Bark beetle history in the Yukon quite different from Kenai Peninsula

by Ed Berg

There has been a fair amount of spruce bark beetle activity in the Yukon in the last decade, but bark beetles are something new in the memories of most Yukoners. Last summer I was invited over to Kluane National Park at Haines Junction, YT to take a look at the tree-rings of their white spruce forests for evidence of past beetle history. We have used the tree-ring method extensively on the Kenai to develop a 250-300 year record of beetle activity from 20 sites in the Kenai Peninsula–Cook Inlet area. Conservation ecologist David Henry at Kluane Park had read some of my reports on the Kenai beetle history, and invited me to assist him with a similar study in the Kluane area.

We asked a basic question: Have spruce bark beetles been in the Kluane forests in the past? No one remembered any beetle outbreaks, but we did have one clue—an old US Forest Service report that described a bark beetle outbreak along the road from Haines Junction down to Haines, Alaska. This report described an early 1940s outbreak along the Haines Cut-Off, as the road was known. The road was being constructed about that time, as a connector to the Alcan Highway from the port of Haines, during World War II. I reasoned that the beetles probably got started in slash piles along the new road. The beetles love horizontal trees, and produce many more offspring from a recently fallen tree than from a standing live tree.

Armed with increment borers and notebooks, I and my vegetation crew—Candace Cartwright, Pam Russell, and Doug Fisher—set off last June for a week of intensive tree coring with David Henry and his Kluane Park co-workers. We sampled four stands, taking a total of 439 cores and discs of trees. We chose one stand along the Haines Road, where we could see old standing snags with bark beetle scars. The bark was long gone, but the narrow three-inch maternal beetle galleries aligned along the trunks were still plainly visible. Kluane has a dry climate (12 inches of precipitation at Haines Junction), and dead trees preserve very well, unlike the Kenai where wood rots quite readily.

When we cross-dated the old beetle-scarred snags, we found they died between 1934 and 1942. So, the beetle outbreak started well before the World War II construction of the Haines Road, contrary to my initial conjecture. I imagine, however, that the added construction slash fueled the beetle fire, even if it didn't start it.

When we measured the tree-rings of the older living trees we observed a strong growth pulse starting in the late 1930s. The wide rings were typical of a beetle-thinned stand, where smaller survivors have been "released" from competition with the now-deceased overstory trees. In many trees this growth pulse continues to the present day because the canopy has not completely reclosed in that forest.

The pre-construction start of the Haines Road outbreak was a surprise, but it was "small potatoes" compared to what we found, or didn't find, in the other three stands. In the other stands the trees had grown very slowly but steadily; indeed, remarkably steady, without a hint of any growth pulses in the 200-350 years recorded in their tree-rings. These stands simply had never been thinned—by beetles, windstorms, or by human hands. This uniform growth pattern is totally opposite from the Kenai, where every stand that we have examined shows from one to five growth pulses, indicating bark beetle thinning at least every 75-100 years, and often more frequently if the thinning (i.e., tree mortality) has been light.

The oldest outbreak that we can see in our 250+ year record on the Kenai is in the 1810-1820s. A major outbreak occurred in the 1870-1880s in the southern and central Peninsula, and the 1910s saw beetle thinning from Homer to Elmendorf. The 1970s brought brief but extensive thinning from Sterling north to Point Possession. These events are clearly visible as growth pulses in the tree-rings of survivors. To not find such pulses in the three Kluane stands "knocked our socks off!" The Kluane stands are typical productive upland sites that are representative of the forests of the region, and they all have beetles today. For this reason, I am fairly confident that our small sample of stands indicates that spruce bark beetle outbreaks have been very rare in the Kluane area in the past.

Both Kluane and the Kenai have experienced major regional outbreaks in the 1990s. Our tree-ring evidence suggests that these are the most severe outbreaks for the 250-350 years that we have good tree-ring records. What has been so special about the recent period? I point the finger to the record-breaking run of warm summers that we have been enjoying. On the Kenai the summers warmed up in 1987 and stayed quite warm through 1997, and are still warmer than the long-term average.

In Kluane the summers warmed up in 1989 and were several degrees warmer through 1995; there was a cool 1996, then a very warm 1997. In 1998 the temperatures dropped back down to average and have since stayed there. The Kluane beetles took several years to build up after the 1989 warm-up, and they attracted the attention of foresters for aerial surveys beginning in 1994. The Kluane red-needle acreage (newly dead trees) peaked in 1998, and then dropped off sharply when the summers cooled back down to normal.

On the Kenai the red-needle acreage has dropped dramatically in recent years (e.g., down to 15,823 acres in 2001), but only because there aren't many large spruce trees left. The beetles have eaten themselves out of house and home. In Kluane there are still many mature trees alive in the forests, and the cool summers since 1998 appear to have arrested the outbreak in midstream. We had a similar situation with the northern Kenai outbreak which followed the extremely warm (and dry) period of 1968-1969; that outbreak was arrested by the cool summers of the early 1970s.

As I see it, the chief reason why the recent beetle outbreak has been the largest and the longest is that the run of warm summers has been warmer and longer than at any time since the 1600s (for which we have tree-ring based estimates of summer temperatures). Indeed, our summers probably haven't been this warm—for multiple summers—since the Medieval Warm Period which ended in the 1200s with the onset of the Little Ice Age. Andy De Volder has reconstructed summer temperatures from hemlock treerings on the Skyline Trail, and sees the coldest point in the 1810s. Temperatures have risen irregularly since that time, like the stock market, but the 1990s were clearly the longest run of warm summers. Temperature reconstructions from the Yukon show a similar upward trend from the 1830s, as do many high latitude sites worldwide. This is global warming in our backyard.

We are approaching the time of year for the annual bark beetle mating flight, being usually at the end of May or early June. The beetles like several days of 60 degree weather, and then you see them buzzing around rather drunkenly, looking for a fresh tree. I always ask readers to give me a call (at 260-2812) if you see a bark beetle flight. The calls have been fewer in recent years, thankfully, but I'd appreciate hearing about any flights that you see.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Additional information can be found on his Cycles of Nature website at http://chinook.kpc.alaska.edu/~ifeeb/cycles/cycles_index.html. Previous Refuge Notebook columns can be viewed on the Web at http://kenai.fws.gov.