

Whitebark Pine Restoration in Wildfire Areas

Project No. 13.W.SON.02

Prepared for: Lillooet Tribal Council

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Fisheries and Oceans Canada



Executive Summary

Whitebark pine (*Pinus albicaulis*) populations are declining range-wide due to the effects of white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*), fire suppression, and global climate change. Several approaches to restoration have been identified including producing and planting rust resistant seedlings, prescribed burning for habitat restoration, silviculture techniques, and protecting trees from mountain pine beetle. In 2010 members of the Lillooet Tribal Council collected seed from healthy whitebark pine trees for planting on many of the burned sites in the region. This project was co-funded by the Fish and Wildlife Compensation Program and the Aboriginal Funds for Species at Risk. Fortunately this project was being implemented under the compensation program when AFSAR funds were secured, this delay permitted an evaluation of local needs and resulted in a shift of objectives from the original plan for activities conducted under AFSAR. This project focussed on: outreach with the public and industry; restoring and conserving whitebark pine habitat by working with industry, developing planting prescriptions, and seedling planting; and building local seedling production capacity. It was estimated that 90 students and 40 resource managers from the Lillooet Region were reached through outreach activities conducted within this project. A total of 500 seedlings were planted over 1.5 ha in Yalakom Provincial Park, and three other sites were considered for planting but were rejected due to access constraints and potential location within the timber harvesting landbase. This number of seedlings planted was lower than proposed, largely due to nursery shortfalls; to counter this from being prevalent, a workshop component was developed to improve the production of whitebark pine seedlings. Recommendations were made in five general areas including: outreach, cone collections, seedling production, planting prescriptions, and seedling planting.

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1. Introduction

Whitebark pine (*Pinus albicaulis*) populations are declining range-wide due to the impacts of white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*), changes to fire regimes, and global climate change (COSEWIC 2010). Whitebark pine is a provincially blue-listed species (BC Conservation Data Centre 2014) and is listed as endangered under the Federal Species at Risk Act (SARA) (Environment Canada 2014). The losses of whitebark are far greater than just its intrinsic value as whitebark pine plays an important role as a keystone or foundation species. It is a pioneer species, establishing in disturbed sites following forest fires (Arno 2001); captures soil moisture, and provides food for wildlife species in high elevation sites (Tomback and Kendall 2001).

In 2009-10 large stands of whitebark pine in the Lillooet area were burned in landscape level fires. These fires killed many mature whitebark pine but also created ideal competition free areas for whitebark regeneration. Many of these large burned areas were anecdotally observed in 2011 and it is assumed that the resulting advantages of ideal seed bed creation were outweighed by the high number of seed trees killed; this is one of threats posed by a changing fire regime – increased local mortality of entire stands of mature trees. High elevation burns tend to regenerate slowly and it is widely accepted that planting may be required to sufficiently re-stock burned areas (Moody 2006).

In 2010 the Lillooet Tribal Council collected seed throughout their Traditional Territory from phenotypically rust resistant parent trees. The council has slowly been working on seedling production over time in conjunction with the Cayoosh Band owned Split Rock Nursery and the Whitebark Pine Ecosystem Foundation of Canada.

The four threats impacting whitebark pine populations require pro-active management. Whitebark pine in protected areas requires as much restoration work as whitebark occurring outside of the area as the threats act on whitebark regardless of location. This project was designed to both address some aspects of the threats, and in conjunction with the Aboriginal Funds for Species at Risk Program (AFSAR), build local capacity and awareness to work over time to restore whitebark pine in the St'at'imc Traditional Territory.

As this project was co-funded by the Aboriginal Fund for Species at Risk (AFSAR); many of the associated deliverables to meet the goals and objectives are contained within a more comprehensive forthcoming plan created for the St'at'imc Traditional Territory. This plan will be provided to the BC Hydro Staff as a companion document to this report.

2. Goals and Objectives

This project has multiple goals and objective including:

- 1) Build local understanding for conservation concerns and importance of whitebark pine (AFSAR)
 - a) Develop outreach materials for local use.
 - b) Conduct presentations and field based restoration activities with youth and community groups.
 - c) Conduct interviews with Elders to identify local Traditional Ecological Knowledge.

