Statistical Evaluation of Periphyton Samples from Montana Reference Streams 2

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Periphyton Bioassessment Methods for Montana Streams (Bahls 1993) presents procedural guidelines and numeric biocriteria for using the composition and structure of periphyton communities to assess biological integrity and impairment of aquatic life in Montana streams. This manual was based on the findings of a 1990 Montana reference stream study and follow-up surveys in 1991 (Bahls et al. 1992). Three metrics sediment index, pollution index, and diversity index–and two sets of biocriteria are provided, one for mountain and foothill streams and one for plains streams. These original metrics have been supplemented by additional metrics adopted by the Montana Department of Environmental Quality (State). These metrics and biocriteria are linked to beneficial use classifications in Montana Surface Water Quality Standards. While generally accepted, Montana's metrics and biocriteria have not been subject to rigorous data analysis protocols. Advances in biological data analysis and the collection of a large amount of periphyton data since 1993 now offer the opportunity to review existing metrics, test new ones, and refine or develop biocriteria for those metrics. Therefore, the purpose of this study is to use generally accepted statistical protocols and recent periphyton data to develop and test an array of candidate metrics and to revise or establish biocriteria as needed. Biocriteria are evaluated for their ability to address two key questions directly relevant to the State's assessment of naturally flowing streams: 1) Do diatom sample results indicate impairment under 303(d) guidelines? 2) If so, do diatom sample results indicate the cause of impairment? Criteria developed within this framework directly support the State's water quality assessments. Of specific interest to the State is the level of impairment where aquatic life use support is partial or none. Criteria address instances where diatom community response is most likely; that is, impairment due to sediment, nutrients, and/or metals. Diatom community response to other causes is expected to be limited, regardless of the level of impairment, and therefore not addressed.