

Why Wood is Good

(or not as bad as you thought)

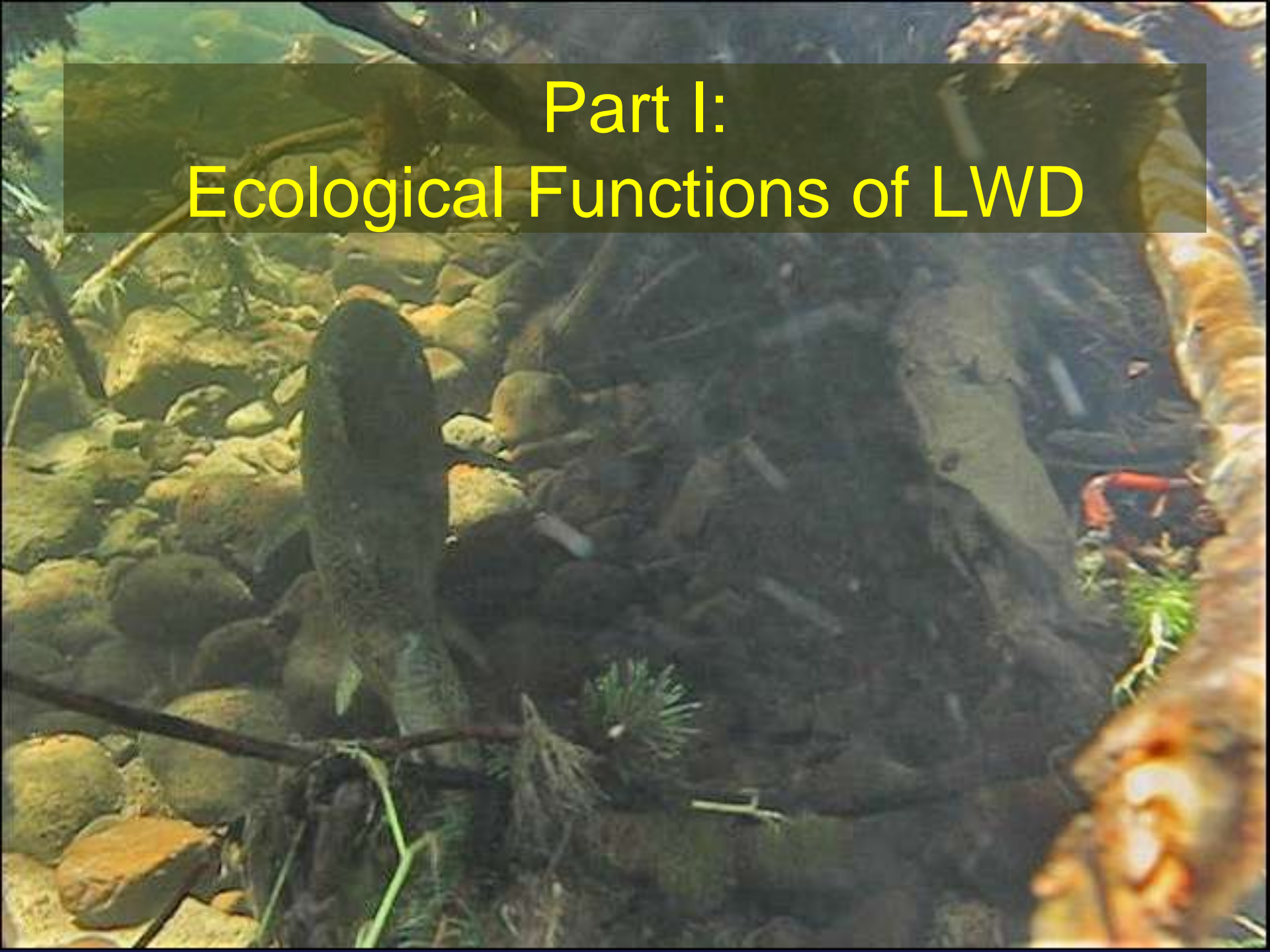
Presented To:
White Salmon River Festival & Symposium
June 6, 2007

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Two Components to this Presentation

- An overview of the ecological functions of Large Woody Debris (LWD) in streams & rivers
- Human interactions with LWD (with a focus on raftable rivers in the Pacific Northwest)

Part I: Ecological Functions of LWD



Large Woody Debris (LWD) - defined

Generally, any piece of wood:

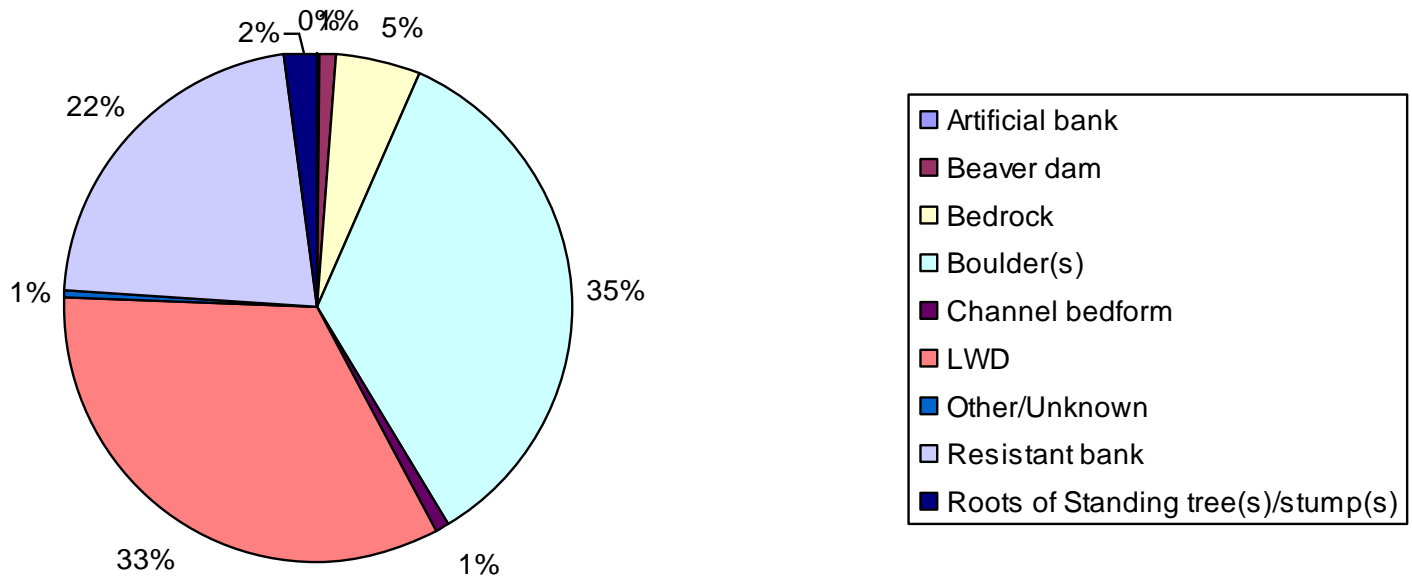
=> 2m (~6.6') long

and

=> 10cm (~4") diameter

LWD is one of the major elements causing/contributing to pool formation

Primary Pool Forming Factors for 916 Pools in the Klickitat Subbasin



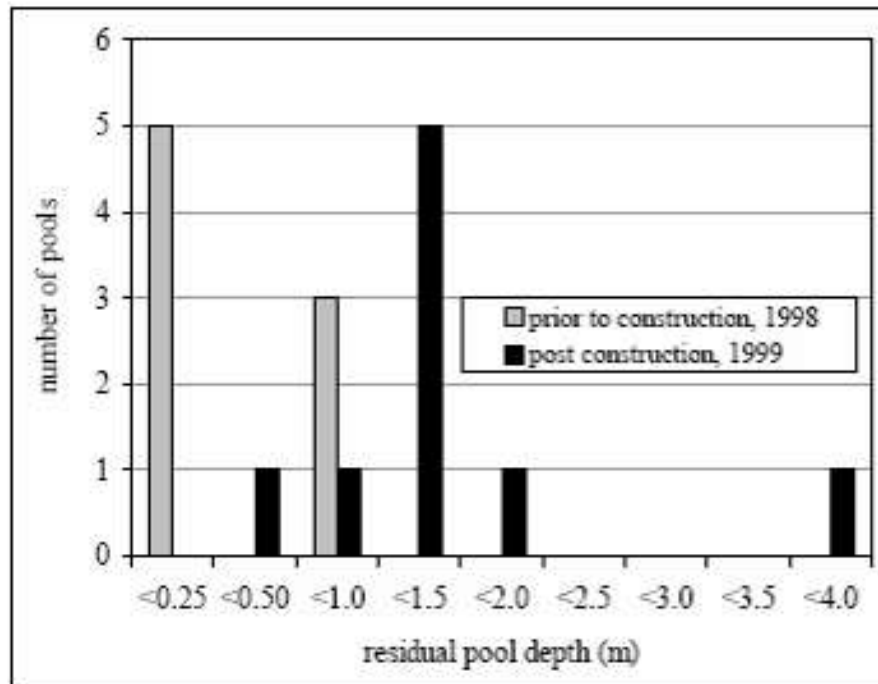
Yakama Nation - Unpublished Data

LWD is often associated with...



....Increased pool depths...

Figure 8. Total number of pools and residual pool depth in the treatment reach (RM 21.5 to 21) North Fork Stillaguamish.



...Finer surface substrate distributions...

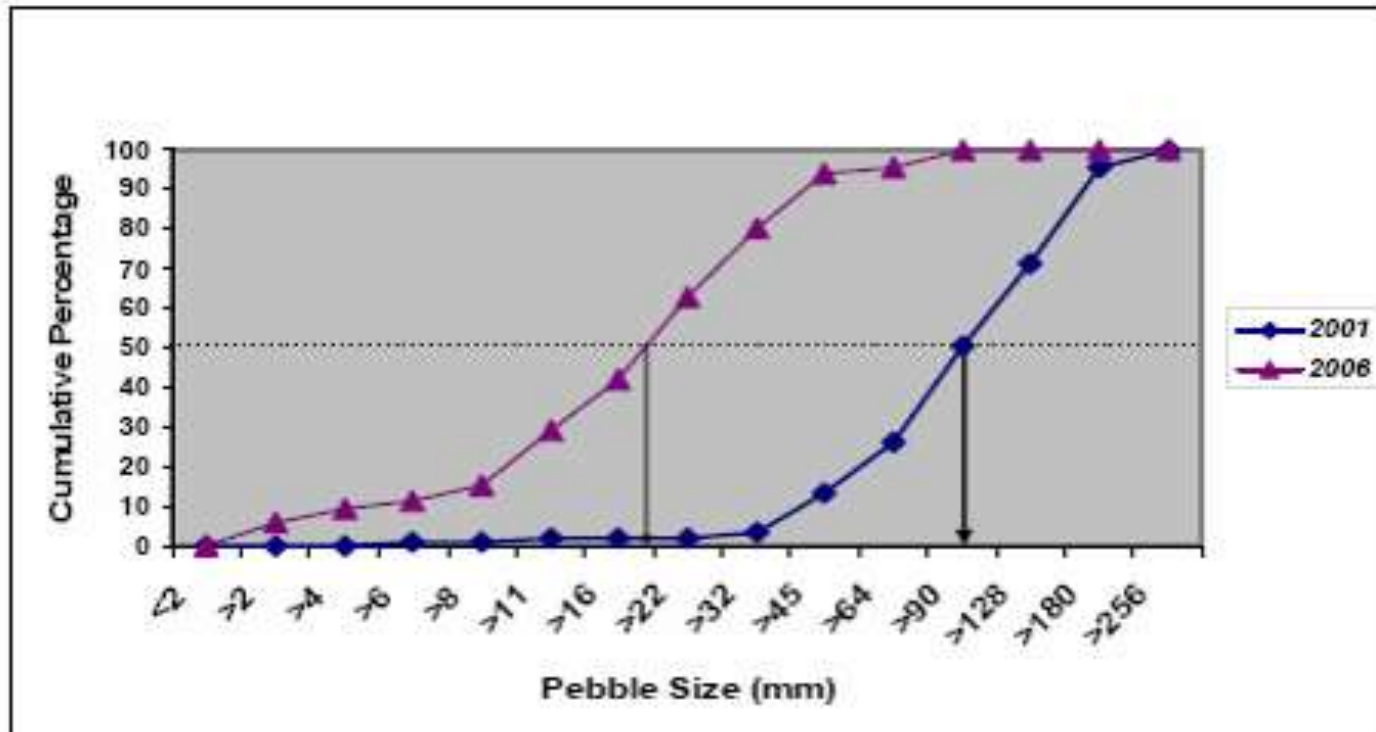


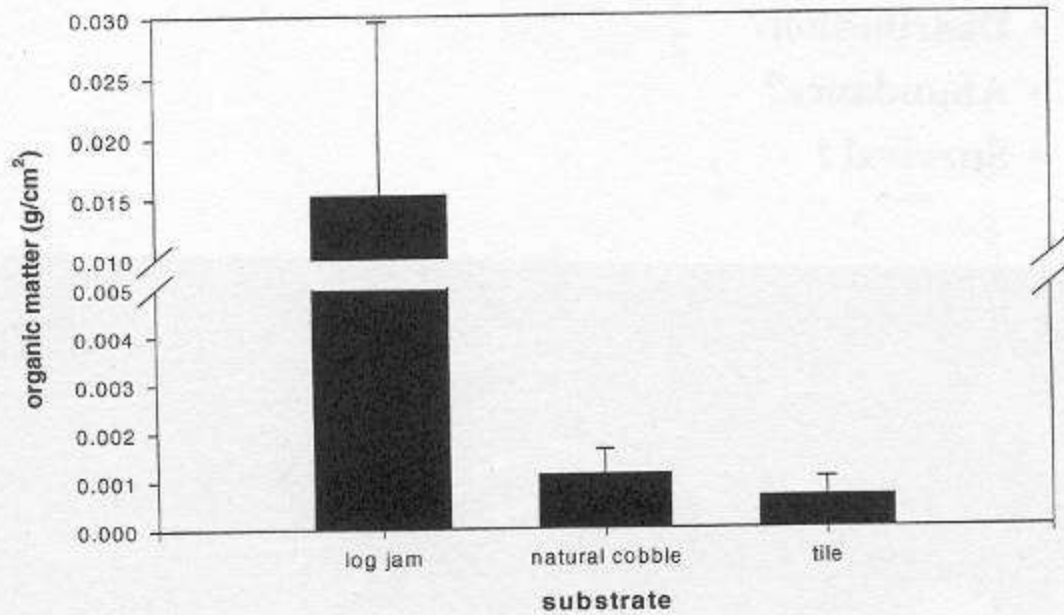
Figure 14. Particle-size distribution on channel bed surfaces immediately downstream of engineered logjam #01-1, Elwha River, 2001-2006. Arrows show median particle size in 2001 and 2006.

