

Swanson Hydrology and Geomorphology

Customer Success Story

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“Using Autodesk’s civil engineering software, we can test a lot of things and get answers quickly. A client can ask for changes, and we can get a quick turnaround to see how things will work. On the Napa River, we were fine-tuning the flood wall and grading elements, constantly changing them. The software would automatically redo the calculations and spit out the new cost estimates. It’s really slick.”

Mitch Swanson
President
Swanson Hydrology and Geomorphology

A River Runs Through It — Again

Firm uses Autodesk’s civil engineering software to restore a sustainable ecosystem

When Huckleberry Finn and his friend Jim, the runaway slave, rafted down the wide Mississippi River, the banks teemed with vegetation, wildlife, and colorful characters. Imagine their journey today along any of the hundreds of rivers, streams, and creeks whose twisting curves have been straightened and routed through concrete channels. Would Mark Twain’s tale have gripped our collective imagination in the same way? Maybe not.

Across the country, countless miles of waterways have been tamed into channels to control floods, irrigate dry lands, and generate electricity. Despite the benefits these engineering marvels deliver, concrete waterways aren’t always the perfect answer. Lacking the vegetation found in a natural ecosystem, channels can fill with sediment or erode, making them costly to maintain and unable to transport water.

If a channel or levee system isn’t working, returning the site to a more natural state can help achieve the objectives of flood control or irrigation. Remediation projects have grown more common as older channels failed and protections for wildlife habitat increased in the last decades.

In the early days of remediation, biologists knew how a restored creek should function, but they lacked the engineering savvy and heavy equipment needed to design and build a working waterway. Civil engineers are masters of construction, but they were frustrated by nature’s preference for meandering routes and wiggly lines. Biology and engineering expertise are both essential to devise a sustainable ecosystem that can carry water, protect against flood damage, and allow native vegetation and wildlife to flourish, but the practitioners had little in common.

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Prior to restoration, the Trout Creek channel showed excessive width and depth, a flat and sandy bed, and poor habitat quality.

Mitch Swanson waded into this gap more than 20 years ago, and has a thriving practice today. A stream scientist trained in fluvial geomorphology—the study of land forms created by flowing water—Swanson relies on biologists, hydrologists, and ecologists to help him assess and predict what nature needs on a remediation project. He enlists the talents of civil engineers to run the calculations and figure out how to build new land forms good enough to entice steelhead trout and salmon back to a stream.

Swanson Hydrology and Geomorphology is a small firm but has enough expertise to manage almost every aspect of complex restoration projects. The firm starts by making land surveys and topographic maps with Autodesk Land Desktop to inform its conceptual design, then uses AutoCAD to develop a 3D plan for the grading, irrigation, and revegetation necessary to restore habitat. Engineers analyze water velocities and calculate expected runoff, then run simulations in a flood control application to test the design. The results come back in AutoCAD, permitting rapid changes if required. “We use Autodesk tools from beginning to end,” says Matt Weld, Principal Engineer.

The sophisticated software is critical to their success. “We can test a lot of things and get answers quickly,” Swanson explains. “A client can ask for changes, and we can get a quick turnaround to see how things will work. On the Napa River, we were fine-tuning the flood wall and grading elements, constantly changing

them. The software would automatically redo the calculations and spit out the new cost estimates,” he adds. “It’s really slick.”

Once a design is final, engineers use Autodesk Civil 3D to create the detailed construction plans. The 3D views also ease the anxiety stakeholders often feel about a remediation. Swanson calls it “geopsychology,” and spends significant time mediating between the multiple interests involved in every project. He’s found that information is the key to getting people to agree. “Some people have trouble imagining what a project is going to look like. Seeing the plans in 3D really helps,” he says. “When people see what’s going to happen, their defenses come down. Once they feel involved, they can look at the big picture,” he notes.

And once the restoration project is complete, “People are inspired when they see it in the ground,” Swanson says. “Sometimes even I can’t believe that people built the thing,” he admits. Asked about his favorite project, he quickly names Trout Creek, a habitat restoration effort in the Tahoe Basin, where the task was to restore the land to a time “before cows, before people.” Swanson’s voice reflects his love of the work. “Now it’s pristine. It’s paradise,” he says with pride.

To learn more about how Autodesk Civil 3D is helping organizations around the world visualize civil engineering projects and complete tasks faster, visit www.autodesk.com/civil3d.



After restoration, Trout Creek easily accommodates snowmelt from mountains surrounding the Tahoe Basin.

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