- 2) Restoration and conservation of habitats (BCRP/AFSAR)
 - a) Identify local polygons of whitebark pine to highlight to local industry.
 - b) Identify candidate restoration areas impacted by industrial activity.
 - c) Identify potential impacts and develop management options with local tenure holders.
 - d) Develop educational materials directed at local land managers.
 - e) Identify naturally disturbed sites, such as wildfire areas, suitable for whitebark pine planting.
 - f) Plant whitebark pine seedlings in areas identified above with volunteer assistance.

- 3) Build local seedling production capacity (AFSAR)
 - a) Attend a workshop developed by Yellow Point Propagation.
 - b) Initiate production of seedlings.
- 4) Support ongoing research and recovery initiatives.
 - a) Collect seeds from healthy trees.
 - c) Communicate with researchers to ensure collected data and seed stock play a role in Provincial rust screening activities.

3. Study Area

The study area for this project is within the Bridge River drainage of the St'at'imc Traditional Territory. The primary field sites reviewed for planting potential were burns up the Yalakom Valley including the Jade Mountain and Big Dog fires. Specific sites visited to assess for planting included the Elizabeth mine road, La Rochelle, Blue Creek, and Yalakom Provincial Park (Figure 1). Planting was conducted in Yalakom Provincial Park.

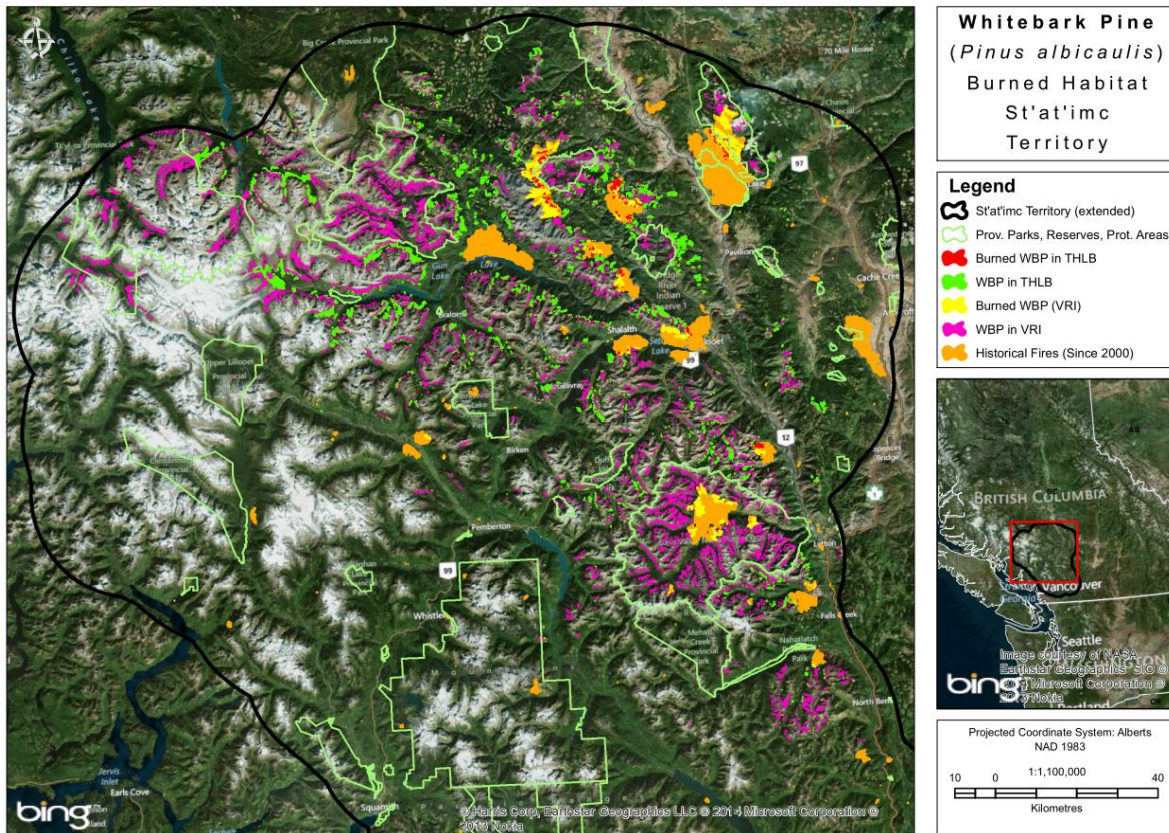


Figure 1. Whitebark pine and burned whitebark pine habitat in the St'at'imc Traditional Territory.