McHenry et al. 2007

...Organic matter retention...

Elwha River – October 2002

Organic Matter Collected From Various Substrates



McHenry et al. 2007

...Greater salmonid abundance...

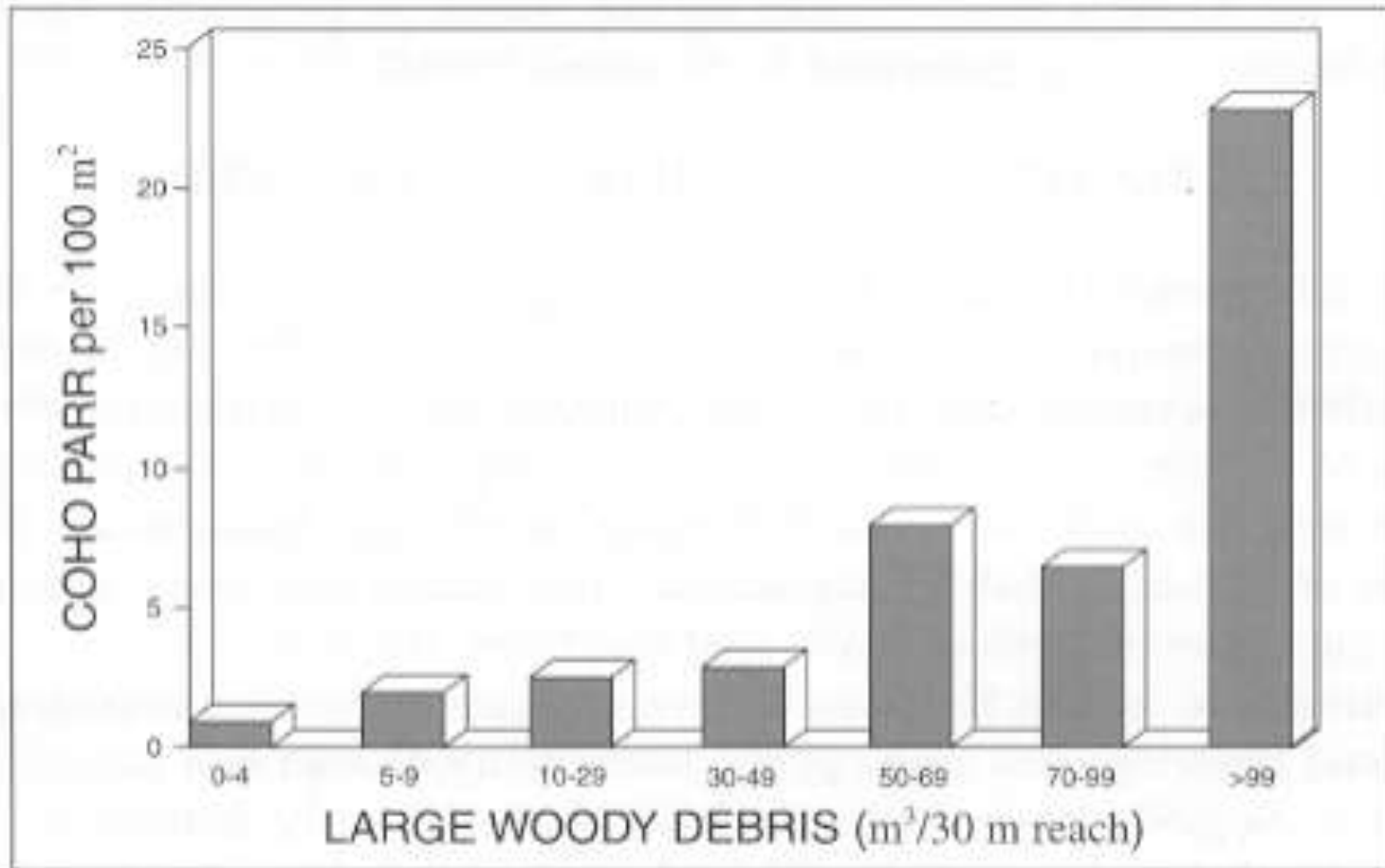
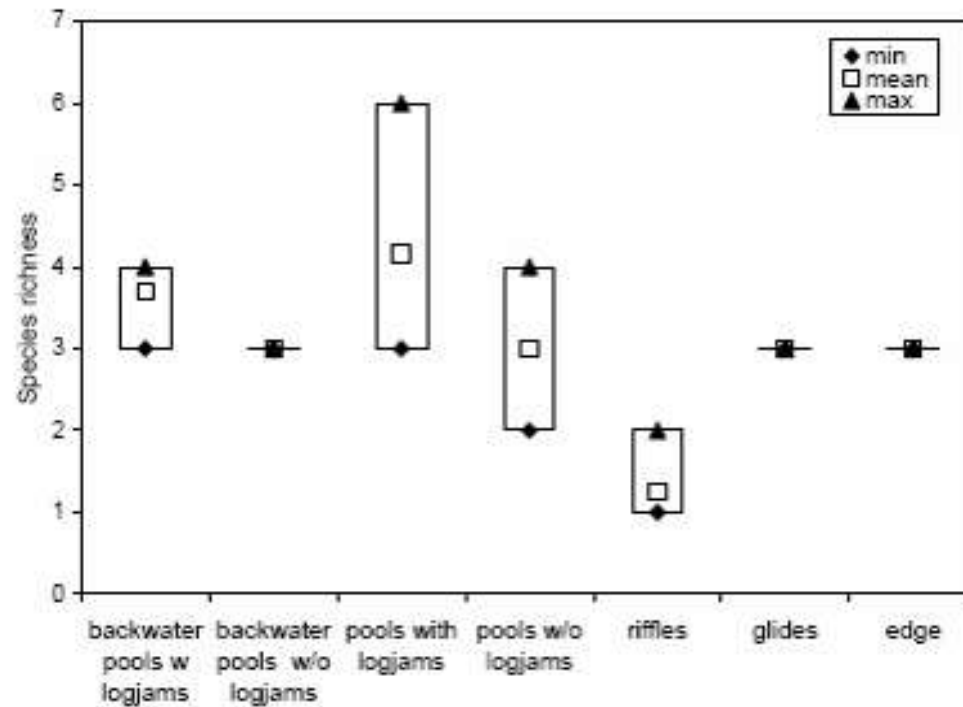


Figure 1-3. Relationship between volume of large woody debris (LWD) in streams and the density of coho parr in winter (from Koski 1992).

...and greater fish species diversity

Figure 5. Differences in species richness by habitat type in the Elwha River. Summer of 2000.



