River Beads as a Conceptual Framework for Building Resilience into River Management

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River beads refer to retention zones within a river network that typically occur within wider, lower gradient segments of the river valley. In lowland, floodplain rivers that have been channelized and leveed, beads can also be segments of the river in which engineering has not reduced lateral channel mobility and channel-floodplain connectivity. Decades of channel engineering and flow regulation have reduced the spatial heterogeneity and associated ecosystem functions of beads occurring throughout river networks from headwaters to large, lowland rivers. I discuss the processes that create and maintain spatial heterogeneity within river beads, including examples of beads along mountain streams of the Southern Rockies in which large wood and beaver dams are primary drivers of heterogeneity. I illustrate how spatial heterogeneity of channels and floodplains within beads facilitates storage of organic carbon; retention of water, solutes, sediment, and particulate organic matter; nutrient uptake; biomass and biodiversity; and resilience to disturbance. I conclude by discussing the implications of river beads for understanding solute and particulate organic matter dynamics within river networks and the implications for river management. I also highlight gaps in current understanding of river form and function related to river beads. River beads provide an example of how geomorphic understanding of river corridor form and process can be used to restore retention and resilience within human-altered river networks.

Biography

Ellen Wohl received a BS in geology from Arizona State University and a PhD in geosciences from the University of Arizona before joining the faculty at Colorado State University in 1989. Her research focuses on physical process and form in river corridors, including interactions with biotic and human communities. Her research is predominantly field-oriented and she has conducted field research on every continent but Antarctica.

She has written more than 200 scientific papers and book chapters, as well as 16 books, and is a Fellow of the American Geophysical Union and the Geological Society of America and a Colorado State University Distinguished Professor. Much of her current research examines how physical complexity associated with the presence of instream wood and beaver dams influences the form and function of river ecosystems.