

## EXECUTIVE SUMMARY

This study explores the application of the monitoring and adaptive management approach to enhancement projects using large woody material (LWM), in small urban streams (80 to 800-acre watersheds) in the Puget Sound lowlands of western Washington.

An initial LWM stream enhancement informational survey conducted across several jurisdictions yielded only limited success. While monitoring of LWM projects is generally enthusiastically called for and endorsed, it is not clear what or how LWM project data should be gathered, how it will be used, or how it would be retrieved once an agency has collected it. Senior management needs to more consistently encourage a much better job of monitoring the outcomes of these projects.

The second phase of the study focused on seven stream enhancement projects installed in the City of Redmond between 1991 and 2004. A straightforward, objective monitoring protocol was developed and applied to determine if each project had achieved its goals. The protocol used LWM loadings and spatial distributions in undisturbed Pacific Northwest streams of similar size to Redmond's, to provide the best "reference" for comparing habitat enhancement projects – for these are the natural conditions under which local salmon species evolved.

Redmond's projects all contained significantly less LWM than the reference systems. While most Redmond projects satisfactorily achieved bed and bank stability, our success at creating instream habitat was more limited. This "under achievement" is directly related to the *inadequate hydraulic interaction* between various stream flows and the LWM. A majority of LWM volume needs to be below bankfull depth if it is to provide habitat value or energy dissipation during storm events.

Two other issues received attention: First, it appears that real stream enhancement opportunities might be missed based on "risk aversion" – *unrealistic fears* of LWM and stream flow interactions. Second, because of contract liability issues, in-house staff typically have little control over potential shortcomings in the LWM installation process.

Moving through this review it became clear that better *visual examples* of desirable stream habitat features – both, natural and constructed – could substantially benefit stream restoration planning efforts. The final phase of this study provides a solid start towards filling this need.

The most striking conclusion of this study is that hugely beneficial insights accrued to Redmond staff as a result of instituting the relatively simple and inexpensive project review and monitoring procedures described herein.