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Can we handle a big flood?

Region should be set for a 500-year event, experts say. It isn't.

By Deb Kollars -- Bee Staff Writer

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A year after the haunting images of Hurricane Katrina, Sacramento remains at serious risk for a similar disaster.

It is hard to fathom, especially on summer days like these when Sacramento's two rivers, the American and the Sacramento, appear as sparkling ribbons flowing between levees covered in grasses and cottonwood trees.

But the dangers are grave, and solutions elusive.

With the one-year anniversary of Katrina approaching, The Bee asked state and federal hydrologists last week to describe what the water flows and river heights would be if floods of certain magnitudes arrived in Sacramento. It was a departure from the more common practice of talking about floods in terms of their likelihood, such as 100-year events (those with a 1-in-100 chance of happening in any given year.)

The estimates, which engineers dug out of recent and complex hydrological models by the U.S. Army Corps of Engineers, are chilling.

During a 100-year flood, river heights on the American River at Watt Avenue, for example, would reach 49 feet and remain running within the existing 54-foot levees, the models showed.

But the river's height, known as "flood stage," could not even be accurately calculated for larger 200-year events and beyond because the water flows would be so swift and voluminous they would break out levees and gush over the tops, said Dan Tibbitts, a hydraulic engineer with the corps.

"Unfortunately Sacramento is not prepared for these big events," said Arthur Hinojosa, chief of the state Department of Water Resources hydrology branch.

For urban areas, 100-year flood protection is considered the federal government's minimal safety standard. To most flood control experts, it is an inadequate threshold.

It also doesn't exist yet in some of Sacramento's heavily populated areas, including Natomas and the Greenhaven-Pocket neighborhood. Current levee work in Greenhaven-Pocket should provide 100-year protection levels later this winter.

According to the nation's top flood experts, cities such as Sacramento that are vulnerable to flooding should have at least 500-year protection.

If cities settle for less, they may squeak by without consequence for years, decades or longer, said Gerald Galloway, a professor of water resources management at the University of Maryland and one of the nation's pre-eminent flooding authorities.

But rare as they are, a monster flood in Sacramento remains firmly in the realm of possibility,

he and others said.

"It's not a question of if. It's a question of when," said Larry Larson, executive director of the American Association of State Floodplain Managers in Madison, Wis.

To reach the 500-year gold standard, Sacramento likely would need to build a dam upstream on the American River, such as the controversial one that has been proposed for years at Auburn, as well as invest billions in other improvements.

Instead, Sacramento's leaders have settled on a more modest plan to eventually raise protection to a 200-year level. This would enable the city to withstand a flood with a 1-in-200 chance of occurring in any given year, and flows deeper and faster than anything we have seen on our two big rivers.

For perspective, the floods of 1986 and 1997, which pushed the flood control system to the brink, were pegged as 65- to 70-year events. According to flood officials, they gave a glimpse of what a 100-year event would be like.

The 200-year work involves building new spillways at Folsom Dam and levee improvements along the American River and surrounding the Natomas Basin.

It will be a major step forward in terms of flood safety. But the 200-year plan is still more than a billion dollars and eight years away from being a reality.

In addition, there is a major gap in the plan:

The 200-year protection level will apply to areas along the American River and the Natomas basin. But studies haven't even been done yet to determine how to reach a similar safety margin along the Sacramento River from downtown south to the Pocket.

"We're not sure when or how the system might rupture," said Stein Buer, executive director of the Sacramento Area Flood Control Agency, speaking of the vulnerability along the Sacramento. "If there is more water, you can't automatically say the levees will fail. ... It still needs to be studied."

Currently, the Sacramento River's design capacity near downtown is 110,000 cubic feet per second, meaning that engineers have certified it to handle flows that high. This time of year, it is moving at about 18,000 cfs, Hinojosa said.

According to the corps' hydrology models, a 200-year flood would bring an estimated maximum flow of 160,000 cfs down the Sacramento River at I Street. The river's corresponding flood stage would rise to 36 feet inside levees 38 feet in height at that location.

