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Learning from Nature: Using Bioengineering to Save Water Bodies

BY SENA CHRISTIAN – FEBRUARY 5, 2013

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California city's efforts to stabilize creeks with plants are part of a larger paradigm shift in public works initiatives

Donna Wilson believes when you love something you should give it a name. So when she and a few other regular visitors to a greenbelt along Linda Creek in the city of Roseville, CA discovered a gather of western pond turtles sunning themselves on an oak tree that had fallen across the creek back in 20 they named the spot Turtle Grove in honor of the threatened species. "I got a degree in anthropology," Wilson says, as she stops to look at the spot on a recent afternoon. "Anthropology is a love of culture, and I see this creek and greenbelt as a culture, a community."

Photos by Sena Christian Environmental engineer Scott Dietrich and volunteer Donna Wilson replant willow s a January afternoon using a biotechnical engineering method to stabilize an eroding creek bank in Roseville, Calif.

Then one day, a city crew armed with chainsaws attempted to remove the oak tree as part of a flood control measure. The measure was instituted after a torrential downpour in 1995 ruined homes and alerted city officials to the fact that Roseville's multiple creeks could quickly expand to the size of small rivers. Since fallen trees could back up water, snag debris and cause localized flooding, city policy required the removal of all large oaks that fell into creeks.

Wilson and her fellow residents, who are now part of an outfit called Friends of Linda Creek, went to b for the turtles. Once city officials understood that downed trees can be crucial habitats for fish and bug in creeks, they agreed to conserve the oak — crews removed a portion of the tree to ease water flow i the creek and left the rest for the turtles. The city now determines whether to remove trees on a case-case basis.

Turtle Cove is a testament to the efforts of Friends of Linda Creek, which now dedicates itself to the preservation, conservation and restoration of this 15-mile long Sacramento River tributary that runs through Placer and Sacramento counties.

This group has also made possible pilot efforts at biotechnical engineering — a sustainable practice that uses live, native plants to stabilize creeks. The roots of the plants grow into the soil and bind the soil particles together thereby reducing erosion.

Scott Dietrich, an environmental engineer with the city of Roseville, is the man behind the city's biotechnical engineering efforts, which is becoming the preferred method of erosion control and stream bank restoration in this Sacramento suburb. The efforts are also part of a larger paradigm shift for public works initiatives that now incorporate an environmental standpoint. No longer do crews just throw down rocks and concrete.

"The concept is nature does a better job than man when you're talking about a creek," Dietrich says.

Walking through the Linda Creek greenbelt on a warm January afternoon, Wilson stops to read a sign noting the area as an open space/wildlife preserve. The city is developing plans for a \$10 million paved bike trail to cut through this land — yet another threat to her beloved creek that Wilson's actively fought. The retired real estate sector employee's volunteer work with Friends of Linda Creek constitutes a 40-hour workweek. Wilson walks to a spot at the bank from where she spots Dietrich standing knee-deep in the creek. "Look at him in the water," Wilson says, smiling. "He's just a happy kid out here."

The willow fence acts as a retaining wall, holding back loose soil and debris from falling into the creek

Last October, some 30 people had come together to plant deer grass, blue elderberry, coyote brush, black rush, white alder, Oregon ash, oak, and willow trees as part of the grassroots-generated effort to restabilize stretches of bank. But vandalism and high water flows weakened the support that had been established by the plantings. Dietrich is now replanting willow in the sandbars — there's a lot of sand down there — to stabilize the area.

Salmon run in Linda Creek and members of the Indigenous Maidu tribe lived alongside this waterway about 10,000 years. Raccoons, wild turkeys, skunks, frogs, turtles, and river otters now make their home here, along with dozens of people whose houses butt up against the creek bank. But as with several other creeks that run through this city, improper management of the waterway has led to people living next to it losing property to erosion, oak trees falling into the water and paved bike trails getting inundated.

If city officials understood how creeks work — they like to meander — trails would never have been built in those vulnerable areas, Dietrich says.

