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Response of Mountain Stream Channels and Associated Riparian Areas to Flow Regulation

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Abstract.—The need for channel maintenance flow releases below water development projects in the central Rocky Mountain region is currently being debated. The objective of our study was to measure the change in hydraulic geometry of mountain stream channels in response to water diversion. Channel width, depth, width to depth ratio, cross-sectional area, and conveyance capacity were measured above and below diversion structures on 20 stream reaches in Wyoming and Colorado to determine the extent of channel adjustment since regulation. Ocular estimates of riparian vegetation density were also made. Diversion structures ranged in age from 12 to 106 years and reduced streamflow up to 90%.

Our preliminary analysis using paired *t*-tests indicates no significant ($P > 0.05$) differences in channel dimensions above and below diversions on steep (slope $> 4.0\%$) and moderate (slope 1.5 to 4.0%) gradient channels. Low gradient (slope $< 1.5\%$) channels responded to streamflow depletion by significantly reducing their depth, area, and conveyance capacity. In a majority of cases, we observed no differences in vegetation density above and below diversion structures.

Our preliminary results indicate that moderate to high gradient mountain stream channels located in the forest snowpack zone may be maintained with reduced streamflow regimes. Low gradient channels, where encroachment and aggradation appear more likely to occur, should be the primary focus of channel maintenance flow studies.