

Effects of Large Woody Debris on Anadromous Salmonid Populations

Beechie, Timothy J.; Sibley, Thomas H. **Relationships between channel characteristics, woody debris, and fish habitat in northwestern Washington streams** *Transactions of the American Fisheries Society*. 126(2). 1997. 217-229.

This is another study showing the effects of LWD on river morphology, specifically pool habitat. It delves into the specific sizes of LWD necessary for pool formation in different gradient and size waterways.

Cederholm, C. J.; Bilby, R. E.; Bisson, P. A.; Bumstead, T. W.; Fransen, B. R.; Scarlett, W. J.; Ward, J. W. **Response of juvenile coho salmon and steelhead to placement of large woody debris in a coastal Washington stream.** *North American Journal of Fisheries Management*. 17(4). Nov., 1997. 947-963.

This study reinforces the theory that LWD increases the juvenile coho salmon population, especially during winter months. Rainbow trout were also shown to increase in abundance in treatment sections during the winter. Coho outmigrants also increased in LWD treatment regions

Crispin, V.; House, R.; Roberts, D. **Changes in instream habitat, large woody debris, and salmon habitat after the restructuring of a coastal Oregon stream** *North American Journal of Fisheries Management*. 13(1). 1993. 96-102.

This study shows an increase in pool and off-channel rearing habitat after the introduction of LWD. No quantitative tests of juvenile coho populations were included.

Keim, Richard F.; Skaugset, Arne E.; Bateman, Douglas S. **Physical aquatic habitat II. Pools and cover affected by large woody debris in three Western Oregon streams.** *North American Journal of Fisheries Management*. 22(1). February 2002. 151-164.

This study tested the affect of mainly red alder, rather than large conifers, on river channel morphology in the Pacific Northwest. This was more of a hydrological study testing the increase in pool volume provided by this LWD (pool volume has a positive correlation with some salmonid populations). The study lasted 3 years and indicated that red alder did provide viable LWD and resultant cover.

Nickelson, Thomas E.; Lawson, Peter W. **Population viability of coho salmon, *Oncorhynchus kisutch*, in Oregon coastal basins: Application of a habitat-based life**

cycle model *Canadian Journal of Fisheries & Aquatic Sciences*. 55(11). Nov., 1998. 2383-2392.

This study shows the direct effects of poor freshwater habitat (e.g. absence of LWD) on ocean coho abundance and potential future extinction.

Pollock, Michael M.; Pess, George R.; Beechie, Timothy J. **The importance of beaver ponds to coho salmon production in the Stillaguamish River basin, Washington, USA** *North American Journal of Fisheries Management*. 24(3). August 2004. 749-760.

This study implicated the loss of beavers, and the ponds they create, in the large scale reduction in coho numbers in the Stillaguamish River. The authors also suggested that reintroduction of beavers to the area could increase the juvenile coho abundance in the area.

Quinn, Thomas P.; Peterson, N. Phil. **The influence of habitat complexity and fish size on over-winter survival and growth of individually marked juvenile coho salmon (*Oncorhynchus kisutch*) in Big Beef Creek, Washington** *Canadian Journal of Fisheries & Aquatic Sciences*. 53(7). 1996. 1555-1564.

Survival of wild juvenile coho salmon was most strongly correlated with the quantity of large woody debris in this study. Habitat complexity was very weakly correlated with coho survival.

Roni, Philip; Quinn, Thomas P. **Density and size of juvenile salmonids in response to placement of large woody debris in western Oregon and Washington streams** *Canadian Journal of Fisheries & Aquatic Sciences*. 58(2). February, 2001. 282-292.

This was a large scale study testing the effects of large woody debris on salmonid density in 30 Pacific Northwest rivers and streams. It established that large woody debris, and the pool habitat that it generally promotes, enhanced coho salmon populations year round. Cutthroat trout, and rainbow trout populations were also tested, and only winter populations benefited from the placement of LWD. A density response was found in the larger populations of coho salmon. Incidentally, out-migrant numbers weren't tested in this study, this is likely due to an experimental design that had poor separation between treatments (river stretches were tested rather than separate rivers). This is an important study in anadromous salmonid and freshwater habitat interaction in that it quantifies potential benefits rather than inferring habitat heterogeneity as an immediate benefit to salmonid populations.

Roni, Philip; Quinn, Thomas P. **Effects of wood placement on movements of trout and juvenile coho salmon in natural and artificial stream channels** *Transactions of the American Fisheries Society*. 130(4). July, 2001. 675-685.

This study suggests that woody debris reduce movement, and resultant growth of rainbow trout and coho salmon. This is the only study that suggests LWD might have a negative

effect on salmonid growth and or abundance (larger fish generally have lower mortality. There are many assumptions in this idea and it isn't well supported by the study methodology.

Solazzi, M. F.; Nickelson, T. E.; Johnson, S. L.; Rodgers, J. D. **Effects of increasing winter rearing habitat on abundance of salmonids in two coastal Oregon streams** *Canadian Journal of Fisheries & Aquatic Sciences*. 57(5). May, 2000. 906-914.

This study is very similar to the Roni and Thomas paper above. The same salmonid species were tested, but the number of waters was scaled down to essentially 2 drainages. This allowed for a longer experimental duration (8 years as apposed to 3 years), potentially flushing out some of the long-term affects of LWD on anadromous salmonid populations. Out-migrants were also tested and a design that allowed less mixing between treatments assured more accurate results. Coho populations again benefited from increases in LWD and pool habitat. Rainbow and cutthroat populations also benefited during winter months with the increases in refugia that LWD provided.