DRAFT: Whitebark Pine Restoration in the Kootenay - Columbia

UKE-F19-W-2753

Prepared for: Fish and Wildlife Compensation Program

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Prepared with financial support of the Columbia Basin Trust and Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and public stakeholders.

10-January-2019

Executive Summary

Whitebark pine (*Pinus albicaulis*) is a blue-listed species in British Columbia and listed as Endangered under the Species at Risk Act (SARA) primarily due to white pine blister rust, mountain pine beetle, fire suppression, and global climate change.

This project aligns with the Upper Kootenay Ecosystem Enhancement Action Plan – Upland and Dryland Areas Action Plan:

- Action #8 - Objective 2A: Support Whitebark Pine Restoration Efforts

To achieve this objective several recovery-based goals, were addressed including:

  - Re-establish whitebark pine in wildfire areas;
  - Assist in identifying blister rust resistant stock by collecting cones to be used in rust screening and seedling production;
  - Improve public knowledge of whitebark pine.

A total of 5,310 whitebark pine seedlings were planted at Forster Creek (3,310) and Mount Skelly (2,000) over a combined area of 12.6 ha. The Forster Creek location was planted in a recent cutblock in conjunction with Canfor and the Mount Skelly location was planted in a 15-year-old burn.

Over the summer months in 2018, cones were collected from 22 sites within the study area. To collect cones, trees were visited once in early summer to place cages over cones to protect them from foragers. These trees were revisited in early fall when seeds had matured, and cages and cones removed. Trees for cone collection were those displaying putative resistance to white pine blister rust. An estimated 300,000 seeds were collected in the region.

Outreach was conducted with a number of groups including: Canfor, Zanzibar, nature writer Fraser Los, Kimberley Daily Bulletin, and CBC. Outreach included field visits with employees, interviews for print articles, and on-air interviews with radio.

This project was originally designed as a three-year project; however, given the exceptionally large seed collection, the number of years to complete this project will expand. The following recommendations were made to guide project implementation in future years:

- Survey high elevation burns to identify suitable planting habitat;
- Implement seedling production in a sustainable and systematic means;
- Continue with targeted seed collections from healthy trees in heavily infected stands;
- Identify additional funding alignments within FWCP as the Upper Kootenay Ecosystem Enhancement Action Plan, has concluded;
- Seek multi-year funding to limit funding caused shortfall in project implementation;
- Continue with both targeted and opportunistic outreach; and
- Work closely with other groups such as the Ktunaxa Nation, Canfor, and ski areas to expand the scope of whitebark pine recovery in the region.

Table of Contents

1. Introduction

Whitebark pine (*Pinus albicaulis*) is a blue-listed species in British Columbia and listed as endangered under the Species at Risk Act (SARA) (BC CDC, 2002). Awareness of whitebark pine has elevated recently due to it being a conservation concern; however, it also plays an important ecological role supporting numerous species and ecosystem processes.

1.1. Species Description

Whitebark pine is one of three five-needled pines in BC, other species being western white pine (*Pinus monticola)* and limber pine (*Pinus flexilis*). All three of these species occur within the Columbia Basin but generally occupy different habitats. The western white pine is more abundant at lower elevations in the west Kootenay and cooler moister sites in the east; limber pine is restricted to the Rocky Mountains and montane regions of the Rocky Mountain Trench; and whitebark pine occurs at high elevations across the region.

Whitebark pine grows on dry to moderately moist upper subalpine habitats ranging from treeline to closed subalpine forests. Whitebark occurs most abundantly on drier, exposed south-facing slopes near treeline where competition levels may be suppressed. In Canada, whitebark pine reaches its northernmost extent at approximately 55°N in the Coast Mountains and at about 54°N in the Rocky Mountains between the British Columbia and Alberta border (Figure 1; COSEWIC, 2010). Elevations vary in Canada, with trees commonly found at 1950m to 2250m at the Canada-USA border and from 1000m to 1600m in northcentral BC (COSEWIC, 2010).

As per its name, the bark on young whitebark pine trees is thin, smooth, and chalky-white. As the tree ages the bark thickens and forms narrow, brown, scaly plates (COSEWIC, 2010). Whitebark pine needles are 3-9cm in length and tend to clump towards the end of branches (COSEWIC, 2010; Parish, 1948). Pollen buds are visible in mid-June to mid-July and are raspberry red in colour, which is easily distinguishable from the yellow-orange pollen buds of western white pine, lodgepole pine, and limber pine (Pigott, 2012). Mature cones are egg-shaped to nearly round, and are dark brown to purple in colour, ranging in size of 3-8cm in length. Cones are first produced when the tree is 30-50 years in age and a sizable crop is commonly not produced until the tree is 60-80 years in age (COSEWIC, 2010). Cone production also varies between years, experiencing cone failures in some years and in others experiencing a mast cone production. It is in these mast years that the bulk of seed caching and reproduction occurs. Cones are permanently closed and require the bird, Clark's nutcracker (*Nucifraga columbiana*), to break open the cone and cache seeds for seed dispersal.

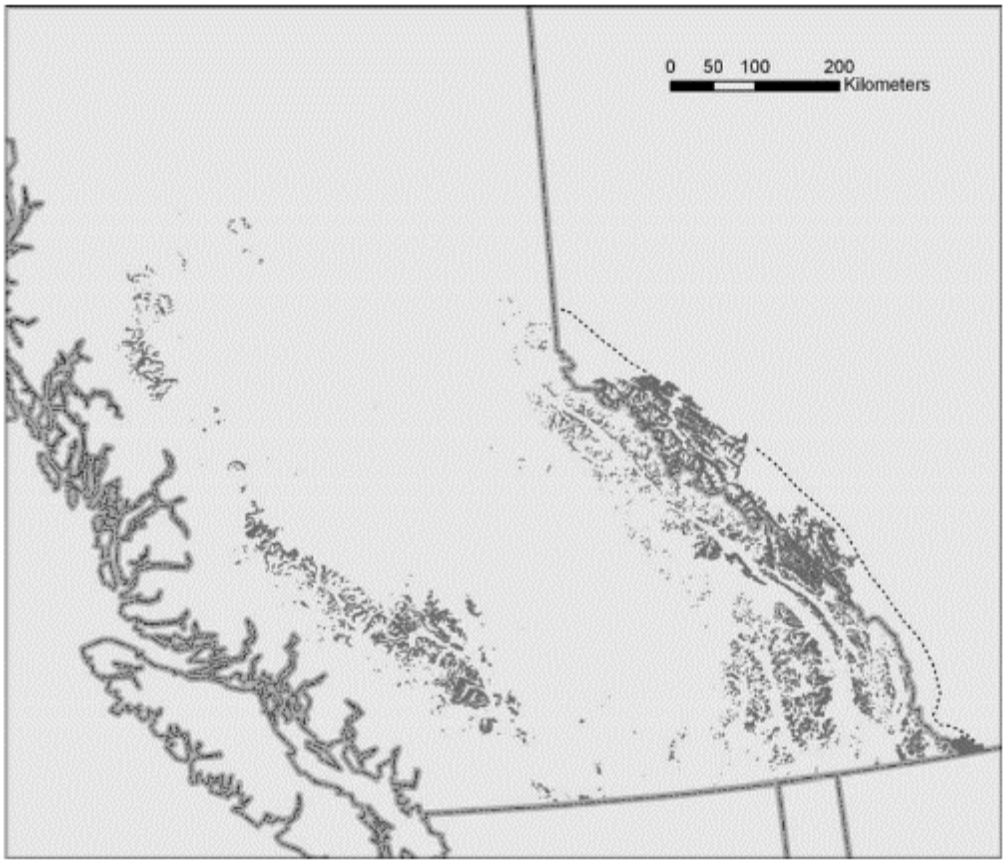

Figure 1. Canadian Range of Whitebark Pine. Dotted line in Alberta indicates eastern edge of range (COSEWIC, 2010)

1.2. Ecological Role

Whitebark pine plays a very important ecological role, growing in some of the most inhospitable climates, tolerating high wind and snow, with relatively little soil or water (Pigott, 2012; COSEWIC, 2010). On these sites whitebark pine stabilizes soil, reducing erosion; slows the progression of snowmelt; and facilitates the growth of conifers and understory vegetation by creating favourable habitat for establishment (COSEWIC, 2010).

Whitebark pine is also very important for wildlife, particularly Clark's nutcracker, red squirrel, and grizzly and black bears. Whitebark pine seeds are highly nutritious, containing about 52% fat, 21% carbohydrates and 21% protein, which make them a prime choice to store as a winter food source for the nutcracker and red squirrel and provide a rich source of calories for bears building pre-denning fat deposits (Pigott, 2012).

Clark's Nutcrackers are known for their habit of storing abundant seed crops in spatially distributed cache sites across the landscape. As many of these caches are never recovered, new trees emerge from these caches. This seed caching behaviour results in mutualism, whereby the tree benefits from the dispersal services provided by the nutcracker. The ecological consequences of this bird-pine mutualism are very profound indeed, setting the stage for a foundation ecosystem.

1.3. Threats and Conservation Status

Whitebark pine populations are rapidly declining, due to four main agents, including:

1) **White Pine Blister Rust**
   White pine blister rust is caused by the fungus *Cronartium ribicola,* which was introduced to British Columbia in 1910 from Europe (Pigott, 2012). The fungus requires alternate hosts from the *Ribes* (currant and gooseberry); and in some instances, *Pedicularis* (lousewort), or *Castilleja* (Paintbrush) genera may serve as alternate hosts. Fungal spores are released from the alternate hosts and enters through the stomata on the needles of the pine tree and travel down the branch to the main stem where it girdles and eventually kills the tree (Pigott, 2012).

2) **Mountain Pine Beetle**
   Mountain pine beetle (*Dendroctonus ponderosae*) can kill and reproduce in whitebark pine. Trees already weakened by white pine blister rust are more susceptible to mountain pine beetle attack (Alberta Whitebark and Limber Pine Recovery Team, 2014).

3) **Fire Suppression**
   Whitebark pine is a poor competitor and requires fire to 'reset' successional conditions to allow for adequate regeneration to occur. Under natural fire regimes, low intensity fires would burn through stands, removing the understory, which would allow whitebark pine to thrive (COSEWIC, 2010). As well, Clark's nutcracker uses burned sites for seed caching, allowing for regeneration of whitebark pine (COSEWIC, 2010). Years of fire suppression have allowed shade tolerant species to dominate whitebark pine habitats, limiting whitebark's ability to establish and survive on sites.

4) **Climate Change**
   Increasing global temperatures will require whitebark pine to migrate to areas of suitable climate and adapt to changed climatic conditions or be extirpated (COSEWIC, 2010). Unfortunately, conditions are changing more rapidly than the tree can respond to. Warming temperatures are expected to increase competition as lower elevation species migrate upslope; further, increasing temperatures, potentially make it more susceptible to blister rust and mountain pine beetle attack.

1.4. Goals and Objectives

This project addressed Action #8 – Objective 2A (Support Whitebark Pine Restoration Efforts) from the Upper Kootenay Ecosystem Enhancement Action Plan – Upland and Dryland Areas Action Plan with an expected outcome of improved whitebark pine habitat. To improve whitebark pine habitat and to support future work, this project consisted of several recovery-based goals, including:

1) Re-establish whitebark pine in wildfire areas;
    - Plant 5,000 whitebark pine seedlings over 15 ha in wildfire and timber harvest areas.
2) Assist in identifying blister rust resistant stock by collecting cones to be used in rust screening and seedling production;
    - Collect cones from healthy parent trees in highly infected stands, primarily stands with greater than 80% rust infection.
3) Improve public knowledge of whitebark pine.
    - Conduct outreach to increase public knowledge and improve the size of the local volunteer pool and improve the level of local knowledge about whitebark pine.

2. Methods

To accomplish the goals in Section 1.4, the following methods were developed and implemented:

a) Planting: Planting was implemented by first pre-surveying the proposed planting areas at Mt Skelly and Forster Creek. The Mt. Skelly site was previously surveyed several years ago, the pre-planting survey in 2018 was to ensure that natural regeneration had not occurred to an extent that rendered the site not in need of restoration planting and to ensure that suitable access was still present. The survey at Forster Creek was to determine the plantability of the site following timber harvest; to assess this, planting locations at the prescribed density were inventoried to ensure the prescribed density of 400 stems/ha could be planted on the site.

   The prescribed planting density required inter-tree spacing of approximately 5 m; where natural seedlings were present this inter-tree distance was maintained. Planters were instructed to select appropriate microsites by selecting sites protected from excessive shade, sun, and frost. This often resulted in planting on the shady side of small features such as rocks and stumps and avoiding sites such as low cool air collecting sites.

   The seedlings planted were generated from seed collected from 'putatively resistant parents' these are parents that display some forms of resistance to blister rust (they are the healthiest in the population) but have not been formally tested for resistance to rust.

   Following planting the boundaries of the planting area were mapped using GPS and maps were created in QGIS showing the planting boundaries.

b) Seed Collection: Seeds were collected from healthy whitebark pine trees displaying putative resistance to white pine blister rust. These were healthy trees growing in highly infected stands (>80% rust infection preferred). Once a tree was selected, its location was mapped using GPS, measurements of DBH and height taken, health comments documented, and a unique number tag affixed to the tree.

   To collect seeds, cones had to be protected from foragers by placing wire mesh cages over the cones in early summer. In early fall, when seeds had matured, the cages along with the cones were removed. Cones were dried for approximately six weeks and then seeds were removed. Some seeds were sent to nurseries for seedling production, other seed was dried further and sent to the Surrey Seed Centre for storage.

c) Outreach: To conduct outreach, target groups (forest companies, ski areas, and naturalist groups) and broad media outlets in the region were contacted. Offers were made to deliver talks, field visits, and conduct relevant interviews.

