



Issue No. 14: Spring/Summer 2008

Nutcracker Notes

Whitebark Pine Ecosystem Foundation



Mountain pine beetle-killed limber pine at treeline in Colorado (see Schoettle's article; photo by A. Schoettle)



Whitebark near its northern limits in B.C. (see Haeussler's article; photo by Sierra Curtis-McLane)

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suppressed one "seedling" was 84 cm tall, 1.8 cm in diameter and 184 years old. That is almost 100 rings per centimeter!

The other research projects on whitebark pine in Willmore Park involve mountain pine beetle, bears, cones and plants. Brooks Horne of Forest Health Branch of ASRD has been attempting protection against mountain pine beetle infestation with the anti aggregation pheromone verbenone. This work has taken place in a small number of stands with a significant component of cone bearing whitebark pine. Pouches were put on trees in one stand in 2006, two stands in 2007 and a third will be added in 2008. The total area protected will be about 17 ha. This program has been successful to date but the threat to whitebark and lodgepole pines within the area by mountain pine beetle will probably be substantial for several years. Alberta Parks is also co-sponsoring research on the phenology of mountain pine beetle in whitebark pine stands as well as documenting the other arthropods and investigating the effect white pine blister rust has on these organisms (E. Esch, University of Alberta, Dr. D. Langor, Canadian Forest Service and Dr. J. Spence, University of Alberta).

The ecological relationship between whitebark pine and grizzly bears in the northern Canadian Rockies is not clear. Current thought is that whitebark pine seeds do not form a significant component of the diet of bears (grizzly or black) in the northern Rocky Mountains of Alberta; however this has never been tested. Alberta Parks is initiating a project with the Grizzly Bear Program of the Foothills Model Forest to determine if whitebark pine seeds do form a significant part of the grizzly bear diet. Sites supporting whitebark pine will be targeted for the collection and content analysis of grizzly bear scat.

Leonard Barnhardt and co-workers in ASRD have collected cones from a stand in Willmore Park and seeds have been extracted and stored at the Alberta Tree Improvement and Seed Centre. Alberta Parks and ASRD are working on a forest gene conservation plan that addresses gaps and needs in tree gene conservation at a Natural Subregion and seed zone level. Seeds of whitebark and limber pines have been identified as high priority for collection and the two agencies will be working closely together to identify stands for protection and seed collection. Dr. Vern Peters from King's College, Edmonton will be examining the relationship between cone production, tree regeneration and radial growth of whitebark pine. We are hoping to expand much of the work being done on whitebark pine in Willmore Park to other protected areas in the Canadian Rockies in Alberta and to limber pine throughout the province. Staff from several agencies (ASRD, Alberta Tourism, Parks and Recreation, Canadian Forest Service, Parks Canada, King's College) meet regularly to discuss research priorities and conservation strategies for whitebark and limber pine in Alberta. We are all working to help ensure that whitebark and limber pine remain on the landscape as part of the natural heritage of Alberta.

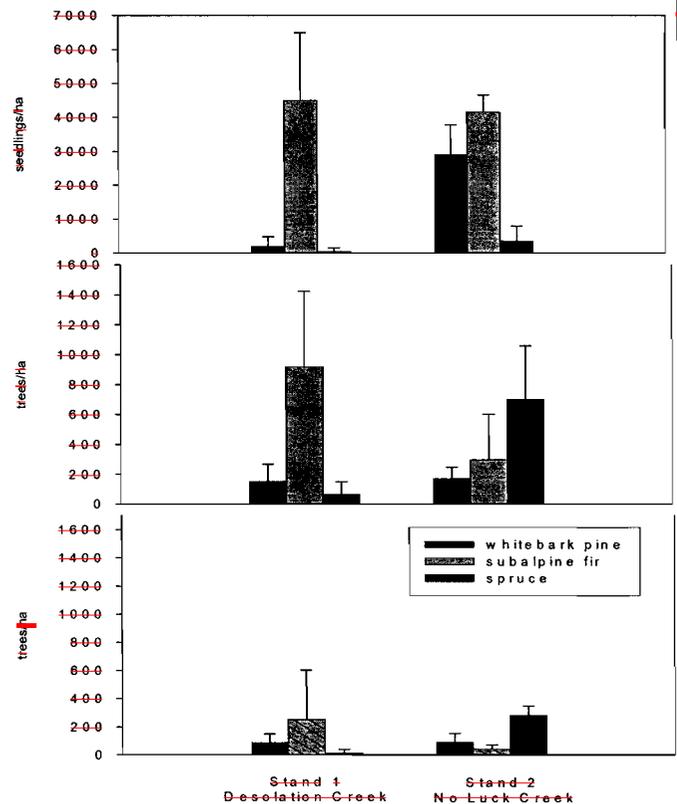


Figure 1. Density of seedlings, live and dead trees (top, mid and bottom plots) in two stands sampled in the Willmore Wilderness.

