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Supporting Geomorphic Processes Across the Riverscape in Stream Restoration Design

An Introduction to Using Wood in Rural and Urban Stream Restoration Projects

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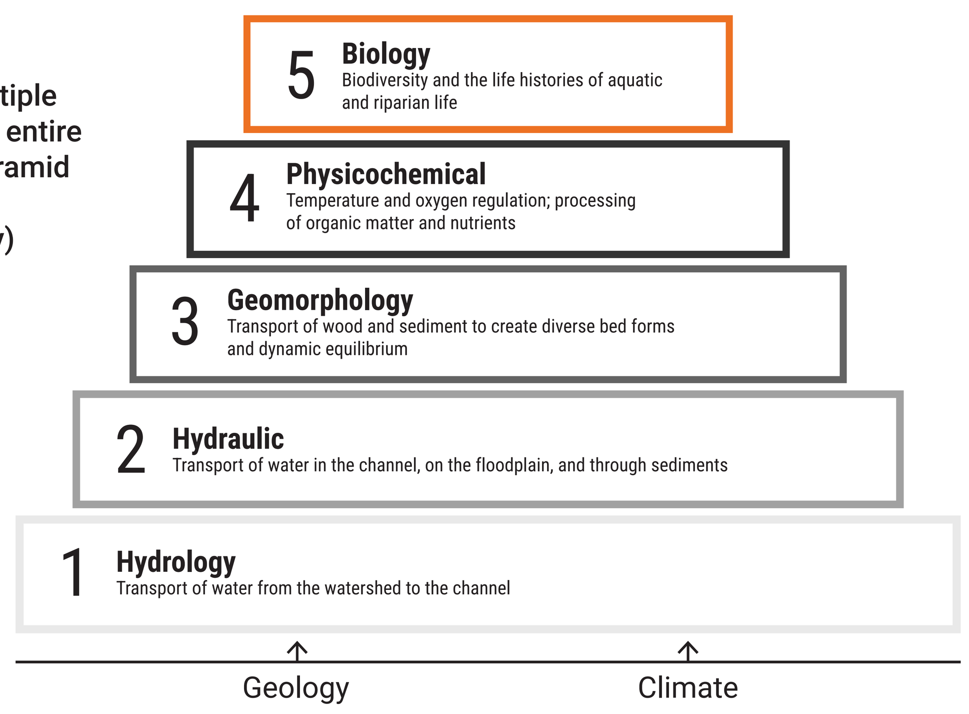
Introduction:

Best practices in stream restoration call for the practitioner to work with natural geomorphic processes to design channels that maximize function and support ecological services across the riverscape. Armed with guidance from multiple restoration schools of thought, the designer has several options at their disposal to craft designs that satisfy the project's goals and objectives. Among the decisions the designer must consider is the application and extent of using wood throughout the project. In the early 2000s when stream restoration was still in its infancy as a widespread practice, many designers shied away from using wood in favor of rock due to the perceived lack of stability associated with wood as a structural element. Fortunately, the paradigm of stream restoration is shifting from stability as a singular goal to an approach that incorporates riverine processes and recognizes the important role wood plays across for improving and/or restoring in- and near-channel ecological services. Presented here are the benefits of using wood in stream restoration projects; guidance for design of several applications of wood; and examples of several types of wood-centric stream restoration projects in both urban and rural settings.

Figure 1. **Wood provides multiple benefits across the entire stream function pyramid (based on Stream Mechanics imagery)**



Benefits of Wood in the Riverscape

Wood plays a critical role in driving or supporting geomorphic processes and functions across the riverscape. These processes and functions can be viewed through the lens of the Stream Functional Pyramid, developed by Stream Mechanics (Figure 1). Log jams and/or large wood pieces promote hydrologic functions by pulsing water onto floodplains, which supports in- and near-stream sediment and nutrient cycling. Wood supports hydraulic functions by diversifying flow regimes and promoting localized scour and deposition of sediment. From a geomorphic perspective, wood affects channel morphometry and can trigger channel migration and channel incision or aggradation. Water chemistry and physical attributes are also affected by wood and its decay. Wood supports biological functions by providing physical habitat directly to invertebrate organisms and cover/rearing habitat to fish and other fauna.