3. Results

a) Planting

A total of 5,310 seedlings were planted over 12.6 ha (Table 1). Planting occurred at two locations, Forester and Mt. Skelly:

Table 1. Summary of Whitebark Pine Seedling Planting in the Region.

Location	Area (ha)	Number of Seedlings	Density (Seedlings/ha)
Forster	6.5 ha	3,310	509
Mt. Skelly (Kuskonook)	6.1 ha	2,000	327
Totals	**12.6 ha**	**5,310**	

a. **Forster** – The Forster site was located approximately 40 km west of Radium Hot Springs up the Forster Creek drainage (Figure 2). Planting at Forster occurred in late June 2018. Planting was done in a recent timber harvest cutblock in collaboration with Canfor. Planting was completed by Canfor contractor Zanzibar Holdings Ltd. and paid for by Canfor. In this planting, FWCP funding was primarily used for layout of the planting area, establishing monitoring plots to track the success of planting over time, and outreach with Canfor and planting crews. The planted density was 509 stems/ha, which is higher than the prescribed 400 stems/ha; this higher density was due to planting in the merchantable forest where seedlings are typically planted at high densities to ensure satisfactory regeneration and meet silviculture obligations.

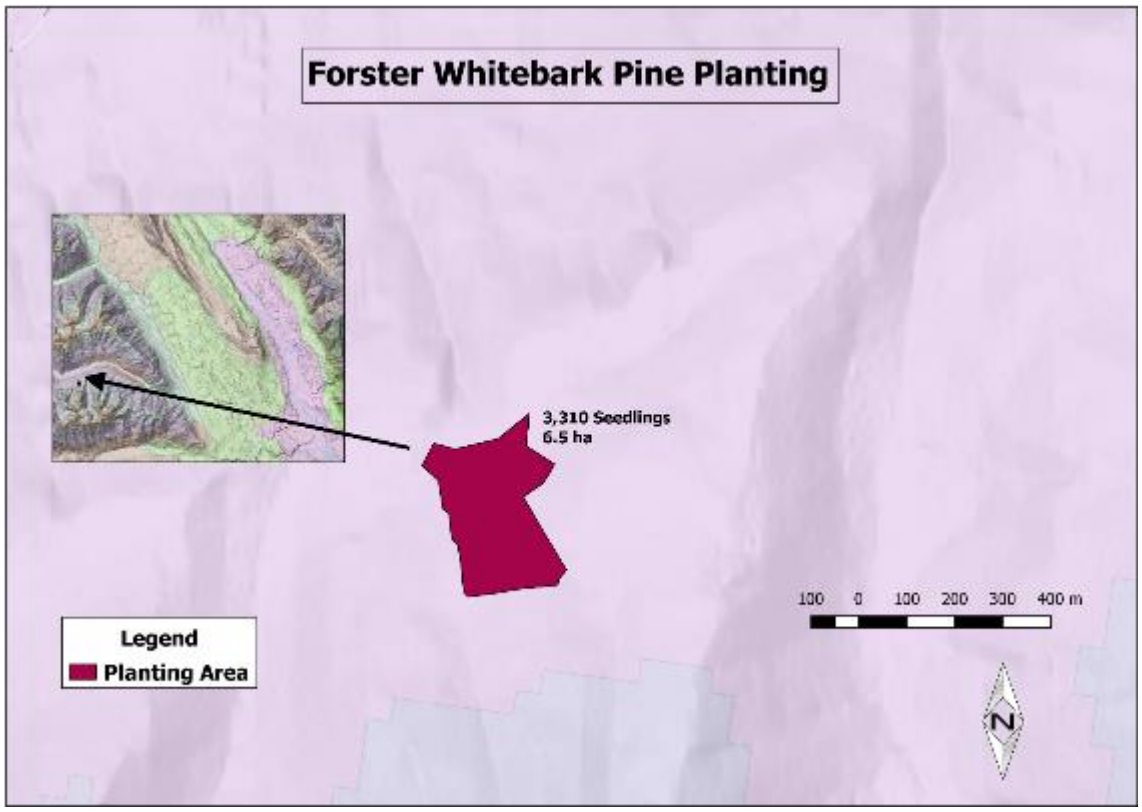

Figure 2. Map of planting location up Forster Creek west of Radium.

b. **Mt. Skelly** – The Mount Skelly site was located approximately 50 km north of Creston up the Sanca Creek valley (Figure 3). Planting was in the 2003 Kuskonook burn. Planting occurred in late September 2018. This planting required a 1 km hike to access with an approximate 150 m elevation gain. Planting at this site was solely for ecological restoration of whitebark pine as the site had burned in 2003 but had very little natural recruitment to-date. The planting density was 327 stems/ha, which is lower than the prescribed 400 stems/ha; this lower density was due to some natural regeneration on site which was spaced off of, and due to some unplantable substrates such as rock outcrops and shallow soils. The robust plugs for planting required between 10 – 15 cm of soil for planting (Figure 4).

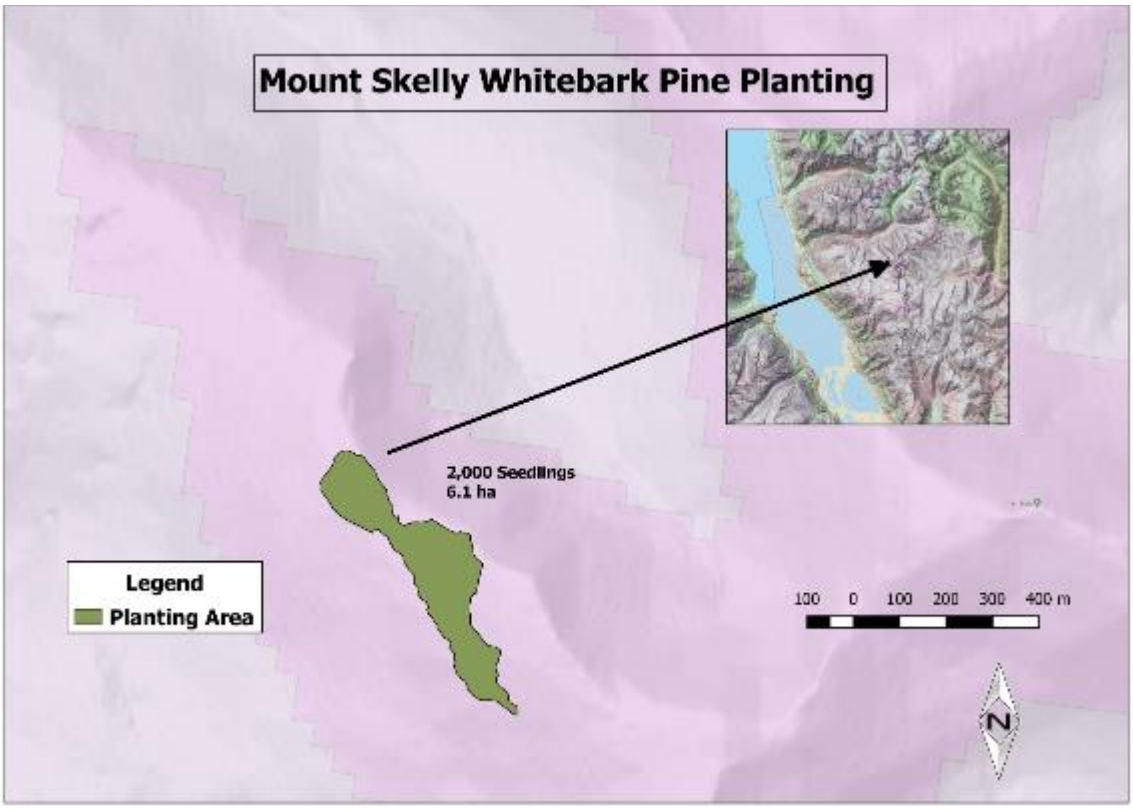

Figure 3. Map of planting site on Mount Skelly, east of Kootenay Lake near Sanca Creek.

Figure 4. Quality of seedlings planted at Mt. Skelly.

b) Cone Collections

Cones were collected at a total of 22 locations within the Columbia basin study area (one of these was marginal in the Flathead River Drainage) (Figure 5). A total of 5,990 cones were collected for an estimated 299,500 seeds collected from the region. This large collection was facilitated by the contributions of partner funders including: Parks Canada, Columbia Basin Trust, Teck Coal Ltd., and the Forest Enhancement Society.

Table 2. Summary of Cone Collection Trees.

Location	Number of Collection Trees	Number of Cones	Estimated Number of Seeds*
Baker	5	157	7850
Baldy Kootenay	8	200	10000
Bootleg	14	650	32500
Estella Mine	3	215	10750
Finlay	6	458	22900
Grassy Tops	5	529	26450
Hefty	2	88	4400
Loop Ridge	3	50	2500
Michel Head	7	225	11250
Mount Seven	8	207	10350
Mount Stevens	4	150	7500
Moyie	7	171	8550
Mt.Gass SW3	5	204	10200
Panorama	9	390	19500
PowCow	6	153	7650
Red	6	377	18850
Sand	6	151	7550
Siwash	6	394	19700
Sorcerer Lodge	21	641	32050
Stagleap	3	47	2350
Table Mountain	7	153	7650
VOR	11	380	19000
Total	**152**	**5,990**	**299,500**

*Based on 50 seeds per cone (may be low estimate)

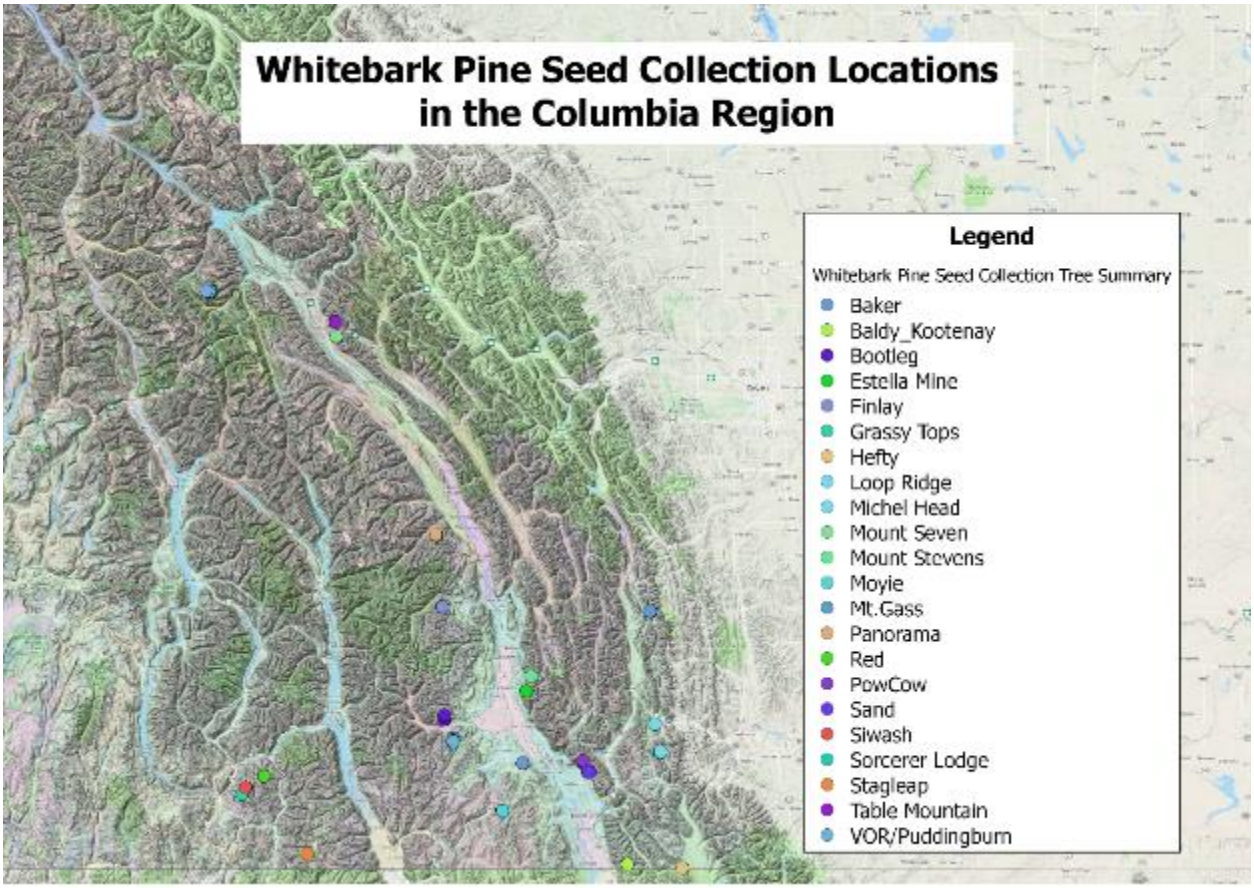

Figure 5. Map of cone collection locations in the East and West Kootenay.

c) Outreach

Outreach was conducted with several groups including:

- Canfor – An outreach field day was conducted with Canfor planners, silviculture foresters, and biologists. During this day we inspected a cutblock for whitebark pine planting opportunities and reviewed ecologically suitable conditions for whitebark pine planting.

- Zanzibar – Outreach was conducted with planters employed by Zanzibar. They were instructed on the importance of whitebark pine and appropriate planting site selection such as protective microsites and low competition sites.

- Fraser Los – Outreach was held with writer Fraser Los at Sorcerer Lodge. We were conducting work at this lodge as it has a history of supporting whitebark pine work (~10 years). In 2018 we collected cones here through collaborative work with Parks Canada and Fraser accompanied us to site to observe whitebark pine work. He submitted articles to The Canadian Rockies Annual and Canadian Wildlife (Both presently submitted but not published).

