Scientists forge unprecedented common ground in river classification

March 16 2016, by Mary-Ann Muffoletto

Utah State University alum Alan Kasprak, postdoctoral research geologist with the U.S. Geological Survey, holds a trout on the Middle Fork John Day River in Oregon, USA. Kasprak is co-lead author on a March 16, 2016, paper in PLOS ONE describing the first watershed-scale comparison of four major stream classification frameworks. Credit: Utah State University.

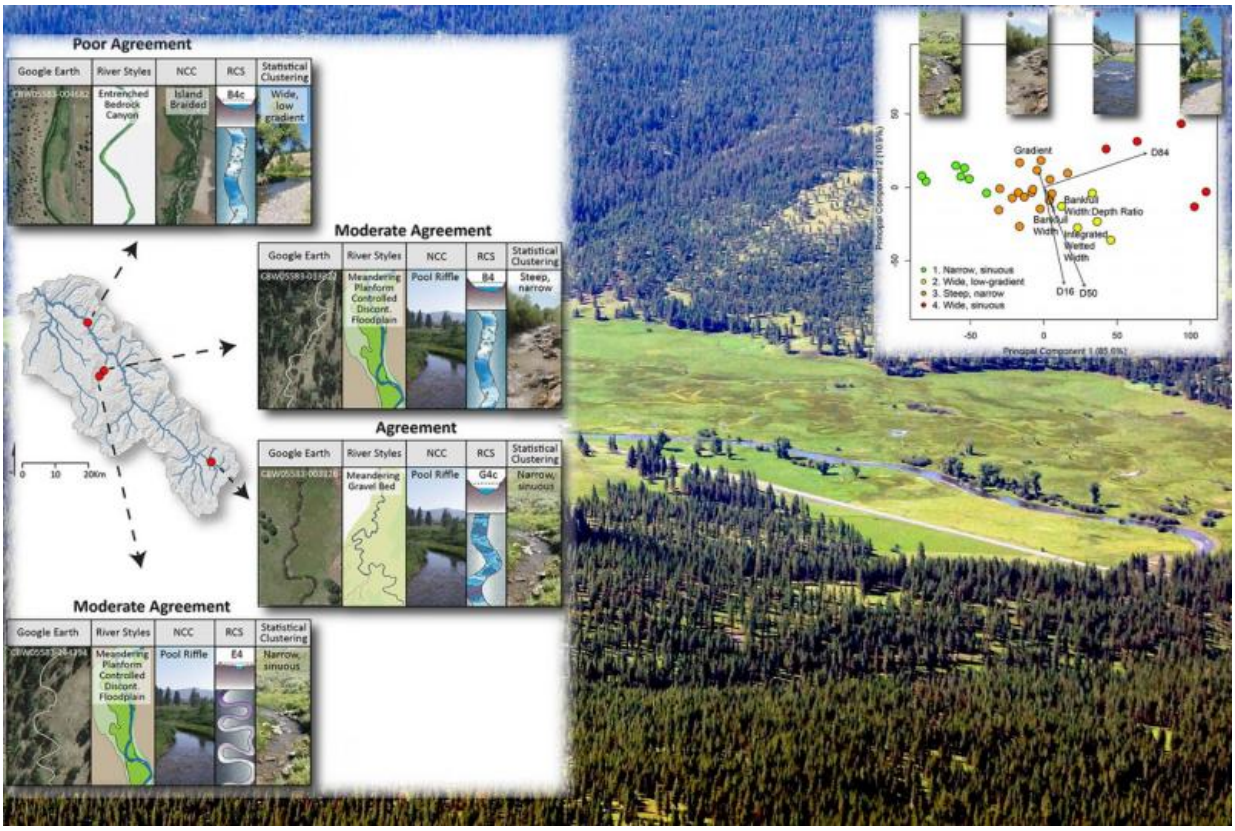
How do you describe a river? By its shape? By how much water flows through it? By the plants and animals that live in and around it?

For years, scientists have employed varied classification systems to distill complex geomorphic, hydrologic, and ecological information about rivers into simple descriptions of their channels and floodplains. The utility of these classification systems, frequently used to assess stream health and to manage and restore rivers, is hotly contested among river scientists. That's because these approaches often rely on simple measurements of a river's shape to infer the processes, like sediment transport and bank erosion, that happen within the watershed. Despite this debate, direct comparisons between frameworks are exceedingly rare.

For the first time, Utah State University scientists and research partners compared four popular stream classification frameworks at the watershed scale and demonstrated significant common ground among the divergent approaches. Their findings appear in the article, "The Blurred Line Between Form and Process: A Comparison of Stream Channel Classification Frameworks," in the March 16, 2016, online edition of *PLOS ONE*.

The researchers undertook the endeavor as part of a short course led by the USU-based Intermountain Center for River Rehabilitation and Restoration.

"We realized, for all the debate about which classification framework is 'best,' the scientific community lacked a clear understanding of just how often the approaches agreed or disagreed, and what the reasons for this might be," says USU alum Alan Kasprak, postdoctoral research geologist with the U.S. Geological Survey in Flagstaff, Ariz. and co-lead author on the paper.



Utah State University river scientists and colleagues from the U.S. Geological Survey and other universities compared four popular stream classification networks at the watershed scale for the first time, and demonstrated significant common ground among the divergent approaches. Their findings appear in *PLOS ONE* March 16, 2016. Credit: Utah State University.

Kasprak, USU scientists Nate Hough-Snee, Reid Camp, Martha Jensen, Joe Wheaton and Nick Bouwes, as well as Gary Brierley of the University of Auckland, Kirstie Fryirs of Macquarie University, Dave Rosgen of Wildland Hydrology, and Tim Beechie and Hiroo Imaki of the National Oceanic and Atmospheric Administration, applied the River Styles Framework, the Rosgen Classification System and Natural Channel Classification, along with a form of statistical classification, within Oregon's Middle Fork John Day River Basin.

"Our study site is an intensively monitored watershed in the United States' Pacific Northwest," says Hough-Snee, doctoral student in USU's Department of Watershed Sciences and the USU Ecology Center, EPA STAR Fellow and co-lead author of the paper. "Across the watershed, the classifications' outputs were in agreement 80 percent of the time."

According to Hough-Snee and Kaprak, these classifications, often pitted against each other for their trade-offs in data requirements, user expertise and the time and costs required to undertake a given classification, show complementary groups of stream types across frameworks.

"As a river research community, we've used different terminology to characterize streams that look the same," Hough-Snee says. "The processes that lead to these sets of forms are often very similar, so we should emphasize these similarities, rather than dwelling on subtle, semantic differences in what we call a given stream."

Utah State University doctoral student Nate Hough-Snee is co-lead author on a March 16, 2016, paper in PLOS ONE describing the first watershed-scale comparison of four major stream classification frameworks. Credit: Mary-Ann Muffoletto, Utah State University.

The research findings will help land managers, researchers and stream restoration practitioners understand where and why each method is similar or different, he says.

"We hope this comparison will aid in selection of appropriate methods that provide maximum accuracy, efficiency and cost-effectiveness, when designing stream restoration and undertaking habitat condition assessments," Hough-Snee says. "These condition assessments may

include the rapid identification of high-quality fish habitat or allow managers to compare different watersheds that have historically been classified under different approaches.

More information: "*"The Blurred Line Between Form and Process: A Comparison of Stream Channel Classification Frameworks,"* , *PLOS ONE,* 16 March 2016, dx.plos.org/10.1371/journal.pone.0150293

Provided by Utah State University