young lodgepole pine (<i>Pinus contorta</i> var. <i>latifolia</i>) forest. Canadian Journal of Forest Research 40:2302–2312.
Sullivan, T.P Sullivan, D.S. Lindgren, P.M.F. Ransome, D.B.	Large mammals	<ul style="list-style-type: none">• Sullivan, T.P., D.S. Sullivan, P.M.F. Lindgren, & D.B. Ransome. 2006. Influence of repeated fertilization on forest ecosystems: Relative habitat use by mule deer and moose. Canadian Journal of Forest Research 36:1395–1406.

Lindgren, P.M.F. Sullivan, T.P. Sullivan, D.S. Brockley, R.P. Winter, R.	Tree growth	<ul style="list-style-type: none">• Lindgren, P.M.F., T.P. Sullivan, D.S. Sullivan, R.P. Brockley, & R. Winter. 2007. Growth response of young lodgepole pine to thinning and fertilization treatments: 10 year results. Forestry 80(5):587–611.
Clason, A. Lindgren, P.M.F. Sullivan, T.P.	Non-timber forest products	<ul style="list-style-type: none">• Clason, A.J., P.M.F. Lindgren, & T.P. Sullivan. 2008. Comparison of potential non-timber forest products in intensively managed young stands and mature/old-growth forests in south-central British Columbia. Forest Ecology and Management 256:1897–1909.• Sullivan, T.P. 2009. Integration of non-timber forest products (NTFPs) with timber production. Sharing the forest – a future beneath the trees? Timber, NTFPs, and conservation. Applied Mammal Research Institute, Summerland, B.C. [Extension Brochure]. (Accessed May 2011).