- Kimberley Daily Bulletin – An interview was conducted with the local Kimberley newspapers. This article described the threats to whitebark pine, the work being conducted, and the funders supporting work near Kimberley (www.kimberleybulletin.com/news/conserving-the-whitebark-pine-tree/).
- CBC – An interview was conducted with Bob Keating of CBC news. This interview was conducted in response to a release regarding funding provided by the Columbia Basin Trust (CBT); a funding match on this project.

4. Discussion

Seedling Planting

Seedling planting was conducted at two vastly different sites; post timber harvest (Forster) and post wildfire (Mt. Skelly). Although the timber harvest site was a more recent disturbance, it was a more difficult site to plant than the 15-year old wildfire. The large amount of slash on site at Forster compared with the site 'cleaned' by wildfire at Skelly resulted in more slash and debris to move through. Despite the high debris level on site, the Forster site was planted to a higher density to meet the requirements of forestry silviculture obligations. This higher planting density resulted in a lower than targeted area being planted (target 15 ha vs 12.6 ha actual) despite more seedlings planted (target 5,000 vs 5,310 actual).

Inspections of seedling planting generally yielded good observations of planting quality. The only issues were planting in shallow soil, which were typically skipped by planters. Shallow soils are common in whitebark pine habitat and should be identified when selecting a planting site. Whitebark pine naturally establishes on these types of soils but seedling plug size may render them unplantable. When inspecting a planting site, a planting shovel should be used to inspected soil depth. These soils tend to present in a mosaic at high elevations and rarely dominate a planting site where trees had previously established.

We had a slight overage in seedlings delivered, which was easily mitigated as we had large planting areas and had additional funders supporting the project. Seedling production is a constant issue with whitebark pine as it is a challenge to germinate with a range of 30% to 70% of seeds growing to seedlings; further it is a slow growing crop in the nursery taking 2-years to grow a plantable seedling vs. 1-year in most crop trees, thus reacting to seed failures cannot compensate rapidly for poor germination. This issue with production means that a greater number of seeds are required to meet seedling needs; further, when planning planting in future years it is difficult to accurately predict how many seedlings will be available. This deviation in planned vs produced seedlings can introduce budget issues as well as restoration issues, when one considers that seedlings generally cost about $2.50 each.

The collaborative work with Canfor on this project may result in more flexibility with seedling production as industry may uptake any excess seedlings not planned for at time of production or during proposal submission. Expanding collaboration with other groups may allow for larger grows at the nursery, possibly leading to lower seedlings costs and eventually greater areas restored. Canfor is only one of many industrial companies that may consider planting whitebark pine, there are many others including forest companies, mining companies, ski areas, and non-profits that may absorb any overages in whitebark pine production as well.

Cone Collections

The cone crop in 2018 was the largest observed by the author in 15-years of studying whitebark pine. Comparable crops have been observed in the Chilcotin; but the crop this year was very large and widespread, occurring across all of British Columbia. The timing of this crop was very serendipitous as a large amount of matching funding was secured for 2018 allowing us to make the largest collection to-

date since whitebark pine recovery efforts were initiated. It was estimated that approximately 300,000 seeds were collected in the region, though some of these belong to other groups such as Parks Canada and Teck Coal; this total is about 1/4 of what was collected across the province in 2018.

It is estimated that this crop may provide enough seed for 10-years of seedlings for all groups (Yield an average of 15,000 seedlings per year based on conservative 50% germination). This rate of deployment would be many times greater than has been planted at a provincial scale to-date; thus, making good use of the seed collected this year will require a dedicated effort over the next decade. This will require identification of well-suited planting sites and a well-planned and implemented planting program. As seed can be stored for extended periods, deployment should be based on the suitability of available planting sites and not just a desire to work through the collected seed. Seed will be properly stored at the Tree Seed Centre (BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development) until it is withdrawn each year for seedling production. Depending on deployment, a need for additional collections is possible at a regional scale, such as if all seed from the Rocky Mountains are deployed and only seed from the Purcell Ranges remain.

Although this collection targeted trees displaying putative resistance, thus it is assumed the seedlings produced should be superior to seedlings produced from randomly selected seed, it does not preclude the need for future collections until all stored seed is depleted. As additional plus trees (putative resistance) are identified in new populations, selective collections may be undertaken to test trees for blister rust resistance and to increase the genetic diversity of stored seed. Likewise, opportunistic cone collections may be undertaken if additional large cone crops are observed, as collecting during a large crop is the most cost-effective means to collect cones. As whitebark pine cones are a two year crop, observations should be made to identify upcoming opportunities based on cone production levels. For example, cones pollinated in 2019 will not be mature until early fall of 2020, but these maturing cones will be observable on the tree from mid-summer 2019 until maturity in 2020; thus, if cones are observed on desirable trees early in this cycle, plans for cone collections can be made and implemented.

Outreach

Outreach was conducted in a somewhat opportunistic manner, though all groups targeted were well suited to the message. Based on the conversations that were had with participants, it was identified that targeted talks that go beyond the natural history and conservation concerns are warranted. For example, outreach specific to industry groups is warranted such as ski area needs and forestry specific management concepts.

Outreach to the CBC and writer Fraser Los were achieved through the individuals contacting the author for information on whitebark pine. This may indicate that the public has a greater interest than originally thought and extensive outreach may yield good results for improving public knowledge and possibly improving volunteer participation in the region.

5. Recommendations

This project was originally proposed as a three-year project; however, given the large seed collection completed along with the large wildfires in the region, the scope of this project has shifted to beyond this time frame. The following recommendations and timeline were developed to build on the work completed in 2018:

- Survey high elevation burns to identify suitable planting habitat;
- Implement seedling production in a sustainable and systematic means (see timeline);
- Continue with targeted seed collections from healthy trees in heavily infected stands, cone crops should be periodically surveyed to identify these opportunities;
- Identify additional funding sources as the Upper Kootenay Ecosystem Enhancement Plan (UKEEP), a five-year partnership between the Columbia Basin Trust and FWCP, concluded in 2018-19, under this plan whitebark pine was explicitly identified. Future work will likely have to garner funding by emphasizing the importance of whitebark pine to grizzly bear, particularly as habitat based actions for grizzly bear are identified in the Species of Interest and Upland Dryland Action Plans;
- Seek multi-year funding to limit funding caused shortfall in project implementation, particularly as seedling production is 2-year endeavor thus ensuring funding for planting when seedlings are ready for planting;
- Continue with both targeted and opportunistic outreach; and
- Work closely with other groups such as the Ktunaxa Nation, Canfor, and ski areas to expand the scope of whitebark pine recovery in the region.

To implement these recommendations, the following basic timeline was developed (Table 3). This timeline is basic and primarily deals with seed and seedling management. This timeline should be refined once burned areas have been surveyed and a minimum restoration area for the region is known.

Table 3. Timeline of whitebark pine work to deploy seed collected under this program.

Year*	Activity
2019	• Production of 5,000 seedlings. Seeds are already in production. • Survey recent burns to identify planting sites, results of surveys will dictate seedling production levels for future years. Based on current seedling production, 12.5 ha must be identified for planting in 2020. • Conduct outreach with potential seedling buyers including forest companies, ski areas, and mining companies; underscore the current large availability of seed presently available.
2020	• Plant 5,000 seedlings. • Enter seed into stratification for seedling production. Number of seeds will be based on results of burn surveys and development of yearly deployment.

Year*	Activity
2021	• Plant seedlings. • Enter seed into stratification for seedling production.
2022	• Plant seedlings. • Enter seed into stratification for seedling production.
2023	• Plant seedlings. • Enter seed into stratification for seedling production.
Opportunistically	• Collect cones as crops materialize on putatively resistant trees. • Conduct outreach.

*Timeline presents a 5-year plan, though seed availability will likely support a 10-year plan.

6. References

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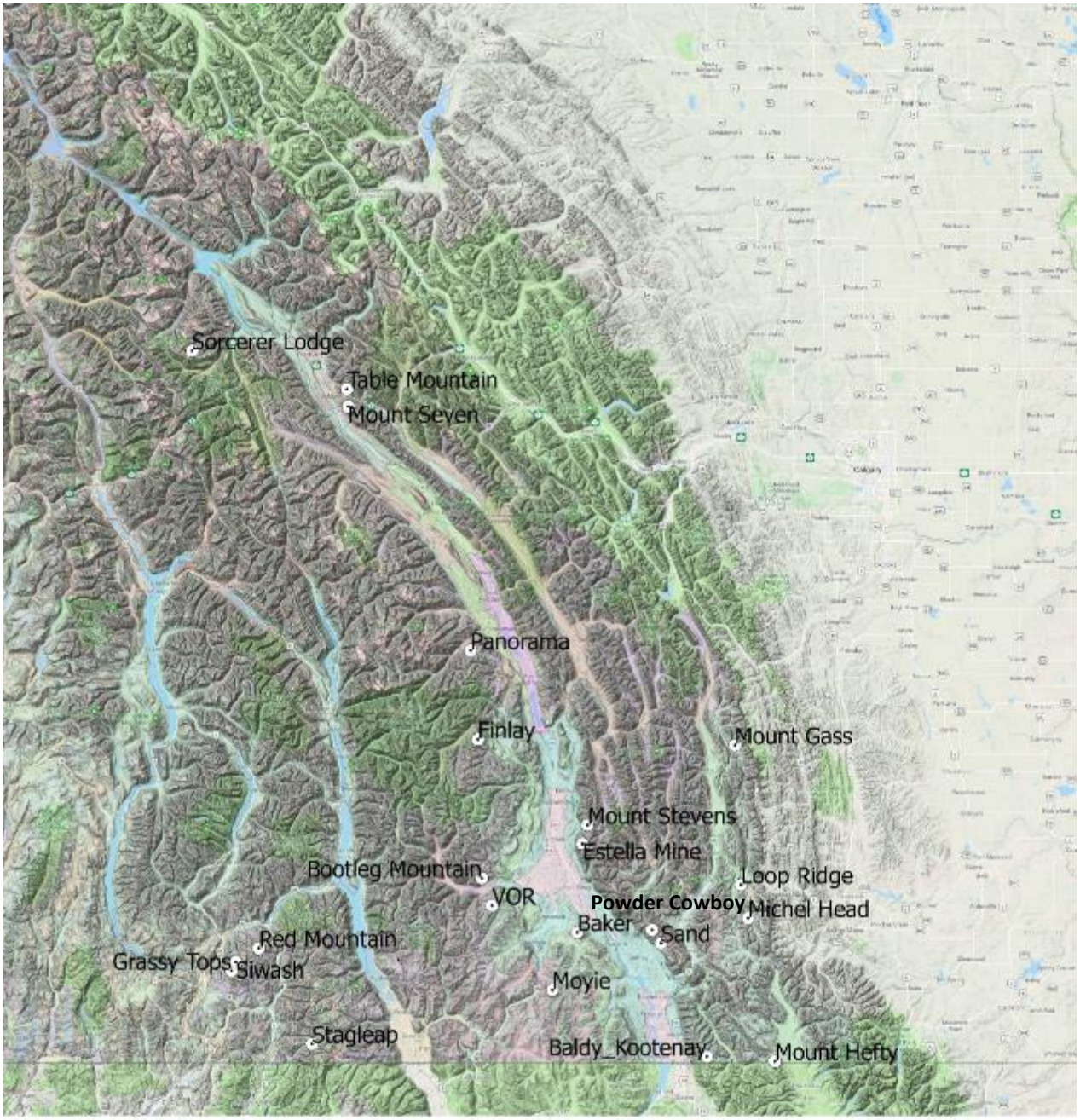
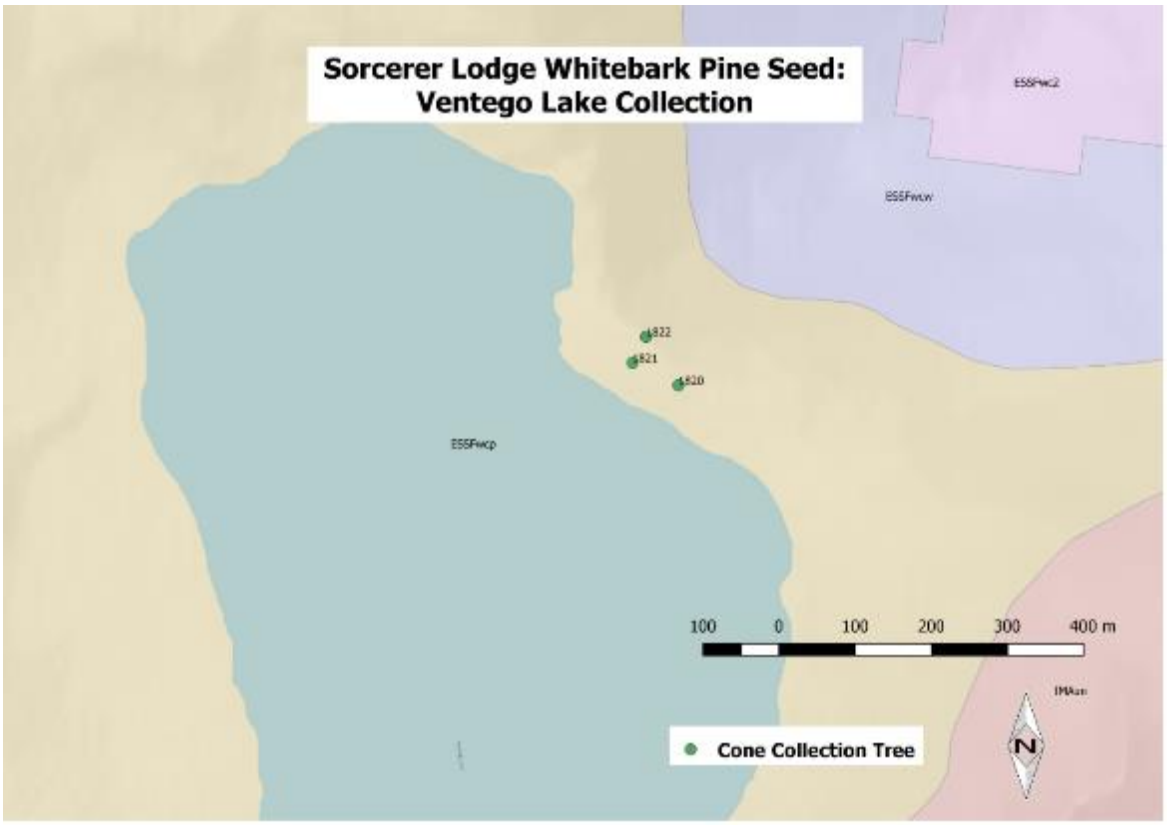
Appendix 1: Cone Collection Maps

