Vanishing ponds/lakes show drying

by Ed Berg

A pond where the water has fallen more than 10 feet in the last decade.

I have claimed in this column over the last several years that the Kenai Peninsula is drying out. This is always a tough claim to make as we head into the fall rainy period. On the scale of years and decades, however, I think we are indeed drying out, sort of like a business whose annual profits are slowly declining despite seasonal periods of high income. You can see this loss in our annual water budget, which is the water available after precipitation has evaporated from the soil and been breathed out by plants. In our case the water budget has been declining irregularly since the late 1960s. Our water income has declined slightly, but the main offender is the warmer summers.

Summer warmth makes the plants breathe out (transpire) more water, and it evaporates water from the soil and water surfaces. This warm summer water loss is like a tax that subtly erodes our water budget.

Using weather data from the Kenai airport starting in 1944, I have calculated the annual water budget before and after the drought of 1968-69. I estimate that since 1967 our available water has gone down from 5.8 inches to 3.0 inches. This is like a 48% drop in water "profit" over the last 35 years. (Homer showed a similar decline after 1989, from 10.2 to 7.0 inches, a drop of 31%.)

I had an opportunity this summer to see how this water shortfall translates into a drying landscape. Grad student Eric Klein from Alaska Pacific University and I spent the summer visiting 84 sites in the central Peninsula, looking at drying ponds, falling lake levels, and spruce invasion of wetlands.

We were assisted by refuge biotech Doug Fisher, who is a high school teacher from North Dakota and a four-year veteran of my field crew, and by volunteer Al Magness, a forester drying out from wet summers on the Tongas National Forest in Southeast.

The first thing we observed is that some places are dying out, and others are not drying out at all. Some lakes and ponds are down, but many appear to have quite stable water levels.

When looking at lake levels as climate indicators, I should first say that only closed-basin ("landlocked") lakes are of interest. Lakes that have outflowing streams are like an overflowing bathtub; as long as the water coming into a lake equals the water flowing out, the lake level will be stationary, regardless of the volume of flow.

Lakes with outlets tell you nothing about the climate, unless it gets so dry that the water stops flowing. The two middle Jean Lakes where the Sterling Highway enters the mountains are an example of this rather extreme situation, where the connecting stream has dried up and the lake levels are down several feet. These shrunken lakes are now climatically interesting.

So, for starters, we avoided lakes and ponds with outlets, and focused on closed basins. Even so, we found many closed-basin lakes and ponds where the water level was basically stable, falling at most a few inches over the summer.

On the other extreme, we found a pair of ponds where the water has fallen more than 10 feet in the last decade (see photo). Less dramatically, we observed many former ponds and shallow lakes that were colored "blue" on the 1950 USGS topographic maps that are now simply grassy pans, often with small spruce and birch saplings poking up through the grass.

So, why have some closed-basin lakes and ponds dried up, and others appear to be quite unaffected? The key factor appears to be the presence of a large peat "sponge" around the lake or pond. We took soundings of the peat soils at our sites with a 4-meter

(13-foot) soil auger, and many times found that we couldn't hit a solid bottom in 4 meters. This was a great surprise to me; I had no idea that we had such thick peat deposits on the Peninsula.

I think that thick peat around a lake or pond acts as a reservoir or buffer that keeps the lake or pond from drying out. *Sphagnum* moss, a chief component of peat, has tremendous water holding capacity.

Civil War surgeons knew that a dry ounce of sphagnum moss can hold a pint of blood in a wound dressing, and gardeners generally consider sphagnum peat to have a water holding capacity of about 15 times its dry weight.

Lakes and ponds that are surrounded by flat, wet peatlands in a closed basin are probably only the tip of a water "iceberg;" a much greater volume of water can be stored in the peat than is visible in the standing body of water.

So, we learned that only certain closed-basin lakes and ponds are "climate sensitive," and that these lakes and ponds generally lacked a peat buffer zone. Some good examples are Picnic and Campsite Lakes on Mystery Creek Road, and Jigsaw Lake at the end of Swan Lake Road. These lakes show exposed aprons of mineral soil without much recruitment of woody vegetation, which suggests that their water levels have been down for less than a decade.

There are numerous examples of dry ponds in the rolling "kettle moraine" topography along the Swanson River Road and Swan Lake Road, and west of the Swanson River oilfield to the Beaver Creek gasfield. The bluejoint grass (*Calamagrostis*) sod is usually well established in these pans, indicating that they have been dry for several decades.

These observations of a drying landscape probably come as no surprise to hunters and hikers who roam the hills of the central Kenai Peninsula. Long-time horse packers have told me, for example, that it is harder nowadays to find places to water their stock in the high country. Pilots comment on the "bath tub ring" around some of the closed-basin lakes on the northern Peninsula.

I would think that with all the beetle-killed forest there should be more water on the landscape, because there are fewer trees transpiring water. The climatic drying, however, seems to have more than counterbalanced any hydrological reprieve that the dead trees might have offered.

The timescale of the drying that I have discussed here is several decades long, probably since the 1968-69 drought, from which we have never really fully recovered. This drying has no doubt intensified during the warm summers of the 1990s, which greatly facilitated the spruce bark beetle outbreak. In my next *Refuge Notebook* I will take a look at the drying landscape on a much longer, hundred-year timescale, as shown by the advancing black spruce forest on the Peninsula's extensive peatlands.

As a final thought, I would say that with global warming, I don't expect to see this drying trend turn around anytime soon. If you are buying lake front property for your retirement years, you might want to avoid closed-basin lakes or else plan to build a long pier.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will be teaching his one-credit "Geology of Kachemak Bay" class at the Kenai Peninsula College, starting Sept 9th in Soldotna and Sept 12th in Homer. Class schedule is at http://chinook.kpc.alaska.edu/~ifeeb/cycles/cycles_index.html. 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.