

Handout for members

GMNR 9/9/08

2008-B0191

River Safety Council

www.RiverSafetyCouncil.org

Proposed Safety Guidelines for the Construction and Placement of Large Woody Debris (LWD) Affecting Streams used for Recreation In Washington State

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With acknowledgement for content provided by
Recreational Canoeing Association of B.C., and
Whitewater Kayaking Association of B.C.

Large Woody Debris Guidelines

Introduction

The purpose of this document is to provide guidance for minimizing and mitigating the hazards created when Large Woody Debris and Large Woody Debris structures (hereafter referred to as LWD), for the enhancement of fish habitat, are constructed in rivers used by canoeists, kayakers, rafters, swimmers, anglers, innertubers or any other in-stream users.

The goals of this document are to:

- 1) Standardize a LWD planning process in which the agencies and organizations and other Proponents involved in the planning, design, approval, construction and maintenance of LWD solicit and include input from the recreational river user community.
- 2) Ensure that agencies and organizations involved in process of placing LWD inform themselves as to the appropriate location and construction of these structures by utilizing the river use community's experience to reduce the hazard posed by these structures.
- 3) Ensure that Proponents are held accountable for the installation process used for these structures; including, but not limited to the planning, design, approval, construction, monitoring, continued operational safety and repair or removal of damaged LWD structures.
- 4) Establish a protocol for communication between the Proponents of LWD and the river user community over the lifespan of LWD projects from conception throughout the life of the project.
- 5) Establish a set of guidelines, and a protocol for planning to be used by Proponents of LWD, which documents consideration of in-stream users when developing and maintaining LWD.

The recreational river user community frequents most of the Northwest creeks and rivers. The whitewater paddling sport is growing quickly worldwide, and every year the number of paddlers from across the country and around the world traveling to the Northwest to enjoy the richness and diversity of our river systems increases. The abundance of recreational use on waterways reflects the important social and economic values linked to river use.

Given that LWD and LWD structures have been adopted by a number of agencies for enhancing fish habitat, the paddling community wishes to contribute to the planning process in order to help minimize and mitigate the potential risk to in-stream users presented by LWD, and to work to eliminate poorly designed or poorly located structures. A legacy of poorly implemented structures is debris which can be extremely hazardous, ugly and very difficult to remove, sometimes accumulating in areas that are impossible to access with machinery. LWD structures can be a hazard not only at the time of placement, but may deteriorate into hazards in the future.

The potential value of installing in-stream LWD must be weighed not only on its costs and its likelihood of success for a limited set of initial proposal criteria, but also against its potential negative impacts on the navigability of the waterway, and the potential impacts to human life.

The paddling community views many of the manmade installations of LWD as unnatural; this is due to the location of the structures along the river course, the positioning of the structures relative to the local currents, the construction, and the materials used. There is a substantial difference between many of the manmade LWD structures, and the natural wood in streams. As such we believe that manmade structures must be treated as introduction of unnatural debris on waterways, and that the agencies responsible for their introduction should be accountable for the structures before, during and after installation.

Potential Hazards of LWD Structures to River Users

Historically, the single largest hazard to paddlers on streams or rivers nationwide is wood debris; in the form of logs (especially with branches), log jams, or root balls. Unlike boulders or other bedrock, wood tends to produce a serious threat to paddlers who are unfortunate enough to come in contact with it. This is well documented in paddling accident records and is one of the major causes of deaths in paddle sports.

Wood debris tends to perch above the riverbed such that there are opportunities for a person to be swept under it by the tremendous force of the water. Attempting to pull one's body up and on top of the debris is extremely difficult, and rarely possible, even in a weak current. Similarly, when wood debris consolidates into log jams, it creates sieves which allow water to pass through while straining and retaining objects underwater — potentially kayaks, canoes, paddlers, or swimmers (paddlers forced to exit from their boat, or inner tubers).

Either of the preceding scenarios results in extreme entrapment hazards in which a person may be pinned underwater by the force of the current, resulting in potential death due to drowning.

In whitewater safety training, wood debris is stressed as the greatest hazard that one is likely to encounter on most rivers. Given that this is a known and documented threat to human life, the paddling community has clear concerns regarding the intentional introduction of these structures on streams or rivers, particularly since LWD structures have a history of migration in the river, producing unpredictably changing hazards.