Species	Desolation Creek	No Luck Creek
Whitebark pine	1518 (1758) n=23	1690 (1800) n=14
Subalpine fir	1638 (1783) n=32	1728 (1807) n=10
Engelmann spruce	1520 (1753) n=8	1634 (1781) n=39

Table 1. Earliest (and average) dates of establishment for whitebark pine, Engelmann spruce and subalpine fir in two stands in Willmore Park. ■

Threatened Whitebark Ecosystems at their Northern Limits in B.C.

Sybille Haeussler, Bulkley Valley Research Centre and University of British Columbia, Smithers, B.C.

Whitebark pine reaches its northwestern range limits on the eastern slopes of the Coast Mountain Range, near my hometown of Smithers, British Columbia. The unusual scraggy-looking pines perched atop local rock outcrops and occasional sightings of Clark's Nutcrackers have long been a source of affection, pride and concern among local naturalists, foresters and biologists. But lately, concern has turned to alarm as the massive mountain pine beetle outbreak that has turned

18 most of interior British Columbia into a sea of red and grey, has finally reached these remote mountain tops (Fig. 1, on front cover).

Whitebark pine ecosystems in west central British Columbia face the same threats as elsewhere in their range: blister rust kills young trees, mountain pine beetle kills old trees, and creeping succession to shade-tolerant conifers occurs in the absence of wildfires. At their northern limits, these ecosystems may be particularly vulnerable because they are infrequent, viable seed production is uncertain, and the environment cannot support healthy flocks of Clark's Nutcrackers. The current pine beetle epidemic may tip these already weakened ecosystems over the edge.

In 2007 I undertook a joint research project with the Bulkley Valley Research Centre, a not-for-profit institute and the Forest Sciences Department of the University of British Columbia, with logistical support from BC Ministry of Forests and Range, Office of the Wet'suwet'en, Westland Resources and funding from the BC Forest Science Program. The research targeted isolated whitebark pine-dominated forest ecosystems that occur well below treeline (around 800-900 m elev.) on dry, gravelly soils. I hypothesized that these rare, lower elevation ecosystems would exhibit greater change than the more widespread rock outcrop ecosystems near timberline because forest succession would be more rapid and both the beetle and the rust would be more virulent in more benign environments.

These northern whitebark pine ecosystems have understories dominated by a white carpet of reindeer (*Cladina*) lichens with conspicuous circular patches of ericaceous shrubs (*Vaccinium membranaceum*, *Empetrum nigrum*, *Cassiope mertensiana*, *Menziesia ferruginea*) and mosses (*Pleurozium schreberi*, *Dicranum* spp.) extending outwards from tree bases (Fig. 2). Apparently, lichen carpets are not a feature of more southerly whitebark pine ecosystems. For this reason, they may serve as useful indicators of the effects of climate change-related stress on forest ecosystems situated near the boreal/temperate zone transition.

We re-inventoried four old growth Whitebark Pine – *Cladina* lichen-dominated ecosystems located in mountains south of Smithers that were described during British Columbia's biogeoclimatic ecosystem classification program between 1978 and 1985. In fact, I did the vegetation work on two of these remote, helicopter-access plots during a summer job with the BC Forest Service nearly 30 years ago. One site near Burnie River experienced an undocumented mountain pine beetle outbreak in the 1980s or 1990s and was situated near an wildfire of unknown age. We conducted a detailed stand reconstruction and vegetation study in the Burnie old growth and wildfire areas to determine dates of these disturbance events and the successional processes that followed.

To our dismay, we discovered that all four old growth stands had been severely attacked by mountain pine beetle since 2004 and that very few mature whitebark pine trees remain alive. The dead trees were up to 500 years old, making them the oldest known trees in the region. The few mature pines in the Burnie stand that had survived the 1980/90s outbreak were attacked during the July 2007 beetle flight.