4. Methods

In order to address each of the three main goals, a diverse methodology was developed as described here:

1) Build local understanding for conservation concerns and importance of whitebark pine (AFSAR):

To address this goal, a series of outreach events were held at local schools, a local resource conservation forum, with local Licensees, and interviews were conducted with St'at'imc Elders. The outreach events consisted of classroom presentations and Clark's nutcracker games.

2) Restoration and conservation of habitats (BCRP/AFSAR):

To identify local restoration opportunities for seedling planting, a GIS exercise was conducted where all Vegetation Resource Inventory (VRI) polygons with a component of whitebark pine in them (Species 1-6) were overlaid on areas burned since the year 2000 to identify suitable whitebark habitat in an early seral state. The areas identified were then reviewed by St'at'imc Nation members with a good knowledge of local access and candidate sites for field visits were selected.

Selected sites were field assessed to determine the suitability of the site for whitebark pine planting. Site characteristics quantified included: i) Access for seedling planting; 2) The presence of dead whitebark pine to confirm the suitability; 3) Potential for the site to be in the timber harvesting landbase; and 4) the ecological suitability of the site to whitebark pine planting. Once a site was selected, the relevant agencies were contacted regarding the potential to plant on the site, and seedlings were planted in late September 2014.

To facilitate future seedling production, seed was also collected under this program. To collect cones, cages were placed over the cones in early summer to protect them from foragers until the seeds were fully mature and ready for collection in early fall.

Timber extraction may also serve as a restoration tool provided the harvest retains a sufficient number of seed trees on site and reduces the stocking levels of non-whitebark species. This approach requires long-term planning with industry. To address this aspect of the work plan, educational materials were developed and meetings were held with industry representatives.

3) Build local seedling production capacity (AFSAR)

To build local seedling production capacity a workshop was attended at Yellow Point Propagation to improve seed handling, propagation, and seedling production skills. This workshop was attended by two Split Rock employees with the intention to share their new skills with the other employees.

5. Results

1) Build local understanding for conservation concerns and importance of whitebark pine (AFSAR):

Presentations were made to five school classes including four elementary classes and one high school class. Combined these presentations reached an estimated 90 students. For each class a powerpoint presentation was delivered along with a play-based learning activity. The activity demonstrated how cone masting affects the availability of seeds to Clark's nutcrackers and how in past years both the tree and the nutcracker benefit.

A presentation was made at a local natural resource meeting to bring greater awareness to the concerns regarding whitebark pine (Appendix III); and a letter was sent local forest Licensees regarding the management of whitebark pine. Collectively it is estimated that these two activities reached 40 resource managers from the Lillooet Region.

2) Restoration and conservation of habitats (BCRP/AFSAR):

Based on the extensive areas burned in the region in recent years, an expansive area of burned whitebark pine habitat was identified (Table 1, Figure 2). From this query, four areas were visited based on local knowledge of suitable access and they were each evaluated for planting suitability, including:

- 1) LaRochelle – Site had difficult vehicle access due to rocks on road; forest was potentially within timber harvesting land base (THLB). Due to these constraints, site was dropped as potential planting site.
- 2) Elizabeth Mine Road – Site had good vehicle access; dead whitebark in mixed forest confirmed suitability of site; very extensive area that could support a large number of seedlings; potentially in timber harvesting land base.
- 3) Yalakom Valley – Good vehicle access; steep slope with loose soils; dead whitebark on slope confirmed suitability of site; steep slope and loose soils makes access challenging.
- 4) Yalakom Provincial Park - Good vehicle access; steep slope with loose soils; dead whitebark on slope confirmed suitability of site; trail running up slope facilitates planting access.

Table 1. VRI summary of whitebark pine habitat and burned whitebark pine habitat in the St'at'imc Traditional Territory. Note: some of these areas are outside of the BC Hydro area of interest.

