Kenai National Wildlife Refuge ecologist defends mountain hemlock

by Ed Berg

My recent column on mountain hemlock has generated some lively debate among the readers.

In that column, which ran January 31, I described mountain hemlock as a long-lived tree species that we find in isolated clumps on the western lowlands of the Kenai Peninsula. It appears to be growing well and reproducing, even though its real home is high in the mountains above spruce treeline, such as at Turnagain Pass.

I suggested that we should consider planting mountain hemlock in areas where beetle-killed spruce forest has been logged off, because of hemlock's great longevity and its resistance to bark beetles.

This suggestion did not sit well with the foresters. Mountain hemlock has a poor track record on the Kenai as a commercial tree species. Al Peterson from the state Forestry Division commented that he had a terrible time finding buyers for mountain hemlock in state timber sales in Cooper Landing. The trees were bowed and had a considerable amount of defect (rot) in the middle of the trunks.

U.S. Forest Service plant pathologist Lori Trummer pointed out that older hemlock typically has two different kinds of stem rot: red ring rot (*Phellinus pini*) and the indian paint fungus (*Echinodontium tinctorium*). She noted that the 1987 Kenai forest inventory indicated that the net annual growth of mountain hemlock sawtimber on the Kenai was actually negative, because of loss due to rot.

These comments make me wonder if I am barking up the wrong tree!

What can be said in defense of mountain hemlock? I will concede up front that mountain hemlock does not have immediate potential as a commercial tree species, but trees have other value besides monetary value, such as aesthetic and wildlife habitat value. Does mountain hemlock have such values, if not cash crop value?

Since my January writing I have taken the occasion to visit two lowland mountain hemlocks stands. The Discovery Well stand on the north side of the Swanson River oilfield is a fine old-growth stand with trees dating at least to the 1600s, from our previous tree corings. The understory is open, with only an occasional rusty menziesia shrub and a carpet of *Hylocomium* feathermoss.

It is pleasant to walk through this park-like stand and the term "elfin forest" comes to mind. The trees were all alive and green—a condition that I rarely meet in white/Lutz spruce forests of the Kenai Peninsula today after the extensive beetle kill of the 1990s.

The trunks of many of the larger trees had a banana-like bow that would drive a sawyer nuts in short order, because such trunks are impossible to mount on a sawmill for cutting full-length boards. I saw some grapefruit-sized conks (shelf or bracket fungi) on some of the larger trees, indicating heartrot. I cored a large 26 inch diameter tree with conks, and found that only the outer five inches of wood were solid.

A tree of this diameter should be about 450 years old. It was alive and had good foliage, and it may well have been rotten inside for several hundred years.

It is worth recalling that most of the wood in a tree is dead tissue. The inner wood is called the heartwood, and its primary function is support.

When the heartwood is quite rotten, the tree structurally becomes a big tube and can still be quite strong. That is why it is usually easier to bend a solid metal bar than a metal tube.

Hemlock wood appears to grow faster than its heartrot, so the heartrot really isn't a problem for the longevity of the tree.

The second mountain hemlock stand that I visited is about a mile down the Funny River Horse Trail. You see hemlock trees mixed with white spruce and birch along the trail as you come up over the first steep hill on the trail. The pure hemlock stand lies about 50 yards to the west of the trail.

This is a smaller and younger stand than the oilfield stand. The largest trees are 23 inches in diameter and would be about 400 years old.

I didn't core any trees, but I didn't see any conks growing on the trees, so I would expect that most

trunks are solid in the middle. The large trees again had that banana-like bow. The younger trees were nice and straight, so I am wondering at what age and under what conditions the bowing sets in.

The Funny River trail stand was also open and park-like, with a moss carpet and scattered rusty menziesia bushes. It appears that only certain plants can tolerate living under a closed hemlock canopy, and grass isn't one of them.

This ability to suppress competing vegetation is called "allelopathy." Walnuts trees are an extreme example: there are very few plants that can grow under a black walnut tree. The tree secretes a toxin called "juglone" which inhibits respiration in most plants, including black walnut seedlings.

I did an Internet search on "mountain hemlock allelopathy" and turned up a student thesis project on precisely this topic at Reed College, but no results are available yet. The student, Amanda Hemmerich, plans to make chemical extracts of hemlock bark, foliage, and soils, and to test the effect of these extracts on various plants and soil microorganisms in greenhouse experiments.

I would expect that most of her plants will turn up their toes with a good dose of mountain hemlock extract.

I observed good seedling reproduction extending out from both of the hemlock stands, especially in disturbed soil. There was an old cat trench off the Discovery Well pad, probably dating to the 1957 construction, and it had saplings 8 feet tall. There was abundant cone production, especially at the Discovery Well site, and I saw squirrels at work in both sites.

As I noted in my earlier article, I am puzzled about why these hemlock stands are not larger. What is limiting their rate of spreading? The presence of seedlings and saplings away from the center of the stands shows that the stands are spreading but apparently at a slow rate.

