



## Enhancement Project Application Funding Cycle 2011-2012

[HCTF to complete] Project File #: \_\_\_\_\_

Project Name: Restoring Whitebark Pine Ecosystems to Enhance Subalpine Bear Habitat

### PROPONENT INFORMATION

Project Leader & Title: Dr. Sybille Haeussler

Author of Proposal (if different from Project Leader):

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AMOUNT REQUESTED FROM HCTF FOR FUNDING CYCLE 2011-2012: \$ 5,000

Will this be a multi-year project? **Y** (If yes, please complete Budget Section 10.6)

Have you ever received HCTF funding for this project/location/species before? **N**

If yes, please list the HCTF Project #:

For continuing projects: Year \_\_\_ of Year \_\_\_ (e.g. 2 of 5 years). *Record only those years that HCTF has provided funding.*

Did this project receive SEED funding from HCTF? **N** If yes, please list the HCTF Project #: \_\_\_\_\_

### PROJECT INFORMATION

Project Description:

We are seeking \$5000/yr for a project to restore recently burned endangered whitebark pine ecosystems with high habitat potential for grizzly and black bears. We will collect disease-resistant whitebark pine seeds and replant burned areas that will otherwise regenerate to species of lower habitat value.

Have you discussed this project with the Regional Manager of the Ministry of Environment? Yes, Dana Atagi, Acting Regional Manager, Skeena Region supports the project.

Project Location: Nenikekh/Nanika-Kidprice Provincial Park and Gosnell Creek southwest of Houston

UTM Coordinates: 601768E/5976846N and 576397E/6001956N

Project Type: V-M

Species to be enhanced: M-URAR M-URAM, B-OTHER (Nucifraga columbiana)

DETAILED PROJECT PROPOSAL OUTLINE

1. EXECUTIVE SUMMARY (~500 words or less)

Grizzly and black bears and other wildlife depend on whitebark pine ecosystems for high quality nutrition in good seed years (Fig.1). COSEWIC and BC's Conservation Data Centre recognize whitebark pine trees (*Pinus albicaulis*) and their ecosystems as endangered. Research by the BV Research Centre in the ESSFmk subzone of west-central BC has shown that whitebark pine is not regenerating on dry ridgetops and terraces in recent wildfires. Most parent trees are now dead from mountain pine beetle. Clark's Nutcrackers and red squirrels harvest the few remaining cones on surviving trees before seeds are fully mature. Moreover, saplings are rapidly dying from blister rust disease (*Cronartium ribicola*).

We have located excellent sites for planting whitebark pine in two recent wildfires, the 2004 Nanika Burn (within the new Neníkeh/Nanika-Kidprice Provincial Park) and the 2010 Gosnell Fire (just north of the new Morice Lake Provincial Park). We are requesting \$5000/yr from HCTF to assist in a habitat enhancement-restoration project mostly funded from other sources with plenty of in-kind support. Our objectives are to enhance grizzly and black bear habitat by caging cones on blister rust-resistant trees, collecting seeds, growing seedlings and replanting whitebark pine seedlings following approved seed collection and regeneration guidelines and removing competing species in the vicinity of planted seedlings. Project success will be measured by the amount of viable seed collected, number of trees planted, % survival of planted trees and total area successfully treated.

The recent burns selected for enhancement are located in excellent bear habitat near salmonid streams (Gosnell Ck., Nanika R.) and should regenerate with abundant black huckleberry. Black and grizzly bears are numerous in the area. By acting immediately, we will optimize the regeneration window for whitebark pine and the habitat benefits for wildlife. In the long term, we expect to provide a high quality food source that will round out the bears' diets, and support other wildlife species while restoring the critically endangered whitebark pine ecosystem. If we do nothing, this important wildlife tree and the valued ecosystem it supports are at risk of extinction and will contribute to a decline in the ability of the west central BC landscape to support healthy bear populations.



Figure 1. Bear scat, 2007 seed year, from Mt Sidney Williams, the northern limit of whitebark pine. Roughage is 100% whitebark pine seedcoats.

## 1. ISSUE (~250 words or less)

Whitebark pine ecosystems of west central BC (ESSFmk/02 and /03, blue-listed provincially) are keystone ecosystems for wildlife including grizzly and black bears (Pigott 2010). In good seed years pine stands act as nutritional hot spots for bears and other wildlife, providing high protein, high fat food in an environment where high quality food is sparse and intermittent (Fig. 1) Loss of this critical food source cascades through the subalpine foodweb causing lower reproductive fitness and territorial conflicts including negative human-bear interactions, as animals to seek food elsewhere (Mattson and Jonkel 1990).

