

## Large Woody Materials in River ecosystems – important when creating salmonid habitat



Figure 1. Large Woody Debris in Tämälven, Sweden  
(Picture Erik Degerman, 2008)

### What is Large Woody Materials?

Large woody materials or woody debris, (often referred to as LWD) in aquatic environments usually constitutes of logs, stumps, trees, or parts of trees from the riparian corridor. The LWD has been created by natural processes like storms, draught, erosion, natural ageing, forestry and beaver activity among others and subsequently been transported into the river.

The more technical definition of LWD is a piece of wood  $\geq 0.5$ -1 meter in length and with a diameter of  $\geq 10$  cm. In small streams ( $< 2$  m) LWD should have a diameter of at least 5% of the width of the stream (e.g. in a stream 0.5 m wide you can add branches down to 2.5 cm in diameter). In the past the importance of LWD was unknown. It was common practice to remove LWD from streams.

Today we know more about the ecological importance of large wooden debris, and it is crucial to leave large wooden debris in the watercourse in order to sustain fisheries habitat.

### Ecological Importance of LWD

Large woody debris in the watercourse have both a direct and indirect ecological effect. It can be a source of food and in itself provide cover and shelter for fish and other inhabitants. Submerged or partly submerged trees can also help the river current to cut deep holes equally beneficial to fish as a refuge and cover.

Swedish studies have shown (Degerman *et. al* 2004) that the abundance of brown trout (*Salmo trutta*) did increase by 300% when LWD was increased from 0 to 8-16 pieces per 100 m<sup>2</sup> water surface.

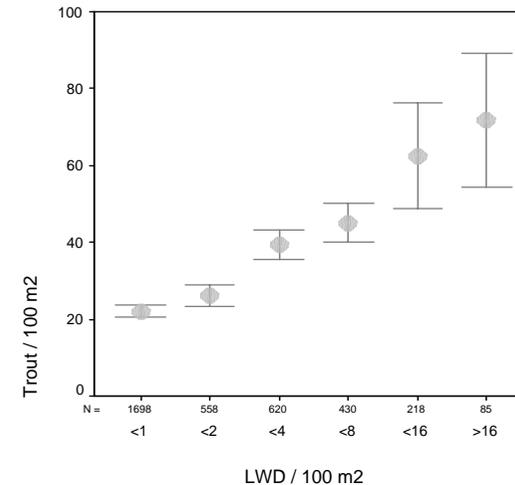


Figure 2. Number of brown trout per 100 m<sup>2</sup> in forest streams less ( $\leq 6$  m wide) in relation to the amount of LWD per 100 m<sup>2</sup> (Degerman *et. al* 2004).

Despite this fact it is not advisable to make restoration efforts to this extent. The LWD should be added during a number of consecutive years to let natural processes contribute to the restoration work.

### Considerations when adding LWD as part of a restoration project

- It is recommended to random place 6-12 pieces of LWD per 100 m watercourse in farming and forest lands. In areas not used for commercial activities 12-20 pieces of LWD can be placed per 100 m. From inventories performed, it has been established that under undisturbed conditions 20-70 LWD can exist.



Figure 3. Natural jam of debris in Frösvidalsån, Sweden.  
(Picture Erik Degerman 2008)

- Where possible it is recommended to place the LWD counter to the water flow to increase the likelihood of it creating suitable fish habitat but also so that the LWD stays in place. (In Sweden 85% of intentionally added LWD in watercourses stay in place, however it is often needed to secure the LWD by means of using wires, stones etc)
- One should carefully consider where to place the LWD. It should not be placed in locations where it is likely to cause harm to private property and installations or is likely to be washed away e.g. in sections with an elevation of more than 3% or in sections with large boulders.
- The composition of the LWD placed in the watercourse should reflect the diversity of trees along the river bank. Branches and trees should be taken at least 15-20 meter from the river bank in order to leave the riparian trees to give shade etc.
- The abundance of dead wood in the watercourse often exceeds that in the surrounding terrestrial environment since the wood decomposes slower in the aquatic environment. For deciduous trees the lifespan as LWD in aquatic environments is roughly 20 years and for coniferous trees the double (up to 100 years). The pines of coniferous trees exert toxic substances into the water as they are submerged and initially deter fish from the immediate surroundings, but the effect is very short lived.

### **Tips for managing existing LWD**

Existing LWD should be left in the watercourse unless it causes damming or hindrance. LWD may need to be modified or removed if it causes flooding or speeds up natural erosion processes. Great care should be taken to change as little as possible in these cases. If possible do not remove large trunks and roots but start with removing branches

and jams of small size debris. Keep logs that are at least 1.5 times the stream width. Most fish can swim under, or around log clusters or debris jams, especially during high flows. Brush, weeds or other small material should not be thrown into a watercourse. This material could create jams or block a culvert which can cause flooding, erosion, or block fish passage.

### **Benefits with Large Woody Materials in summary**

- It creates pools and covers both of which act as good fish habitat
- Reduces erosion to the bed and banks of the stream
- Can create islands and gravel bars that increase habitat complexity
- Can be a food source to aquatic insects and trap other important nutrient sources
- It stops sediment from washed away downstr

### *References*

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