Regional equations for streams in forested watersheds in the Pacific Northwest

Allie Davis¹, Kaleb Madsen², John Petrie²

¹Henderson State University – Department of Chemistry
²Washington State University – Department of Civil and Environmental Engineering

Introduction and Objectives

The objective of this project was to determine and evaluate equations capable of estimating width, depth, discharge, and sediment load of stream channels in the Pacific Northwest in order to predict and monitor the effects of logging on water quality. This study is necessary as suspended sediment is currently amongst the largest pollutants in North American waters. Large amounts of suspended sediment entering Pacific Northwest channels have contributed to changes in channel morphology and a significant decrease in salmonid and macroinvertebrate populations.

Data collected from around 400 sites across the Pacific Northwest was compiled to determine both a general equation and more specific equations for each physiographic province of the Pacific Northwest. These regional equations are capable of predicting characteristics, e.g., bankfull width and depth, from bankfull discharge and drainage area (Fig. 1).

Separate equations were obtained for bankfull discharge and drainage area to width, depth, and slope for the Pacific Northwest. Equations for bankfull discharge and drainage area to width and depth were also calculated for the six physiographic provinces of the Pacific Northwest. Of the twenty equations tested, all equations were determined to be statistically different from the general Pacific Northwest equations. From the calculated p-values, depth and drainage area seemed to change the least with geographic provinces.

Now, it is possible to accurately anticipate and minimize the effects of logging on streams systematically by implementing the use of drainage area or discharge to predict changes in suspended sediment load.

Future Work

General and specific equations have been developed for watersheds in the Pacific Northwest. Now, it is possible to use the equations to determine the effects of logging and increased sediment transport on aquatic ecosystems. Attempts can be made to reduce sediment load in order to preserve and improve water quality of channels. In the future, precipitation, climate and additional site data will be collected and assimilated into each equation in order to render them more useful and accurate. Likewise, generating discharge equations for the Middle Rocky Mountains province and Grand Plains province would be useful.

Acknowledgements

Thank you to the Northwest Advanced Renewables Alliance (NARA) project for graciously funding this research and to Dr. Shelley Pressley and Washington State University for giving me the opportunity to conduct and present summer research.

Contact Information

Allie Davis
Undergraduate Student
md190513@reddies.hsu.edu
(501) 909-9852

Kaleb Madsen
Graduate Student
kaleb.madsen@wsu.edu
(360) 356-8805

John Petrie
WSU Faculty
j.petrie@wsu.edu
(509) 325-0909

NARA is led by Washington State University and supported by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30416 from the USDA National Institute of Food and Agriculture.