

MCCORMACK MANAGEMENT

ASSISTED MIGRATION
OF DOUGLAS- FIR IN
THE OMINECA REGION

CONTRACT # ER14DVA-005
& 22000 20 SERN2013-6

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INTRODUCTION

The Society of Ecosystem Restoration of B.C. (SERN) in conjunction with the Ministry of Forests, Lands, and Natural Resource Operations Vanderhoof District engaged McCormack Management to investigate the opportunities and impediments to deploying Douglas-Fir (Fdi) and Western Larch (Lw) in the Omineca region. The specific tasks were to:

1. Review the Vanderhoof Ecosystem Restoration Strategic Plan.
2. Review Provincial, Regional, and local District policy and legislation pertaining to the deployment of Fdi and Lw within the Omineca.
3. Develop a list of potential collaborators.
4. Develop a rationale for stakeholders to become involved.
5. Identify the area within the Omineca Region that might be suitable for expanding the range of Fdi and Lw.
6. Identify where the potential range of Fdi and Lw coincides with planned or existing licensee blocks that are not yet stocked.
7. Identify 1 or more areas that are affected by mountain pine beetle that have low timber value, low conifer stocking, reasonable access, and potentially high value wildlife habitat.
8. Meet with potential collaborators to explore the basis for an agreement with SERN to establish more Fdi and/or Lw in cut blocks or areas not satisfactorily restocked (NSR).
9. Undertake field sampling as necessary to collect data for a regeneration prescription.
10. Develop examples of regeneration prescriptions for specific areas that employ Fdi and Lw as a way to mitigate future climate impacts.
11. Develop strategic guidelines for deployment of Fdi and Lw within the Omineca.
12. Develop one or more agreements with potential collaborators.

As the project progressed it became apparent that a number of tasks were either already being worked on by other initiatives (task #5 and 11); that the timing of the project precluded field work or potential collaborators would prefer to do this work (tasks #6, 9 and 10); or that there was little interest (task #4, 8, and 12). Therefore this project focused on tasks 1, 2, 3, and 7.

POLICY REVIEW

The following discussion is limited to some legislation and policy that directly affects the deployment of Fdi and Lw in the Omineca Region particularly the Vanderhoof, Fort Saint James, and Prince George Districts. It is not intended to be an exhaustive review but is meant to highlight some of the key sections of legislation and policy that may be helping or hindering the deployment of Fdi and Lw in silviculture programs.

LEGISLATION

FOREST AND RANGE PRACTICES ACT (FRPA)

The tree seed, species, and standards employed on provincial crown land in British Columbia for reforestation (BC) are highly regulated. Forestry legislation requires forest tenure holders that prepare Forest Stewardship Plans (FSPs) to establish a free growing (FG) stand¹ on areas where timber has been harvested. The regulations outline the approval tests² for the stocking standards in an FSP. The Minister or his designate has some discretion to approve stocking standards that do not meet the approval tests³ if it will adequately address the future supply of timber for a given area.

The forestry legislation in BC also requires that the seed used to establish a FG stand follow the *Chief Foresters Standards for Seed Use*⁴. In addition, the regulations specifically allow the Chief Forester to set standards for the transfer of seed and to approve alternatives to the standards for seed transfer⁵. The standard itself defines the allowable geographic limits⁶ for the use of seed and seedlings in BC. Ninety-five percent of the trees planted by a tenure holder in any given year within a management unit must comply with the seed transfer guidelines⁷. The Chief Forester has made a number of amendments to the standards over the last several years to address climate change and mitigation. Notably the upper elevation for seed transfer limits was increased in November 2008⁸ and the range for the use of Lw was expanded in June 2010⁹. In the latter amendment up to 10% of the total number of seedlings that a forest tenure holder plants in a given year in a management unit may be Lw seedlings if they are planted in the Lw1, Lw2, or Lw3 seed planning zones¹⁰. However, the Lw planted would not count as a FG tree unless a tenure holder's stocking standards in their FSP included Lw.

¹ *Forest and Range Practices Act* s 29 and 30

http://www.bclaws.ca/Recon/document/ID/freeside/00_02069_01#section29

² *Forest Planning and Practices Regulation* section 26

http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/14_2004#section26

³ *Forest Planning and Practices Regulation* s 26 s 5

⁴ *Forest and Range Practices Act* s 31 and s 169(a)

⁵ *Forest Planning and Practices Regulation* s 43

⁶ *Chief Forester's Standards for Seed use* s 8

⁷ *Chief Forester's Standards for Seed use* s 8.8 and 8.9

⁸ Climate Based Upward Elevation Changes Nov. 2008

<http://www.for.gov.bc.ca/code/cfstandards/amendmentNov08.htm>

⁹ Assisted Range and Population Expansion of Western Larch for Use as a Climate Change Adaptation Strategy in British Columbia June 2010

<http://www.for.gov.bc.ca/code/cfstandards/amendmentJun10.htm>

¹⁰ *Chief Forester's Standards for Seed use* s 8.11 and 8.12

Fdi is already an ecologically suitable species on some site series in the Omineca Region and it is included in many forest tenure holders stocking standards in their approved FSPs. Forest tenure holders can be encouraged to establish more Fdi on these sites without having to tie up resources to propose and get approval to amendments to their stocking standards. It is recommended that SERN engage the Ministry of Forests, Lands, and Natural Resource Operations (FLNRO) and forest tenure holders staff about increasing the establishment of Fdi where it is currently ecologically suitable.

There is flexibility in the current forestry legislation to increase the use of Fdi and Lw in the Omineca Region. The onus is on forest tenure holders to propose amendments to their stocking standards in their FSPs' to increase the range of Fdi and include Lw on site series where it would be considered ecologically suitable. This requires some investment in time and resources by the tenure holder to propose appropriate standards that will meet the approval tests. If there is a reluctance to approve stocking standards that propose Fdi and Lw as being ecologically suitable outside their current range by statutory decision makers (SDMs), tenure holders may not want to spend the time and resources to amend their standards. To assist forest tenure holders and SDMs in this task the Reference Guide for FDP Stocking Standards¹¹ are being updated to expand the sites where Lw and Fdi are ecologically suitable. SERN can play a role in encouraging communication of these changes among forest tenure holders and SDMs so that stocking standards can be amended in an efficient manner.

PRIVATE LAND MANAGEMENT ACT

The Private Land Management Act regulates private land managed as forest and taxed under BC Assessment Authority property classification (class 7). This act encourages private landowners to manage their lands for long-term forest production. The *Private Forest Managed Forest Land Council*¹² is responsible for administering the Act. Land owners are required to comply with the act and regulations. Among other things the regulation under this act defines a successfully regenerated stand as a minimum of 400 SPH and 25% above the brush height in the interior¹³. The species of tree established has to be identified in the management commitment that the land owner makes when that person agrees to designating his property as privately managed forest¹⁴.