Name	Total Area of Whitebark Pine (ha)	Burned Area of Whitebark Pine (ha)
Non-Protected Landbase		
Non-THLB¹	87,005.18	4,761.35
THLB¹	11,713.42	628.55
Protected Areas		
BIG CREEK PARK	364.97	-
BIRKENHEAD LAKE PARK	74.41	-
BISHOP RIVER PARK	1,745.47	-
CORNWALL HILLS PARK	31.56	-
DUFFEY LAKE PARK	407.06	-

Name	Total Area of Whitebark Pine (ha)	Burned Area of Whitebark Pine (ha)
FRED ANTOINE PARK	1,011.62	-
GARIBALDI PARK	71.91	-
JOFFRE LAKES PARK	129.95	-
MARBLE RANGE PARK	2,937.49	1,088.56
MEHATL CREEK PARK	42.00	-
SOUTH CHILCOTIN MOUNTAINS PARK	12,852.53	-
STEIN VALLEY PARK	21,055.37	1,328.8
TS'IL?OS PARK	9,163.78	-
UPPER LILLOOET PARK	31.03	-
YALAKOM PARK	2,121.76	42.7
Protected Areas Subtotal	52,040.9	2,459.9
Total	150,759.5	7,849.8

¹THLB: Timber Harvesting Landbase.

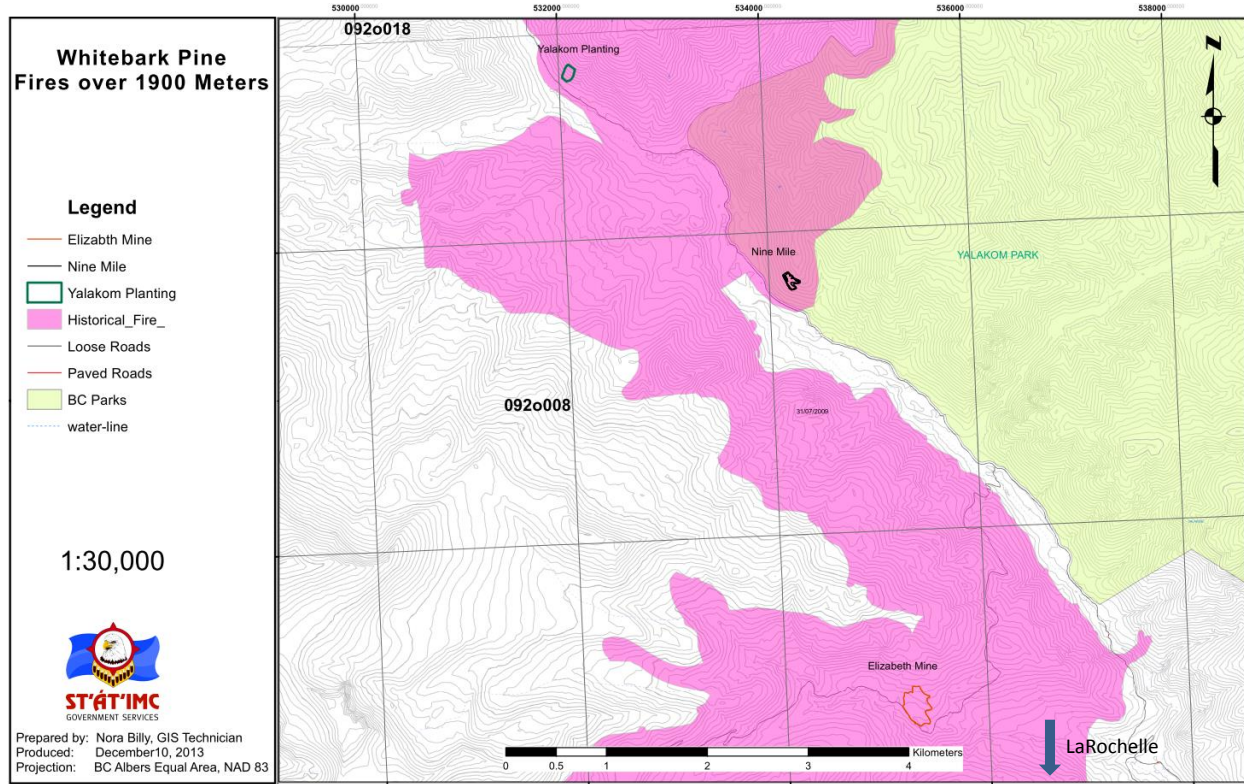


Figure 2. Map of burned areas surveyed for whitebark pine planting potential.

