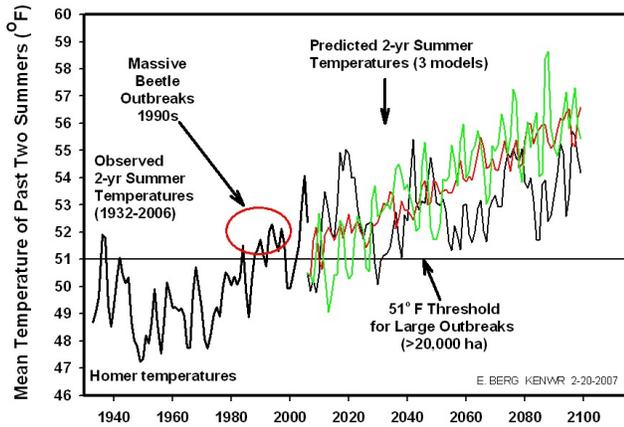
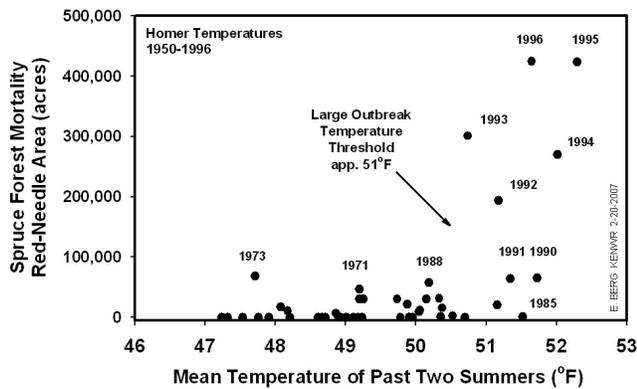


Bark beetles will shift Kenai forests toward hardwoods over next century

by Ed Berg



Past and predicted summer temperatures for southern Kenai (Homer). Summer temperatures of most of this century are predicted to be above the 51°F threshold for large spruce bark beetle outbreaks. Climate prediction models are ECHAM (Max Planck Institute, Germany), CCC (Canadian Climate Center), and CMS (National Center for Atmospheric Research, USA).



Large areas of forests are killed by spruce bark beetles after two or more summers with temperatures averaging more than 51°F. (Annual forest mortality areas from U.S. Forest Service aerial surveys 1950-1996. Temperatures were recorded at the Homer airport).

Beetle-killed spruce has become the dominant signature of upland forests on the Kenai since the massive 1990s bark beetle outbreak. Tall gray ghosts still tower

above younger green spruce and leafy hardwoods, although many of the ghosts have fallen down by now.

Over the years my response has changed from saying, “Egad, look at all those dead trees!” to saying, “My, look at how many trees survived and are now thriving!” There is a healthy complement of smaller trees released from competition with the now-deceased big guys, and we see some seedling recruitment, especially in disturbed soils. So, the forest is recovering, albeit faster in some places than others.

Private landowners have replanted some of the logged areas, such as east of Ninilchik where you can see six foot tall spruce and lodge pole pines, with foot-long leaders on top. This is impressive growth for southern Alaska, where slow-growing spruce trees are expected to have a 120-year rotation for saw timber.

Our warmer climate thus appears to bode well for our recovering spruce forests, at least for the younger trees. But there is a hostile force waiting in the wings that will derail any longevity for these youngsters. The spruce bark beetles that killed the parent trees will likely be even more effective in killing their offspring, due to the same climate warming.

The spruce bark beetles are a time bomb that may take up to several decades to explode. The delay is due to a peculiar fact about the way the beetles work; they primarily attack larger trees and do not attack saplings. Bark beetles go after sugar in the inner bark (phloem), just like a porcupine or a bear. A beetle-worthy tree has to have phloem thick enough for beetles to make galleries (tunnels) for egg laying. Sapling-thin bark simply doesn’t have enough room for mother beetles. Furthermore, young trees can produce more pitch than old trees, and they use pitch to cement the beetles Mafia-style into their galleries.

Thin phloem and abundant pitch protect young trees from bark beetles until trees are perhaps 40-60 years of age, depending on the site growing conditions. This creates the time bomb delay. The bomb however requires a weather trigger.

Spruce bark beetles thrive on warm summers, especially runs of two or more warm summers. Our

weather on the Kenai is strongly tied to the El Niño—La Niña cycle. In past decades a run of several warm summers would initiate a beetle outbreak, and then a run of several cool summers would shut it off. This happened, for example, with the outbreaks of 1962, 1971-73, and 1979-81.

I compared annual red-needle area (spruce forest mortality) with the summer temperatures for 1950-1996 and found a fairly distinct threshold of 51°F for large beetle outbreaks. If the average May-August temperature of the past two summers reached 51°F, we usually had outbreaks of more than 50,000 acres. The massive 1990s outbreak was driven by a record 11-year run of warm summers (1987-1997) where almost every summer was above the 51°F threshold. In 1998-2002, La Niña returned and the summers cooled somewhat, but still remained above average temperature. By then, of course, the beetles had “eaten themselves out of house and home” and there were few mature spruce trees left to eat.

Prior to the late 1980s, La Niña kept the bark beetles under control by bringing summer temperatures down to the 48 to 50°F range. Nowadays, a La Niña summer (like 2006) only makes the summers slightly less warm but still above 51°F beetle threshold. This means that the beetle bomb continues to tick as today’s juvenile trees enjoy their youth.

I plotted summer temperature predictions from three well-known global climate models for the next

hundred years. They predict that all summers will be warmer than 51°F after 2030. These predictions don’t mean that white, Lutz and Sitka spruce forest will go extinct on the Kenai; they simply mean the trees will never grow very old. Bark beetles will likely hit the trees when they reach a size of perhaps 12-14 inches diameter, at least in stands where there are enough such trees to create a critical mass necessary to launch an outbreak. In any case, it unlikely that we’ll ever again see old spruce giants of two to three foot diameter class, such as some of the coastal Sitka spruce of the past century.

Some will lament the passing of large, old spruce forest on the Kenai, but the new hardwood-dominated forests should provide a more diverse landscape friendlier to a wider variety of life, especially birds and insects. Fire will be less of a concern with less spruce forest, but the drier climate will still make grass fires a major threat in the spring before green-up.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will teach his one-credit course on Global Climate Change at the Kenai Peninsula College in Soldotna and Homer, beginning February 27 and March 1, respectively. You can check on new bird arrivals or report your bird sighting on the Kenai National Wildlife Refuge Birding Hotline (907) 262-2300. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.