While private managed forest land parcels would be good candidates for the use of Fdi and Lw, a review of the latest maps¹⁵ (Jan 2005) available on the *Private Forest Managed Forest Land Council* did not identify any private managed forest land in the Prince George assessment area. SERN should access the most current information from the BC Assessment Authority for the Prince George assessment area to determine if any private forest managed land has been added in since 2005. If this is the case, the land owners could be approached about collaborating with SERN. Going forward, this should be performed annually so additional potential collaborators can be identified and contacted.

¹¹ Reference Guide for FDP stocking Standards. Updated February 2014 with Climate Based species selection recommendations and March 31st 2013 to include new BWBS Classification".

http://www.for.gov.bc.ca/hfp/silviculture/Stocking_stds/Reference%20Guide%20incorporating%20climate%20change%20Feb%2017_14.xlsm

¹² Private Managed Forest Land Council <http://www.pmflc.ca/>

¹³ *Private Managed Forest Land Act, Private Managed Forest Land Council Regulation, 2007 s 31* http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/11_182_2007#part3_division4

¹⁴ *Schedule A Council Regulation s 31* http://www.pmflc.ca/docs10/FPO-03_reforestation_stocking.pdf

¹⁵ Private Managed Forest Land Maps January 2005 <http://www.pmflc.ca/maps.php>

POLICY

VANDERHOOF ECOSYSTEM RESTORATION STRATEGIC PLAN (SOCIETY FOR ECOLOGICAL RESTORATION)

The strategic plan focusses on sites that have an existing Fdi component where potential ecosystem restoration could occur. This plan identifies Fdi stands as one of the four initial ecosystem types that should be considered for ecosystem restoration. Specifically, they are rare; under threat from Douglas-Fir bark beetle; have high functional importance as ungulate habitat; are at risk of loss through fire because of fire protection in the past; have an unnatural buildup of fuels (especially in areas that are coincidental with mountain pine beetle); and are not explicitly managed in other programs¹⁶.

The plan does not explicitly discuss the increased establishment of Fdi or Lw, however, it does discuss increasing the diversity of the forest and restoring ecosystems to the conditions that are likely to exist in the future as a result of climate change. Fdi and Lw could both be used for this purpose.

DOUGLAS-FIR MANAGEMENT GUIDELINES FOR THE PRINCE GEORGE FOREST REGION¹⁷

In April 2001 The *Prince George Forest Region* (now Omineca) developed management guidelines for Fdi. The purpose of these guidelines was to provide principles and interim objectives for managing interior Fdi (*Pseudotsuga menziesii*), until Landscape Unit objectives for species composition would be put into effect. These guidelines resemble the objectives and strategies from the Prince George¹⁸, Fort Saint James¹⁹, and Vanderhoof²⁰ Land and Resource Management Plans (LRMP) which were approved in the late 1990s. The intent of these guidelines was to ensure that Fdi persisted on the landbase where it was already present naturally so that there would be no net loss of Fdi on the landscape. To date there have not been any legal landscape unit objectives put into effect for the management of Fdi. It was to provide guidance to decision makers when approving operational plans under the *Forest Practices Code* (FPC). Since these guidelines were developed, the FPC was repealed and replaced with the FRPA, which relies on professional reliance to ensure there is adequate management of forest resources. There is an opportunity for SERN to improve awareness of this policy in the Omineca Region and link it to increasing the deployment of Fdi for climate adaptation.

¹⁶ The Vanderhoof Ecosystem Restoration Strategic Plan page 16.

¹⁷ Douglas-fir Management Guidelines for the Prince George Forest Region
ftp://ftp.for.gov.bc.ca/RNI/external/!publish/!Web/SOPS/Research/Douglas_Fir_Management.pdf

¹⁸ Prince George LRMP approved January 1999
http://www.ilmb.gov.bc.ca/sites/default/files/resources/public/PDF/LRMP/Prince%20George_LRMP.pdf

¹⁹ FSJ LRMP endorsed March 30th 1999
http://www.ilmb.gov.bc.ca/sites/default/files/resources/public/PDF/LRMP/Fort%20St%20James_LRMP.pdf

²⁰ Vanderhoof LRMP endorsed January 1997.
http://www.ilmb.gov.bc.ca/sites/default/files/resources/public/PDF/LRMP/Vanderhoof_LRMP.pdf

CHIEF FORESTER'S GUIDANCE FOR INCORPORATING LW INTO FSP STOCKING STANDARDS

In December 2010 the Chief Forester distributed a memo²¹ providing guidance for the development of stocking standards for the Lw range expansion area identified in the amendment # 10 to the *Chief Forester's Standards for Seed Use*²². It provides a good discussion in how best to incorporate Lw into stocking standards so that the standards will meet the approval tests. Specifically, it discusses where Lw might be ecologically suitable; the issues relating to immediate and long-term forest health effects as it relates to Lw; appropriate free growing height for Lw; how Lw maintains or enhances an economically valuable supply of timber; and how Lw would be consistent with timber supply assumptions. There is an opportunity for SERN to incorporate this guidance along with other materials in any workshop or training developed for increasing the establishment of Fdi and Lw in the Omineca Region.

²¹ Chief Forester's guidance for the incorporation of western larch into stocking standards
http://www.for.gov.bc.ca/hfp/silviculture/Signed_125986_Guidance_memo.pdf

²² Assisted Range and Population Expansion of Western Larch for Use as a Climate Change Adaptation Strategy in British Columbia June 2010
<http://www.for.gov.bc.ca/code/cfstandards/amendmentJun10.htm>

COLLABORATORS

It is SERN's desire to develop partnerships with organizations who are conducting reforestation activities in the Omineca Region to increase the use of Fdi and Lw in anticipation of climate change making these species ecologically suitable on some sites in the future where they are not suitable today. A key deliverable of this project was to compile a list of potential collaborators, determine if any would be interested in collaborating with SERN, and what the impediments might be to increasing the use of Fdi and Lw in reforestation activities.

A list of forest tenure holders comprised of forest license, community forest agreement, and woodlot license holders was compiled to provide a list of individuals and organizations to be contacted who might be interested in collaborating with SERN in increasing the deployment of Fdi and Lw in the Omineca Region. Initially, the effort was focused on the Vanderhoof and Fort Saint James Districts; however, many of those contacted were responsible for managing multiple operations across several districts. Some organizations managed FG obligations on behalf of other forest tenure holders such as First Nations, community forest agreements, and woodlot licenses. As such, the interviews provided a good cross section of potential collaborators across the Omineca Region. During the interview process other organizations (e.g research forests, Universities, College, etc.) were identified as potential collaborators and were contacted as well.