Restoration treatments incorporating LWD tend to produce more desirable salmonid responses

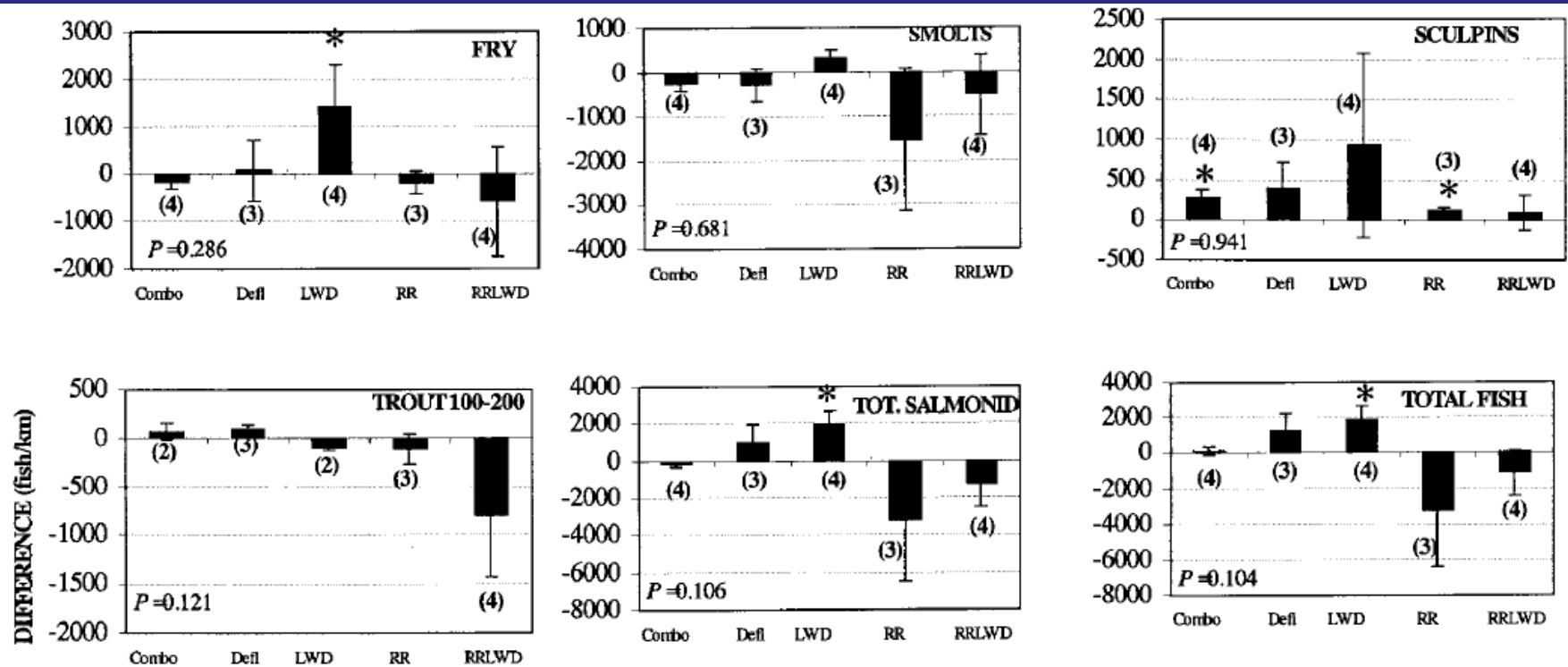


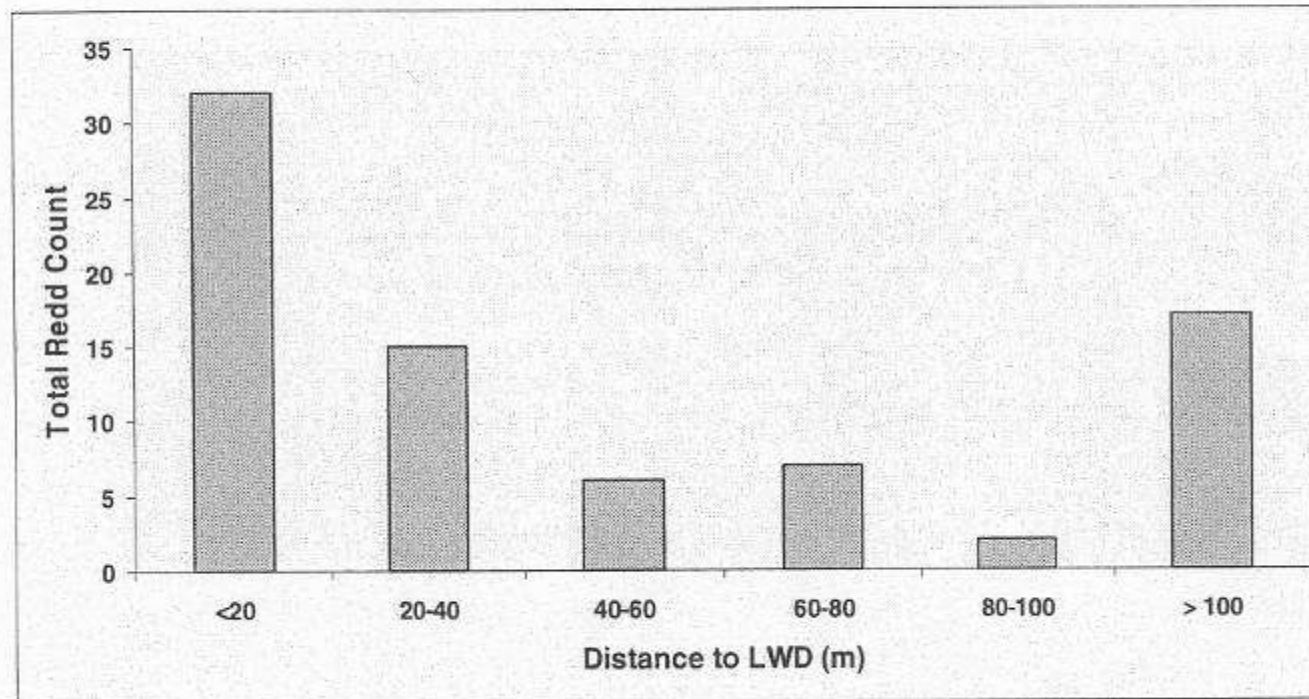
Figure 5.

Mean difference observed in the number of salmon fry, salmonid pre-smolts, total juvenile salmonids, 2+ trout, sculpin and total fish between bank stabilization sites and their control areas. Error bars represent +/- one standard error, numbers in parentheses represent sample size, asterisks (*) denote significant differences (t-test: $P < 0.10$) between the project type and their controls, and the P -value represents results of the ANOVA.

LWD provides favorable spawning conditions

(associated with cover and substrate storage/sorting)

Chinook Redds – Habitat







McHenry et al. 2007

Klickitat River Meadows Restoration Project:

Lower Kessler's Ranch Unit
Constructed 2004
Yakama Nation Fisheries

of Adult Chinook Observed

	1
	2
	3
	18



- 100% of adult spring Chinook (all 30 fish) were no more than 3' from LWD
- adult Chinook were observed moving into several of the constructed jams within 24 hours of construction (and, in at least one case, prior to completion)



Jam "N4" (previous slide)

Site "N4", a naturally-occurring jam

- the only channel-spanning jam in the surveyed reach
- over 10' deep
- accounted for 60% of the adult Chinook observed

Note: photo taken 6/4/07 nearly 3 years after snorkel survey and following high flows in November 2006



Underwater video of adult spring Chinook salmon holding in a LWD cluster several days after it was constructed (Klickitat River Meadows Project, Site K1, Yakama Nation Fisheries Program)

