

Exploring Whitebark Pine at its Northwest Limit

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Despite funding challenges, the Bulkley Valley Research Centre continues its efforts to study the dynamics and condition of whitebark pine ecosystems at their northwest limit near Smithers in west-central British Columbia and to begin a small-scale restoration program. Previous Nutcracker Notes reports by Haeussler (2008) and Clason (2010) have described some of the work to date. We also enjoy helping Sierra Curtis-McLane (2010) of the University of B.C. Centre for Forest Conservation Genetics with her assisted migration trial sites near Smithers.

Whitebark pine ecosystems in west-central BC are remote and mostly unroaded, which constrains our ability to do research on a shoestring budget. In 2009 I joined University of Alberta graduate student Alana Clason and two field assistants at a fly-in fishing cabin on Coles Lake, 150 km south of Smithers, where we spent several weeks revisiting old whitebark ecosystem classification plots established in the 1980s. Alana successfully defended her masters thesis in July 2010 and now plans a whitebark-focused PhD project at the University of Northern BC. This summer, two research trips were made into the wonderful new Nenikëkh/Nanika-Kidprice Provincial Park, once by canoe and once courtesy of the BC Floatplane Association. The BC Forest Service continues to assist us in supplying vehicles, radios and drivers for 4 x 4 forays into the rough, roaded territory surrounding Morice Lake. Thanks to all our volunteers and supporters.

From these adventures we have learned many things about whitebark pine ecosystems in the far northwest. Much of the news is discouraging, but there are some rays of hope. Many of our observations will come as no surprise to whitebark pine observers further south, but others may be unique to our region. We welcome your feedback.

From 1977 to 2002, the Pacific Decadal Oscillation (PDO) was in a dominantly positive (warm) phase. This was a period of major decline for whitebark pine ecosystems in west central BC. We are not aware of any significant forest fires that burned in whitebark pine territory during this period. Meanwhile, white pine blister rust continued its relentless spread –perhaps exacerbated by mild, moist conditions. There were patchy outbreaks of mountain pine beetle across the region from the late 1980s to early 1990s. At Coles Lake, virtually all mature to ancient whitebark pine

trees alive in the early 1980s died during this period (Fig. 1). The massive early 2000s pine beetle epidemic did not affect Coles Lake because so few sizeable pine trees remained! We expected subalpine fir to increase in the absence of wildfire and following the death of the pines, but this did not occur because there was also a severe balsam bark beetle (*Dryocoetes confusus*) outbreak and above-normal levels of 2-year cycle budworm (*Choristoneura biennis*), which together caused substantial subalpine fir decline. The decline of pines and subalpine fir, accompanied by an increase in mountain hemlock (*Tsuga mertensiana*) suggests that the Engelmann Spruce-Subalpine Fir biogeoclimatic zone on the eastern slopes of the Coast Mountains has been transitioning towards a Mountain Hemlock zone-like forest as predicted by Hamann and Wang (2006).

In direct contrast to this ingrowth of wet-climate species, however, the frequency of wildfire on the east slopes of BC's Coast Mountain Range may have increased since 2003. In addition to many wildfires in the Bella Coola-West Chilcotin region to the south, there have been two major fires in whitebark pine habitat of west central BC: the 2004 Nanika Burn at Kidprice Lake, and the Gosnell Fire of August 2010. These crown fires burned through subalpine fir stands, but ridge crests within both fires contain excellent habitat for whitebark pine regeneration. In the Nanika Burn we located just 4 whitebark pine seedling clumps in a several-hectare search area. This abysmally low figure corresponds closely to sapling densities of 2.9 clumps/ha recorded in the 1974 Burnie Burn (Haeussler et al. 2009). We propose to supplement this natural regeneration with planting and direct seeding of stratified seeds along ridge crests. Since subalpine fir and lodgepole pine are both regenerating vigorously in the Nanika Burn, we think it will be appropriate to uproot competing seedlings in the vicinity of planted and seeded whitebark pines. Mountain hemlock does not regenerate readily after wildfire in this area.

On a brighter note, the 2000s mountain pine beetle epidemic appears to have exhausted itself over most of west central BC (though it continues to grow near Smithers). Two types of whitebark pine stands remain. Near Kidprice Lake, there are several wildfire-origin stands (apparently dating from the negative PDO phase of 1947-1976) with little mountain pine beetle damage. These immature stands contain seed-bearing whitebark pine trees with minimal blister rust infection, and will be our first priority for cone caging and seed collection to begin in 2011. There are also many residual stands near timberline (1500 – 1800+ m elevation) but these may not be appropriate for regenerating mid-elevation wildfires and beetle-affected stands (800-1200 m) (Reinhard Stettler, pers. comm., June 2008), particularly in light of climate change. Outside of the Provincial Park, we will plant a

small trial using more southerly seed sources in 2011.

Our most encouraging discovery is that healthy whitebark pine seedlings (<30 cm tall) are common in the understory of immature and mature lodgepole pine forests on gravelly fluvial deposits. We initially discounted these stands as they had no visible overstory or mid-canopy layer of whitebark pine. Clark's Nutcrackers appear, however, to have been caching beneath the lodgepole pine trees and the canopy and understory layers are sufficiently sparse that the whitebark seedlings are healthy, although growing slowly. With the death of overstory lodgepole pine from pine beetles, these seedlings may now release. We are considering facilitating their growth by cutting or girdling neighbouring subalpine fir and lodgepole pine regeneration and would appreciate advice from others who have done restoration work in similar stands. We are also curious if there is a cue that lures the Nutcrackers to cache in these dry, open lodgepole pine-lichen ecosystems or whether this is the only type of forest understory in which cached seeds survive and grow.

We have not yet been able to track the behaviour of Clark's Nutcrackers in our area. A few birds are invariably present in whitebark pine stands in July and August, even in poor seed years, but disappear in September and October. They appear to be in severe competition with red squirrels to strip all of the whitebark cones before they are fully mature. We don't know if they are caching unripe nonviable seeds in the recent wildfires or mostly caching elsewhere (under dry lodgepole pine? near timberline?). What do they use as their alternate food source? Nearby trees include subalpine fir, mountain hemlock and a few lodgepole pine. Perhaps they travel 50 km west to the nearest stands of Douglas-fir. Intriguingly, the northernmost contiguous stands of whitebark pine lie at the same latitude as the northern limit of Coastal Douglas-fir (at Gardner Canal), and the northernmost isolated stands coincide with isolated northernmost stands of Interior Douglas-fir near Fort St. James. The complexity of these relationships compels us to learn more.

Details of our work are posted on the Bulkley Valley Research Centre website at:
http://bvcentre.ca/research/project/testing_ecological_resilience_theory_in_pine-lichen_ecosystems_of_west_cent/

References

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Figure 1. Ghost forests at Coles Lake, BC after late 1980s mountain pine beetle. ■

Imitating lightning strikes for whitebark pine restoration

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A restoration burn for whitebark pine was first planned in Waterton Lakes National Park in 1999. The site was at Summit Lake in the Subalpine Ecoregion, an open coniferous forest of subalpine fir, Engelmann spruce and whitebark pine, with a dwarf herb/shrub layer of huckleberry and beargrass (Achuff et al. 2002). Many of the whitebark pine are dead or dying from white pine blister rust or mountain pine beetle (Smith et al. 2008). Regeneration of whitebark pine is present but healthy seedlings are few due to blister rust and competitive exclusive by faster-growing conifers. Whitebark pine is listed as Endangered in Alberta (Government of Alberta 2010), and has been assessed as Threatened