The oldest hemlocks in these stands probably predate the oldest neighboring spruce by 200-300 years, so they haven't been lacking in time for seed dispersal. I doubt that soil conditions are a factor, because there is no obvious variation in soil conditions or vegetation around these sites.

It is well known that most seeds of conifers such as hemlock, spruce and pine, fall within one or two tree-lengths of the seed parent. If the Kenai lowland hemlocks have only been in the forest for a few generations, as a product of infrequent long-distance seed dispersal events, these trees may simply not have had enough time to spread out across the landscape. The pollen record in lake sediments says that white spruce has been on the peninsula for at least 8,000 years, so white spruce has had much more time to establish continuous forest cover over large areas.

Let me return to the question of the value of hemlock in our forests, and ask if it is worth artificially planting hemlock on the peninsula. I think that the chief value of mountain hemlock on the Kenai is as old-growth wildlife habitat. We have very little old-growth forest habitat on the Kenai, outside of the mountainous areas. Even though the lowland white/Lutz spruce typically doesn't burn for hundreds of years (as discussed in last week's Refuge Notebook), the trees are thinned by the beetles at least every 100 years or so.

Basically, our spruce trees don't live long enough to create classic old-growth forests, with huge standing trees and a lot of coarse woody debris on the ground in various stages of rotting. We see this kind of old-growth forest on the south side of Kachemak Bay and in the Girdwood area, for example, although beetles are taking out much of the Sitka spruce component of these old-growth forests.

Marten are creatures that prefer mature and old-growth forest. Most of the marten trapped on the Kenai come from the mountains on the Seward side, and only rarely are they seen on the western lowlands. Marten like old-growth forest because of hollow logs and stumps for nest sites, and the runways under snow-covered fallen trees. The closed canopy of older forest also provides good thermal cover for a variety of prey species.

Refuge biotech Stephanie Rickabaugh is planning to do a study this summer looking for marten with DNA hair traps. These traps are baited with scents and contain a strand of barbwire and some sticky material that captures a few hairs as the animal passes through the trap.

The DNA in the hair is analyzed to produce a "DNA fingerprint" for each individual marten. Stephanie's study will focus on the old growth hemlock and surrounding mature spruce-birch forest from the Discovery Well north of the oil field to the Bufflehead Lake area.

In Southeast Alaska and Vancouver Island, old-growth mountain hemlock provides important thermal cover for deer. In these forests one also finds Townsend's warbler, a mature forest specialist that is

probably a victim of habitat loss in the beetle-killed forests on the Kenai.

The largest mountain hemlock stand on the Kenai lowlands is the stand north of Scaup Lake. This stand, measuring about 1,100-by-450 meters, is a highly visible landmark for helicopter pilots flying to offshore oil platforms in the Inlet.

We have cored trees in this stand dating to the 1500s. Refuge Biologist Liz Jozwiak spent a week doing bird surveys in 2001 along the southern border of this stand. She camped under the tall hemlock trees and recalls it as some of the most aesthetically pleasing forest that she has experienced on the Kenai. The wood frogs were singing in full voice, and she frequently heard northern boreal owls calling during the night.

This old-growth habitat thus appears to have some special qualities for both humans and wildlife, and we need to think more about how to preserve this habitat.

With warmer summers expected from global warming, we can expect higher chronic levels of spruce bark beetle infestation on the Kenai. Our white/Lutz/Sitka spruce forests will cycle faster, with trees typically dying in mid-life 125 years or less, rather than 200-250 years. If this is the case, mountain hemlock is probably the only native species that will have the longevity to produce old-growth forest habitat in the future on the western Kenai.

If we want to have any old-growth forest in future, we need to protect the existing mountain hemlock stands from wildfires and logging. We also need to consider well-designed plantings of hemlock in areas that are not slated for any future development. Mountain hemlock is shade tolerant, so it could be planted in beetle-killed spruce forests, at least where the grass was not too thick.

In logged areas, mountain hemlock could be planted side-by-side with lodgepole pine, with the expectation that it would naturally succeed the pine after a couple hundred years or after the pine was cut.

On the Kenai National Wildlife Refuge the national policy of the U.S. Fish and Wildlife Service prohibits planting exotic species, such as lodgepole pine or Siberian larch, but we could consider planting a native species like mountain hemlock.

There is also the possibility of genetically improving mountain hemlock. Our existing lowland hemlock trees have already proven their hardiness on the Kenai with more than four hundred years of survival. Forest geneticist John Alden at the University of Alaska Fairbanks has suggested that trial plantings are needed to develop stock with suitable characteristics for commercial planting.

At best, mountain hemlock—at least with its present genetics—would be a niche market, for landowners and public land managers interested in promoting native forest diversity and old-growth wildlife habitat on the Kenai, with a long eye on the future.

If selective breeding and good silvicultural practice could straighten out the trunks and speed up the growth rate, early harvest (say at 100 years) could preclude the old-age heartrot problem and produce a hardy bug-resistant tree. Such an improved mountain hemlock variety might compete quite favorably as a commercial lumber or pulp tree, on par with some of the presently popular but bug-prone species like white spruce, lodgepole pine, and Siberian larch.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at http://kenai.fws.gov.