Sierra snow surveying techniques more than 100 years old

By Norimitsu Onishi, New York Times

PHILLIPS – Along Highway 50, elevation 6,820 feet, a California winter ritual unfolded here on a recent morning. In the snow-blanketed meadow of a local homeowner's backyard, reporters representing news organizations from across the state followed a man on skis who kept plunging an aluminum tube into the snow.

Leading the pack was Frank Gehrke, California's chief snow surveyor, the man responsible for measuring the Sierra Nevada's snowpack, the source of a third of this state's water supply. Part groundhog, whose appearances signal the shift of the seasons, and part Federal Reserve chairman whose utterances on the state of the snowpack can move California's multibillion-dollar agricultural industry, Gehrke has led the Department of Water Resources' snowpack surveys for a quarter-century.

Frank Gehrke is the face of snow surveys in the Sierra. Photo/LTN file

In the state that is home to Silicon Valley, Gehrke and his team use the stick-the-tube-into-the-snow method developed by a local classics professor more than a century ago.

“There’ve been only incremental changes,” Gehrke said, interspersing this winter’s second monthly survey with a veteran’s calm observations of the snowfall and hints of the possible coming drama that is California’s annual snowmelt. “This course is very uniform, which is normal, because the snowpack during accumulation is kind of uniform. But once you start getting into the melt, it starts to go crazy.”

His assessment of this month’s survey – after a strong start, the snowpack’s water content fell to 93 percent of average for this time of the year because of a “midwinter lull” – was covered by the media throughout the state.

In California’s water system, one of the world’s most sophisticated and complex, the snowpack plays a leading role by supplying water to more than 25 million people and almost one million acres of farmland. Snow that accumulates on the Sierra Nevada’s 400-mile range starts to melt in the spring, draining into rivers that feed reservoirs below.

As Gehrke and his team gauge the depth and water content of the snowpack, other department officials begin forecasting how much water the snowpack will be able to deliver this year.

Those who depend on the snowpack for water adjust their plans accordingly. Water districts may start looking for water elsewhere or carry out conservation measures. Farmers consider the forecasts in deciding what crops to plant or whether to take bank loans to buy more seed and equipment for the year.

Ryan Jacobsen, who is executive director of the Fresno County Farm Bureau and also sits on the board of the Fresno Irrigation District, said that the snow surveys are the “bible for what decisions irrigation districts are going to make for the rest of the year.”

“Fresno County is the No. 1 agricultural county in the nation, but we also happen to be situated climatically in the middle of a desert,” he said. “It really is the Sierra Nevada snowpack that makes this desert bloom.”

It was in 1908 that James E. Church, a classics professor at UNR developed the existing method of forecasting water runoff from the depth and water content of snow. To settle a dispute over water rights in nearby Lake Tahoe, he was able to predict the water from the snowpack on Mount Rose by using a hollow tube that he called the Mount Rose snow sampler. Government agencies adopted his technique and, in 1929, California passed a law mandating that state officials measure the Sierra Nevada snowpack and issue forecasts of the water supply.

“You can almost say it made the development of the West possible,” Gehrke said. “Prior to that, they really didn’t even have tools to use to hope to predict how much runoff they would have.”

A civil engineer, Gehrke, 65, grew up in Missouri, where snow was considered more of “a nuisance” than anything else. “We would get occasional snowstorms, and our big hope was that the schools would close, though they rarely did,” he recalled.

He joined the Department of Water Resources in 1987, which coincided with the start of a six-year drought. The drought brought more resources and public attention to the snow surveys. The monthly surveys, which run from January through April, became media events starring Gehrke.

“He’s sort of iconic,” said John Laird, secretary for the state’s Natural Resources Agency, who had come to participate in the snow survey. “He’s the face of snow measurement.”

The water resources department issues forecasts after studying the data collected by Gehrke as well as 40 cooperative agencies at about 250 locations. His team includes 10 snow surveyors, some of whom travel with their measuring tubes to

remote spots by hiking, snowmobile or even helicopter. Sensors located throughout the Sierra Nevada provide real-time data but are not considered as accurate as the manual surveys.

A new project by NASA's Jet Propulsion Laboratory in Pasadena could soon enrich the snow surveys' findings. As part of what the laboratory calls the Airborne Snow Observatory, scientists will begin flying over the Sierra Nevada next month aboard a plane equipped with an imaging spectrometer and a laser system known as lidar. The findings, which will be used for water management as well as the study of the impact of climate change on snowpacks, are expected to yield a broader view of the snowpack and more precise predictions of the snowmelt, said Thomas H. Painter, a research scientist heading the observatory.

Gehrke, who is working with the laboratory, has flown on some preliminary flights.

"Frank is the bridge across the legacy of water management and snow observation in the Western U.S. to this technology," Painter said.

Perhaps no one was better than Gehrke at finding the drama in California's snow cycle. Would the midwinter lull be followed by steady accumulation in February? If February turned out to be dry, would there be what he calls a "March Miracle" before the final, comprehensive survey in early April?

Gehrke started skiing back to Highway 50, catching up with the reporters who were already packing up their gear. Fewer reporters would show up next month, he said, but April's snow survey would draw the biggest crowd.

"March is sort of the shoulder season for snow surveys," he said. "Everybody's looking forward to April."