The 2004 Nanika and 2010 Gosnell wildfires are in excellent bear habitat with nearby salmonid runs on the Nanika R. and Gosnell Ck. and great potential to regrow abundant black huckleberries. The ridgetops and gravelly outwash in these fires supported large whitebark pine, now dead. We recorded extremely poor whitebark pine regeneration rates in the Nanika and 1974 Clore Fires (<3 trees/ha). 80% of mature whitebark pine in the ESSFmk have died from mountain pine beetle and up to 10% of saplings die per year from blister rust disease (Haeussler et al. 2009; Haeussler 2010). Nutcrackers and squirrels harvest the seeds of residual pine trees before they mature, preventing successful regeneration. By artificially regenerating whitebark pine on the ridgetops, we will enhance this important food source for the bears as well as stimulating overall productivity of the subalpine foodweb.

COSEWIC (2010) has declared the situation as urgent. These valuable ecosystems (and the bears they support) will disappear if nothing is done.

## PROJECT OBJECTIVES

**General Objective:** To enhance habitat for grizzly and black bears and other subalpine wildlife (Clark's Nutcrackers, jays, squirrels, chipmunks and other rodents) by planting disease-resistant whitebark pine seeds and seedlings within recent wildfires and adjacent MPB-killed areas located in areas of excellent bear habitat.

### Operational Objectives:

1. To collect viable seeds from at least 20 apparently blister-rust resistant whitebark pine parent trees in 2011 and per year over 5 years (seed production is intermittent).
2. To successfully regenerate at least 1000 whitebark pine seedlings from seed over 5 years in high value, recently burned or MPB-killed bear habitat and protect these seedlings from competing vegetation and other damage.
3. To successfully produce 500 - 1500 nursery-grown whitebark pine seedlings per year over 5 years (it takes 2-4 years to produce a seedling ready for outplanting).
4. To successfully establish 100 (2011) to 1500 whitebark pine seedlings per year over five years within high value, recently-burned or MPB-killed bear habitat.
5. To successfully regenerate >20 hectares of endangered whitebark pine ecosystems over a 5 year period.

These Objectives support HCTF Strategic Plan Objective 1.1 as well as contributing to Objectives 1.2, 2.2, 3.1 and 3.2. They also support the objectives and strategies of the Morice LRMP and Nenikekh/Nanika-

Kidprice Provincial Park Management Plan (BC Parks 2009) which have identified maintenance of endangered whitebark pine ecosystems as a priority for overall ecosystem health and biodiversity.

## 2. ACTIVITIES/METHODOLOGY

**Winter 2010/11** A permit will be obtained from BC Parks to conduct habitat enhancement activities in Nenikekh/Nanika-Kidprice Provincial Park. Planting whitebark pine is listed a strategy to maintain whitebark pine ecosystems in the Nenikekh/Nanika-Kidprice Park Management Plan (BC Parks 2009). We will also discuss the project with the Office of the Wet'suwet'en Natural Resources Manager, who has partnered with the BV Research Centre on past whitebark pine research activities (Haeussler et al. 2009), to address any concerns about potential cone collection and enhancement activities. Only local seed will be used in BC Provincial Parks.

### Seed Collection and Processing 2011/12

In 2010, two volunteers GPSed the locations of approximately 20 cone-bearing immature whitebark pine trees on the west shore of Kidprice Lake, in Nenikekh/Nanika-Kidprice Provincial Park, directly opposite the 2004 Nanika Fire. We have also identified one highly blister rust resistant tree at McKendrick Pass (Haeussler et al. 2009). In June 2011 we will climb these trees and place hardware cloth cages over some developing female cones to protect them from bird and rodents. In Sept.-Oct. 2011 we will return and harvest the cones. As funds permit, we will also cage trees adjacent to the 2010 Gosnell Fire. The seed collection and processing methods will follow approved methods for whitebark pine cones and seeds (Pigott and Krakowski 2010; Ward et al. 2006).

Seeds will be extracted and stored until needed following the approved guidelines for whitebark pine seed processing and a random sample of seeds will be tested for viability (Ward et al. 2006). In spring 2012, a selection of seeds will be cold-stratified to break seed dormancy and nicked to promote germination following the methods used by Curtis-McClane (2010; Trent et al. 2005) who has achieved good field germination at a test site near Smithers, BC. Provenances will carefully labelled and kept separate.