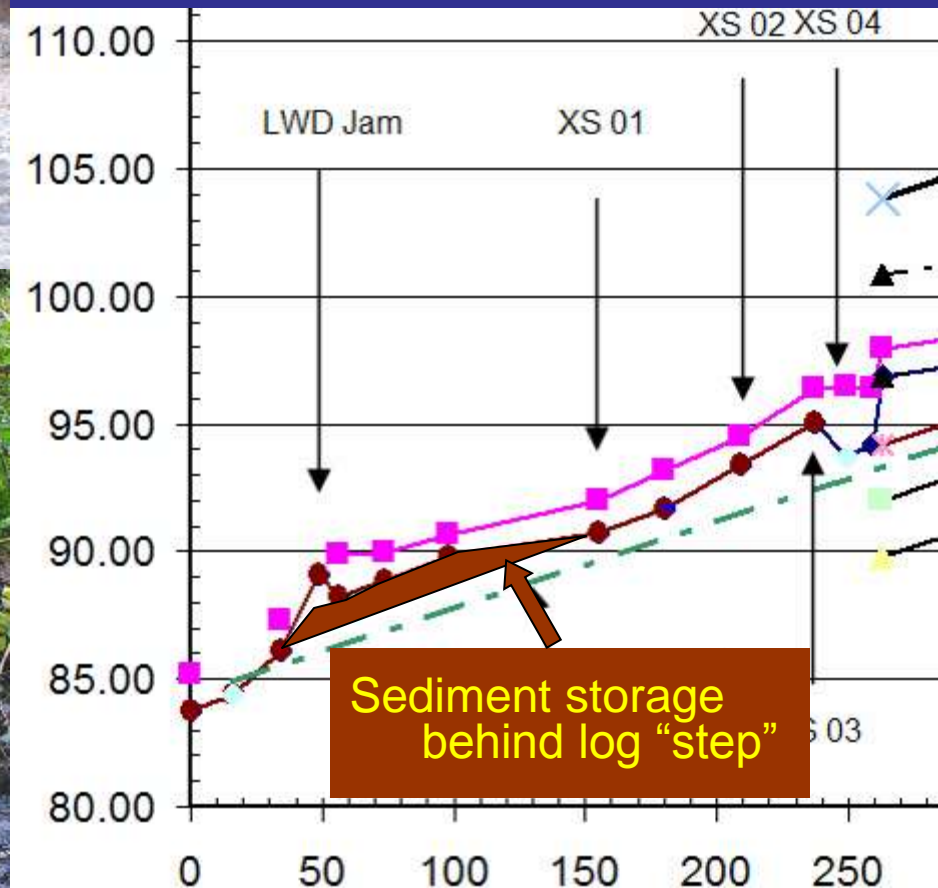


Underwater video of a different adult spring Chinook salmon holding in a LWD cluster several days after it was constructed (Klickitat River Meadows Project, Site K1, Yakama Nation Fisheries Program)



Underwater video of 3 adult spring Chinook salmon holding in a LWD cluster of natural origin (within Klickitat River Meadows Project, Site N1, Yakama Nation Fisheries Program)

LWD stores sediment, can control stream grade, and dissipate energy along banks



Other Functions / Findings

- 2% LWD content in the bed can account for 50% of the roughness (Magna and Kershner 2000)
- Frequency of quality pools decreased in 52-54% of Columbia Basin rivers draining managed watersheds since roughly 1940 (McIntosh et al. 2000)
- Resistance to flow in vegetated floodplain channel is 40% greater with LWD than without. Velocities were higher and depths were lower without LWD. (Abt et al. 1998)

In western Washington:

- Average diameter, length, and volume of LWD pieces increases with stream size (Bilby and Ward 1989)
- In streams <7m channel width, 40% of LWD pieces were oriented perpendicularly to flow (Bilby and Ward 1989)
- In streams >7m channel width, 40% of LWD pieces were oriented downstream (Bilby and Ward 1989)
- Pool area correlated with the volume of the LWD forming the pool in streams of all sizes (Bilby and Ward 1989)

The type, amount, distribution, and function of LWD is a function of:

- Recruitment rates
- Stream type
- Natural history of reach & watershed
 - Flood events Disease / Bugkill
 - Debris flows Fire
- Management history of reach & watershed
 - Riparian harvest stream cleaning
 - Splash damming road crossings

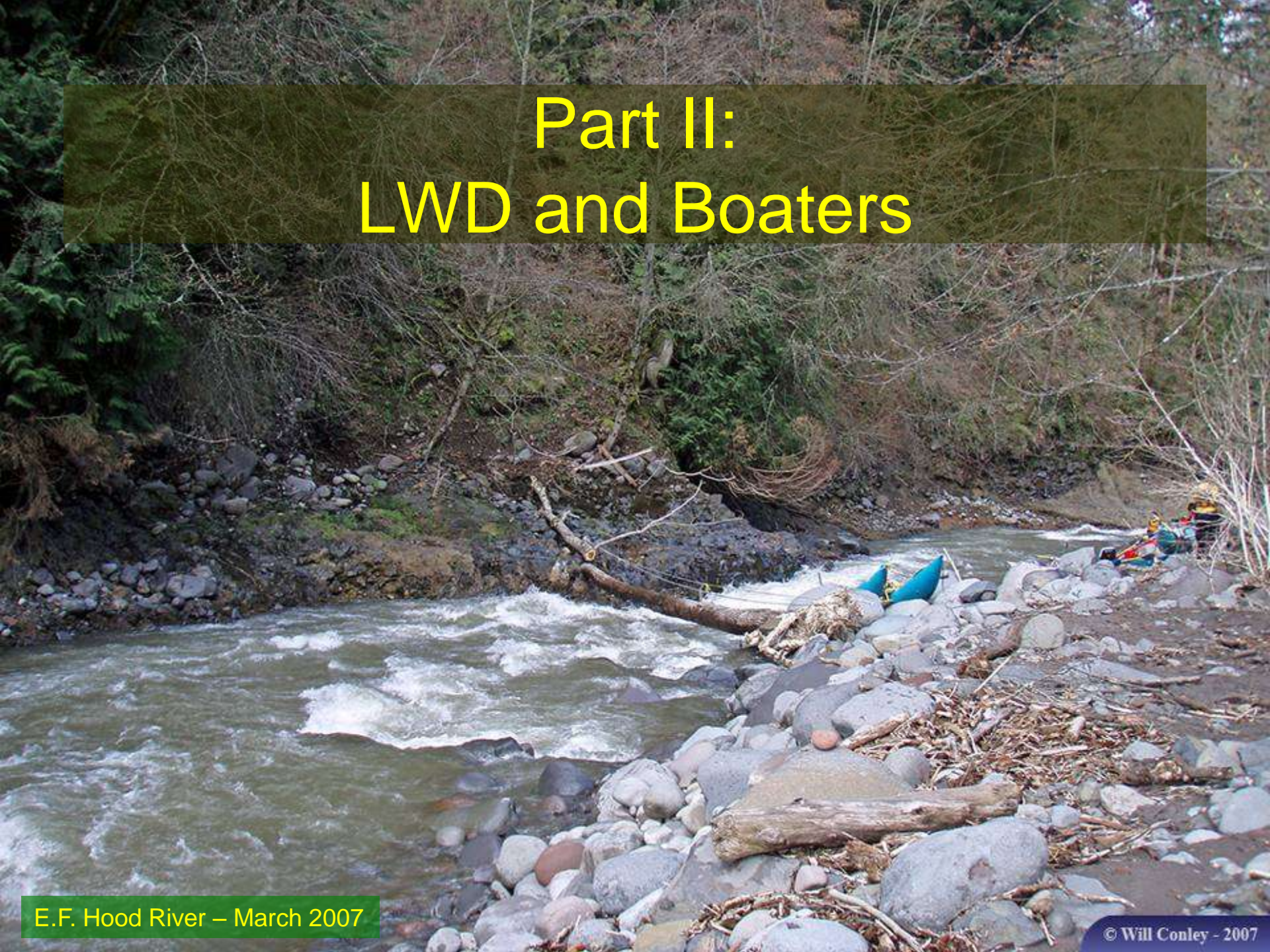
The longevity/duration of LWD's effect is a function of:

- species (related to decay and density)
- Position in the water column (wet/dry)
- Stability
 - Association with other pieces
 - Association with bed and or bank materials
 - Association with vegetation
 - Presence of rootwad
 - Size

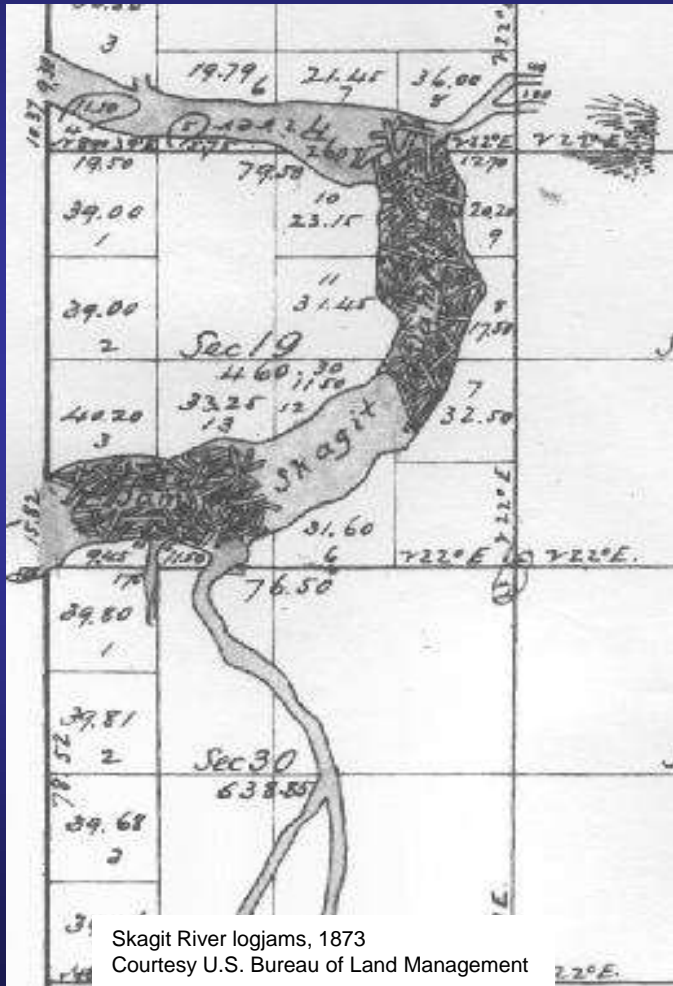
Literature Cited

- Abt, S.R., S.J. Dudley, and J.C. Fischenich. 1998. Woody Debris Influence on Flow Resistance. *In* D.F. Hayes [ed.] Engineering Approaches to Ecosystem Restoration. Proceedings of the 1998 Wetlands Engineering and River Restoration Conference. ASCE, Reston, VA.
- Bilby, R. E., and J.W. Ward. 1989. Changes in Characteristics and Function of Woody Debris with Increasing Size of Stream in Western Washington. *Trans. Am. Fish. Soc.* 118:368-378.
- Koski, K.Y. 1992. Restoring stream habitats affected by logging activities. Pages 344-397 *in* G.W. Thayer [ed.] Restoring the nation's marine environment. Maryland Sea Grant Book, College Park, MD.
- McHenry, M., G. Pess, T. Abbe, H. Coe, J. Goldsmith, M. Liermann, R. McCoy, S. Morley, R. Peters. 2007. The Physical and Biological Effects of Engineered Logjams (ELJs) in the Elwha River, Washington. Report submitted to the Salmon Recovery Funding Board and Interagency Committee for Outdoor Recreation.
http://www.fws.gov/filedownloads/ftp_westwafwo/ELJ/Elwha%20ELJ%20Monitoring%20Final%20Report-final.pdf
- McIntosh, B.A., J.R. Sedell, R.F. Thurow, S.E. Clarke, and G.L. Chandler. 2000. Historical Changes in Pool Habitats in the Columbia River Basin. *Ecological Applications.* 10(5):1478-1496.
- Pess, G.R., M. Liemann, M. McHenry, T. Bennett, R. Peters, P. Kiffney, and H. Coe. 2005. Juvenile and adult salmonid response to the placement of logjams in the Elwha and Stillaguamish Rivers: preliminary results. Report submitted to Stillaguamish tribe of Indians, Lower Elwha Klallum Tribe, and Washington Trout.
http://www.fws.gov/westwafwo/fisheries/Publications/elj_report_year1.pdf
- Peters, R.J., B. R. Missildine, and D.L. Low. 1998. Seasonal Fish Densities Near River Banks Stabilized with Various Stabilization Methods: First Year Report of the Technical Flood Assistance Project. USFWS, Lacey, WA.
<http://www.fws.gov/westwafwo/fisheries/Publications/FP125.pdf>