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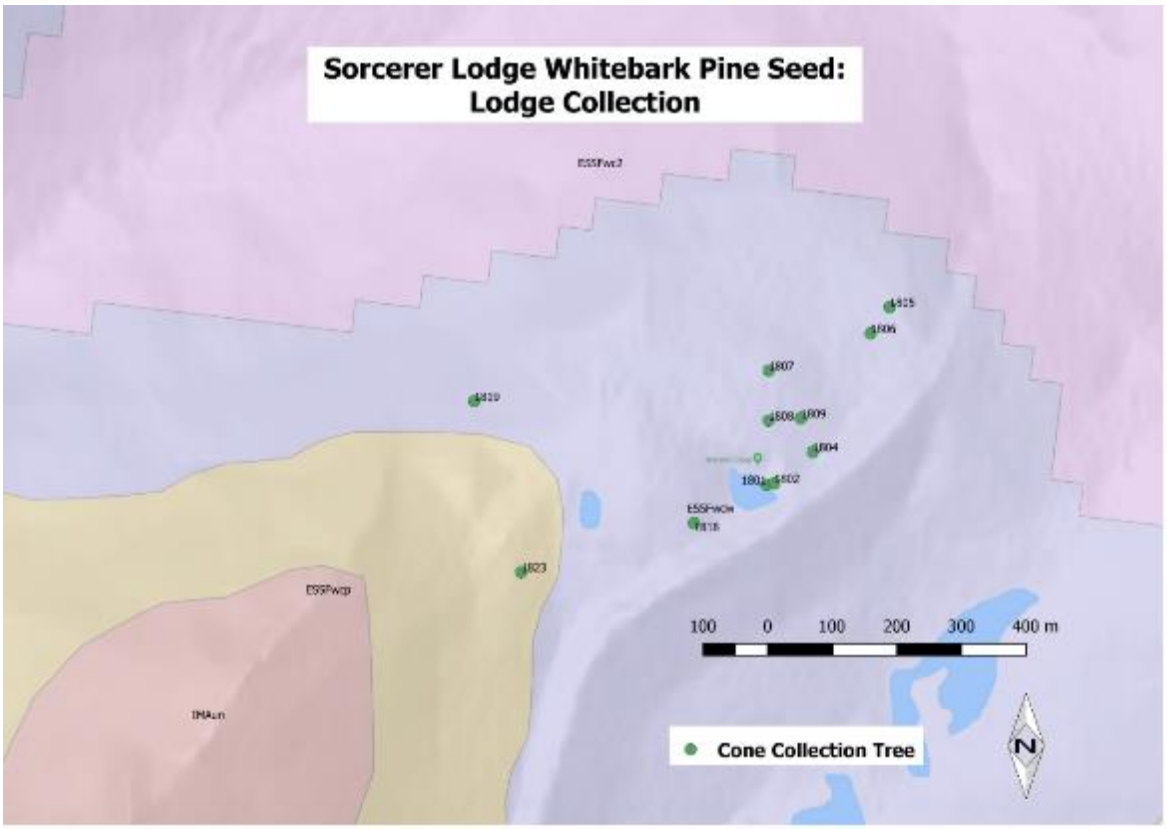
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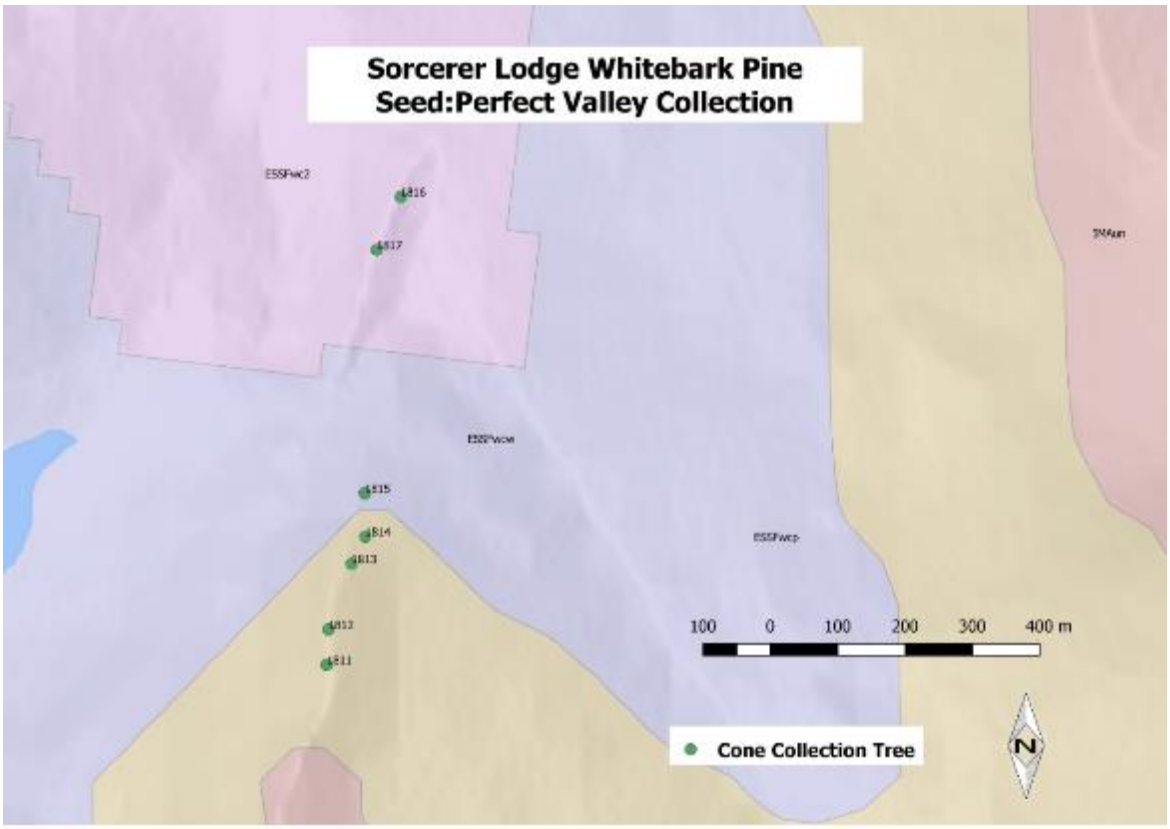
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Golden Whitebark Pine Seed Collection
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Golden Whitebark Pine: Table Mountain Seed Collection
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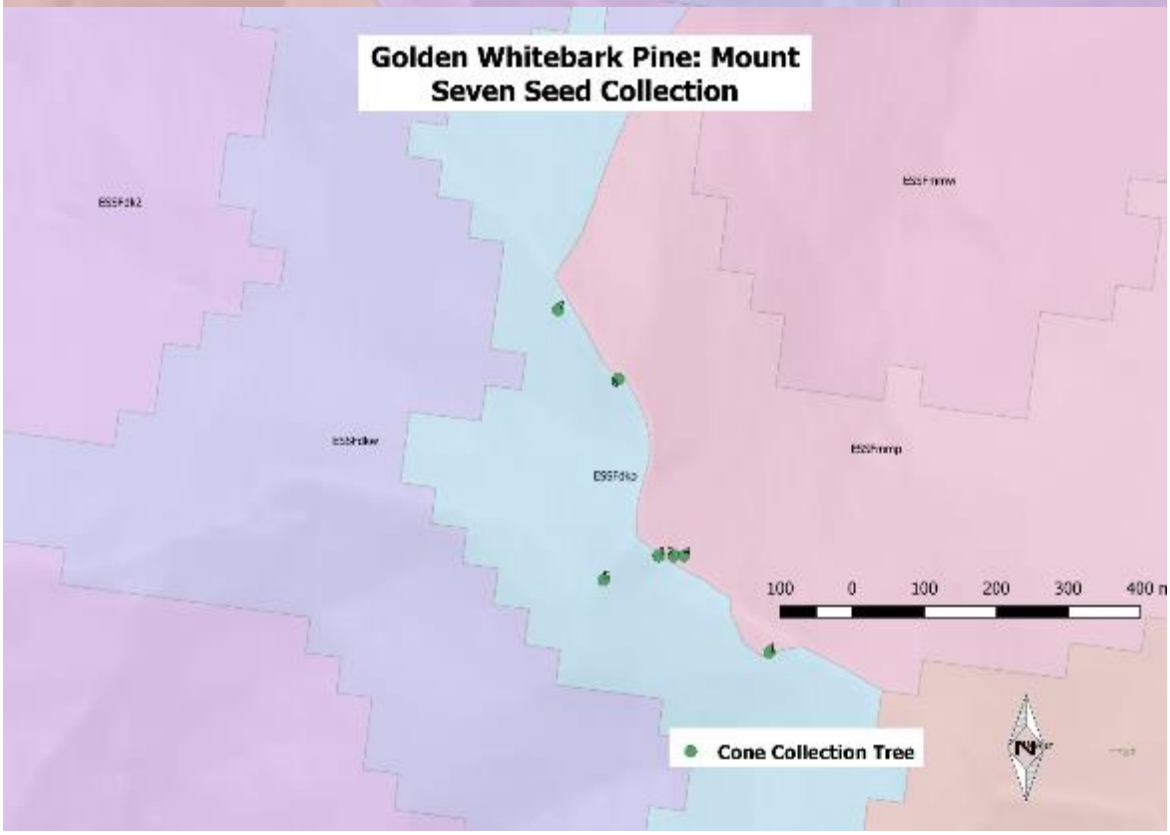
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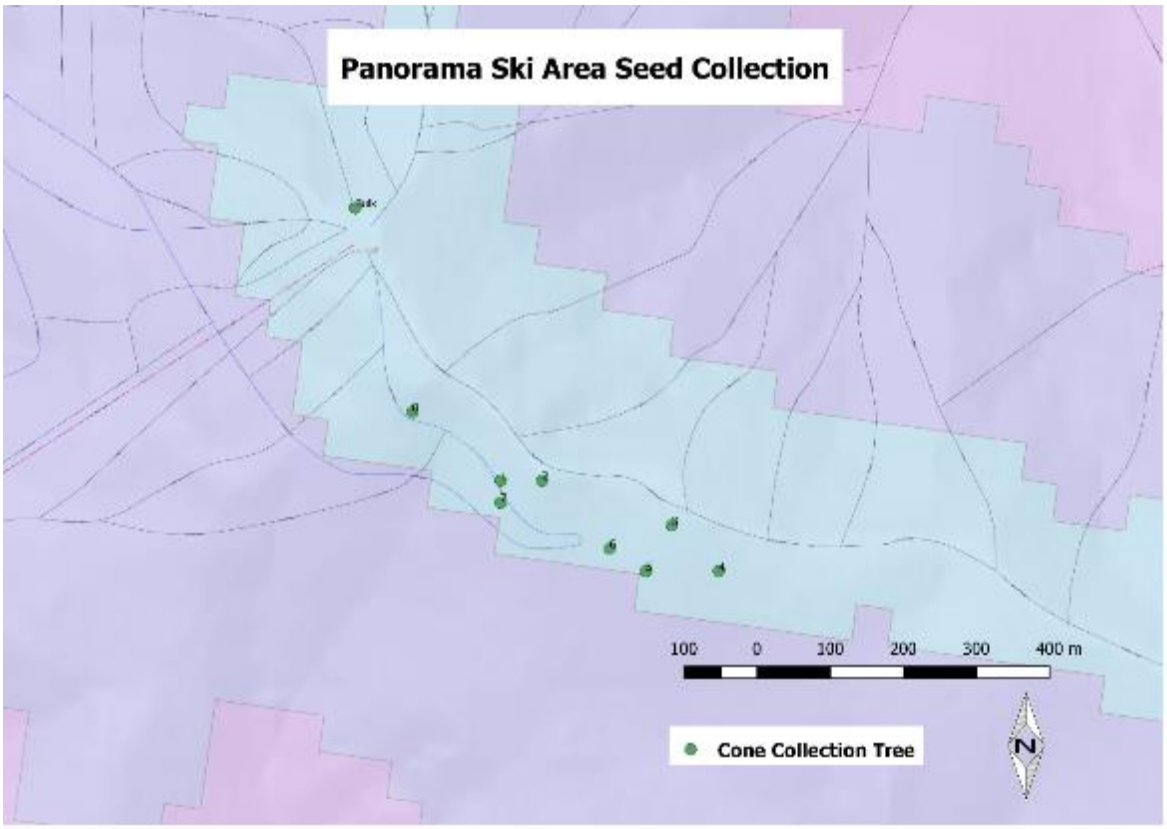
Panorama Ski Area Seed Collection
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Cone Collection Tree
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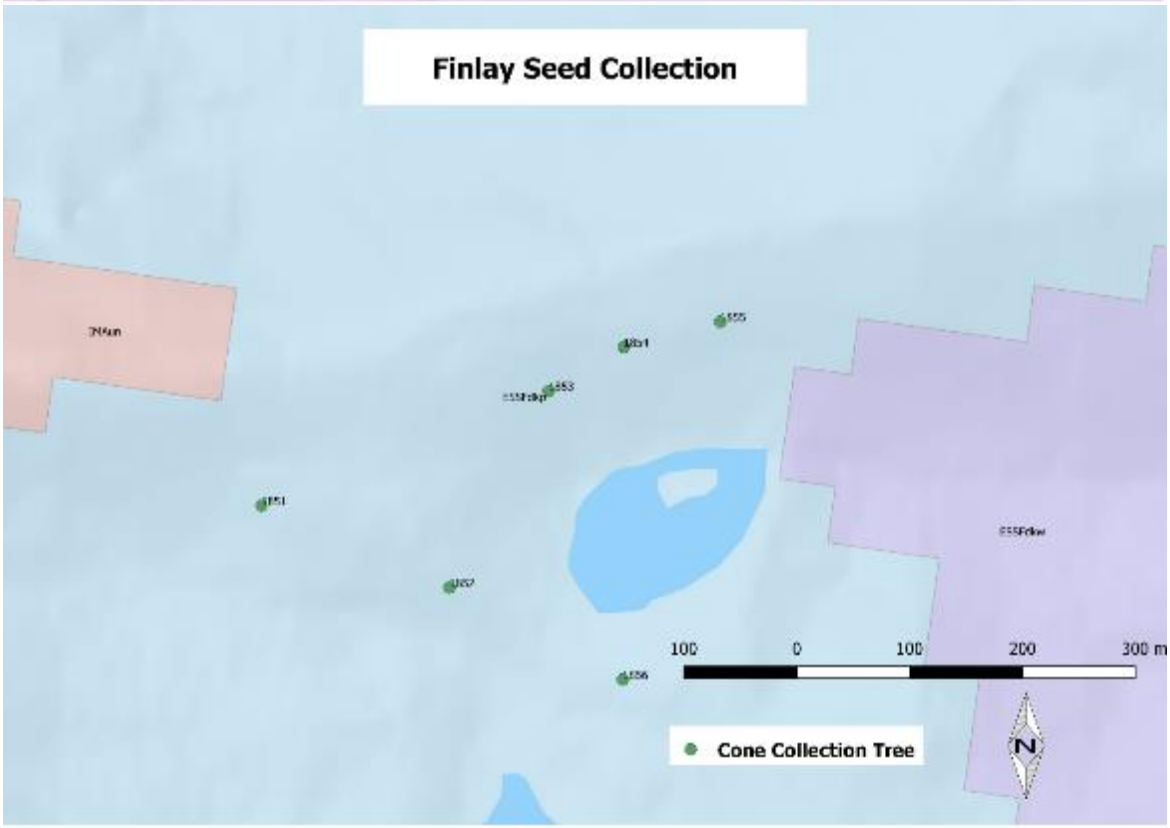