INTERVIEW PROCESS

Telephone interviews were conducted with individuals responsible for silviculture for 11 different forest tenure holders and British Columbia Timber Sales (BCTS) that had operations in the Omineca Region primarily in the Vanderhoof and Fort Saint James Districts. A woodlot license holder in the Omineca Region was also contacted. For the purposes of this discussion woodlots and BCTS were considered to be forest tenure holders. The conversations ranged in length from about 15 to 30 minutes.

The interviews were conducted using the following standard outline. A brief description of what the Society of Ecosystem Restoration in Northern BC (SERN) is and the purpose of the project was discussed at the start of the conversation. The specific points covered were:

- To encourage the increase of deployment Fdi and Lw in the Omineca Region.
- Document the impediments to accomplish this from forest tenure holders' perspective.
- Find partners/collaborators who might be interested in working with SERN to increase the use of Fdi and Lw for reforestation in the Omineca Region.
- Explore the basis for an agreement with SERN to establish more Fdi and/or Lw in cut blocks or areas of NSR and develop some type of agreement if possible.

A list of standard questions was developed to provide an outline for the interviews in order to get a sense of what the current practices and future intentions of forest tenure holders are in the Omineca Region as they relate to planting Fdi and Lw. It should be noted that the standard questions were intended as a guideline only to help provide some structure to the interviews so that key information could be gleaned from the interviews. In many cases additional discussion providing valuable information was provided as the interviews were conducted.

Standard Questions

1. Are you currently planting Fdi in your operation, and if so, how many or what percent is it of your total program?
 - a. Are you planning on increasing the amount Fdi in your operation?
 - b. If you are not planting Fdi, why not?
2. Are you currently planting Lw in your operation, and if so, how many or what percent of your total program?
 - a. Are you planning on increasing the amount of Lw in your operation?
 - b. If you are not planting Lw, why not?
3. Are you considering amending stocking standards to allow Fdi and Lw on more sites?
 - a. If not, why not?
 - b. What are the barriers to amending stocking standards?
4. What would you recommend for incentives to encourage increased use of Fdi and Lw?
5. Are you considering climate adaptation in your operations?
6. Would you be interested in some type of agreement, such as a memorandum of understanding, for deploying more Fdi or Lw?
 - a. If not, why not?

As mentioned above, most individuals offered some additional comments and suggestions not covered by the above questions. These are documented on the summary below under other comments.

SUMMARY OF RESULTS.

Question 1: Deployment of Fdi.

Most of the forest tenure holders contacted have planted, were currently planting, and/or were planning on planting Fdi in their operations; however, Fdi is a small component of the total seedlings planted. Most tenure holders stated it was typically less than 2% of their planting program, although, some indicated that it comprised up to 5% of their total silviculture program in some years. Some tenure holders indicated they were planning on increasing the amount of Fdi planted; however, there is a general concern on the performance of young Fdi seedlings and the limited amount of sites that are suitable. The risk of summer frost damage, flat ground, and fine textured soils were mentioned frequently as limiting the ability to use Fdi more than forest tenure holders currently do. There is an opportunity for SERN to monitor changes in the proportion of Fdi (and Lw) established over time using a report similar to the species monitoring report²³ generated by the Resource Practices Branch. This will allow SERN to measure how successful some of their initiatives are in increasing the establishment of Fdi (and Lw).

Some forest tenure holders stated that their operations were located outside the seed planning zone for Fdi so they were not planning on planting any Fdi at this time. Other forest tenure holders stated the Fort Saint James District is near the northern limit of Fdi range. Some also stated that the Vanderhoof District does not have a lot of Fdi ground so it is not ecologically suitable for most sites. This is limiting the ability to plant more Fdi in these districts. Comments were also made about the arbitrary nature of the seed planning zone boundaries splitting operating areas which limits the

²³ Species Monitoring Report Prince George T.S.A. May 2012

amount of Fdi planted on sites which would otherwise be suitable. SERN should encourage a review of the Seed Planning Zones for Fdi for possibly expanding their area to account for climate change. Predictive Ecosystem Mapping (PEM) and the updated *Reference Guide for FDP Stocking Standards* should be used as one of the inputs so that seed planning zone boundaries are less arbitrary in nature. Finally, the Gis analysis discussed further in the report will identify potential areas that could be suitable for Fdi in the Fort Saint James and Vanderhoof Districts. Once the field verification is complete SERN should make these maps available to forest tenure holders.

The woodlot license holder has planted a few hundred Fdi, however, this species is not relied on to achieve a FG stand. There was a concern with the greater difficulty of trying to establish Fdi compared to other species such as pine and spruce. There is an opportunity for SERN to develop an outreach program to woodlot license holders to improve their success in establishing Fdi. This could include offering site assessments, training, financial assistance, and follow up monitoring.

Question 2: Deployment of Lw.

Although some forest tenure holders have planted Lw in their operations it is a small proportion of their total silviculture programs to date. There is a general interest among forest tenure holders to increase the planting of Lw as a possible solution or an alternate species to plant where there is a pine rust problem. Several factors were identified that were seen as impediments to planting more Lw. such as; Lw cannot be counted as a FG tree until FSP stocking standards are amended; forest tenure holders operations being outside the amended seed zones for Lw; the seed transfer limits in the *Chief Forester's Standards for Seed Use* restricts the amount of Lw that can be planted outside the seed planning zones; and that once stocking standards are amended, Lw will not be considered preferred on enough sites. Similar to the actions identified above for Fdi, SERN should encourage a review of the Seed Planning Zones for Lw for possibly expanding their area. PEM and the updated *Reference Guide for FDP Stocking Standards* can also be used for one of the inputs for Lw. The GIS analysis will identify potential areas that could be suitable for Lw and, as with Fdi, once the field verification is complete SERN should make these maps available to forest tenure holders.

A few forest tenure holders indicated that there are some Lw trials in the Fort Saint James District. It was stated that these might be useful for monitoring purposes. There is an opportunity for SERN to identify these sites and if they are suitable develop a monitoring program in cooperation with other partners.

One forest tenure holder suggested that the 5% allowable tolerance in the seed transfer guidelines be pooled among forest tenure holders in an management unit so an individual tenure holder could have more than 5% but the overall amount not exceed 5% for a Forest District or T.S.A. This is an innovative approach for increasing the amount of Lw established, however, it will require a change to the *Chief Forester's Standards for Seed Use*. There is an opportunity for SERN to investigate the regulatory changes further and communicate this to FLNRO staff for their consideration.

The woodlot license holder has planted about 5000 Lw seedlings, however, it is not relied on to achieve a FG stand. If SERN decides to develop an outreach program for woodlot license holders for Fdi, LW could also be included in this program.

Question 3: Amending stocking standards.

