The effectiveness of riparian reserves for protecting stream and riparian areas in coastal British Columbia: a large-scale experiment.

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Fixed width riparian reserves have long been advocated for the protection of stream and riparian area values. However, there have been exceedingly few empirical tests of the effectiveness of these guidelines. We began an experimental test of riparian buffers at UBC's Malcolm Knapp Research Forest. The 13 stream sites were assigned to controls (n=3), 30 m reserves (n=3), 10 m reserves (n=3), or clearcuts (n=4). These sites were sampled from 1996, through cutting in 1998, to the present, using a replicated BACI design. Within the streams, the amount of riparian cover was inversely related to algal biomass, and even with 30 m reserves, algae increased significantly. The strongest effects for water temperatures were for the no-buffer treatment, as expected, although the magnitude of response within that treatment varied greatly among the three replicates. Clear patterns of recovery to pre-logging conditions were not detected. Detailed study of one of the no-buffer treatment streams indicates significant within-reach temperature variability, and energy budget estimates indicate that hyporheic exchange through step-pool structures may play a strong role in moderating stream temperature response following clearcut harvesting. Many measures of water quality and turbidity showed elevated concentrations from before to after the manipulations, and even after 4 years post-harvesting all had not recovered to control levels. Increases in turbidity were mostly associated with the time of hauling on roads during rainy periods. The responses of cutthroat trout were idiosyncratic and not obviously associated with treatments. Buffers of 30 m provided a moderate amount of protection for several aspects of the riparian system, including small mammals, amphibians, and terrestrial invertebrates, over results from the clearcuts. Fixed width reserves of 30 m and 10 m provide some protection from forest harvesting and may speed the rates of recovery as the surrounding blocks regenerate.