These methods will be repeated in subsequent years at other accessible ESSFmk locations, according to the size of the seed crop, funding availability, and the quantity of seed collected in prior years.

### Direct Seeding and Planting 2011

In late May or early June 2011, shortly after snowmelt, we will regenerate two sites in the 2010 Gosnell Fire. One site is a rocky ridgetop that was severely burned. The other site is a glaciofluvial terrace with ca 100% mountain pine beetle mortality that received a light burn. We will use 2.5 yr old nursery stock donated by the mycorrhizal lab at UNBC (see attached letter of support) for this enhancement project and seeds donated by the BC Centre for Forest Conservation Genetics. Outside of the park, we are using some non-local BC provenances because concerns about climate change have led researchers and the BC Forest Genetics Council to recommend seed transfer guidelines for this species (Bower and Aitken 2008; J. Krakowski, BC Forest Service geneticist, pers. comm. Sept. 2010). The non-local provenances will be supplemented by local seed sources as soon as they become available (see below). No non-local seed sources will be used in Nenikekh/Nanika-Kidprice Provincial parks.

Planting procedures will follow guidelines for whitebark pine (McCaughy et al. 2009) although we will remove other tree seedlings within a 2-3 m radius of the planted trees rather than the 6 m radius recommended by these authors. Provenances and seedlings will be identified with stakes and tags.



In Sept/Oct 2011 prior to snowfall we will record germination, survival and height growth of all planted seeds and seedlings at the two Gosnell sites.

**2012 - 2015**

In late May or June 2012, shortly after snowmelt we will plant locally collected cold-stratified seeds at the two Gosnell sites and in the Nanika Fire on ridgetops near Nanika River, following above procedures. In the Nanika Fire we will use only locally collected seed sources.

Seeding and planting methods will be modified from those above as we gain experience. The scope of the planting program will expand according to seed and seedling supply and available funds. We do not anticipate planting nursery stock at Nanika until 2013 or 2014 because it will take several years to produce locally grown seedlings ready for outplanting.

**Nursery-Grown Seedling Production**

In 2011 we will use donated seedlings grown by the UNBC mycorrhizal laboratory (Linda Tackaberry and Dr. Hugues Massicote). Subsequently we will work with local grower Joe Wong of Woodmere Nursery in Telkwa to produce whitebark pine seedling stock (see letter of support). Mr. Wong is keen to learn how to grow this difficult species and will donate labour and equipment to the project to produce the first generation of local seedlings (up to 1000 trees). For subsequent generations we will pay for stock production however we are not seeking funds from HCTF for this portion of the project.

| Project Objective       | Activities/Methods            | Timeline                    |
|-------------------------|-------------------------------|-----------------------------|
| Collect Viable Seeds    | Cage cones                    | June 2011 & subsequent yrs  |
|                         | Harvest cones, extract seeds  | Sept/Oct. 2011 & subsequent |
| Outplant seeds          | Outplant seeds Gosnell Ck     | May/June 2011 & subsequent  |
|                         | Outplant seeds Nanika         | June 2012 & subsequent      |
| Grow seedlings          | Grow seedlings in nursery     | Winter 2011/12 - 2015/16    |
| Outplant seedlings      | Outplant seedlings Gosnell Ck | May/June 2011 & subsequent  |
|                         | Outplant seedlings Nanika     | June 2013 & subsequent      |
| Successfully regenerate | Monitor germination/survival  | Sept/Oct. 2011 & subsequent |

**3. BENEFITS/RISK**

Based on our research at the older McKendrick and Clore wildfires (Haeussler et al. 2009) it will take more than 20 years before there is any habitat enhancement for bears because it takes that long for the trees to reach cone-bearing size. With only ~20 ha to be planted over 5 years, we expect relatively few bears to benefit in the first generation, but benefits should grow exponentially over hundreds to thousands of years as blister rust resistant trees spawn future generations of robust whitebark pine. Uninfected trees live 300-500+ years. Moreover, successful regeneration techniques acquired in this project will be applied to future restoration work. We expect BC to soon begin restoring whitebark pine ecosystems on a wide scale, as is already done in the US and Canadian National Parks once their keystone role in the mountainous landscape becomes more widely appreciated.

There is a huge benefit to undertaking this work immediately. The sooner after wildfire that planting occurs, the more rapidly the pines will grow, due to the post-fire nutrient flush, and the more likely they are to compete successfully with faster growing trees (Campbell and Antos 2003). Secondly, we

are steadily losing whitebark pine ecosystems to continued spread of the MPB outbreak, blister rust infection, succession to mountain hemlock and subalpine fir in unburned areas (Clason et al. 2010) and increased fires with the 2000s shift of the Pacific Decadal Oscillation and anticipated effects of climate change (BC MFR Wildfire Mgmt Branch 2009). The longer we wait, the more difficult it will be to find seed trees and the more irreversible habitat loss will occur.

