

Improving Public Safety of Large Wood Installations

Designing and installing safer large wood structures

Bottom Line

This scoping-level research project identified specific research gaps on safety issues and determined the best way to address these gaps to design and install safer large wood structures.

Better, Faster, Cheaper

Ensuring the safety of the public is paramount to Reclamation's efforts. Concerns over public safety and liability of large wood projects in Reclamation's restoration programs need to be addressed.

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Problem

Large wood installations are an important component of Reclamation's overall river restoration strategy. However, large wood structures can pose a public safety hazard to river recreational users such as boaters, swimmers, fisherman, and children. Installing large wood structures in rivers can produce what are known in the boating community as "strainers." Flow through or flow underneath the structure can pin boaters or swimmers against the structure or pull them under the water surface. Large wood structures also produce an attractive location for fishing, playing, and climbing.



A multilog large wood structure placed in the center of the Green River, a tributary of the Colorado River.

Design features such as structure porosity, structure orientation, log submergence, percent river obstruction, and use of cables and metal bars affect the safety of the structure. Large wood installations can become structurally unstable and fail, such that part or all of the structure moves downstream. Liability associated with large wood installations has become a widely discussed topic within the river restoration community.

While public safety is typically considered during the design process, there is a lack of cohesive information on this topic. A Large Wood Conference, "Technical Workshop on Large Wood Applications and Research Needs in River Restoration" hosted jointly by Reclamation and the U.S. Army Corps of Engineers in February 2012 identified the need for design criteria to improve the safety of structures as a high priority.

Solution

Researchers identified four major topics relating to safety issues of large wood structures:

1. Public Safety: Public safety involves the dangers of human interaction with the structure. People can be pinned against a wood structure by the force of approaching water, entrapped under or against the structure, or snagged on branches. American Whitewater's paddling accident database shows that wood is among the leading factors contributing to paddling deaths (see "More Information" on next page). Many factors to minimize this risk should be examined, including:

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- Porosity of the large wood structure
- Flow under the structure
- Orientation of wood
- Structure placement/percent of river obstruction
- Anchoring
- Visibility
- Ability to avoid structure
- Limiting access

2. Structural Stability: The loss of stability of large wood structures can cause damage at and downstream from the structure. This can become a hazard to life and property during large flood flows, or can lead to the loss of habitat enhancement goals at the site. One of the challenges of installing large wood structures is that they tend to not be static over time. Wood recruitment from natural or free floating logs in a river may alter an initially safe structure.

3. Liability: Liability associated with large wood structures has grown as a topic of discussion in recent years. Often, there are multiple agencies, funding sources, designers, installation contractors, landowners, and others involved in a project. A common question then is, “Who is responsible for accidents and damage related to large wood structures?”

4. Risk Analysis: A risk assessment approach would be valuable for large wood installations. This type of approach would help designers and project managers determine how to design and secure large wood structures and where to place installations to minimize risk based on potential consequences at the site.

Future Plans

Future research may focus on developing physical and numerical models and a guidance document. The research paths that would benefit the four major topics from a technical perspective are:

- Developing a risk assessment approach for large wood structure installations
- Developing a traffic engineering framework for identifying reaction time to avoid large wood structures
- Determining the best configuration of logs in a logjam structure for specific project goals
- Developing application methods of implementing smaller large wood structures, while minimizing risk and maximizing habitat benefits
- Creating a database of information on installed projects showing how installations change over time
- Researching safe ways to anchor large wood structures that do not require cable, chains, anchors, or other non-natural or non-degradable materials
- Providing design guidance to help understand how structures may fail so in the event of failure they are designed to fail as safely as possible
- Improving design elements for safer large wood structures such as porosity, flow through, and log orientation
- Assessing habitat performance of stable versus mobile wood

“Large wood structures are an important part of Reclamation’s overall river restoration strategy. It is our responsibility to ensure that they are designed and installed as safely as possible.”

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More Information

www.usbr.gov/research/projects/detail.cfm?id=8952

www.americanwhitewater.org/content/Accident/view