There were two forest tenure holders contacted who have already amended their stocking standards to include Fdi; one to implement the Fdi Management Guidelines for the Prince George Forest Region (a.k.a. Omineca Fdi strategy); and another to include Lw (and Tamarack) for a specific block to address a rust issue. A couple of forest tenure holders indicated that they were in the process of amending their stocking standards to include Lw, however, none have actually been

submitted to date (Oct. 2013). Other forest tenure holders indicated that they have considered amending stocking standards on a block specific basis to address rust issues, but it is an inefficient way to manage stocking standards and too time consuming given the constraints on their time and resources. Most forest tenure holders indicated there is a reluctance to go through the process of amending stocking standards due to the time and resources required to accomplish this. Several explicitly stated that they were not planning on amending their stocking standards for Fdi and/or Lw at this time. In general, there is an impression that FSP stocking standards will not be approved until the *Reference Guide for FDP Stocking Standards* is updated to include Lw and Fdi on sites where they are currently not suitable. It was felt that Government (Gov't) should take the lead in amending this document due to the scientific rigour that would be applied to this process. The *Reference Guide for FDP Stocking Standards* is in the process of being updated so there is an opportunity for SERN to encourage FLNRO staff to communicate this to forest tenure holders. This will allow them to start amending their stocking standards to include Fdi and Lw on more sites.

One forest tenure holder thought there was an opportunity for a group of tenure holders to propose changes in the stocking standards. It was felt that a group effort would be more efficient and Gov't would be more receptive to the proposed changes if a group worked together on a proposal. It was stated that it might be appropriate for SERN to facilitate this process. SERN, in cooperation with FLNRO, should contribute to facilitating this with any interested forest tenure holders.

Question 4: Incentives and impediments.

Some forest tenure holders identified their legal obligation to establish a FG stand as an impediment to planting more Fdi and Lw. If Fdi and Lw are planted where they are not currently suitable they may not meet FG requirements in the short term even if they become suitable in the future. If Gov't shared the risk of failure forest tenure holders would be more inclined to plant more Fdi and Lw. If these species were planted on a site and FG is not achieved there should be some relief from achieving the standard. For example, one forest tenure holder suggested that there should be some relief on achieving FG. (e.g. if 90% of areas are FG than you get relief on the other 10%). As mentioned above, SERN can ensure that forest tenure holders are aware of the changes to the *Reference Guide for FDP Stocking Standards* so that stocking standards can be amended.

In addition to some relief from free growing obligations, several other forest tenure holders identified funding to offset any additional costs for establishment of Fdi and Lw where operational trials were conducted; using multi stocking block standards as a potential way to provide flexibility in moving planting stock and species around on the landscape; and providing some training on where to use Lw and Fdi for reforestation to help improve the use of these species in silviculture programs. There is an opportunity for SERN to identify funding sources that may be appropriate to offset increased costs for operational trials, encourage FLNRO to provide guidance on landscape level species targets for stand establishment, and develop training and provide it to forest tenure holders for the use of Lw and Fdi in silviculture programs.

Question 5: Climate adaptation.

Most forest tenure holders are not considering climate adaptation directly in their silviculture decisions, although several thought that their current strategies regarding planting Fdi and Lw and managing rust problems were indirectly managing for climate change. It was felt that the climate had not changed enough. Until plantations fail because the climate is changing, there is more risk in not meeting FG by planting species such as Fdi and Lw that are not currently adapted to the site. It might be more appropriate to look at the provenances of Pli and Sx, rather than Fdi and Lw, and adjust their seed transfer guidelines to adapt to climate change as these species have a wide geographic range. One forest tenure holder stated that they were not modifying their practices until Gov't shares the risk of climate change. If SERN is involved in the development of any training programs it should include information and strategies on the effects of climate change as it relates to

silviculture practices in the Omineca Region. SERN should investigate if there are any opportunities for new initiatives for the seed transfer guidelines for Sx and Pli in the Omineca Region, and if there are encourage FLNRO to communicate this to forest tenure holders. There is also an opportunity for SERN to participate in monitoring programs for Fdi and Lw in the Omineca Region to better determine how Fdi and Lw are adapting to climate change.

Question 6: Interest in an agreement.

In general, forest tenure holders thought that collaborating with SERN to increase the establishment of Fdi and Lw was premature. More detail needs to be provided about a specific program before forest tenure holders are willing to commit to collaborating with SERN. A few forest tenure holders stated they would be more receptive to collaborating if funding was provided to offset increased costs and FG obligations were relieved on sites where Fdi and Lw were utilized. Before SERN approaches collaborators, potential sites should be identified and funding sources determined so enough detail can be provided to potential collaborators on the nature of their commitment. The GIS analysis and the field verification of these sites will aid in this task.

The woodlot license holder stated that there is a lot of flexibility to plant a variety tree species on a woodlot. Woodlot license holders would be receptive to collaborating with SERN if it could help with: providing Fdi and Lw seedlings at a lower cost; modifying free growing obligations to accept Fdi and Lw; funding any follow up monitoring. SERN should consider developing a program specifically for small tenure holders to increase the establishment of Fdi and Lw on woodlots. This program should include extension, funding, and monitoring for those woodlots that want to participate. The *Woodland Almanac*²⁴ is a good tool to communicate to woodlots about potential collaboration should SERN decide to pursue agreements with woodlot license holders.

Other comments

Even though the emphasis was on contacting forest tenure holders in the Vanderhoof and Fort Saint James Districts, several individuals were also responsible for operations in the Mackenzie and Prince George Districts. The comments above could be applied to the entire region and no attempt was made to contact any additional forest tenure holders in the Mackenzie and Prince George Districts. Many of the forest tenure holders also manage several smaller forest tenures, such as First Nation NRFLs', community forests, and woodlots, on behalf of other partners. Most of the silviculture decisions for these smaller tenures are taken by the larger forest tenure holders and the smaller tenures are incorporated into their larger silviculture programs. When implementing actions identified in this report, SERN should to the extent it has the resources, include other forest tenure holders in the Omineca Region whether they operate in the Fort Saint James and Vanderhoof Districts or not.

One of the initial tasks for this project was to identify where the potential range of Fdi and Lw coincides with planned or existing forest tenure holder cut blocks that are not yet stocked. For most forest tenure holders, sowing requests are not developed on a block specific basis but for an operating area using historical requirements from past operations in that area. The focus on mountain pine beetle salvage has resulted in very short term harvest planning. In many cases, the location and timing of harvesting operations is not known before a sowing request must be submitted. This was often mentioned as the reason why sowing requests were not developed using harvest planning for cut blocks. Historical information and general knowledge of the operating areas were used to develop the sowing requests in many cases. As discussed above, Making the maps

²⁴ <http://www.woodlot.bc.ca/resources.html>

available to forest tenure holders that are produced by the GIS analysis could be used to aid in the development of sowing requests.

There is a relationship between whitebark pine, an endangered species²⁵, and Fdi. Research indicates Clark's Nutcracker, which is important for whitebark pine seed dispersal, will utilize Fdi seed as a secondary food source²⁶. Increasing Fdi on the landscape could indirectly affect how whitebark pine is maintained on the landscape. When conducting the field verification of the potential sites from the GIS analysis, the sites closest to whitebark pine habitat²⁷ should be prioritized for site visits. Should any of these sites be suitable for establishing Fdi, there is an opportunity to apply for Habitat Conservation Trust Foundation²⁸ (HCTF) funding to help offset the costs.