Similar issues have been recognized across BC (Campbell et al. 2008), but aren't adequately reflected in older regional wildlife management plans because the dire situation only became evident after 2007. Recent fires in the ESSFmk have made it opportune to act to protect habitat now.

There is a risk that local seeds will not be adapted to a warmer climate and that trees may die before maturing. Outside of Provincial Parks we are addressing this risk by using mixed provenance plantings that include seeds from warmer climates, as recommended by Bower and Aitken (2008) posted on the [BC Forest Genetics Council](#) website). Within the Provincial Park we will use local seed only. There is some risk that members of the public will not accept artificial regeneration (especially of non-local provenances) in provincial parks. A 2007 Bulkley Valley Naturalists presentation on the topic of active restoration in parks and a [2010 BV Research Centre presentation](#) on assisted migration in whitebark pine received no negative public feedback. We engaged the Office of Wet'suwet'en as partners in our 2007-2009 research project and our work plan includes continued proactive discussions to avoid any concerns arising about this habitat enhancement project.

There is a risk that forestry or other industrial activities will damage the Gosnell Fire cone collection and enhancement sites (e.g. gravel pit construction). These sites are on non-commercial/non-operable forest land (ESSFmk/02 & /03 rock outcrops and gravelly terraces) so are not likely to be silviculturally treated. We will avoid immediate roadside locations, mark the treatment area boundaries with flagging and small signs and enter the restoration sites into the Morice LRMP Sensitive Ecosystem database (ILMB) and forest research plot database (Phil LePage, BC Forest Service, pers. comm.). Maps of sites within Neníkeh/Nanika-Kidprice Park will be provided to BC Parks for inclusion in Park Management files to ensure no accidental damage to enhancement areas. We have not budgeted for interpretive signs to notify park users because it is a wilderness park with minimal human footprint and would be needlessly extravagant given current tight budget situation.

The project damages very little habitat (a few small subalpine fir and lodgepole pine seedlings clipped at ground level around planted trees), and involves no handling of animals. Workers will need Bear Aware and First Aid training and equipment (costs included in proposals submitted to other funders), as we have already had 2 bear encounters while scoping out the project sites.

There is no mandatory medium and long-term maintenance of the project. Although monitoring tree survival, vigour, cone production and bear use would be desirable over the medium-term, it lies beyond the scope of this proposal. As these are non-commercial stands, there is no requirement to meet silvicultural free-growing standards.

#### 4. EVALUATION/MEASURES OF SUCCESS

For each year of the project we will report the following:

##### Formative Evaluations:

**Objective 1. Collect viable seeds.** Number of trees climbed, cages installed, weight of seed collected and the % viability.

**Objective 2. Outplant stratified seeds.** Approximate number of seeds planted based on the weight of seed and average weight per seed.

**Objective 3. Grow nursery stock.** Number of live seedlings produced by the nursery at the end of each year of the project.

**Objective 4. Outplant seedlings.** Number of seedlings planted at the end of each planting season.

**Summative Evaluation:** (Will be calculated each year, but 5 yr results of most interest.)

**Objective 5. Successfully regenerate > 20 ha.** Number of germinated and planted seedlings alive calculated from % germination and % survival. Mean seedling height. Planting density. Total area treated. (We have not yet determined an optimum stocking density range-these values will be derived from ongoing studies; depends on mortality rates, range of stocking in natural ecosystems).

## 5. COMMUNICATION/OUTREACH

1. Post information about the project on the BV Research Centre [whitebark pine webpage](#) , updated annually at end of fiscal year.
2. Report activities in Nutcracker Notes, newsletter of the Whitebark Pine Ecosystem Foundation in 2012; see Haeussler 2008, Clason et al. 2010 and Haeussler 2010 for past reports.
3. Host one public slide presentation in Houston or Smithers, probably in 2012, and a second near the end of the project.

Other than website maintenance costs which are part of the BV Research Centre administrative overhead allowance, costs of outreach activities will be borne by other funders and unpaid volunteers.

HCTF financial support will be acknowledged in writing or verbally at all venues.

## 6. LITERATURE CITED

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### 7. MAP





Map showing location of Nanika/Kidprice and Gosnell study areas in relation to Morice Lake, Smithers and Houston, BC.