Multi-layered, interdisciplinary mapping of a wilderness watershed: The "Big Onion Project"

Project leaders:
*Colden Baxter (**Idaho State University**), Christian Torgersen (**USGS/U. Washington**), Kate Dwire (**US Forest Service**), Joe Ebersole (**US Environmental Protection Agency**), Jen Pierce (**Boise State University**), Joe Giersch (**National Park Service**), Jeremy Monroe (**Freshwaters Illustrated**), and Jim and Holly Akenson (**Taylor Ranch Wilderness Field Station, University Idaho**).*

The "**Big Onion**" is a multi-layered, interdisciplinary mapping project focused on the Big Creek watershed in the Frank Church-River of No Return Wilderness Area. This watershed has been the site for numerous ecological studies, including several important long-term monitoring efforts. Many of these studies have been limited in their spatial scope, though (as in the case of the monitoring programs) they may be quite extensive in temporal scope. As in most ecological investigations, past research in this watershed has largely focused on single species, a specific habitat, or a limited set of relationships.

Two of the principal goals of "The Big Onion" are: a) to generate a more spatially continuous biophysical perspective of the watershed that will provide improved context for interpreting results of site-based studies and data from monitoring, and b) to bring together a multi-disciplinary team to identify potentially important patterns within and among "layers"—information that will set the stage for ecosystem-level integration and research in this wilderness watershed. Because many observations are shared in "real-time," this approach also provides a way to quickly juxtapose perceptions from multiple disciplines and generate ideas that may lead to future integrative research.

Figure 1. The Big Onion Crew, summer 2005.

AUGUST 2005

During late July and early August 2005, the crew (Figures 1, 2) mapped the lower ~25 km along the axis of Big Creek, beginning at the confluence with the Middle Fork of the Salmon River and moving as a group upriver—"Lewis and Clark style." The team included graduate and undergraduate students from Taylor Ranch Field Station. We focused on mapping aquatic biota (fish, amphibians, invertebrates, algae), riparian and hill-slope vegetation (including extent and intensity of recent wildfires and distribution of large wood jams in the river), channel and hill-slope geomorphology (including pool and riffle dimensions and streambed materials), and also made use of a recently completed, detailed geologic map of the area. In addition, we made numerous natural history notes and collected more limited data on the distribution of bats and spiders—groups of organisms that may play important roles in linking aquatic and terrestrial habitats.

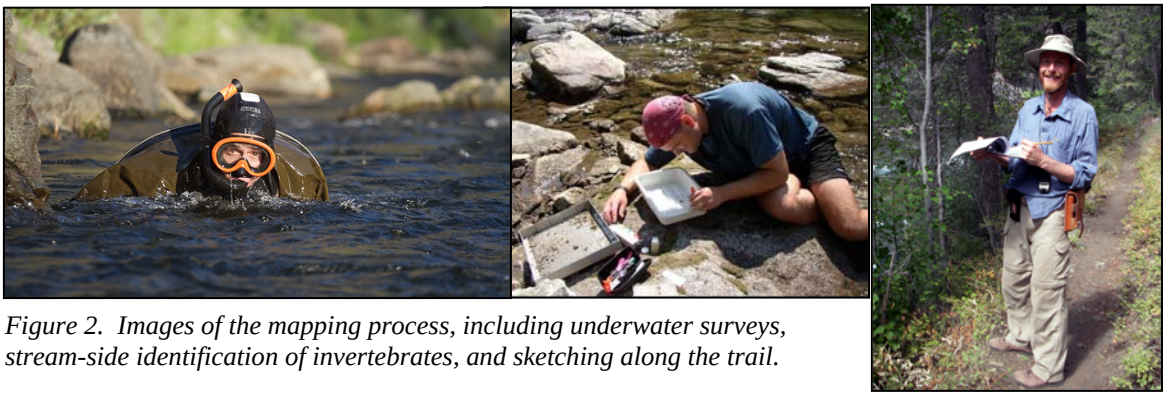

Figure 2. Images of the mapping process, including underwater surveys, stream-side identification of invertebrates, and sketching along the trail.

AUGUST 2006

During the same time period in summer 2006, the Big Onion crew (Figure 3) continued our efforts, extending the maps both spatially and in terms of the number of "layers." Picking up where we left off in summer 2005, we continued to map upstream another ~25 km to the Big Creek landing field. This year's mapping crew included graduate and undergraduate students of biology from Idaho State University and the University of Idaho, as well as geology students from Boise State University.

Figure 3. The Big Onion Crew, summer 2006 (photo by Ethan Welty).