Finlay Seed Collection
100 0 100 200 300 m
Cone Collection Tree
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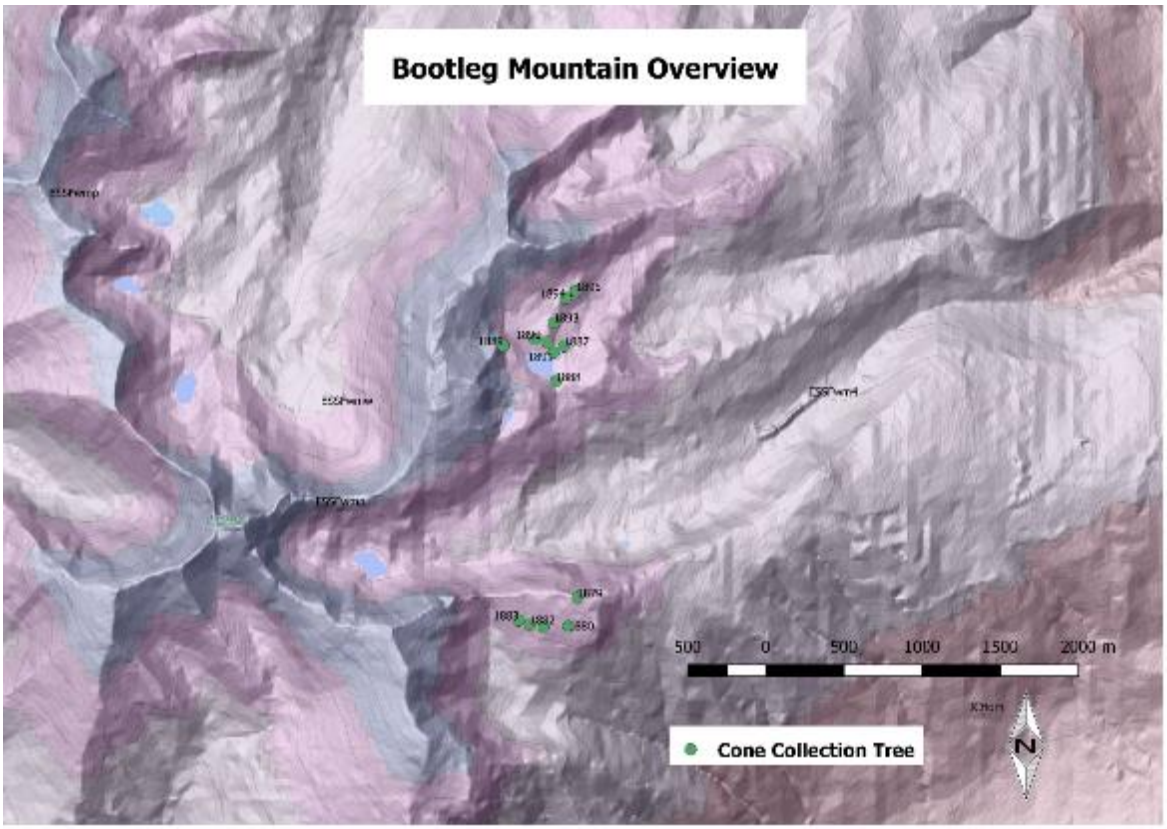
Bootleg Mountain Overview
500 0 500 1000 1500 2000 m
Cone Collection Tree
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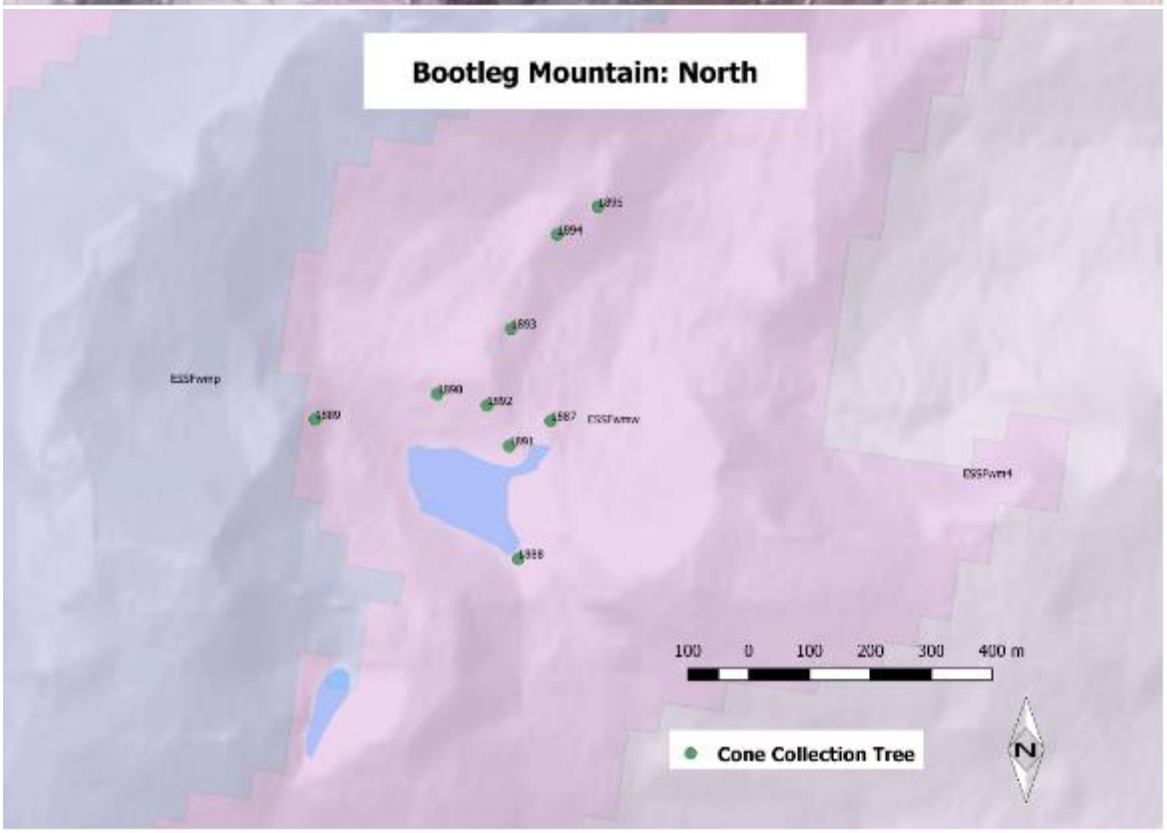
Bootleg Mountain: North
100 0 100 200 300 400 m
Cone Collection Tree
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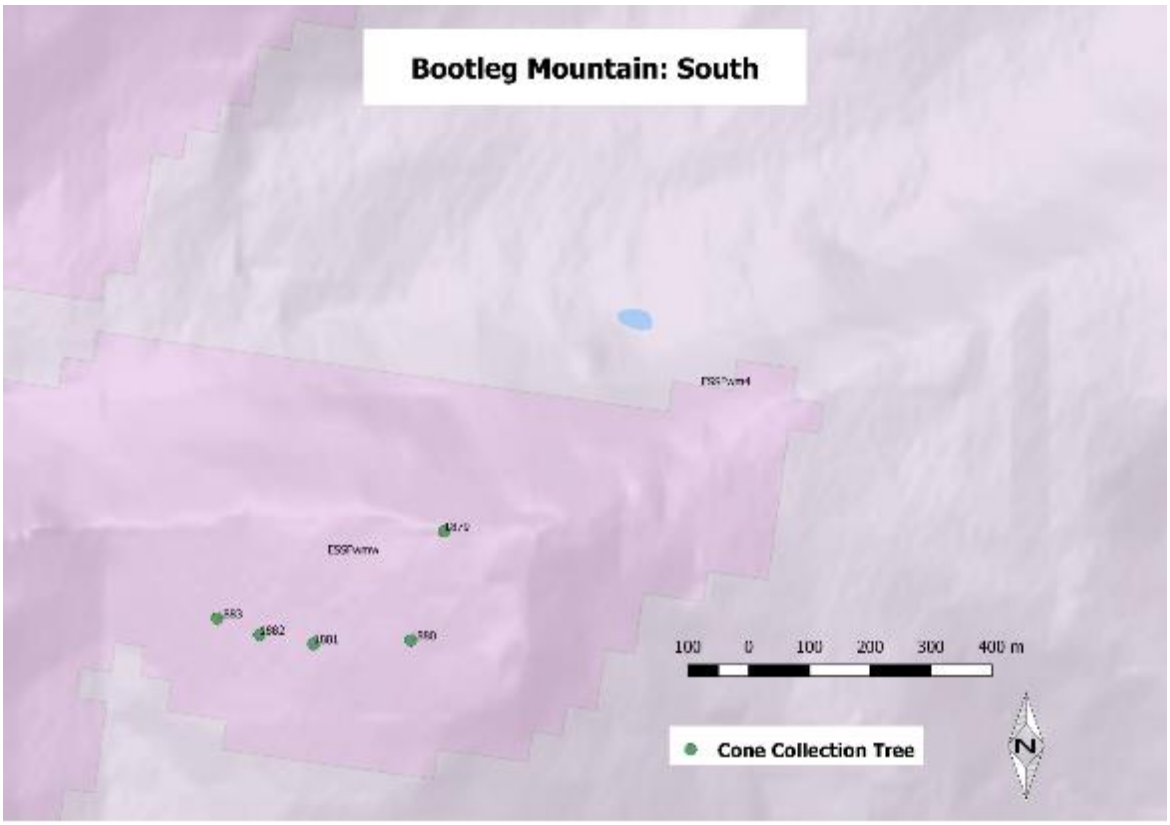
Bootleg Mountain: South
100 0 100 200 300 400 m
Cone Collection Tree
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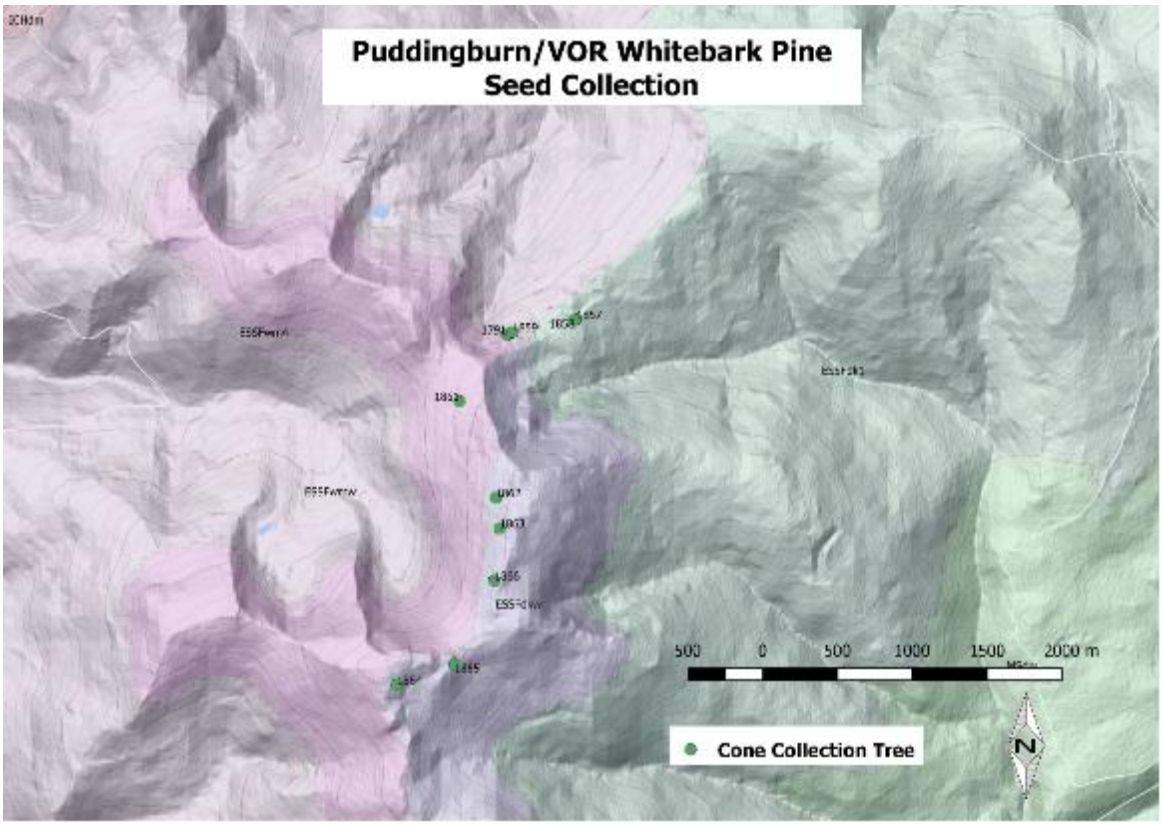
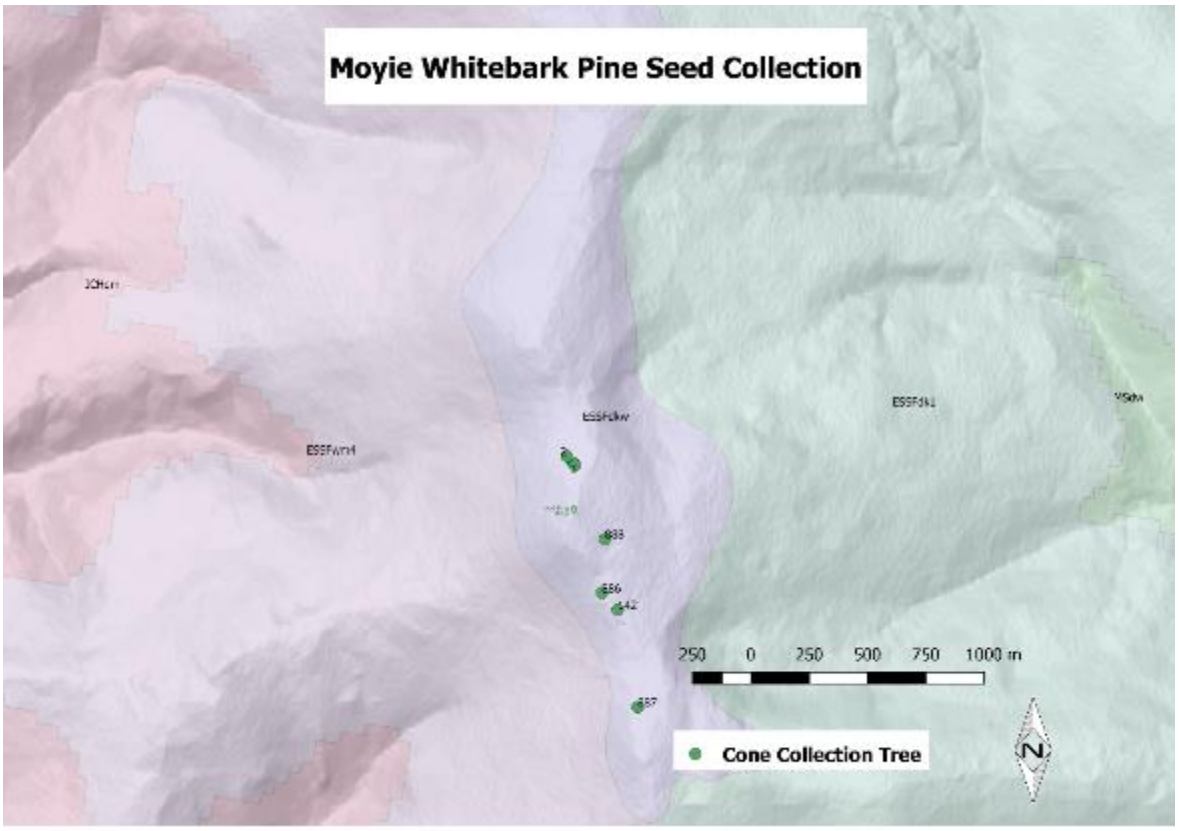

