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CHARACTERIZATION OF A RURAL STREAM TO DEFINE CRITICAL REACHES INFLUENCED BY NON-POINT SOURCE POLLUTION

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ABSTRACT

The objective of this research was to define the current ecological integrity of Bachelor Creek in Moody County, South Dakota and define critical reaches influenced by non-point source pollution. The Bachelor Creek watershed drains an area of 37,852 acres, of which 1,563 acres are considered highly erodible land. Land-use in the watershed area is primarily agricultural with approximately 83% cropland, 5% grassland, and 7% farms and shelterbelts.

Samples and measurements were taken to characterize conductivity, dissolved oxygen, pH, alkalinity, total dissolved and suspended solids, ammonia, nitrate, sulfate, iron, manganese, sodium, and total dissolved phosphorus of 15 sites on Bachelor Creek once per month from April through September in 1998 and 1999. Bottom substrate and embeddedness, stream flow, channel alterations, pool/riffle ratio, bank stability, bank vegetative stability, and streamside cover were evaluated using USEPA's Rapid Bioassessment Protocol (RBP) habitat scoring methods at Bachelor and Brookfield sites. Macroinvertebrate samples were collected at three randomly chosen riffle locations from each site on Bachelor and Brookfield Creeks.

RBP habitat scores for Bachelor reach 5 (upstream) ranged from 31-53% relative to Brookfield reference sites. Bachelor reach 5 consistently failed to support aquatic life uses. Unstable bottom substrate accounted for a majority of the low habitat scores of the degraded Bachelor Creek sites. Bottom substrate composition at reach 5 was 98-100% sand, silt, or clay, whereas the bottom substrate composition at the reference stream was 8-17% sand, silt, or clay. Ammonia levels were often high at reach 5, ranging from 0.06-2.87 mg/L. Sites on reach 5 were considered moderately impaired due to low EPT index (0-1) and taxa richness (4-12) values and high coefficient of community loss (2.25-7.50) in comparison to the reference stream. Results suggest that stream invertebrate communities are highly correlated with impaired habitat conditions and elevated ammonia concentrations in the upper channelized reaches of Bachelor Creek.