

Effects on Macroinvertebrates

By Nancy Jacobson

Evaluation of longitudinal effects of a single large flood wave on the macroinvertebrates was conducted through a summer season of 1983. Control sites were established and related chemical, physical and plant matter measurements and observations were made. The kick sampling method was used.

Roaring River

During low flows in the ice-covered Roaring River in April 1983, nine months after the flood, high conductivity and high iron levels were found. Anaerobic conditions, high turbidity, and suspended sediment were presumably due to the production of ferric hydroxide. Suspended sediment, oxygen depletion and fine bed material are unfavorable for the macroinvertebrate populations in winter.

Snow melt flushed the high ionic concentrations and much sediment downstream. Macroinvertebrate density at a midway point on the Roaring River was only 0.3 percent of the density at a control site on the Ypsilon, a tributary stream, during high flow. This was due to pulsar high suspended sediment levels and a mobile bed and to a largely drifting population. In July a more stable armor layer was created on the riverbed. By August algae but no moss had re-established. The population rose to 3.2 percent of that at the control with a much higher percentage representation of Chironomidae (48.2% versus 4.6%). Drift decreased from 100 percent to 19.5 percent.

Sites upstream of this midway point on the Roaring River suffer less severe erosion and densities were slightly higher. The site below the confluence of the control stream showed a mixture of the densities and biotypes of the two streams but, by the lowest site on the Roaring River, the densities and biotypes were more typical of the Roaring River.

In general at flood-disturbed sites, macroinvertebrate density decreased during peak flow and then increased after peak flow more radically than non-disturbed sites.

Though diversity was not significantly different at flood-disturbed sites, the equitability component was higher and the species richness component was lower. However, both of these indices may be obscured by sample size. In the literature diversity as well as density are reported to decrease following floods.

The primary sources of macroinvertebrate repopulation during the period observed seem to be downstream drift from tributaries and adult egg-laying in the Roaring River, with larval upstream migration playing less, if any, role.

Until some degree of bank stabilization occurs, these trends can be expected to continue.

Fall River

Fall River, in the small section upstream of the confluence with the Roaring River and below the flood-formed lake, returned to a density equal to its control by early July because of the flushing of alluvial fan deposits and the construction of a stable armor.

The site below the confluence formed a less stable armor on top of a mobile bed, like that formed in the Roaring River, due to continuous pulses of new sediment from the Roaring River.

Macroinvertebrate densities, types and trends were similar at this site to observations in the Roaring River.

The downstream site in the Fall River initially served as a catch area for macroinvertebrates transported downstream during the flood. During the 1983 season, substrate at this site remained mobile as sediment from the snowmelt period, in the Roaring River, failed to flush through; gradients are very gentle in this section of Fall River. Consequently, macroinvertebrate densities continuously decreased and percentage drift continuously increased.

Though the downstream Fall River site was a baseline site for three past studies, it is difficult to draw conclusions about biotype because numbers are very small and natural variability is very high. Percentage representation of Chironomidae did not increase here as the season progressed as it did at other flood-disturbed sites.

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Editor's Note:

Because this project represents such an imaginative exploitation of disaster and wide scientific interest, directed toward management and interpretation of a unique situation, more than the usual space has been given to its coverage.



Park visitors appear tiny in relation to the 42-acre debris fan of the Lawn Lake Flood in Rocky Mountain National Park.