Following site visits, the LaRoche site was dropped due to access and the three other sites were considered for planting. Initial discussions with the Ministry of Forests identified that sites within the timber harvesting landbase (THLB) should not be considered for planting; thus sites 2 and 3 were also dropped. It is probable that site 3 was not in the THLB due to poor site conditions for timber production, but given the limited time frame between site visits and planting, it was deemed prudent to remove this as a potential site and pursue it for planting in future years. This resulted in the planting site being selected in Yalakom Provincial Park. BC Parks agreed to the planting in the park based on the conservation concerns regarding whitebark pine.

A total of 500 seedlings were planted over 1.55 ha in Yalakom Provincial Park in late September 2014 (Figure 3). These seedlings were planted along with members of the St'at'imc First Nation and the Lillooet Naturalists Society (Figure 4). Seedlings were planted as singles and in small clusters to replicate the seed caching habits of the Clark's nutcracker. A small subset of seedlings was mapped on GPS to facilitate future monitoring.

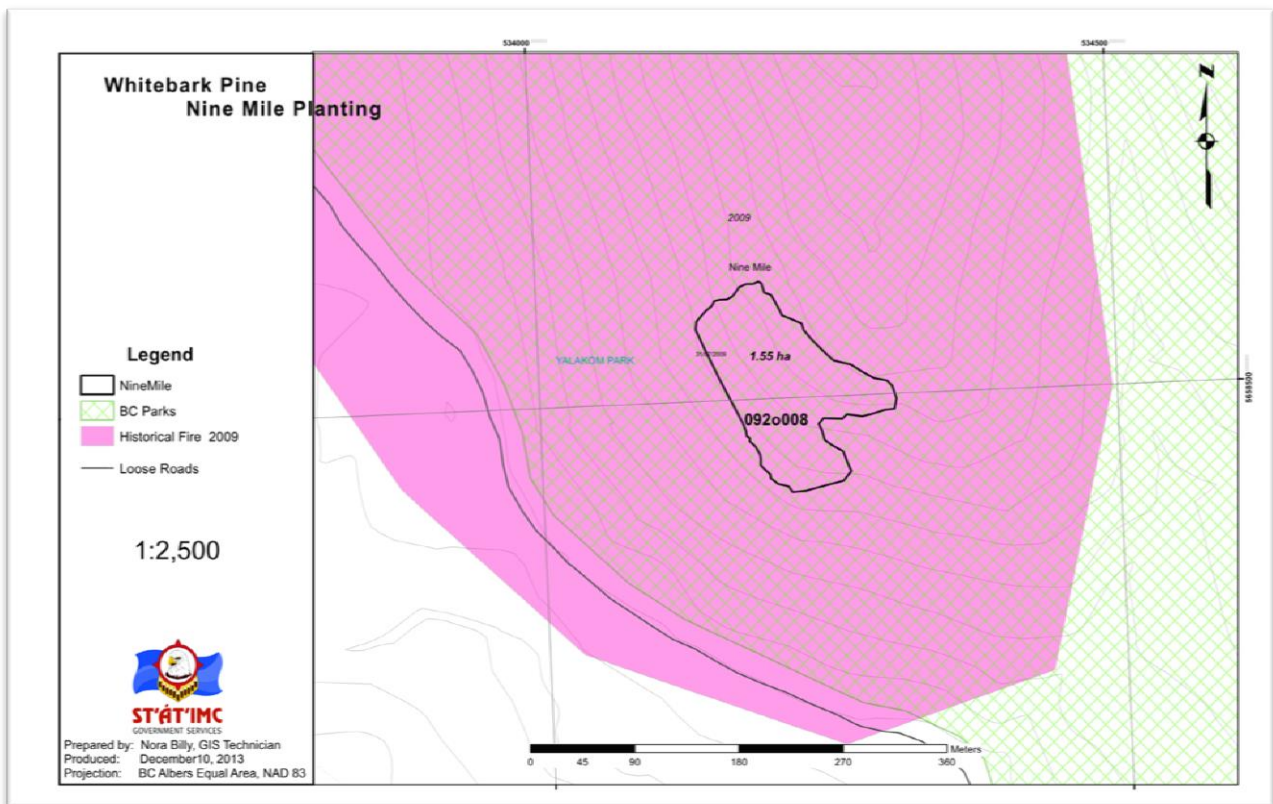


Figure 3. Whitebark pine planting polygon within Yalakom Provincial Park.