Puddingburn/VOR Whitebark Pine
Seed Collection
500 0 500 1000 1500 2000 m
Cone Collection Tree
N


Moyie Whitebark Pine Seed Collection
250 0 250 500 750 1000 m
Cone Collection Tree
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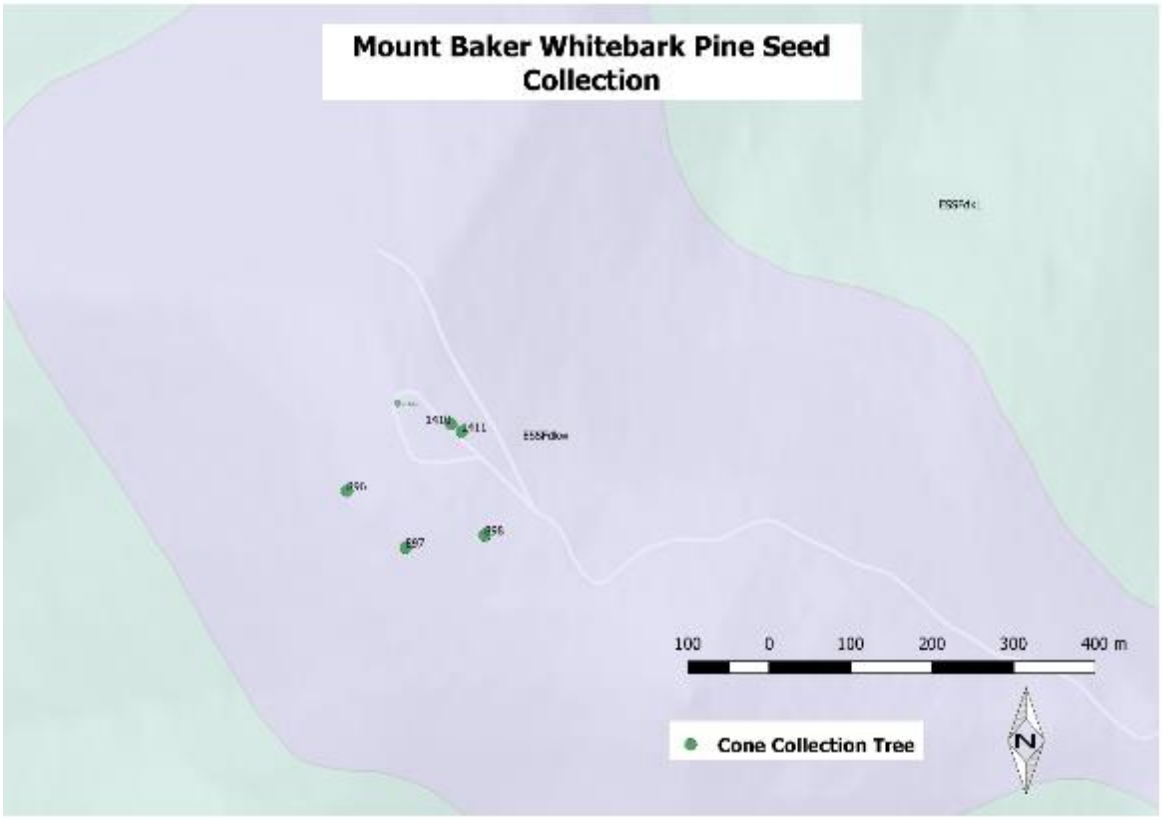
Mount Baker Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
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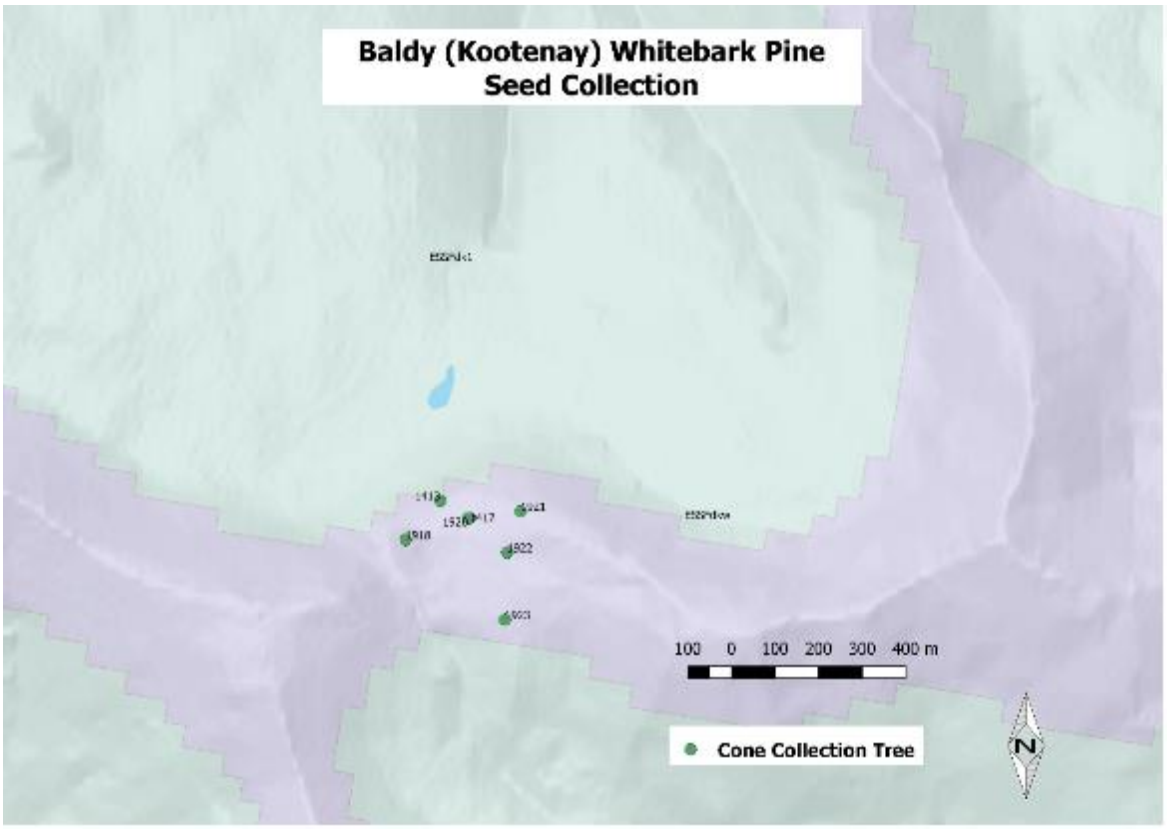
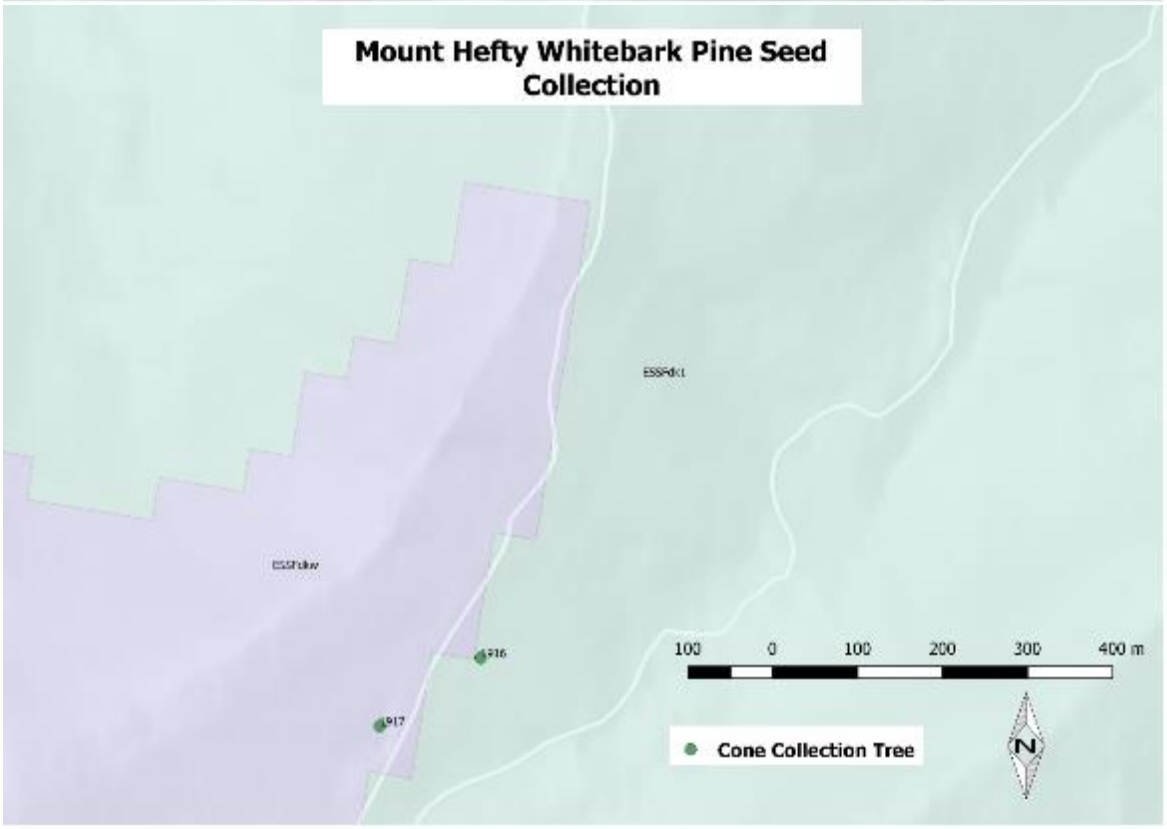