BRINGING TOGETHER THE "Layers of the Onion:

Following the field mapping efforts of the last two summers, project leaders have begun **bringing together the layers of the Onion for analysis**. These data are being assembled in a geographical information system (GIS) database for the Big Creek drainage. This database will not only provide the framework for analyzing patterns within and between map layers, it will also serve as a map-based archive for data from past and future studies in the area. Field maps of vegetation and geomorphic surfaces (e.g., Figure 4) are presently being digitized and integrated into the GIS.

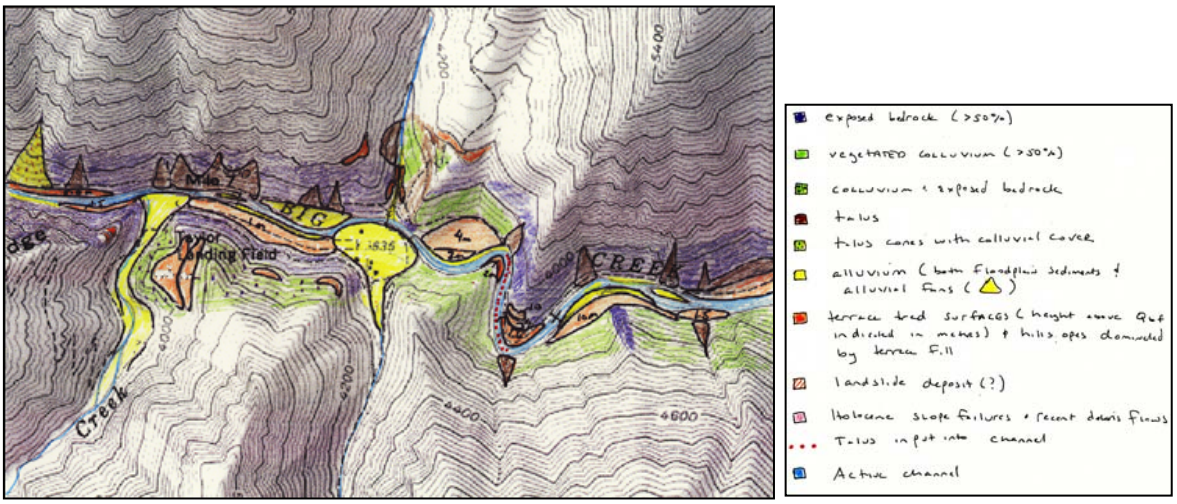

Figure 4. A field map of different geomorphic surfaces (see legend for key to colors) in the vicinity of Taylor Ranch Field Station. Map drawn by Jen Pierce, geomorphologist from Boise State University.

Once in the GIS, data from the maps can be analyzed a number of ways. For example, graphical analysis can be accomplished by plotting data along the upstream-downstream profile of the river, as is being done for fish and invertebrate species (e.g., Figures 5, 6).

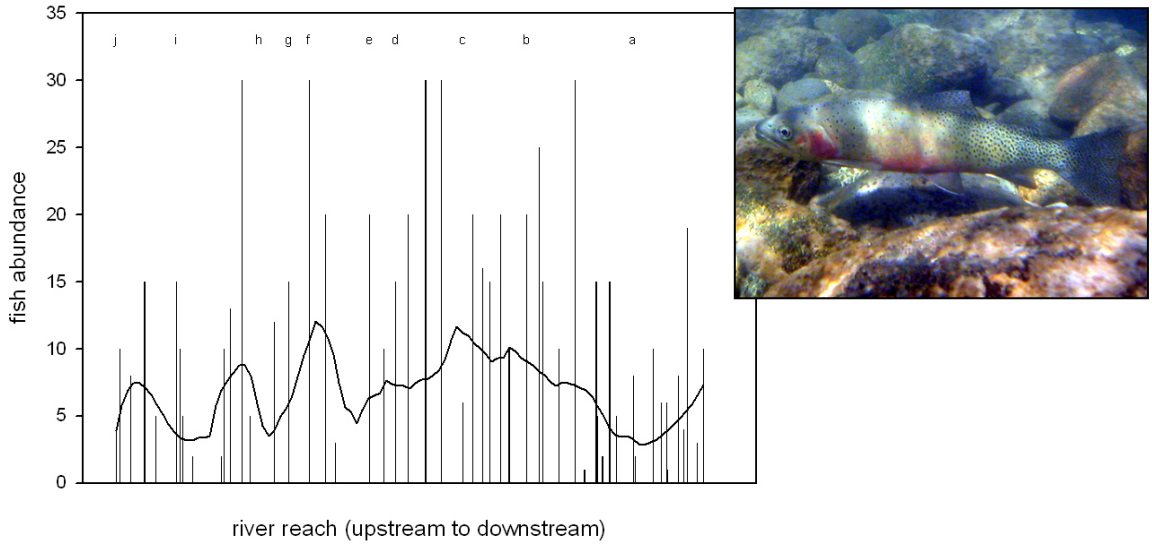

Figure 5. Adult cutthroat trout abundance in the lower 25 km of Big Creek (letters j-a delineate river reaches, from upstream to downstream). Vertical lines are observed fish abundance, and trend lines were created by a smoothing analysis of fish survey data. Created by Christian Torgersen, landscape ecologist with the USGS and University of Washington. Photo by Jeremy Monroe, Freshwaters Illustrated.