In the 25 years that Wilson has been living by Linda creek, the bank has worn down an estimated 15 feet. Wilson had met Dietrich during a bird-watching walk three years ago and convinced the city engineer to walk over to the bank behind her house and see the erosion.

Wilson wanted to know how to effectively address the increasing erosion problem, so Dietrich read a lot of technical engineering, attended a couple workshops, and met with a guy in another part of the city who has been using this technique for 20 years in his business. There aren't a lot of people like that after in the Golden State; the US East Coast and Europe are much further ahead. "It's not an exact science," Dietrich says. "It gets better at." And he wanted to try.

Wilson and the city weren't agreeable and he had to reassure them that the method would be effective and low risk. "They try to control the creek," Dietrich says. "That's just how it's been

cal engineering] is working more with the creek and not trying to fight it so much naturally dissipate? Let's work with that."

to meander, but in urban settings we try to channelize or control the direction and channelizing the creek decreases the slope of the banks and increases the water's flow instability within the creek channel and eventually create pockets of significant erosion. This threatens a creek's ecosystem and adjacent infrastructure.

When erosion was done with hard, inert structures such as rock or gabion walls — traditional tactics known to fail easily and require regular maintenance. "Bioengineering approaches have come to the forefront recently because of its ability to use natural plants to help stabilize areas without sacrificing many environmental benefits that old hard engineering

A bioengineering project was built by volunteers in 2011. It was a woven willow fence along the bank behind Wilson's property that acts as a retaining wall.

In a nearby park along another 200 feet of the bank. Once the plants take root they will be in place and restore the riparian habitat. Each year, the stakes will grow stronger. This approach is less expensive than conventional methods — Dietrich estimates it cost about \$12,000. Plus, a priceless benefit: The approach relies on the local community members who, in turn, feel more personally invested in protecting the natural

"I'd see the creeks and the birds and the fish, and I always wanted to use my background to protect some of these natural resources that we have," Dietrich says. "More than anything, I think it's a different way for us to look at creeks and building around them."

Last October, volunteers planted native trees and grass to stabilize an eroding creek bank. They plan to do more of these projects this spring.

The city of Roseville had to get approval for its biotechnical engineering projects from the California Department of Fish and Game in the form of a memorandum of understanding. A permit wasn't required as is needed for hard engineering measures such as rock and gabion walls, which can often lead to more environmental problems. The bureaucratic ease of biotechnical engineering projects is one more reason people are turning to this method, says John Williams, an ecologist who has worked in the field for 19 years, primarily in northern California.

A "lifelong native plant guy," as he calls himself, Williams co-runs EcoUrban Designs Inc., a firm that conducts stream bank stabilization work, erosion control, soil development, and lawn conversion to edible landscapes. He does some public work projects, but most of his clients are private landowners and ranchers. While some people use the term bioengineering, Williams prefers biotechnical engineer because it doesn't carry the negative association of bioengineered food and animals.

Biotechnical engineering is an ancient technique, he says, used by the Chinese and Julius Cesar's Roman empire. It's still used in Nepal where people build living bridges across creeks. Most Indigenous people are familiar with this technique, Williams says, and while the method isn't new, innovative biodegradable products that help in the stabilization process are.

Williams is currently working with a Boy Scouts troop on a biotechnical engineering stream bank project in the city of Lincoln — down the road from Roseville. While rock and concrete have an end life,

sustainable methods become more successful as time passes, he says. Year after year, plants and trees grow, getting stronger over time.

“I like to think the work I’m doing has influence and impact beyond my own lifetime,” Williams says. “You don’t need a giant budget, big heavy equipment, just the involvement of community groups. The lifespan is really what does it for me — that this (work) will last for hundreds and thousands of years.”

Sena Christian

Sena Christian is a newspaper reporter in California, but enjoys writing about social justice and sustainability for magazines in her free time. She is an avid soccer player and recently planted her first vegetable garden.



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