Baldy (Kootenay) Whitebark Pine Seed Collection
ESSFdk1
ESSFdkw
100 0 100 200 300 400 m
Cone Collection Tree
N


Mount Hefty Whitebark Pine Seed Collection
ESSFdk1
ESSFdkw
916
917
100 0 100 200 300 400 m
Cone Collection Tree
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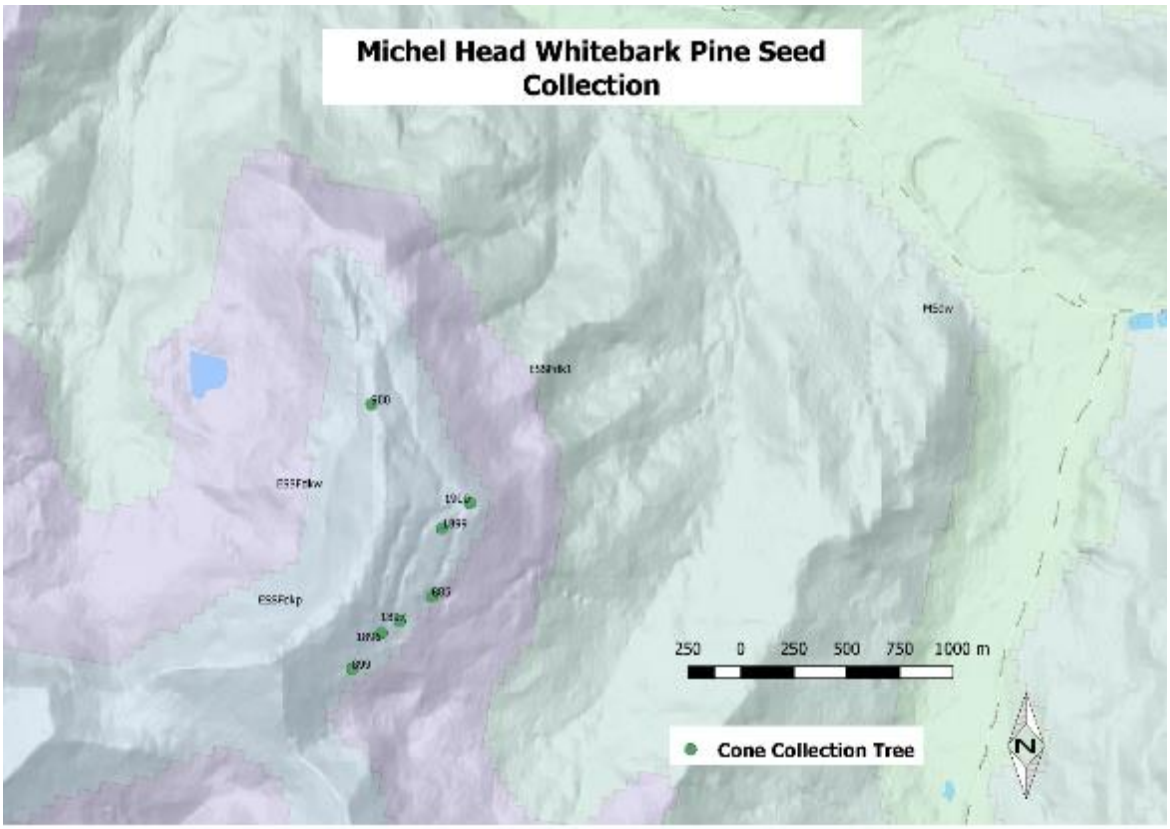
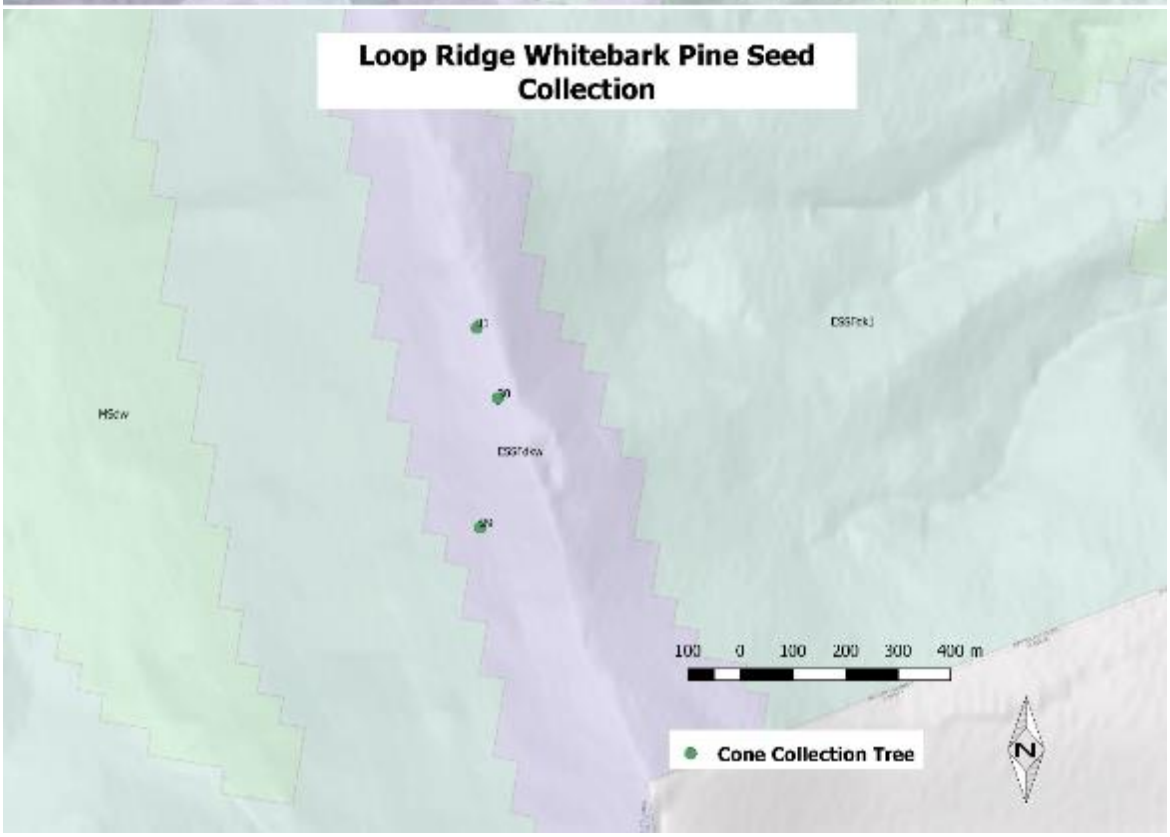

Michel Head Whitebark Pine Seed Collection
MSdw
ESSFdkj
ESSFdkp
250 0 250 500 750 1000 m
Cone Collection Tree
N


Loop Ridge Whitebark Pine Seed Collection
MSdw
ESSFdkj
ESSFdkw
100 0 100 200 300 400 m
Cone Collection Tree
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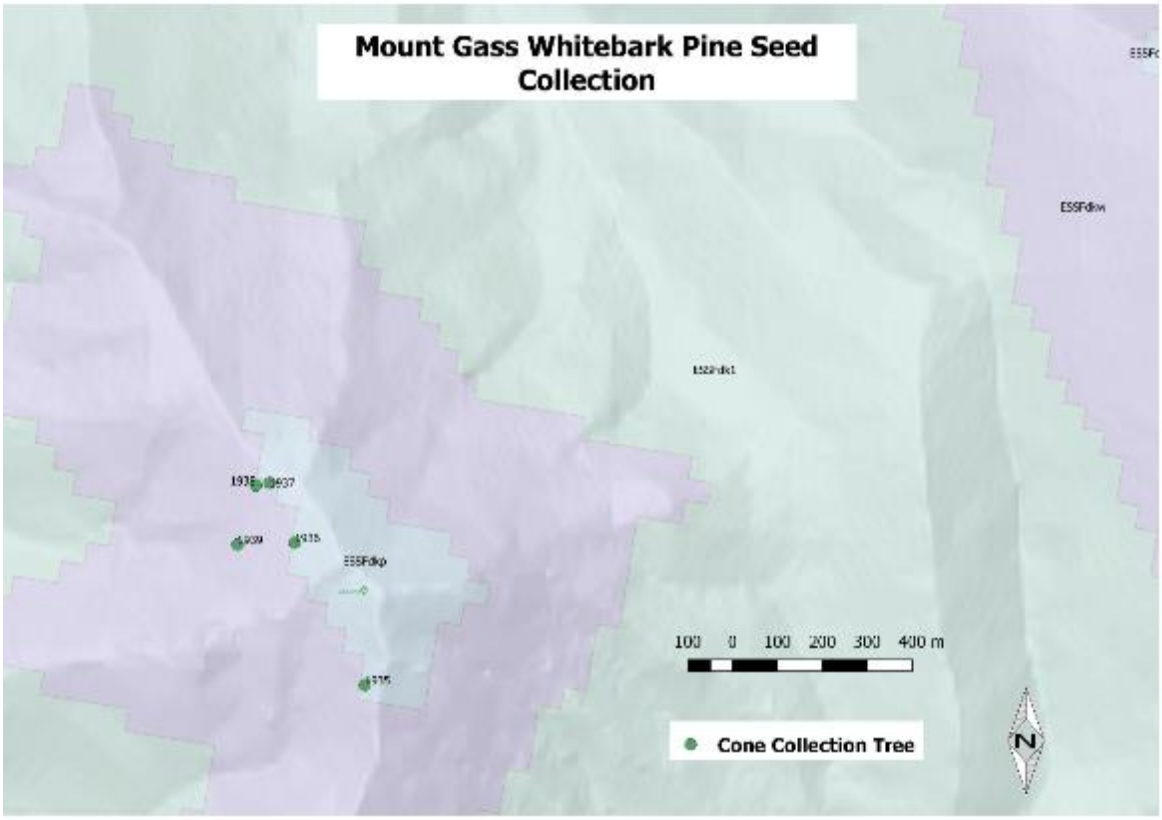
Mount Gass Whitebark Pine Seed Collection
ESSFdkp
100 0 100 200 300 400 m
Cone Collection Tree
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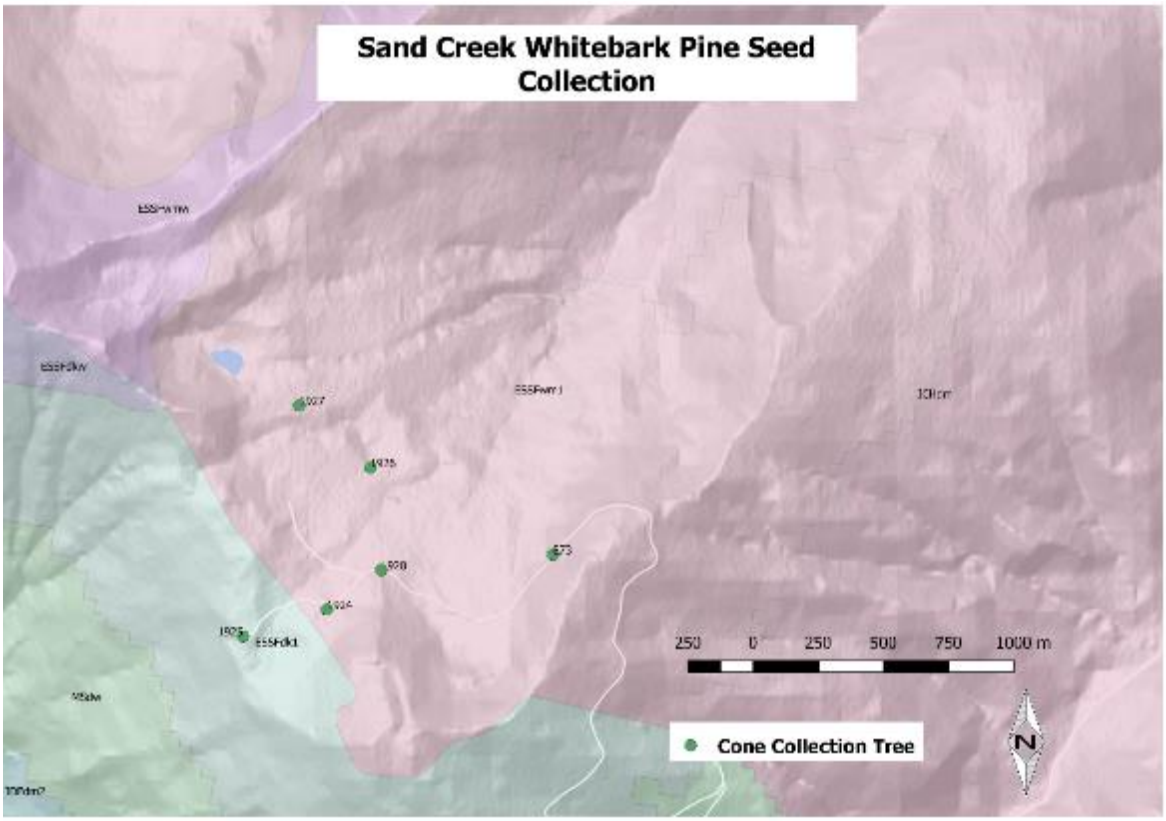
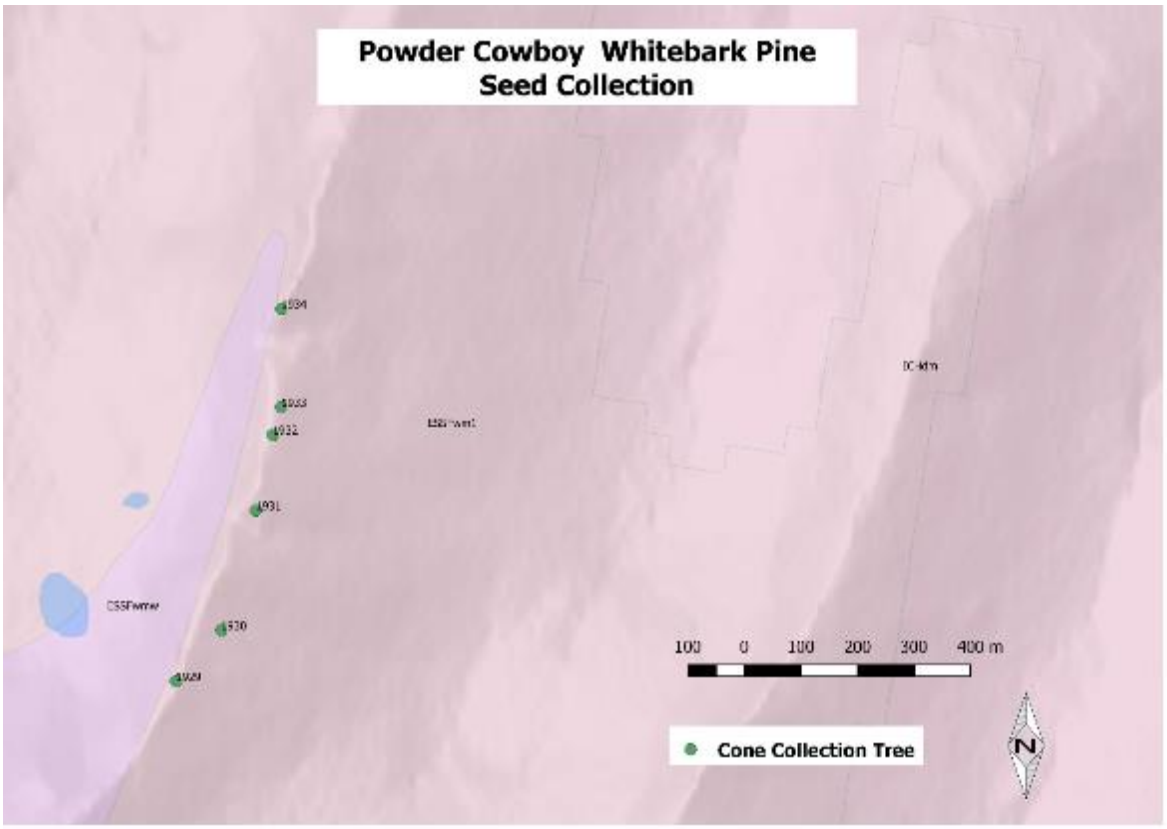

