

October 11, 2007

F/NWO3

MEMO FOR: Hydro Files

FROM: Gary Fredricks

SUBJECT: Galvanized Materials in Adult Fishways

An issue came up recently where we were asked if there are concerns with placing galvanized steel gratings in the adult fishways at The Dalles Dam. I did a quick review of the information available on the internet and came away with the knowledge that we need to be extremely cautious of putting things in fishways that may repel adult salmon, particularly things that leach heavy metals. The data that I have indicates two things, salmon and trout are very sensitive to odors in the water and they are very sensitive and repelled by some heavy metals. Odor sensitivity was demonstrated long ago by Brett and MacKinnon (1954) in their studies of avoidance to odors in Pacific salmon in British Columbia. They found that they could block salmon passage with odors as dilute as 0.002 to 0.012 ppm. Unfortunately, they did not evaluate zinc, the metal that can leach from galvanized steel. The data from some early Atlantic salmon studies indicated an avoidance response to zinc concentrations as low as 0.054 mg/l (Sprague, Elston and Saunders, 1965). Apparently, migrating adult Atlantic salmon were repelled (stopped migrating) at concentrations about ten times higher or 0.48 mg/l. (Saunders and Sprague, 1967). Both of these studies are referenced in Svecičius (1999) who also found a significant zinc avoidance response for yearling rainbow trout at concentrations as low as 0.001 ppm.

We should not necessarily be opposed to the use of galvanized parts in fishways, however, we should not implement these without some sensitivity to the effect they may be causing on migrating salmon. Ed Meyer has mentioned that it may be possible to season (or pickle) galvanized parts such that the zinc leachate is greatly reduced before the parts are deployed in the field. The agencies responsible building and maintaining fishways should look into this with an eye towards the concentration limits presented in the literature. Specifically, what is the leaching rate from gratings like these after seasoning or pickling and how does this compare with the published concentrations that effect fish? Findings from such an investigation could form the basis for new fishway construction and maintenance criteria.

Literature Cited:

Brett, J. R., D. MacKinnon. 1954. Some aspects of olfactory perception in migrating adult coho and spring salmon. *J. Fish. Res. Bd. Canada*. 11(3): 310 – 318.

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Saunders, R. L. and J. B. Sprague. 1967. Effects of copper-zinc mining pollution on a spawning migration of Atlantic salmon. *Water Res.* 1: 419 – 432.

Svecevičius, G. 1999. Fish avoidance response to heavy metals and their mixtures. *Acta Zoologica Lituanica. Hydrobiologia.* 9(2): 103 – 113.