Levees generally are designed with a minimum of 3 extra feet above flood stage, called "freeboard," to handle splashing and wave action. When waters rise into the freeboard vicinity, it gets dangerous because the levee tops are not designed to contain those fast flows and volumes.

"The capacity is there" on the Sacramento River to contain a 200-year event, said Joe Countryman, president of MBK Engineers in Sacramento. But the levees may need to be strengthened.

Countryman has studied Sacramento's flood control system for many years. He views the current models for calculating flood sizes, which are based on historical records and statistical probability, to be riddled with uncertainties, particularly for anything larger than a 200-year event.

"Nobody really knows what the 100-year flood is, let alone the 500-year flood," he said.

Hinojosa agreed the models have limitations. They should be considered best estimates and guides for preparing for floods.

"It is very difficult to predict what Mother Nature will do. These are the best figures we have," Hinojosa said.

The current plans to fix Folsom Dam and strengthen levees should enable Sacramento to safely pass a 200-year flood along the American River.

According to the corps' models, such a flood would theoretically deliver estimated maximum flows of 300,000 cfs on the American River at Fair Oaks just downstream of Folsom Dam, under existing flood control conditions.

For several miles, the river's deep canyon walls could contain such flows.

But as the landscape flattens near Goethe Park and points west, man-made levees hold back the river. At Watt Avenue, the channel currently can handle about 145,000 cfs. Under the planned flood-control improvements, the channel's capacity will rise to 160,000 cfs. That's not enough room for the estimated 300,000 cfs maximum flows of a 200-year flood. But the proposed new spillways at Folsom Dam would enable dam operators to release water sooner into the American and manage the severe storm flows of a 200-year event, flood officials said.

It is doubtful, though, that the dam or river channel could handle the estimated flows from a 500-year event, said Herb Hereth, a consultant with the Department of Water Resources and former chief of hydrology for the U.S. Army Corps of Engineers Sacramento division.

The hydrology models show such an event would produce estimated maximum flows of 530,000 cfs at Fair Oaks and dump as much as 1.9 million acre-feet of water into Folsom Dam in three days -- almost twice the 1 million that materialized in three-day periods during the floods of 1986 and 1997. The reservoir holds 970,000 acre-feet, with water constantly moving in and out during storm events, said Jeff McCracken, spokesman for the federal Bureau of Reclamation, which manages Folsom Dam.

The Sacramento River is less problematic because the bypass system to the north of Sacramento can absorb so much water during flood times, Countryman said. Two-hundred-year protection likely can be achieved by strengthening levees, plus possibly creating easement agreements with upstream landowners willing to allow excess flows onto their land during rare flood events to spare urban areas, he said.

Raising levees is unlikely to be a widely used solution because of costs, numerous flood experts said. Raising levees requires widening them at the base for strength, and in Sacramento, many already have homes built to the levee toe. In addition, raising levees would only be effective if entire stretches on both sides of the river were raised equally.

As head of the Sacramento Area Flood Control Agency, Buer said he would love to find a way to protect Sacramento against floods beyond the scope of a 200-year event.

"Conceptually we agree with the general," he said, referring to Galloway, a retired brigadier general in the U.S. Army, and his 500-year protection recommendation. "The question is, what can we practically accomplish? We're talking about a balanced approach to getting to 200-year protection. Within a decade, we will be there."

In a phone interview last week, Galloway praised Sacramento for the steps being taken.

"Katrina proved a wake-up call to the nation," Galloway said. "Some cities are burying their heads in the sand of the levees. In Sacramento, you all are addressing it."

Even if a community can't provide 500-year protection, it is critical, he added, that people be aware that such huge floods can happen. Property owners should buy insurance. And civic leaders should go all out and develop "gangbuster" emergency plans for communicating, evacuating and saving people's lives in such events, Galloway said.

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