Proposed Process

1) Identify River Users

The Northwest is a popular destination for national and international whitewater paddlers. Therefore, it is important to consider the potential impacts of any LWD programs on the greater paddling community.

However, the largest amount of river usage is likely to be casual use by untrained and uninformed individuals, due in part as a result of population growth in areas outside traditional urban areas.

It is important to communicate and cooperate with the regional river user organizations, which represent the broad interests and needs of river users and who are trained to identify hazardous river conditions.

The Proponents of a LWD project need to identify which type of recreational activities are practiced on a proposed river. Contacting the organized paddling and recreational associations directly, or the River Safety Council, is one of the best ways to identify organized and some casual recreational river use. A survey of residents adjacent to the proposed river and local river rescue personnel should be used to identify casual use and problem areas.

Most recreational river organizations have designated coordinators or contacts, and regional representatives that will have information on key aspects of the use in the area such as:

- Who uses the river (expert or novice boaters, juveniles, swimmers or anglers, etc).
- What types of craft are used (typically kayaks, canoes, and rafts, but sometimes inner tubes, air mattresses and other flimsy flotation devices).
- Where the normal access points are located (referred to as put-ins and take-outs).
- When and why that river, or section of river, is used.
- How popular the river, or reach of river, in question is.

Being frequent travelers on rivers, the paddling community possesses experience-based information regarding water levels, bank stability, rock migration, natural debris accumulation, relative risks associated with different types of debris in various locations, fish habitat, and many other valuable observations that may be of assistance.

Whitewater or canoe tripping guidebooks and web sites may provide some limited information on river usage, but are frequently out of date and do not include many of the now popular runs or access points.

Guidebooks or web sites should not be used as anything other than a general indication of potential use, and most certainly should not be a substitute for dialogue with the local river user organizations.

2) Protocol for communication regarding potential LWD installations

If a LWD project is proposed on a navigable waterway that is used for recreation in the Northwest, the paddling community, through the regional associations, need to be notified and provided opportunity to participate in constructive dialogue regarding the location and construction of any LWD structures.

We believe consultation with recreational river users before placement of structures is critical. Following is a suggested process to follow:

A The River Safety Council will develop and maintain a contact list of recreational river user organizations in the State of Washington.

B. Proponents of organizations proposing to use LWD for fish habitat should at a minimum contact the River Safety Council regarding any known organized recreational river use in the river and the names of other paddle sport organizations in the area under consideration. Proponents should also make contact with fishing and other outdoor user groups that may use or know of use in the proposed river location.

C. The recreational river user associations contacted by the Proponents should inform the Proponents whether the river has a history of use by the recreational river community or has the potential to be used in the future.

D. If the river has been, or potentially will be used by the recreational river community, all potential ways of restoring habitat should be considered so as to determine whether, when weighed against potential risk to river users, if LWD structures are still a viable alternative for enhancing fish habitat.

E. The Proponents should create signage to clearly identify LWD sites in a manner that minimizes the chance of a river user being swept into danger. The Proponents should work with the river user associations to ensure the message clearly creates adequate awareness of the potential hazard and means to avoid the hazard. The signage must be clear to both the river recreation community and the surrounding neighborhoods of the presence of the structures and any dangers associated with them.

F. Proponents create and implement a communications plan to create general local awareness of the LWD and any dangers associated with them.

G. Proponents should create a monitoring plan to detect damage in a timely fashion and commit to a program for repair or removal of hazardous structures or components.

Location of Structures

Concern for human life and safety must be a primary concern in the selection, design and maintenance of LWD structures for fish habitat enhancements. Selection of LWD sites must not be based solely on ease of access, construction requirements, or thoughts related to fisheries issues, but also upon safety considerations and understanding of in-stream use.

The location, in a general sense, and in a more specific definition, should be done so as to minimize and mitigate the potential hazardous effects on river users.

1) General Location

In choosing the general location of the project, or a particular reach of river, the following factors regarding the recreational use of the river need to be considered:

- Popularity of the reach with in-stream river users.
- Is the run currently utilized by in-stream users, or might it become utilized in the future. (i.e. proximity to areas of current or anticipated urban growth)?
- The skill level of in-stream users who normally utilize the stretch of river.
- The presence of play features such as waves, or other features which might attract in-stream users.
- Are festivals, competitions or other events held on the stretch of river?
- Is it in proximity to other recreational amenities such as camping, parks or trails?