OTHER ORGANIZATIONS CONTACTED

During the interview process a number of other organizations were identified that would be potentially interested in collaborating with SERN. These were the Aleza Lake Research Forest²⁹, the College of New Caledonia (CNC) Research Forest³⁰, and the Carbon Offset Aggregation Cooperative³¹ (COAC).

Both the Aleza Lake and the CNC research forests have trials established for Lw and Fdi for assisted migration and have additional trials planned to cover a broader range of biogeoclimatic zones. Both have partners in these trials and would be interested in any additional partnerships for establishing trials for Fdi and Lw. However, not all sites that are proposed for ecosystem restoration will be suitable for a research component. To the extent that a site is suitable for research, the research forests usually facilitate and provide in kind support to projects. Some potential sites for ecosystem restoration may be of interest to researchers who are affiliated with the research forest and who have access to grant money that could be used to help pay for the cost of planting and monitoring. The CNC research forest was particularly interested in drier sites for measuring the performance of Fdi and Lw. They are in the process of applying for a grant for forest research and, if this is successful, they could partially fund projects that had a research component in conjunction with establishing Fdi and Lw as part of ecosystem restoration. They also have students and forestry assistants that can do some in kind work such as surveying or planting. Once SERN has verified some potential sites for possible ecosystem restoration using Fdi and Lw they should contact the research forests about possible collaboration.

The COAC is a BC based organization that helps companies reduce their carbon emissions directly through a reduction in fossil fuel consumption, or indirectly through the planting of trees. COAC provides the trees and does the reforestation. In return, they get the carbon credits that they sell as offsets to other organizations to improve their "green" image. Afforestation, reforestation, and improved forest management^{32,33} would qualify as acceptable projects. COAC will

²⁵ SARA species profile http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=1086

²⁶ Joanne Vinnedge pers. comm.

²⁷ WBP_update_Oct8_2013_diss provided by Joanne Vinnedge Oct. 30th, 2013.

²⁸ Tion Trust Habitat Conservation Foundation

²⁹ Aleza Lake Research Forest http://web.unbc.ca/~aleza/?page_id=39

³⁰ College of New Caledonia Research Forest <http://www.cnc.bc.ca/research-forest.htm>

³¹ Carbon Offset Aggregation Cooperative <http://www.carbonoffsetcooperative.org/>

³² a system of practices for stewardship and use of forest land, which may include production of harvest wood products, which reduces GHG emissions and/or increases GHG sinks / carbon pools.

³³ Protocol for the Creation of Forest Carbon Offsets in British Columbia Version 1.0

http://www.env.gov.bc.ca/cas/mitigation/pdfs/Forest_Carbon_Offset_Protocol_v1_0_Web.pdf

(footnote continued)

do the verification to determine the amount of offsets for a project. It should be noted that the economic return selling the carbon credits is generally insufficient to entirely offset the cost of reforestation. COAC is looking for partners to identify projects that would be suitable for their organization. They are interested in partnering with SERN; however, potential areas would need to be identified to determine if a particular site would meet the criteria. Once the field verification of the potential sites identified by the GIS analysis has been completed SERN should contact COAC to determine if any of these sites would be eligible for carbon offsets.

VOLUME COMPARISON

During the initial scoping phase for this project it was thought that the yield difference between Fdi and Lw, compared to the current species planted (Pli and Sx), might provide a good rationale for stakeholders to collaborate with SERN for deploying more Fdi and Lw in the Omineca Region. Field observations suggested that Fdi, and especially Lw, were performing as well as or better than Pli and Sx on many sites^{34,35}. An analysis of potential timber supply benefits, if any, of planting more Fdi and Lw was beyond the scope of this project, however, some preliminary evaluation done with TIPSy 4.3³⁶ indicates there may not be a benefit. In order to definitively determine what the benefits, may be, if any, SERN should encourage the Forest Analysis and Inventory Branch to include a sensitivity analysis to test the impact of increasing the proportion Fdi and Lw in the next timber supply review for the Prince George T.S.A. In preparation for this, the relationship between site indices for Pli, Sx, Lw, and Fdi on the same sites should be confirmed in the field so a more accurate estimate of site indices can be used for a sensitivity analysis.

³⁴ Assessment of Off-Site Tree Plantations in the Northwest Interior of British Columbia -Project Summary Phil LePage MSc. RPF, Larry McCulloch RPF

³⁵ Extending the Range of Native Conifers, Marley Dana Chewter,

³⁶ TIPSy (Table Interpolation for Stand Yields)

http://www.for.gov.bc.ca/hts/growth/tipsy/tipsy_description.html

GEOGRAPHIC INFORMATION SYSTEMS (GIS) ANALYSIS

Purpose

The objective of the GIS analysis was to identify areas where the establishment of Fd or Lw might be appropriate. What is appropriate however is defined differently by different agencies and individuals. For this analysis we defined appropriate as *having the potential to be successfully established under current conditions without becoming maladapted under future climate conditions*. We termed this, ecologically suitable. In addition to the criterion of ecological suitability, a number of other criteria were also used to more accurately define areas that might be operationally feasible for the establishment of one or both species. The following sections describe this process in more detail.

Supporting Data

The geographic area of interest was defined as the Prince George TSA including the Prince George, Vanderhoof, and Fort St James Districts. The following data and guidance were used in undertaking the analysis:

Source	How It Was Used
2012 provincial VRI data (veg_comp_lyrR1_poly)	To identify leading species
2013 provincial consolidated cutblocks	To identify existing cutblocks
VanJam proposed cutblocks provided by major forest tenure holders in 2013	To identify proposed cutblocks in the Vanderhoof and Ft St James Districts
2002 Cumulative MPB kill produced by Adrian Walton	To determine where mountain pine beetle affected 30% or more of a stand in 2002
PEM mapping for the PG TSA provided by Tony Button (MoE) – based on past District PEM projects	To identify site series in the TSA
Digital Elevation Models for each District provided by Alana Clason – based on 20m TRIM contours	To determine aspect and slope within polygons suitable for Fd or Lw
Provincial digital road atlas	To determine the location of existing roads
Wildfire Management Branch's 2013 historical fires database	To identify areas that had been burned and which might be addressed by in the FFT program
Larch suitability data (Lw1, Lw2, Lw3) from Barry Jaquish (MoFLNRO)	To identify broad areas where Lw could be suitable based on a U.S. climate model and the silvics of the species
Nov 28 th , 2013 Draft Reference Guide For FDP Stocking Standards ³⁷	To identify the BEC units where 01 sites would be suitable for Fd and Lw, considering climate change trends

Methodology

An initial map showing the area that was ecologically suitable was created for both species from PEM data supplied by Tony button (MoE) and information on ecological suitability by site series produced by Bruce Rogers (FLRNO), contained in the document *Draft Reference Guide for FDP Stocking Standards*. In the reference guide, Rogers identified BEC units in which Fdi and Lw could be considered to be suitable on 01 sites based on the principles of feasibility, reliability and productivity, considering future climate envelopes. In our analysis, 01 site series in BEC units where Fdi was already considered to be acceptable, were also included in the mapping of suitable areas. Additionally, we included the SBSvk/03 and 04 as suitable site series for both species. Rogers further categorized species suitability as primary, secondary, or tertiary for both Lw and Fd. Primary

³⁷ The guidelines were developed by FLNRO Ecologists using the best available climate change information for BC. In the PG region they were completed thanks to the efforts of Bruce Rogers.