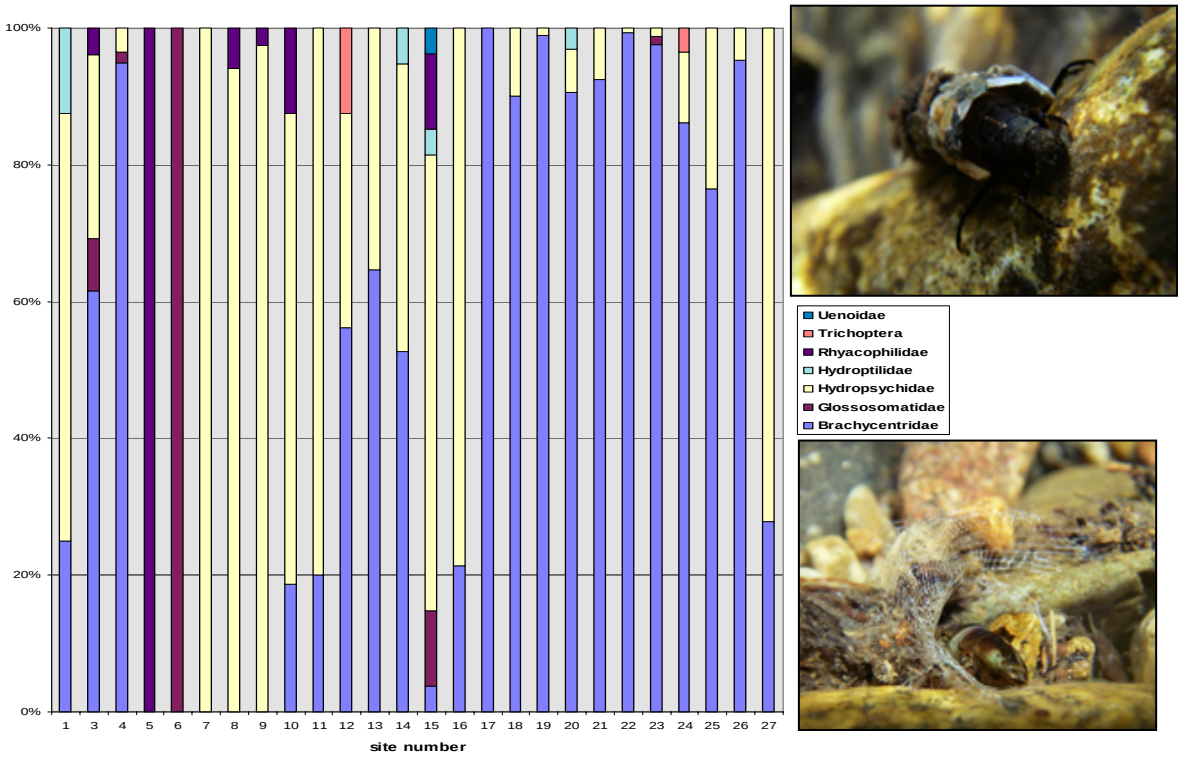

Figure 6. Relative abundance of different families of larval caddisflies (Trichoptera) found in the lower 30 km of Big Creek (site numbers increase from downstream to upstream). Created by aquatic entomologist Joe Giersch. Underwater photos of caddisflies by ISU stream ecologist Colden Baxter.

FUTURE DIRECTIONS

Future directions for the Big Onion include the addition of new layers and involvement of additional collaborators. For example, we intend to incorporate maps of amphibian and reptile distribution generated by Chuck Peterson, ISU herpetologist, as well as information on birds from surveys begun by UI ornithologists Kerri Veirling and Mazeika Sullivan. In addition, with assistance from Taylor Ranch directors Jim and Holly Akenson we hope to integrate into the GIS existing distributional data on ungulate grazers (e.g., deer, elk, sheep) as well as mammalian predators (e.g., cougar, wolves, bears) in the basin. Finally, the watershed has a long and colorful history of human habitation and has been the location for numerous archaeological studies through the years. We are collaborating with USFS archaeologist Larry Kingsbury, who is providing maps of these cultural sites. We anticipate our mapping efforts will complement existing research in this area, and will lead to new directions for integrated ecosystem studies—particularly with respect to investigating important linkages between water and land.

Coordinator:
Colden Baxter, Assistant Professor, Stream Ecology Center
Department of Biological Sciences, Idaho State University, Pocatello, Idaho 83209