CONTRA COSTA TIMES

Posted on Sat, Sep. 23, 2006

2,040-year-old tree's rings read like global history

Using cross-section of pine from tree line, scientists estimate weather for each year of tree's life,

discover warming trend

By Dave Philipps
COLORADO SPRINGS GAZETTE

COLORADO SPRINGS, Colo. - Nothing should grow here.

Late-summer storms hurl hail against the granite slope.

The dawn air freezes all but six weeks of the year. There is no sign of soil.

But on this lonely ridge, the oldest known tree in Colorado's Pikes Peak region, a Rocky Mountain bristlecone pine, has been growing for 2,040 years.

It probably got its start when a gray, jaylike bird called a Clark's nutcracker hid seeds filched from a nearby pine into a nook on the ridge, then forgot about the stash.

Today, the tree's location is known to only six people who keep the route hidden to protect the ancient pine.

The annual rings laid down in the stout trunk, however, are much more widely known. Decades ago, a local boy drilled a core sample no wider than a chopstick from the tree's trunk to reveal the rings.

Since then, scores of scientists have scrutinized the tiny dowel for insight into everything from ancient explosions and Aztec curses to global climate change.

So many scientists have used the pine to study the climate that it has become a sort of global black box -- a flight recorder for the past 2,000 years of Earth.

For all this, the pine doesn't look like much. It's about 15 feet tall. It has one living branch. Twenty centuries of storms have scoured all but 7 inches of bark off the 9-foot diameter trunk.

So much of the tree is dead, gray wood that it looks a bit like a rhino wearing a wreath.

For most of the tree's life, it stood unnoticed on its lonely ridge.

Fires swept through. The tree survived. Miners cut down the surrounding forest. The tree was too twisted to be of use.

It might have gone on unnoticed if a 16-year-old kid from Colorado Springs named Craig Brunstein hadn't spied the old tree in 1968 while hiking high in the mountains.

"I loved everything outdoors, and I was really into trees -- identifying them, finding their ages. I guess I was sort of a nerd," said Brunstein, 54, who now works for the United States Geological Survey in Denver.

The friendly, gray-haired geologist is the one person who knows the locations of the oldest trees in Colorado because he is the one person who has spent decades finding them.

He has such a fondness for the venerable pines that visitors to the backroom where he keeps all his cores can expect him to wave a chunk of bristlecone wood under their noses, smile and say, "Smell that. Doesn't it just smell great? I love it."

When Brunstein started hunting trees, it was well-known that rings could reveal their age.

Leonardo da Vinci noticed it in 1500. Henry David Thoreau wrote in the 1840s that through rings, it is "easier to recover the history of the trees ... than to recover the history of the men who walked beneath them."

But the past century saw the practice make huge leaps. In 1930, a scientist in Arizona used wood cores from Ancestral Pueblo ruins to suggest that the mysterious abandonment of Mesa Verde was caused by a long drought.

In the 1950s, a group of scientists discovered a grove of bristlecones in California that was almost 5,000 years old, and, by overlapping cores from living and dead trees in the area, gradually built a tree-ring chronology dating back almost 9,000 years.

About the time Brunstein spotted his old trees, the rings of bristlecones proved that radiocarbon dating -- the newest, most sophisticated way to measure an object's age -- was inaccurate by at least 1,000 years.

In the summer of 1969, Brunstein convinced a scientist from Harvard University named Val LaMarche to come out and investigate the trees.

LaMarche took several cores back to the lab, where he noticed an odd pattern.

Under the microscope, the compact corduroy of rings revealed the normal alternating pattern of light bands of cells made each summer during the growing season and dark bands made at the end of the year as moisture drained from the living tissue in preparation for winter.

But the cores also showed dark bands where the cells were smashed and broken like a highway pileup. These were frost rings -- scars left from years when the freezing weather came too soon and ice formed in the cells, shredding the thin walls.

An occasional frost ring isn't unusual, but the cores from near Pikes Peak held almost 200, which gave LaMarche an idea.

What if the cold snaps that formed the frost rings weren't just random events?

What if they were a barometer of much larger global catastrophes?

He started comparing frost ring dates with other ancient events and was able to link the damaged rings to events on the other side of the world.

In 42 B.C., when the tree was just a sapling, Sicily's Mount Etna exploded, spewing sulfurous gas into the sky. The sun grew pale for months, crops withered in Europe. Some Romans wondered whether the phenomenon was

caused by the murder of Julius Caesar. There is a frost ring that year.

In 1815, Tambora volcano in Indonesia detonated in the largest eruption in recorded history, filling the air with dust that cooled the whole Earth. Farmers in New England called it "the year without a summer." The cold, rainy weather caused author Mary Shelley to stay inside on her Swiss holiday and write the beginnings of the book "Frankenstein." There is a frost ring that year.

In 1844, a year tribes and trappers in Colorado called "the time of the big snow," storms dropped so much snow that when it finally melted, thousands of buffalo lay dead on the prairie. There is a frost ring that year.

The old trees form so many frost rings, Brunstein said, because they live at about 11,400 feet -- the tree line, where the slightest temperature dip can form ice in the cells.

Brunstein has counted 182 frost rings in cores from the region, which, he said, "makes them one of the best indicators of global climate we have."

The record is so complete that archaeologists have used it to help explain an Aztec curse. In 2004, an article in the journal of the American Meteorological Society used cores to make sense of the pre-Columbian belief that the first year in the 52-year Aztec calendar was always haunted, according to one colonial Spanish scribe, by "famine and death."

Old Aztec pictorial histories show the first year of every cycle plagued with storms and starvation.

One drawing shows famine so severe that coyotes came into the city to devour the dead.

Tree-ring data showed that the "curse" was probably caused by cyclical droughts and cold snaps. Of the 13 cursed years on record, 10 had below-average tree-ring growth or frost rings that could have caused crop failures.

Recording storms is an insightful quirk of bristlecones, but their most useful contribution may be as evidence of how humans are heating up the atmosphere.

In 2004, three climatologists from Penn State, the University of Massachusetts and the University of Arizona published a blockbuster study detailing average temperatures in the northern hemisphere for the past 2,000 years. The team used a broad array of natural record keepers to plot the changes -- coral reefs, layers of ice, lake sediments and the bristlecones near Pikes Peak.

The results showed a relatively flat, stable temperature that suddenly climbed after 1900. The 1990s appeared to be the warmest decade in 1,000 years.

The team blamed the rise on human-made greenhouse gasses.

As might be expected with a politically charged topic such as global warming, the results have been vigorously debated.

The accuracy of many natural record keepers, including the trees, has been questioned. But most climatologists think the study gives a fairly accurate representation.

To make a stronger argument, the cores from near Pikes Peak are being used now by Matt Salzer, a tree-ring scientist from the University of Arizona, to create a more detailed study of past climate that he says will probably reinforce the first.

"There is still some uncertainty," Salzer said. "The idea is to use more and more data to create a better model."

Here's what is certain: In 1900, bristlecones in Colorado started growing much faster. Studies suggest they are reacting to increased carbon dioxide in the atmosphere.

"There's argument over whether that means there's global warming," Brunstein said with a shrug as he examined cores spread out on his table. "Personally, I believe it does."