Figure 4. Crew of volunteer planters from the Lillooet Tribal Council and the Lillooet Naturalists Society (Photo I. Routley)

Cone collections were conducted with volunteers from the Split Rock Nursery who caged cones in early July and cleaned the seed from the harvested cones in late September (Figure 5). In total cones were collected from 10 trees on Mount Poison. The seed from these cones was used in the AFSAR funded training and will be germinated in 2014 for seedlings to be planted in 2016.



Figure 5. Volunteer from Split Rock Nursery collecting whitebark pine cones.

To identify restoration opportunities with tenure holders a series of meetings were held and a letter distributed to Licensees operating in the Lillooet Timber Supply Area (TSA). A meeting of Licensees was held on March 4th where local Licensees were asked to voluntarily work with the St'at'imc First Nation by implementing novel harvesting and silviculture regimes to support whitebark pine restoration. In addition, meetings have been held with BC Parks managers, and recreation tenure holder Chilcotin Holidays. The results of these meetings are still being generated as Licensees consider potential approaches to incorporating whitebark pine in their planning process.

3) Build local seedling production capacity (AFSAR)

Two nursery employees from Split Rock Nursery attended a two day workshop at Yellow Point Propagation to gain a better understanding of seed handling, germination, and seedling production. As a component of this project they produced a document describing whitebark pine seedling production in order to ensure knowledge sharing with current and future employees at the nursery. This document will be appended onto the more comprehensive management document being produced for the territory.

6. Discussion

The methods and results of this project coupled with the additional funding provided by the AFSAR program resulted in the development of a stand-alone management document to be used by the St'at'imc First Nation in the management of whitebark pine in their Traditional Territory. This document will aid in delivering cohesive and coordinated management of whitebark pine in the region.

Outreach has proven to be a very valuable tool as whitebark pine is poorly documented in forest inventories, despite it showing up over great hectareage. A reliance on gleaning local knowledge is often key to identifying suitable worksites. Although the outreach within this project was successful in reaching a local cohort of youth, continued outreach will require teachers and educators be better informed on the plight of whitebark pine. One high school teacher indicated an interest in getting students into the field to plant seedlings. Unfortunately the timing of these classroom visits did not permit this, however this should be considered when planning future outreach.

Several members of the St'at'imc First Nation assisted with this project and will be good resources to facilitate local outreach. Developing the outreach component such that it is locally led by an involved community member would aid in supporting more extensive outreach in the region.

Identifying and confirming seedling planting areas was more challenging than originally anticipated. Regardless of the ecological characteristics of the site all planting on Crown land must be approved by the appropriate government agency (BC Ministry of Forests, BC Parks). To plant on Crown land, requirements included: not alienating merchantable species, registered planting stock, approval of First Nations, and appropriate insurance. Due to these requirements, planting in Yalakom Provincial Park was the easiest path as the potential merchantability of the site was not a factor. Future plantings are possible within the timber harvesting landbase and among merchantable tree species, however greater planning and consultation is required; these opportunities should be identified as a range of ecosystems are desired for replanting activities including within more productive merchantable forest sites.

Planting areas and seedling number were well below those in the original proposal (proposed 2,000 seedlings; planted 500 seedlings). The primary factor limiting the number of seedlings was seedling quality in the nursery. Whitebark pine seedling production is an emerging process and the number of seedlings estimated for this project was well above the number of suitable seedlings that survived in the nursery. Fortunately these seedlings were only an in-kind component of the project; however this also limited the total area that could be planted. This challenge of nursery seedling production was identified as a species' need and included in the companion AFSAR project that was secured using the funds from this project as seed dollars.