With respect to Lw, the data used to create the ecological suitability map was also compared to the data that Barry Jaquish supplied (figure 2). Jaquish also categorized larch as Lw1, Lw2, and Lw3 which roughly corresponds to primary, secondary, and tertiary.

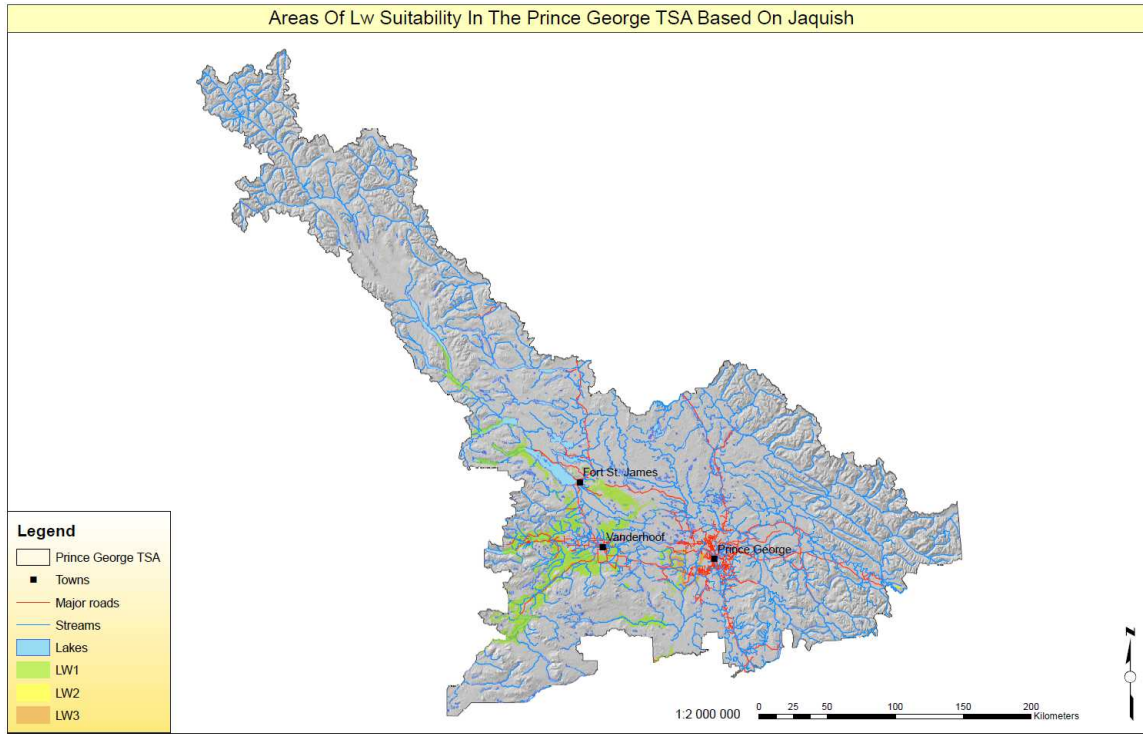


Figure 2 Areas ecologically suitable for Lw in the Prince George TSA, per Jaquish 2012

The area for Lw considered to be suitable by Jaquish is considerably different than the area that's considered to be ecologically suitable using the PEM data (see figure 3).

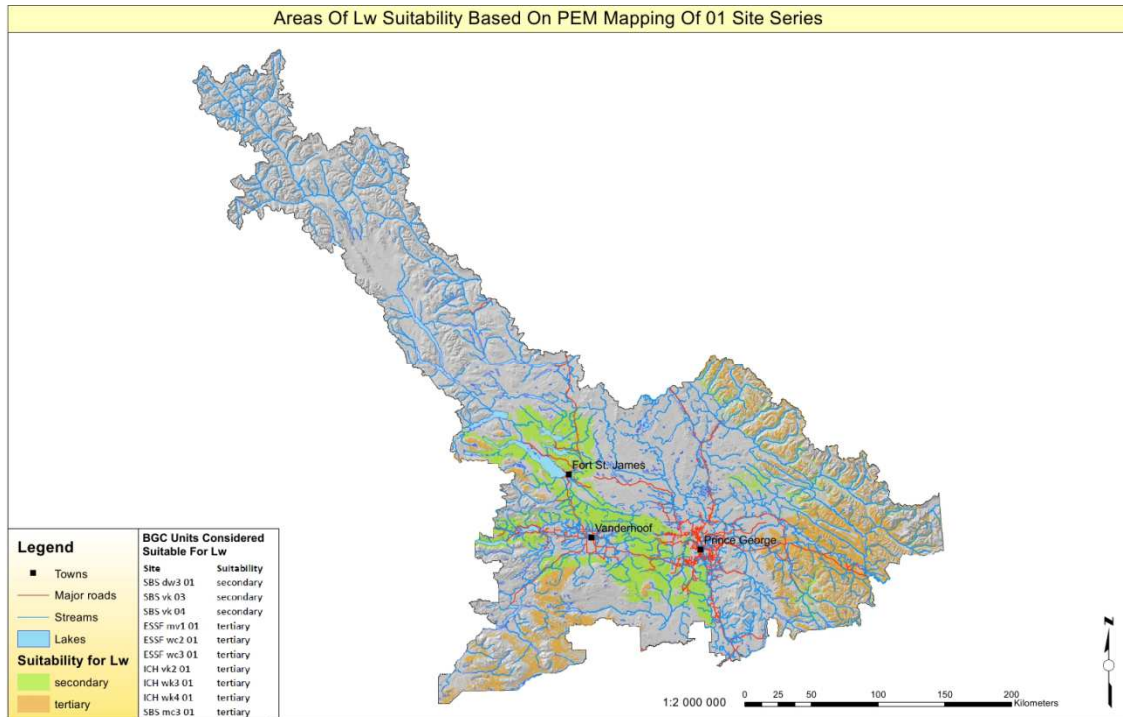


Figure 3 Areas ecologically suitable for Lw based on PEM mapping. Note Rogers did not consider Lw to be a primary species choice in the area of interest.