Part II: LWD and Boaters

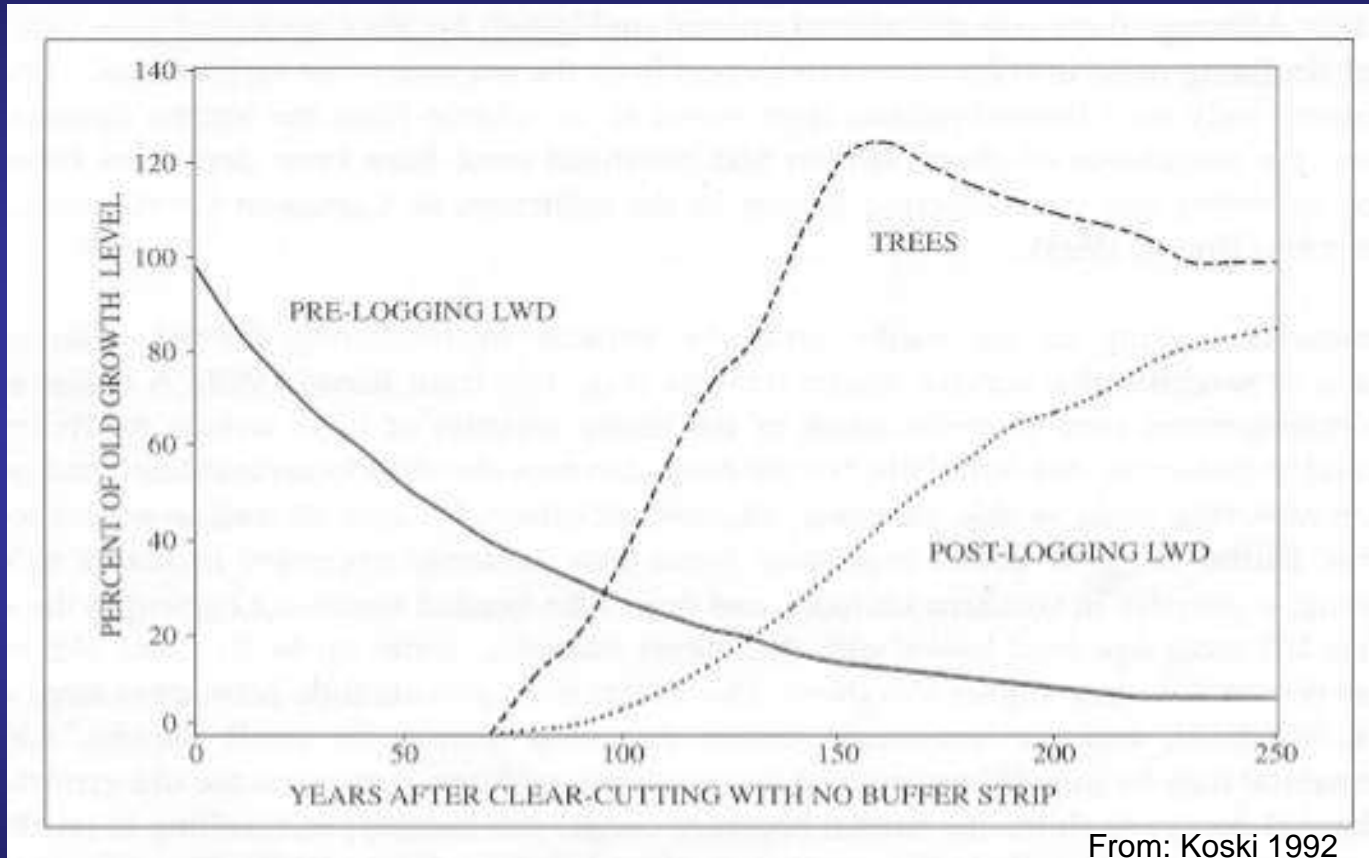


Logs and log jams were historically common blocked navigation even in some of the largest rivers in the country.



- Two large jams on the Skagit River appear on the GLO plat maps in 1873
- One jam (~1/2 mile downstream of Mt. Vernon) had been in place sufficient to block river traffic for nearly 100 years
- A second jam (roughly one mile upstream of Mount Vernon) was younger, but was “rapidly increasing in size at the rate of a quarter mile every three years.”
- The only way around the jam was “A rude skid road built by Upper Skagit Indians to haul their canoes...”
- In the summer of 1876, removal began using crosscuts saws and axes
- Removal involved cutting “through five to eight tiers of logs three to eight feet in diameter, totaling 30 feet deep”
- Removal was completed in 1879.

Whether we realize it or not, today's rafters enjoy historically-low levels of LWD on many runs (particularly in the Pacific Northwest) due largely to historic riparian harvest and stream "cleaning"



Though this may be good news for boaters, it's had generally negative consequences for river function and aquatic organisms

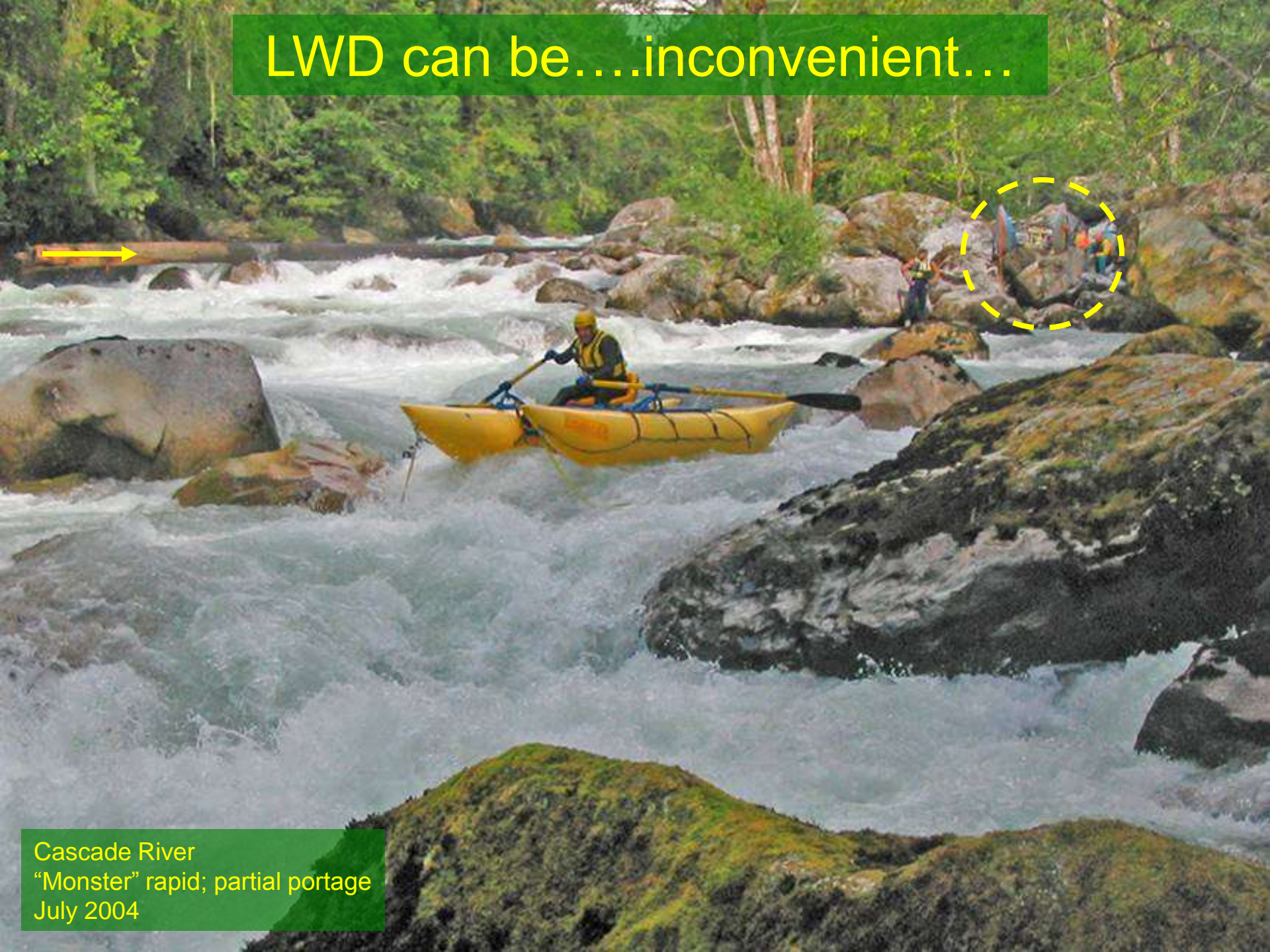
Despite generally record-low levels, LWD still poses a hazard for the recreational boater

Recent (last 3 years) incidents of varying degrees have occurred on numerous Northwest Rivers, including:

- Metolius
- Klickitat
- Tieton
- EF Hood
- SF Clearwater
- SF Boise
- NF Payette
- SF Payette
- Marsh Creek
- MF Salmon
- and many others...

Most of these runs are well-known for their LWD accumulations.

LWD can be...inconvenient...



Cascade River
"Monster" rapid; partial portage
July 2004

...Problematic...



<http://ph.groups.yahoo.com/group/idahowhitewater/photos/view/3f36?b=1&m=f&o=0>



<http://ph.groups.yahoo.com/group/idahowhitewater/photos/view/3f36?b=2&m=f&o=0>

S.F. Payette River
Grandjean Run
May 2007

...Useful...

SF Clearwater River (ID)
Golden Canyon section
May 2007

...Or conveniently out of the way.



MF Feather (WA)
Franklin & Devils canyons section
May 2007

Sometimes LWD looks worse than it is...



Grays River (WA)
"Superbowl" rapid
February 2007

...Sometimes we learn to live with it...