- Are there commercial operations (guiding, rafting, instruction, coaching, etc) which occur on the reach?
- Are there local businesses that rely on the river for sales or services?
- In the event of a structure failure with debris washing downstream, what is the character of the river downstream? Will debris be easily recoverable? Will it affect popular runs? Can it become a hazard in areas that are difficult to “scout”, such as in a canyon?

2) Surrounding Topography and Shoreline Character

The shoreline and surrounding topography of the structure locations can affect access and safety considerably. Consider the following factors:

- The structures should never be in or near a canyon or any area with difficult egress.
- River users should be able to easily and safely exit from their boats in an area of calm water (eddy) upstream of the structures, either to scout the structures or portage around them.
- Gentle shorelines with access from both sides allow for greater rescue and/or portaging options.
- Stability of exit points upstream of any structures is important at time of construction and in the future.
- Potential debris accumulation which might compound the effect of the structure on in-stream users should be considered when choosing locations.

3) River Character

It is critical that the character of the river be evaluated at all water levels. With changing flows, features often change dramatically, disappear, or new features may appear creating hazards. Consider the following:

- Is the riverbed and bank stable?
- Does the channel shift course regularly?
- Gradient directly affects current speed and the ability of a river user or swimmer to reach safety. Narrow channels accelerate flows and increase the difficulty for swimmers or paddlers.

The flow regime of the stream will also contribute to the potential effects on river users. Consider factors such as:

- Seasonal flow variations
- Dam control, and releases
- Moderation of upstream lakes
- Possible winter flooding issues
- Normal water levels for paddling use

4) In-stream site-specific locations

Thoughtful placement of the LWD structure can greatly reduce the risk to the river user as well as the long-term durability of the structure. Consider the following:

- Choosing locations where river users are less likely to be swept in the event of an upset or a swimmer in the water. In general, better locations are the inside of corners, in areas with easier rapids or calmer areas upstream.

- Locating structures on a straight stretch of river outside of the main current is the safest option.
- When a river curves around a bend, the current is forced to the outside of the bend, often with greater force and velocity. Locating LWD on the outside of a bend places it where boats, swimmers, and debris are naturally directed so fighting the current would be required by either boaters or swimmers to avoid the structure.
- Placing LWD structures below steep or significant rapids should be avoided because of the greater likelihood of a boater exiting their boat and being swept downstream into the structure.
- Considering long-term durability, the outside of a bend is generally an unsuitable place for LWD because of the tremendous forces any LWD structure in such a location would be subjected to during moderate and high water events. Impact of floating debris and collection of other debris onto the structure will add to and magnify the forces involved as well as increasing the danger posed for in-stream users.
- Potential LWD sites must be assessed across the range of expected water levels to determine whether river users have adequate line of sight when approaching the structure to ensure ample opportunity for avoidance.

Construction of Structures

The following identifies key safety concerns which in-stream users know through experience produce hazardous conditions when they are present, either naturally, or otherwise. In general these conditions are associated with life threatening circumstances of a paddler (in a boat or on a raft) or a swimmer in the water experiencing difficulties such as entrapment, pinning, and broaching, which are not usually resolved without outside rescue assistance. Removing these conditions leads to less hazardous situations for river users. These hazardous conditions include:

- 1) Undercuts on the upstream faces of any structures. Undercuts promote submersion of any object floating in the water, including boats or people, should they come in contact with the undercut object.
- 2) Rough, sharp or porous upstream faces increase the likelihood of entrapment, pinning, or sieving of objects which come into contact with the face. Spaces or gaps in the upstream surface of a structure should be small enough that a person's limb cannot easily enter and become trapped.
- 3) An upstream shield of tightly spaced, large boulders which deflect current away from the wooden structure is an excellent safety feature. It also helps eliminate the potential for strong currents "undercutting" the structure.
- 4) Open spaces which allow water to flow through a structure dramatically increase the likelihood of hazardous incidents. Masking of these sieves by higher flows further increases their hazardous nature.
- 5) Restriction of the stream channel, particularly if maneuvering is required to negotiate the channel, increases the difficulty of navigating the channel, and also increases the potential consequences if navigation is not successful. Adding multiple sequential obstacles in a restricted channel further increases difficulty and potential consequences.