Once ecological suitability had been established, a number of other criteria were used to refine the initial mapping to identify areas that might be operationally feasible, and which were unlikely to be addressed by another program. Factors included: fire history, whether ecologically suitable areas were within an existing cutblock or cutblock planned for harvest within the next five years, proximity to existing roads, mountain pine beetle impacts, and aspect. Using the ecological suitability map described above as a base map, separate maps were produced after incorporating each factor as follows:

- ecologically suitable but not part of a historic fire.
- ecologically suitable, not in a fire, and not in an existing or future cutblock.
- ecologically suitable, not in a fire, not in an existing or future cutblock, and with an incidence of mountain pine that that exceeded 30% in 2002.
- ecologically suitable, not in a fire, not in an existing or future cutblock, with an incidence of mountain pine that that exceeded 30% in 2002, and within 500 m of an existing road.
- ecologically suitable, not in a fire, not in an existing or future cutblock, with an incidence of mountain pine that that exceeded 30% in 2002, within 500 m of an existing road, and with a warm aspect (azimuth 135° to 225°)

Providing separate maps for each of the factors considered, provides flexibility in deciding how wide to cast the net for field verification. Existing fires were excluded because the Forests for Tomorrow (FFT) program has already targeted these areas for treatment. By including both mountain pine beetle and cutblocks as factors, it is hoped that suitable stands will be identified that are not already being addressed in another program. It is expected that cutblocks will be planted by forest tenure holders. Limiting the suitable areas to within 500 m of roads will make it more likely that potential areas are more operationally feasible. These areas were further refined using aspect because both Fd and Lw require warm aspects and coarse soils.

An example of a map that was subject to each of the factors, and thus depicts the lowest amount of suitable area, is shown in figure 4.

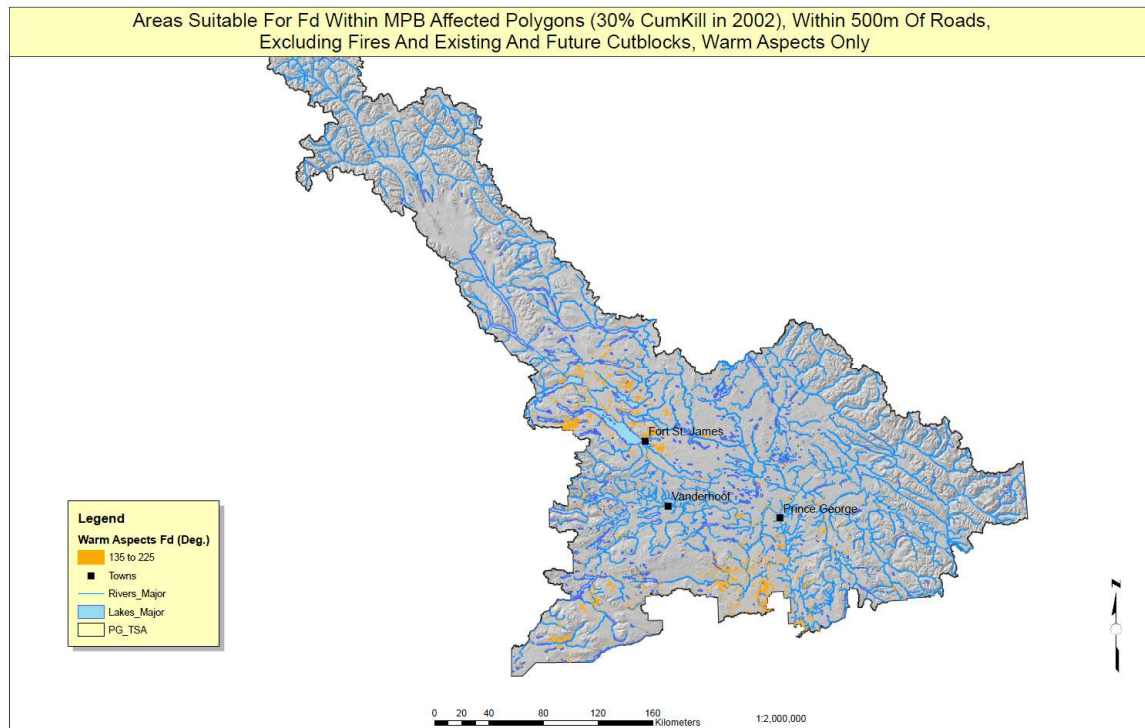


Figure 4 Areas suitable for Fd within mountain pine beetle affected polygons, within 500 m of roads, excluding fires and existing and future cut blocks, warm aspects only.

Separate, geo-referenced pdf maps for each of the factors described above are provided under separate cover. An ArcGIS project has also been produced including all the digital layers needed to produce the pdf maps. It is expected that the ArcGIS data will be used to produce larger scale field maps for field validation work.

Cautions

The GIS analysis we performed is highly dependent on the accuracy of the PEM and VRI data. This data is unlikely to be more than 70% accurate. It is also important to note that, while the site series/tree species correlations in the *Reference Guide For FDP Stocking Standards* were intended to be applied in 2013 and beyond, the guide is still very much a draft and has not been subject to broader peer review, nor have recommendations for site series other than 01 been provided. The guidelines do not, therefore, reflect potential suitability for all areas within a biogeoclimatic unit. Additionally, suggested changes are based on assumptions that climate trends projected from BGC consensus modeling will be realized. Even if this is true, because species limits in 2080 were used as the final filter in producing the guidelines, current conditions, especially at higher elevations, may not yet be conducive to establishing Lw or Fd in these locations. Finally, in identifying areas within 500 m of existing roads, it is possible that some roads portrayed in the atlas may no longer be accessible.

Conclusions And Next Steps

This GIS analysis identifies potential sites that might be suitable for the establishment of Fd or Lw. Sites where mountain pine beetle has killed most of the trees, and there has been no harvesting or reforestation, within 500m of existing roads, may be eligible for ecological restoration. Within the TSA, 60,025 ha were identified for Fd and 17,547 ha for Lw, most of which overlaps with the Fd. Part of that restoration could include establishment of Fdi and/or Lw (likely in association with other species). Increasing the deployment of Fd and Lw could help mitigate against future climate impacts and also improve timber supply and biodiversity objectives.

It is recommended that the next step in increasing the deployment of Fd and Lw include field surveys in areas most likely to be candidates for potential reforestation. The areas that are most likely to be suitable have been identified on the maps entitled “Areas suitable for Fd (Lw) within mountain pine beetle affected polygons, within 500 m of roads, excluding fires and excluding existing and future cutblocks, warm aspects only”. If preliminary fieldwork indicates that these maps are too coarse, or more area is required, the scope of the assessments could include broader areas identified in some of the other mapping products produced in this project. If the survey area is too large, additional analysis will be required as follows:

- Identifying areas where Fd and Lw are ecologically suitable under 1200m elevation.
- Identifying whether candidate areas are in the timber harvesting land base (THLB) or in constrained areas such as old growth management areas or ungulate winter range.
- Determining how close candidate areas are to white bark pine habitat (Clark’s Nutcracker uses the seeds from Fd as a substitute for whitebark pine seeds and, therefore, it may be beneficial to encourage the establishment of Fd near these areas).
- Determine the extent to which other initiatives are establishing Fd or Lw in areas where the species have been identified as ecologically suitable.