Once seedling production becomes efficient and more reliable, a program should be developed that identifies a set number of seedlings to be produced over a given time frame and planted each year. For example, if enough seeds are collected in a mast year to produce 100,000 seedlings; these could be divided over five-years and 20,000 seedlings planted per year. This approach would allow for sufficient planning as the first seedlings would not be available until two years after the seed collection is made and having the seed in place and a proven production track record would be viewed favourably by

potential funders. Since whitebark pine seed or seedlings are not commercially available, a circular program that collects seed, grows seedlings, and plants seedlings is required to continue with restoration in the region.

As this project was the first planting of whitebark pine in the region, the survival of the seedlings planted in this program should be monitored over time to guide future planting work. A walk-through survey should be conducted within 3-years and a formal plot based survey should be conducted within 5-years. The small subset of GPS points taken for some seedlings should be re-visited; however even with 3-5m precision of a GPS unit, monitoring set locations may not be feasible as seedlings were spaced about that distance apart.

Collectively, if the results from this jointly funded project can be implemented; future restoration work in the region may be greatly improved in terms of volunteer support, seedling availability, and locating suitable sites on which to plant seedlings

7. Recommendations

Recommendations borne out of this project span the range of activities and are often interconnected including:

- Outreach
 - Outreach capacity should be developed locally to ensure that potential volunteer groups are fully aware of local opportunities;
 - Suitable volunteer based opportunities should be identified such as seed planting, cone collections, and seeding planting; these activities should be scheduled with volunteers to maximize program efficiency and volunteer rewards;
 - Develop a continuous volunteer stream, for example if grade 9 students collect cones; grade 10 students volunteer in the nursery; and grade 12 students plant seedlings in the field, feasibly one group of students will have collected, grown, and planted their own whitebark pine seeds and seedlings.

- Cone Collections
 - Train field personnel to identify juvenile cones to prepare for years when there are large cone crops;
 - Focus cone collections on mast years;
 - Spread collections across the St'at'imc Traditional Territory;
 - Engage volunteers in assisting with collections.

- Seedling Production
 - Seedling production in the nursery was one of the limitations of this program. Improving seedling production such that it is far more predictable than at present will enable a higher level of planning and preparation in future years;
 - Work closely with local industry to identify additional opportunities for seedling sale and deployment.

- Planting Prescriptions
 - Work with local regulators and tenure holders to develop a multi-year planting plan to ensure areas for future planting work;
 - Identify a range of prescriptions across access levels including drive-in sites up to 2 hour hike-ins; given that whitebark pine is typically a very remote species, only planting where roads occur would not be addressing the natural distribution of the species.

- Seedling Planting
 - Engage volunteers to accomplish a greater area planted;
 - Monitor area planted at three and five year intervals to quantify seedling survival;
 - When planting in less visible locations, establish permanently marked survival transects to provide the best quantification of planting success.

8. Acknowledgements

The Lillooet Tribal Council and its consultants are grateful to project funders. The work conducted within this project could not have been conducted without the financial support of the Fish and Wildlife Compensation Program and its program partners BC Hydro, the Province of BC and Fisheries and Oceans Canada; and the financial support of the Aboriginal Funds for Species at Risk (AFSAR). A generous donation of seedlings by the Whitebark Pine Ecosystem Foundation of Canada.

Volunteer efforts were also greatly appreciated; in particular members of the Lillooet Tribal Council, Lillooet Naturalists Society, and Split Rock Native Plant Nursery.

9. References

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Appendix I: Financial Statement

Financial Statement

	BUDGET		ACTUAL	
	FWCP	Other	FWCP	Other
INCOME				
<i>Total Income by Source</i>	\$9,130.00	\$19,630.00	\$9,130.00	\$23,081.35
Grand Total Income (FWCP + other)	\$28,760.00		\$32,211.35	
EXPENSES	Note: Expenses must be entered as negative numbers (e.g. – 1000, etc.) in order for the formulas to calculate correctly.			
Project Personnel				
Wages	-\$1750.00	-\$1750.00	-\$909.59	
GIS Tech	-\$750.00	-750.00	-\$750	-\$750.00
Consultant Fees	-\$4800.00	-\$4800.00	-\$5197.12	-\$14,433.46
Volunteers (In-kind)	0	-\$4,500.00 ⁱ		-\$1,500.00 ⁱ
**GST/HST#				
Materials & Equipment				
Shovel Use	-\$75.00	-\$75.00	-\$75.00	
Precision GPS Use	-\$255.00	-\$255.00	-\$255.00	
Travel Expenses	-\$1,000.00	-\$1,000.00	-\$1443.29	-\$2,903.89
Travel (In-Kind)		-\$0.00		-\$770.00 ⁱ
Seedlings (In-Kind)	0	-\$6,000.00 ⁱ		-\$1,500.00 ⁱ
<i>(List others as required)</i>				
Administration				
Office Supplies				
Photocopies & printing				
Postage				
General Admin	-\$500.00	-\$500.00	-\$500.00	\$1,224.00
Total Expenses	-\$9,130.00	-\$19,630.00	-\$9,130.00	-\$23,081.35
Grand Total Expenses (FWCP + other)	-\$28,760.00		-\$32,211.35	
BALANCE	<i>The budget balance should equal \$0</i>		<i>The actual balance might not equal \$0*</i>	
(Grand Total Income – Grand Total Expenses) inclusive of GST/HST obligations	0		0ⁱⁱ	