“Tree” Rapid
N.F. American River
Giant Gap Run

...Sometimes we even enjoy it...



surfing on the Wind River
February 2006

...and sometimes we blow it up:



<http://ph.groups.yahoo.com/group/idahowhitewater/photos/view/9fae?b=3&m=f&o=0>

Lake Creek blowout on M.F. Salmon River (ID) and jam that formed downstream at Pistol Creek rapid (July 2006)

<http://ph.groups.yahoo.com/group/idahowhitewater/photos/view/9fae?b=2&m=f&o=0>

Fortunately, technology facilitates awareness of hazards with amazing speed:

Cell phones, satellite phones and the internet have made same-day notification possible from very remote places (e.g. the Lake Creek blow-out)

Unfortunately, technology also expedites distribution of ignorance and misinformation with equally fast speed:

“It's legal to manually manipulate woody debris on rivers--that doesn't include chain saws, but does allow crosscut saws, z-drags, ropes or however you can move something via pure muscle or mechanical advantage. So, if managing agencies say "NO" to manually manipulating woody debris, it's BS and simple intimidation. Besides, studies have shown that cross-river tree falls do not improve the fish & wildlife habitat, but tree falls along the banks do improve fish and wildlife habitat--even on the Metolius.”

So, you want to remove LWD from
the river....legally



S.F. Boise River – July 2006

<http://ph.groups.yahoo.com/group/idahowhitewater/photos/view/8d8f?b=11&m=f&o=0>

In Washington State, to do it by the book, you will need to contact:

- landowner
- WDFW
- county planning department (most likely)

In the case of the Wild and Scenic portions of the White Salmon or Klickitat rivers:

- US Forest Service

If ESA-listed species are present (e.g. Klickitat R.), you may need to contact one or both:

- National Marine Fisheries Service
- US Fish & Wildlife Service

If removal will cause mobilization of sediments:

- US Army Corps of Engineers
- Washington Dept. of Ecology

WDFW

WDFW has authority for issuing hydraulic project approval (HPA) in the State of Washington. As a rule of thumb, if your proposed action might affect the bed, banks, and/or nature of flow, an HPA is required (even if the action is above the ordinary high water line)

- **does not generally write permits for removing LWD from streams. Relocation/repositioning of LWD is permitted**
- **timing** of that work is dependent upon many factors such as fish species present, life history stages that may be impacted (spawning, rearing, etc.), what habitat exists at the site or in close proximity, extent of the work.
- work is evaluated on a **case by case** basis to make a determination on specific timing. General timing dates are available at WDFW's website under "Habitat", in the back of the Gold and Fish Pamphlet. Information regarding the RCW and WAC's that require an HPA be secured for work that will, "use, divert, obstruct or change the natural bed or flow of state waters" is available on the WDFW website
- If in doubt about applicable regulations, the Washington State Office of Regulatory Assistance for help in making this determination. 1-800-917-0043 E-mail: assistance@ora.wa.gov, Web: www.ora.wa.gov.

US Forest Service

The FS was designated the Federal agency responsible for the Wild and Scenic portions of the White Salmon and Klickitat Rivers

- The Wild & Scenic Rivers the Act gives the agency jurisdiction to protect the free flowing nature of the river and enhance its values, as long as limiting other uses does not substantially interfere with public use & enjoyment of those values.
- WA State maintains full jurisdiction over the waters as long as it doesn't impair the purpose of the Act.
- While there is no USFS paperwork per se, the **USFS requests to be be informed of the situation & proposed actions to alleviate the hazard.** The Forest Service will help fill out HPA form (if asked) to remove wood if:
 1. **It was a life-threatening situation, or**
 2. **A high water event would did not take it out before commercial rafting season.**
- All White Salmon outfitters operating plans specifically state:

"Conservation measures for the White Salmon River includes keeping large wood and fallen trees in the river system. Large wood and fallen trees found between RM 6.5 and RM 5.1 will remain in the river channel. **In instances where this material poses a hazard to boaters, the debris would be moved to a safe location, but remain in the river.**"

Klickitat County

The raft runs on the White Salmon River as well as the Klickitat River from roughly 3 miles upstream of the hatchery are located in Klickitat County.

Depending the extent to which woody debris is removed from streams (e.g. removal of one dead tree vs. removal of several living or dead trees), the following may apply:

- Klickitat County's Shoreline Plan may prohibits removal of natural vegetation 50' landward from the OHWM (e.g. removal of trees or branches that overhang the river)
- Klickitat County's Floodplain Ordinance may apply if the removal of woody debris will cause flooding downstream
- Klickitat County's Critical Areas Ordinance may apply if fish habitat is adversely affected. The WDFW or other qualified professional biologist would need to substantiate such a claim prior to the County taking action.

Yakima County

The Klickitat River from roughly 3 miles upstream of the Klickitat Hatchery is located in Yakima County.

From the Yakima County Planning Department:

- “Large Woody Debris found in log jams, rootwads, etc. are some of the most important parts of the river. Log jams are primary in-stream features that can greatly affect sediment transport and fish habitat. Their removal can have big repercussions upstream and downstream on both natural functions, and on adjacent landowners (through flooding and bank erosion).”
- “There are opportunities to be exempt from the permit process - some of which might allow dead wood removal under certain circumstances.”
- “They would have to apply for and meet the criteria of the exemption, and would still have to protect the functions of the stream corridor.”
- “If done carefully, the limited removal of wood for rafting safety might be possible, but it would have to be the minimum needed and it couldn't remove the log jamb etc. completely.”
- “If the work can't qualify for an exemption, it might be approved under a permit or variance with appropriate mitigation.”

NMFS

- Has federal jurisdiction for marine species as well as species that spend a portion of their life history in freshwater (e.g. salmon and steelhead)
- NMFS is actively working to increase the amount of wood in stream channels where ESA listed fish migrate, hold, spawn or rear, it is one of the limiting factors for healthy populations.
- If a person wants to remove wood from a stream channel on private property, they are subject to Section 9 of the ESA which states "except as provided in sections 6(g)(2) (State agreements or plans) or section 10 (research permits)...it is unlawful for any **person**....to **take** any such species...". The word "take" means "harass, harm, kill, disturb, disrupt normal behaviors.." If a Federal agency, a federal permit, or any federal funding is involved in the proposed wood removal that would fall under section 7 consultation.
- In 2002 NMFS consulted on the proposal to remove Condit Dam and approved the action. At the present time the river downstream of the dam is designated critical habitat.
- According to the law, actions are not allowed to "destroy or adversely modify" critical habitat to the point that it reduces the conservation value of that habitat for the survival and recovery of the species.

Take-Home Points:

- Wood in rivers is about ALOT more than fish
- Healthy rivers need LWD for:
 - Side-channel formation / channel complexity
 - Sediment sorting and storage
 - Cover
 - Increased pool quantity
 - Increased pool quality (depth and cover)
 - Grade control
 - Slows downstream transport of matter and energy

Take-Home Points (cont'd):

- There is a knee-jerk tendency to label LWD as “dangerous” or “hazardous”
- The majority of LWD is neither
- Most “hazardous” LWD is really just inconvenient
 - e.g. a channel spanning log with an upstream pool and a portage trail
- Uncut wood will almost always provide greater function and persist longer than cut wood

Before cutting out a log (or jam), consider:

- Is it truly a hazard or more of a nuisance?
- What will happen to the pieces after you cut it?
 - Where will they go?
 - What will they do when they get there?
 - Will they create more of a problem?



LWD can be fun!!!



Wind River (Washington)
February 2006
Surf wave created by LWD