Maps for fieldwork will need to be produced from the ArcGIS mapping product.

SUMMARY

GENERAL COMMENTS

There are already a number of programs in B.C. that are concentrating on the THLB and future timber supply (e.g. FFT³⁸). In order to avoid duplication of effort with other initiatives SERN should initially concentrate on sites that would not likely be managed for timber production or contribute substantially to timber supply, but would require some planting to re-establish tree cover as part of ecosystem restoration. It is expected that these sites could be constrained sites such as deer ungulate winter range or old growth management areas. The goal of reforesting these sites would be re-establishing forest cover to provide ecosystem services, not to necessarily achieve a FG stand. Where establishing a FG stand is not a requirement, the Chief Forester’s Standards for Seed Use would not apply. This could potentially allow greater flexibility for planting Fdi and Lw in these cases. Once the potential sites from the GIS analysis have been verified in the field, SERN can initially concentrate on the sites that are not likely to be treated by other initiatives.

Although sites not likely to be addressed by forest tenure holders, FFT, or other programs should be a priority for SERN, there is an opportunity to collaborate with these organizations. Developing training, facilitating workshops, collaborating in policy review, and applying for funding,

³⁸ <http://www.for.gov.bc.ca/hcp/fia/landbase/fft/>

as it relates to increasing the deployment of Fdi and Lw in the Omineca Region, are just a few examples of the opportunities for SERN.

COLLABORATION

If SERN wishes to pursue collaboration, the following steps are suggested.

Field visits to the sites identified by the GIS analysis, discussed above, should be conducted to collect stocking information, site type, site index, pine composition, volume, slope, access, regeneration, and other relevant information. If the sites visited are suitable, a list can be compiled that prioritizes sites for restoration and treatment. It should be emphasized that some sites may be eligible for ecosystem restoration, but are not suitable for Fdi and/or Lw. These sites should be considered for ecosystem restoration, but may have a lower priority.

Once the list of sites for treatment has been finalized, with treatment objectives and costs documented, SERN will have a much better understanding of the scope and magnitude of an ecosystem restoration program that targets forested areas where Fdi and Lw might be ecologically suitable. With a more detailed list of potential sites and costs, partners and collaborators can be approached to help implement the program. Although it can increase the complexity of any partnership arrangement, it is expected that SERN will be more successful if several organizations are involved. It is not likely that one partner will have the funds or resources to conduct the treatments, thus several possible partners will need to be involved.

The following organizations were most receptive to a partnership and should be contacted first.

- Carbon Offset Aggregation Cooperative. COAC will use the site attributes to determine how much if any offsets can be claimed by the proposed treatment, and how much they are worth. The agreement will need to include a commitment that the land will be managed so that the trees can continue to grow on the site for a fairly long time frame, typically one hundred years. A public communication protocol to increase the awareness of COAC and SERN would also be beneficial if it was included in any agreement.
- Research Forests. The agreement would need to outline the clear guidance and outcomes for any proposed treatment as well as roles and responsibilities of the partners. Non-disclosure and confidentiality may have to be included in the agreement if the research results are considered proprietary.

PROPOSED ACTIONS

The following is a summary of the proposed actions suggested throughout this document for SERN to carry out.

1. Engage FLNRO and forest tenure holders' staff about increasing the establishment of Fdi where it is currently ecologically suitable.
2. In cooperation with FLNRO, communicate any changes to the *Reference Guide to FDP stocking Standards* to forest tenure holders and SDMs as it relates to the expanded suitability of Fdi and Lw.
3. In cooperation with FLNRO, improve awareness of the Omineca Region Fir Strategy among forest tenure holders and link it to increasing the deployment of Fdi for climate adaptation.

4. Encourage FLNRO to provide guidance on landscape level species targets for establishing Fdi and Lw.
5. Check the BC Assessment Authority information for the Prince George assessment area to determine if any private forest managed land has been added in since 2005.
6. Annually check BC assessment Authority information so additional potential collaborators can be identified.
7. If there is any privately managed forest land contact the owners about their interest in collaborating with SERN.
8. In cooperation with FLNRO, develop a workshop or training for increasing the establishment of Fdi and Lw in silviculture programs in the Omineca Region and provide it to interested forest tenure holders.
9. In cooperation with FLNRO, help to develop an outreach program for woodlot license holders to improve their success in establishing Fdi and Lw which includes site assessments, training, financial assistance, and follow up monitoring.
10. SERN should suggest to the Tree Improvement Branch in FLNRO that PEM and the updated *Reference Guide for FDP Stocking Standards* be used as one of the inputs for expanding the SPZ for Lw (and Fdi).
11. Investigate if there are any new initiatives for the seed transfer guidelines for Sx and Pli in the Omineca Region, and if there are, encourage FLNRO to communicate this to forest tenure holders.
12. Encourage a periodic review of the SPZ for Fdi (and Fdi) for possibly expanding their area to account for climate change.
13. Develop a field program to verify that the potential sites identified in the GIS analysis are suitable for treatment.
14. From action #10 above, develop a treatment plan that includes potential resources and costs for treatment.
15. Contact the research forests, COAC, and forest tenure holders, about possible collaboration once it has verified some potential sites for ecosystem restoration from field visits.
16. Make the maps and spatial data from the GIS analysis that identifies suitable areas for Fdi and Lw available to forest tenure holders once the field verification is complete.
17. Investigate the regulatory changes required to pool the 5% allowance in the seed transfer guidelines among forest tenure holders. Communicate this to FLNRO and forest tenure staff for their consideration.
18. Investigate if there is any interest among forest tenure holders in participating in a group effort in proposing changes in the stocking standards. If there is interest, SERN can facilitate this process.

19. Identify funding sources that may be appropriate to offset increased costs for operational trials and communicate to potential collaborators.
20. Engage FFT at the forest district level to explore opportunities for cooperation and avoid duplication of effort.
21. The sites closest to whitebark pine habitat should be prioritized for site visits when conducting the field verification of the potential sites from the GIS analysis. If there are suitable sites for establishing Fdi, apply to the Habitat Conservation Trust Foundation (HCTF) for funding.
22. Identify where existing Lw has been planted, and if they are suitable, develop or add to a monitoring program to in cooperation with other partners.
23. Monitor changes in the proportion of Fdi and Lw established over time to measure how successful initiatives are in increasing the establishment of Fdi and Lw.