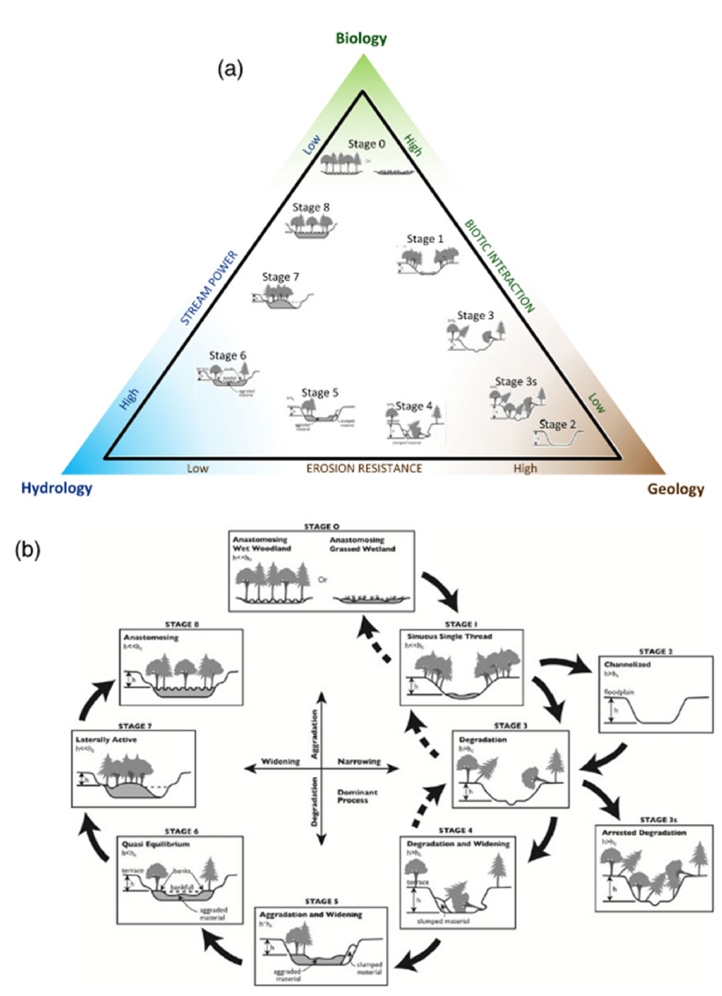


Figure 2. **Castro and Thorne (2018) published the stream evolution triangle integrating geology, hydrology, and biology into a singular graphic depicting the interrelationship among these three cornerstones of river processes. In many riverscape types, wood presence is a fundamental driver of how rivers respond to these relationships, particularly in how water and sediment move across the landscape.**

Project applications: (Top) Waynesboro Stream Restoration, Waynesboro, Virginia (Left) Fanno Creek at Bonita Road, Durham, Oregon (Middle) Gales Creek Bank Stabilization, Forest Grove, Oregon (Right) Fanno Creek: Denny to Hall, Beaverton, Oregon

Is it OK to Use Wood in an Urban Setting?

Absolutely. The benefits listed above are equally applicable to urban streams. Wood structure types generally fall into one of two categories: anchored and unanchored. Unanchored structures carry with then the risk of dislodgement through floating or rolling/sliding. Consequences of wood transport can be unacceptable in urban settings due to their potential effects on infrastructure, stability, and/or adjacent properties. Anchoring wood can greatly reduce the risk of negative outcomes from large wood transport, thus often wood used in urban restoration projects is partially buried, anchored, and/or pinned. Buried wood can be installed below the waterline such that the wood remains saturated, thereby extending its service life. Root wads can be buried beneath reconstructed banks with the root fans extending into the channel to provide great fish habitat as well as slowing down water against the toe of the bank to reduce shear stress and the potential for bank toe erosion.

Available Resources

There are several published tools to assist stakeholders and practitioners in assessing the quantity of wood present on a site as well as producing designs for their construction. The best place to start is with the Large Wood Manual.

References

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