Investigation of Photographic Techniques for Characterizing Stream Substrate

Robert T. Ourso, U.S. Geological Survey, Alaska Science Center, Anchorage

A methodology for describing stream substrate based on photography for both coarse (>2-millimeter) and fine (≤2-millimeter) particle sizes was developed and evaluated against currently accepted protocols. The sampled stream reaches (in Anchorage, Alaska) are wadeable, gravel–cobble-substrate streams that have gradients ranging from about 5 percent for the most-upstream reaches to about 0.25 percent for most-downstream reaches. Size-frequency distributions resulting from digitized photographs were significantly different from those resulting from Wolman pebble counts ($p<0.05$) for five sites in the analysis; the Wolman counts showed a bias for selecting larger particles. Photographic analysis yielded a greater number of measured particles (mean = 989) than the Wolman (mean = 321) given the amount of time expended at each site. Embeddedness ratings from field observations and photographs were statistically different at 5 of 12 sites ($p<0.05$), although both showed significant regressions on digitized surface fines ($p<0.05$). Whereas both are potentially useful indicators of benthic conditions, digitizing surface fines produces semiquantitative rather than qualitative data. Benefits of the photographic techniques include reduced field and subsequent processing time, minimal streambed disturbance, easy sample archiving, and improvements in accuracy and replication potential.