Sand Creek Whitebark Pine Seed Collection
ESSFdkv
ESSFdkt1
250 0 250 500 750 1000 m
Cone Collection Tree
N


Powder Cowboy Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
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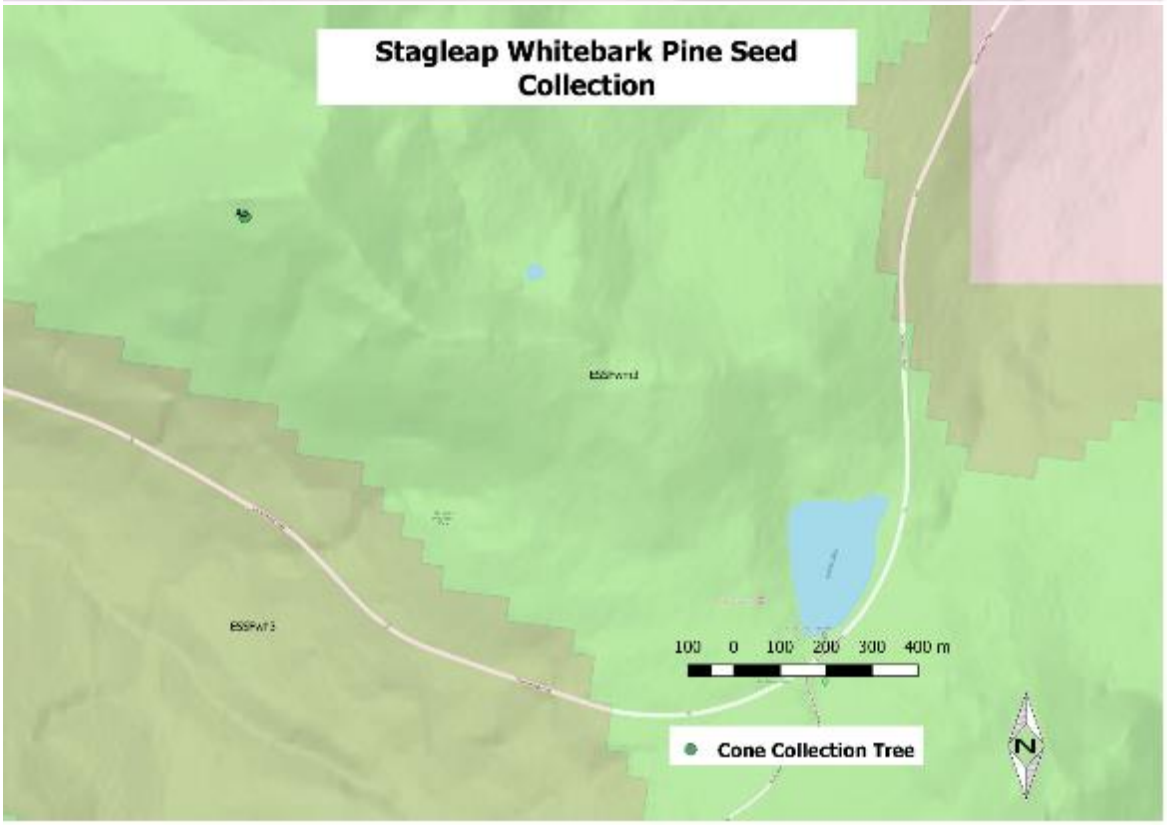
Stagleap Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
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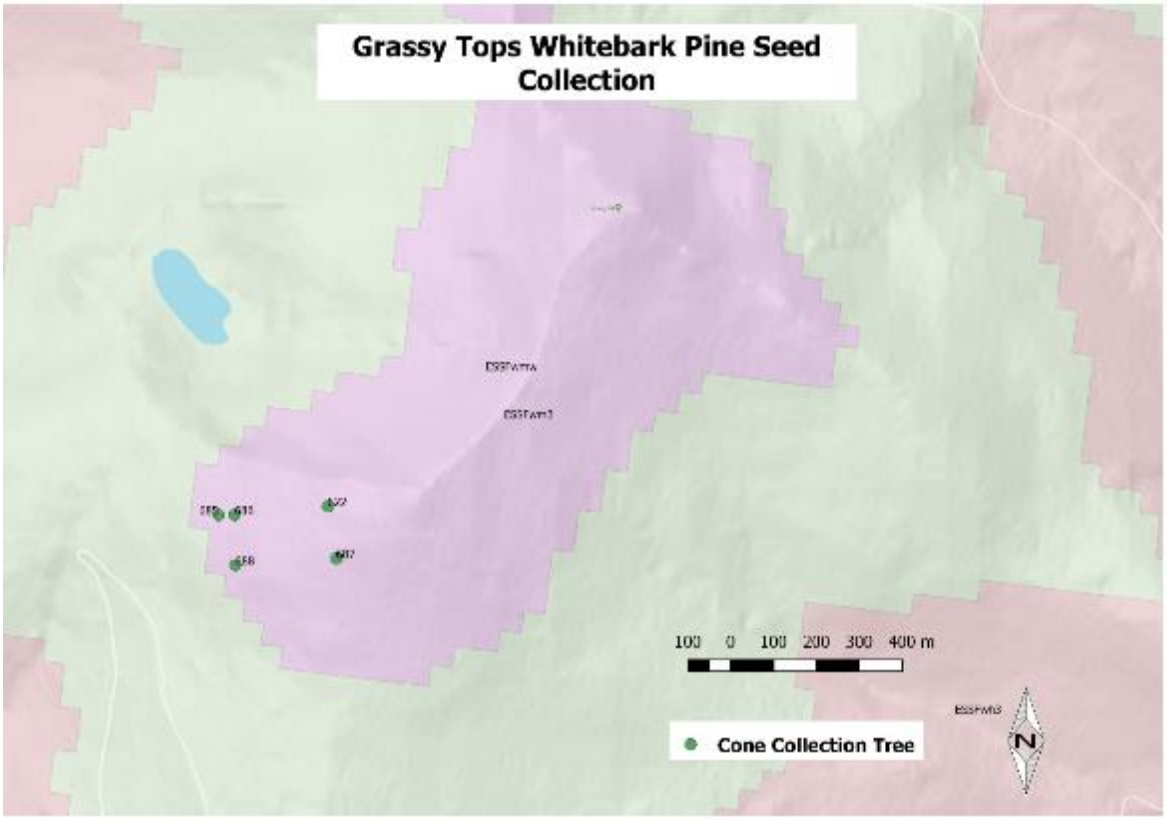
Grassy Tops Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
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Siwash Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
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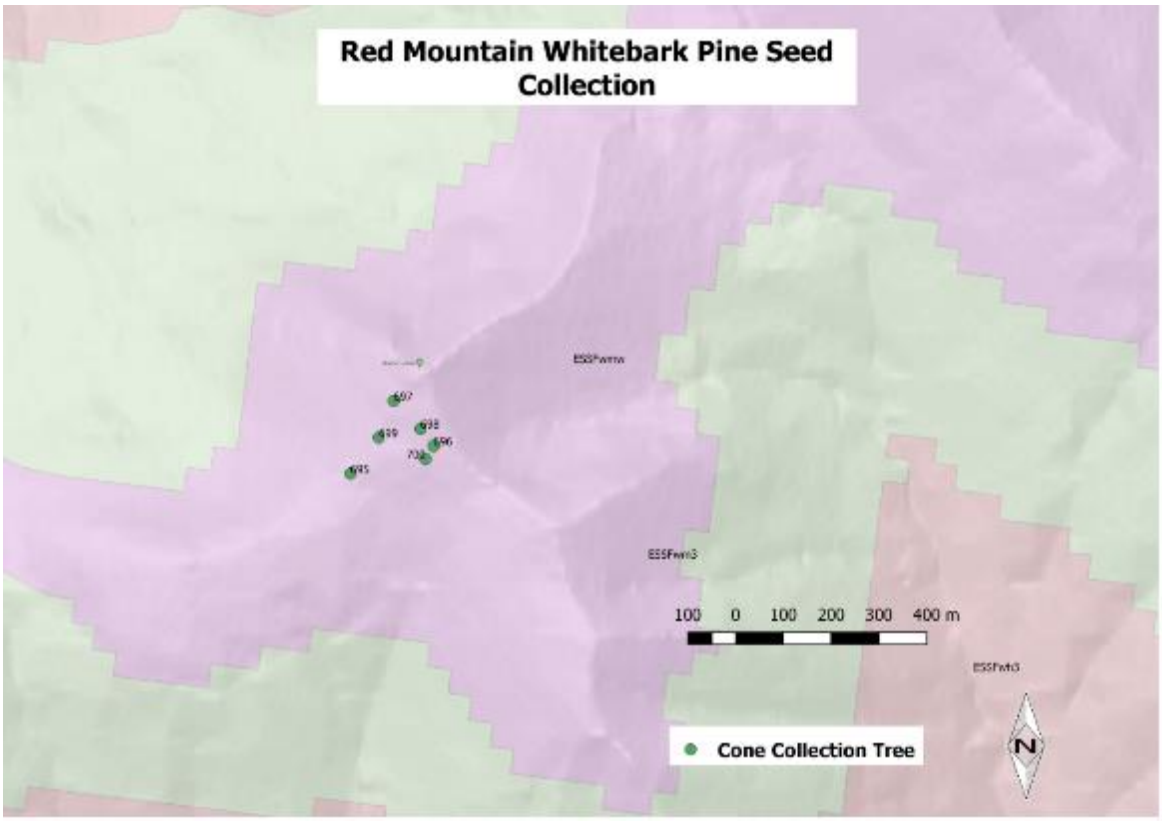
Red Mountain Whitebark Pine Seed Collection
100 0 100 200 300 400 m
Cone Collection Tree
N