6) Cables or other metal articles in a stream exponentially exacerbate the potential for an incident. These objects are strong enough to lodge where other debris would be removed by the current, are difficult to identify as they produce little visible flow disturbance and provide no stagnation point (cushion) or other indications of their presence. They act as strainers of floating objects, including paddlers, swimmers or their craft.

Communication During the Period of Construction

Communication and cooperation between recreational river users and builders and installers of LWD and LWD structures during planning and construction is necessary to ensure that conditions hazardous to in-stream users are avoided or minimized and mitigated. Details, including maps and schedules, should be made available to the river user community through email, web site, signage, letters, or other timely and appropriate means. Providing alternate river access points in order to avoid the construction site may be made part of the mitigation plan in order to avoid hazards or conflict.

Informing River Users - Post Construction

Once the structures are in place, a thorough process to inform river users must also be in effect. Delay between the construction of the structures and the circulation of information on the hazards increases the likelihood of incidents. The communication should include:

- Maps indicating the location of the structures (including GPS coordinates) and clearly indicating which area of the river they occupy. Providing this information in electronic form makes distribution easy.
- Warning signage on the riverbank upstream of the structures, and at popular access points.
- Provide contact information for key persons involved in monitoring on the public notices for the site.
- Provide digital photos of the structures in web and electronic notices for the site.

Monitoring of LWD and LWD Structures - Post Construction

One of the greatest fears of the river recreation community is that the structures are not monitored regularly enough to detect failures in a timely manner. This could result in a new hazard at the original site, or in the event the debris is washed downstream, at an unknown and unexpected location downstream. For example, a structure on an easy run could break free, wash downstream and become lodged in an area to where it is more difficult to avoid the debris. When the failed structure contains cables, chains, or other attachment hardware preventing the debris from separating like naturally occurring debris, the risks can increase far more severely than might otherwise be expected.

Some suggestions for the monitoring of structures are:

- Numbering of the structures so each can be easily identified and reported upon.
- A thorough check of structures after significant high water events.
- Regular checks during spring runoff, periods of increased rain, or unusual water releases (controlled rivers and streams).

- The Proponents provide a contact name and phone number for reporting problems.
- The Proponents keep a log of when checks have occurred and a photographic record of the condition of the structures, and are held accountable by a regulatory agency.

Repair or Removal of Damaged Structures

The Proponents should develop and maintain a systematic process to deal with repair or removal of damaged structures which produce hazardous conditions for in-stream users. The following is a proposal for such a process.

- 1) Routine monitoring should be conducted to detect damage to a structure in a timely manner. A timeline and distribution list should be established for the circulation of monitoring reports.
- 2) The River Safety Council and river recreation community should be immediately notified of the failure.

If the structure, or its components have broken free and migrated downstream:

- 1) The location of the debris must be determined immediately and assessed for potential hazard. The river recreation community must be part of this assessment of hazard.
- 2) Any debris that is determined to be hazardous must be removed as soon as possible. Of particular concern are cables, or pieces of wood which are connected by cable.
- 3) The incident must be documented.

Conclusion

This document cannot contain information to address every circumstance that may arise. A willingness on behalf of all parties to use common sense and good communication must be used to bring satisfactory resolutions to the situations not addressed herein. The River Safety Council wishes to express its willingness to work cooperatively with Proponents, and urge them to freely contact us with any concerns or comments.

The River Safety Council feels strongly that the construction of LWD structures in recreational waterways has a high potential to be extremely hazardous. While efforts can be made to minimize these hazards, introduction of poorly designed LWD structures lead not to a question of if a potential incident could occur, but rather a question of when such an incident **will** occur.

As has been documented on numerous occasions, wood in the river is a very serious contributor to accidents on the river. Worse, it is the source of migratory hazards whose potential impacts are often compounded. The wide variety of recreational use of waterways, varying skill levels and craft type, the wide variations in flow regimes, climate, seasonal variations in flows, varied topography, and river morphology, all contribute to a complex scenario of use.

While the suggested guidelines above address many of the issues, only prior consultation and accommodation of knowledgeable input from river users can contribute to a reduction of hazards from any LWD installations.