ⁱ In-kind Contribution (\$10,500 estimated in budget; \$3,770 actual; due primarily to insufficient seedling delivery).

ⁱⁱ Note an additional \$5050.00 remains to be spent from AFSAR funds not accounted for until April 30, 2014.

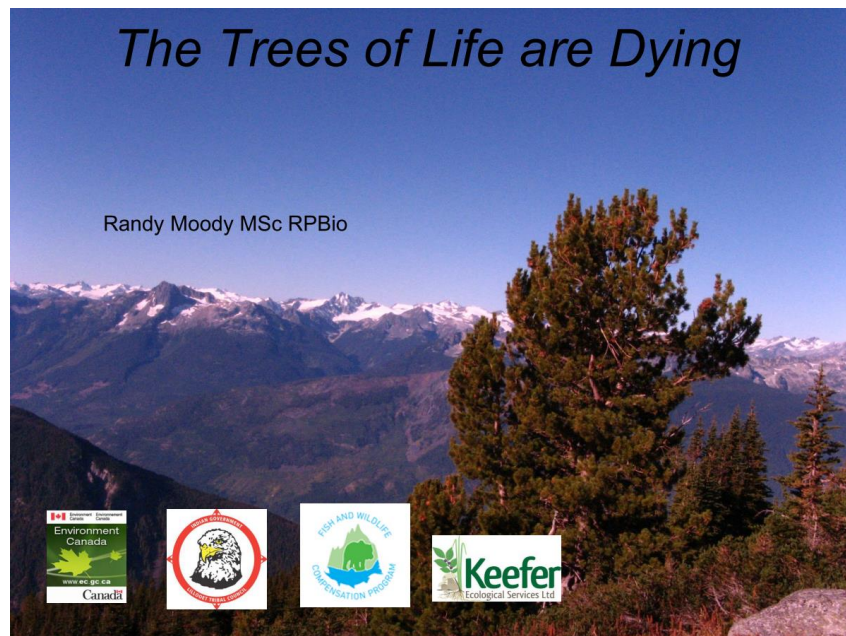
Appendix II: Performance Measures-Actual Outcomes

Project Type	Primary habitat benefited	Primary target species	Upland	Comments
Habitat Conserved – General	Functional habitat conserved/replaced through acquisition and management	Grizzly Bear Whitebark Pine	X	Improved management of extensive area of whitebark pine through Licensee and tenure holder engagement. Discussions have been initiated with tenure holders regarding operational changes to improve whitebark survival. Functional area improved is difficult to quantify at present. Letter to Licensees is attached to report.
Designated rare/special habitat	Rare/special habitat protected	Grizzly Bear Whitebark Pine	X	The mapping products of this project may lead to large areas that may be removed from timber harvest planning. At present the BC MOE is pursuing the establishment of a Wildlife Habitat Area (WHA) focussed on whitebark pine forests.
Prescribed burns or other upland habitat enhancement for wildlife	Functional area of habitat improved	Grizzly Bear Whitebark Pine	X	A total of 1.5 ha was planted with 500 whitebark pine seedlings. These seedlings will produce cones in ~40 years that are desirable food for many species wildlife including grizzly bears.

Appendix III: Confirmation of FWCP Recognition



First slide of presentation at Lillooet Water Forum



First slide of outreach presentation for school groups