Riverscape Restoration Network Presents on April 11, 2024:

A Most Excellent River Science Research Journey

with Dr. Ellen Wohl & Dr. Juli Scamardo

Papers that will be reviewed during the presentation:

2015

- The Science & Practice of River Restoration – Wohl, Lane & Wilcox - seminal paper covering the arch/evolution of stream restoration approaches.

2019

- Saving the Dammed – Why We Need Beaver-Modified Ecosystems – Wohl's book devoted to highlighting many years of research on why beaver are so critical to river health in our upper watersheds.
- The Natural Wood Regime in Rivers – Wohl, Kramer, Ruiz-Villanueva, & Daniel Scott – explains so clearly what is the natural wood regime in river corridors and why it's so important to maintaining natural river processes and health.

2021

- Estimating Widespread beaver dam loss: Habitat decline and surface storage loss at a regional scale – Scamardo, Marshall & Wohl – applying BRAT to all of Colorado to provide important data on how much we've lost when beaver populations were decimated by 1800s trapping, but also how much there is room in our upper watersheds for them to return to do all their amazing work of creating and maintaining biodiverse habitats and improving the resilience of riverscapes to drought, fires, and flooding.
- Restoring Lost River-Wetland Corridors – Wohl, Castro, Cluer, Merritts, Powers, Staab & Thorne - Eloquent explanation of what river-wetland corridors used to look like across the US and what they could be again. This is the paper you need to borrow from when you're trying to explain to different audiences that rivers are so much more than just the channel: "*We define a river-wetland corridor as a relatively wide valley floor within which there is space for persistent alluvial deposits and sufficient connectivity between surface and subsurface hydrology to create and maintain an interacting system of channels, wetlands, and floodplain ponds and lakes. This corridor always includes within it the active channel(s), geomorphic floodplain, underlying hyporheic aquifer, and associated riverine wetlands. The corridor may occupy the entirety of an alluvial valley floor, or its extent may be limited naturally (e.g., by river terraces) or anthropogenically (e.g., by levees).*"

2022

- Natural infrastructure in dryland streams (NIDS) can establish regenerative wetland sinks that reverse desertification and strengthen climate resilience – Norman, Lal, Wohl, Fairfax, Gellis, & Pollock – This paper introduced a new term, natural infrastructure in dryland streams (NIDS), which encompasses both naturally occurring structures (log jams, beaver dams, geologic features) and human-made flow speed bumps (e.g., BDAs, PALS, LWD, RDS) that "all affect streamflow hydraulics and sedimentation and can enhance riparian plant establishment." This paper is a comprehensive review of

published studies on the effect of NIDS and includes charts that summarize the many ecological and ecosystem services of NIDS.

- Biogeomorphic influences on river corridor resilience to wildfire disturbances in a mountain stream of the Southern Rockies, USA Wohl, Marshall, Scamardo, White & Morrison – This paper documents a study of a 9.4km Colorado stream reach, of which most of the upper 8km along with most of the watershed, burned in the 2020 Cameron Peak fire. The authors focused on the role of channel-spanning logjams in attenuating post-fire sediment fluxes and concluded: "*More spatially heterogeneous portions of the river corridor appear to be disproportionately important in attenuating enhanced inputs of sediment following wildfire, and the cumulative effect of this attenuation across a river network likely enhances watershed-scale resilience to wildfire disturbance.*"

2023

- Levees don't protect, they disconnect: A critical review of how artificial levees impact floodplain functions – Knox, Wohl & Morrison – An extensive review of the negative impacts of artificial levees on rivers (loss of multiple floodplain functions) and the restoration case studies in North America and Europe on the effects of fully or partially removing or setting back levees on large lowland alluvial rivers.

- Recognizing the ephemeral stream floodplain: Identification and importance of flood zones in drylands – Scamardo & Wohl – The authors review the literature on dryland ephemeral stream floodplains in order to identify: (1) common definitions and styles; (2) unique hydrologic, geomorphic and biotic functions separate from uplands or channels; (3) current and future anthropogenic and natural stressors to such functions; and (4) knowledge gaps regarding research on ephemeral stream floodplains. "*The temporary storage of sediment and subsurface water in ephemeral stream floodplains makes them disproportionately important for biogeochemical cycling and hosts to richer, denser and more diverse vegetation communities compared with surrounding uplands.*"

2024

- Interpreting floodplain heterogeneity: Using field data to understand unsupervised floodplain classifications – Iskin & Wohl – The authors explain that higher heterogeneity of floodplain form aspects, such as topography, wood distribution, vegetation, water features) equates to higher floodplain functions compared to homogenized floodplains altered by dams, levees, development etc. "*Consequently, quantification of floodplain heterogeneity is needed to understand patterns of spatial heterogeneity on diverse floodplains and to inform floodplain restoration. We use a novel approach of spatially connecting field and remotely sensed data in order to interpret the output of, and build upon, a previous unsupervised classification workflow.*"
- Geomorphic Context in Process-based River Restoration – Wohl, Iskin, Dunn, Rathburn, Scamardo et al – The authors discuss how "*process-based restoration can fail to produce the desired results if geomorphic context is not effectively incorporated into restoration design. An understanding of geomorphic context can be used to select a restoration approach*." Geomorphic context of a river reach refers to the controls on contemporary river form and process. Controls at the catchment- to reach-scale include geologic history, biophysical characteristics, legacies of past human alterations, position within the river network, river corridor geometry, base level stability, disturbance regime, and contemporary human alterations of the river corridor.