Monitoring Large Woody Debris Dynamics in the Unuk River, Alaska Using Digital Aerial Photography

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Abstract: Large Woody Debris (LWD) and changes in its accumulation pattern influence the morphology, flow characteristics, ecological attributes, and physical habitats along a river. Digital aerial photos were acquired for the Unuk River in Alaska during the spring of 2003 and 2004. Digital processing of aerial photos involved high-pass filtering on the second principal component image, followed by a low-pass filtering, thresholding, and color coding to map individual logs and large wood accumulations. This processing technique provided an effective classification of the LWD with an overall classification accuracy of 89%. In the selected test site, the 2004 images show a 23% decrease in LWD, which is attributed to the large-scale wash-over of the wood due to a known flooding event in October 2003. Large shifts in LWD have caused main channel shifts, channel splits, merging of split channels, and changes in locations of sand bars and pools, dislocating and redistributing known fish habitat.

BACKGROUND

Large woody debris (LWD) refers to wood pieces (i.e., entire fallen trees, branches, rootwads) typically larger than 10 cm in diameter and 2 m in length within stream and river ecosystems (Bilby and Ward, 1989; Maser and Sedell, 1994). The quantity and distribution of LWD within a river network when spatially mapped over the landscape presents large wood patterns that are inherently related to within-watershed processes. These relationships between LWD and a river's geomorphological, hydrological, and ecological processes have been widely documented. Research studies have recognized the importance of LWD within rivers and its influence in creating pools (Keller and Swanson, 1979, Robison and Beschta, 1990), modifying sediment storage (Megahan and Nowlin, 1976; Naiman and Sedell, 1979), promoting channel complexity (Keller and Swanson, 1979; Abbe and Montgomery, 1996), providing fish and macroinvertebrate habitat (Anderson and Sedell, 1979; Bisson et al.,

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