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Trees strengthen levees in some cases, study finds

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PUBLISHED SATURDAY, AUG. 27, 2011

For years, California flood control officials have pleaded with the U.S. Army Corps of Engineers to reconsider a policy that bans trees on levees, urging the agency to heed years of independent research that found little risk to flood safety.

Now, a new study by the Army Corps itself has found that trees actually strengthen levees in some situations. The conclusion could force the agency to reconsider its policy, which would otherwise eliminate millions of Central Valley trees.

The controversial levee maintenance policy, which emerged in the wake of Hurricane Katrina, allows only grass on levees, on the grounds that trees could damage levees if they fall down or that their roots may promote seepage that would undermine a levee.

The policy applies nationally. But its consequences may be greatest in California's Central Valley, where millions of trees line hundreds of miles of levees. Making up the Valley's last remaining riparian habitat, the trees are considered crucial to migrating salmon, hawks and a variety of other wildlife.

California has long operated under separate rules – once endorsed by the Corps – that permitted large vegetation as long as plants are maintained to allow inspections.

The Central Valley is unique in that, after the Gold Rush, levees were intentionally built close together to confine rivers and thereby increase water velocity to scour out eroded mining debris. To compensate, wildlife agencies and the California district of the Army Corps in subsequent decades allowed trees on levees to recover some of the lost habitat.

Those trees now constitute most of the Valley's riparian habitat. They also offer

shade and scenery for millions of people who live in communities like Sacramento, Stockton, Marysville and Yuba City.

After Hurricane Katrina, the Corps moved to impose its vegetation policy uniformly across the nation for the first time. After protesting, California was granted a reprieve until July 2012, when the state is expected to propose a compromise as part of a new flood protection plan for the Central Valley.

Failure to comply with the federal mandate means a loss of federal disaster assistance.

The new study, completed in July by an Army Corps research unit in Mississippi, has not yet been publicly released. The Bee obtained a copy from a source close to the project.

It involved field work in Sacramento and other locations including Washington, Oregon, New Mexico and Mississippi. It relied on electromagnetic tools, ground-penetrating radar, root excavations and computer modeling to estimate how trees affect levees.

The team of more than 15 researchers, all Army Corps employees, concludes that trees growing at the base of a levee – called the "toe" – actually improve flood protection.

"Trees near the toe increased the factor of safety because of the reinforcing effects of the roots and the increased counterweight effect of the tree to slope movement," the authors state.

The benefits diminish when trees are located higher up a levee, to the point that safety is "slightly reduced" by trees atop a levee, which add weight in a way that could cause slope failures, especially when winds exceed 40 mph.

It found little evidence to support a key claim by Corps policymakers that tree roots provide a path for water seepage that could erode a levee from within. It called this effect "negligible."

"Those sound like very reasonable conclusions," said Mike Inamine, an engineer who formerly oversaw vegetation policy at the state Department of Water Resources and who was recently hired as director of engineering at the Sutter Butte Flood Control Agency. He commented after The Bee summarized the study for him.

"The study sounds like it confirms current state policy, which is to leave much of

the lower waterside vegetation in place, not only for public safety, but for the important habitat it provides," he said.

The Army Corps declined to respond directly to conclusions in the study because it is not yet considered "final," said Pete Pierce, a spokesman at the agency's headquarters in Washington, D.C.

However, Pierce said via email that the study has already undergone an internal technical review. It plans to release a final version, he said, but a date has not been set.

The study acknowledges more research is needed, especially on whether tree trunks and roots worsen erosion caused by passing water flow.

It concludes that site-specific evaluations are critical to determine whether trees are harmful or beneficial, because so many variables are at work, including tree species, size, soil composition, weather and water flow behavior.

In the meantime, trees are already falling.

The city of West Sacramento is working on a small levee-strengthening project along the Sacramento River near Bryte Park. It is removing 37 trees to comply with Corps policy, and had to replace them with new plantings to compensate for habitat lost for western red bats and Swainson's hawks.

As a result, the policy added "a couple hundred thousand dollars" to the \$17 million project, said Michael Bessette, the city's flood protection manager.

A much larger project planned in 2013 near the city's Southport neighborhood will put thousands of trees at risk and bring much larger compliance costs.

The California Department of Water Resources estimates that removing trees on 1,600 miles of Central Valley levees to comply with Corps policy would cost \$7.5 billion.

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