While flying over the area, it was evident that all lower elevation whitebark pine stands have now been attacked, whereas those at timberline have experienced only minor mortality. The beetle epidemic in west-central BC is now losing momentum as the low elevation lodgepole pine source habitat is essentially dead. With any luck, the timberline whitebark pine stands will not sustain local infestations and many of these trees will survive to help repopulate lower elevations.

The now-dead old growth stands have abundant whitebark pine regeneration in a wide range of sizes and ages, but 72% of these smaller trees are visibly infected with white pine blister rust while 22% still appear healthy. A few of these understory trees seem likely to survive to reach the forest canopy, but it is hard to imagine future forest communities with impressive stands of large, old-growth whitebark pine.

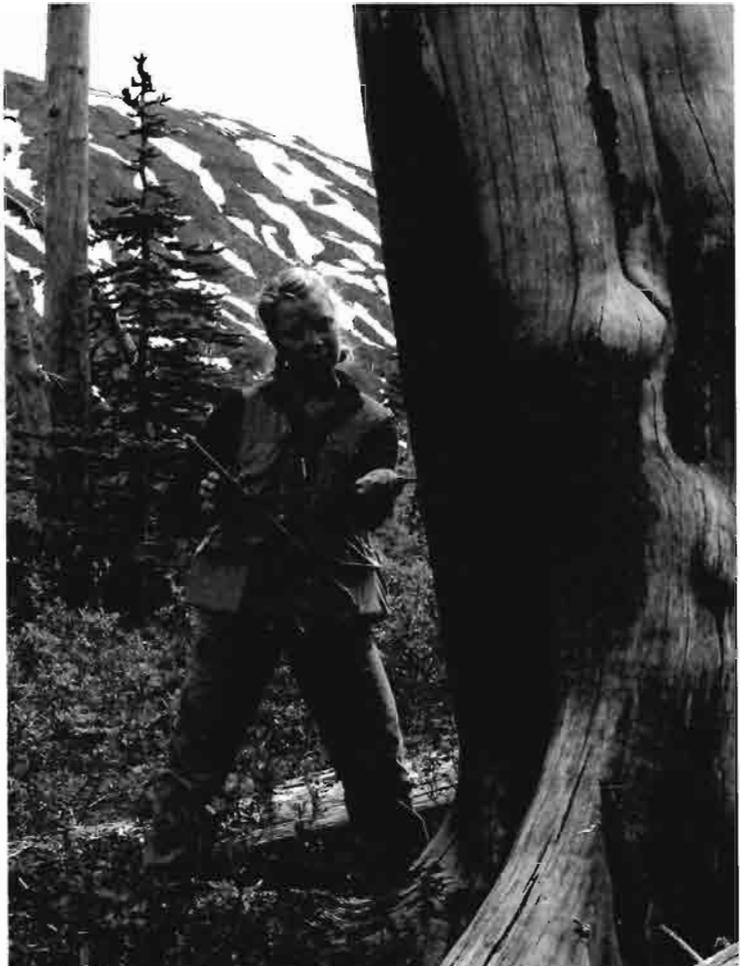
One possible bright note in the otherwise bleak picture (one has to remain optimistic to be a whitebark pine researcher!) is that the hypothesized transformation of a reindeer lichen-dominated open pine woodland to a shaded mossy fir-hemlock forest is taking place much more slowly than expected. On the two driest old growth sites, the cover of reindeer lichens has almost doubled over the past 25-30 years, whereas the two more mesic sites have experienced a 1/3 decline in lichen cover. There was no evidence of an increase in Ericaceous shrubs. Furthermore, subalpine fir and mountain hemlock are taking over very gradually, if at all, because hemlock grows extremely slowly and spreads mainly by layering while subalpine fir is very vulnerable to disease on these ecosystems and has fared not much better than the pines.

On the Burnie wildfire (Fig. 3) we found many massive old whitebark pine snags and fallen logs, but only 10 rust-infected whitebark pine saplings scattered over 3.5 hectares. The 34-year old burn is slowly regenerating to lodgepole pine and subalpine fir, but remains very open and is a potential site for future restoration plantings.

We hope to find funding to conduct more in-depth soils and vegetation work as well as beginning some restoration work within these highly threatened ecosystems. Readers are invited to visit the Bulkley Valley Research Centre website (www.bvcentre.ca) where more detailed study results will be posted in May 2008. ■



Haeussler, Figure 2. Old-growth white-bark communities have white carpets of reindeer lichen with rings of moss and ericaceous shrubs around tree bases (photos by S. Haeussler)



Haeussler, Figure 3. Whitebark pine snag killed by the Burnie wildfire.