Using Fish Assesmblages as Indicators of Aquatic Ecosystem Integrity in Montana Prairie Streams[*]

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Prairie streams in Montana are affected primarily by non-point source pollution and stream habitat degradation, which make assessment with traditional methods such as water chemistry analysis difficult. Quantitative indicators of biological integrity are generally lacking for prairie streams, and little is know about what constitutes a healthy Montana prairie stream fish assemblage. We developed a multimetric index of biological integrity (IBI) for Montana prairie streams using fish assemblages. Choosing effective fish metrics in prairie streams is challenging because native fish assemblages are often depauperate and prairie fishes are adapted to harsh environment fluctuations. We screened fish-assemblage metrics by testing for responsiveness to anthropogenic stress, lack of responsiveness to natural factors, temporal stability, and lack of redundancy. The resulting IBI was comprised of 10 fish-assemblage metrics based on species richness and composition, tolerance to human-induced stress, trophic and reproductive guilds, and age structure. The number of native species, number of native families, number of catostomid and ictalurid species, proportion of invertivorous cyprinids, number of benthic invertivorous species, proportion of litho-obligate

reproductive guild individuals, proportion of native individuals, and number of species with long-lived individuals declined with increasing anthropogenic stress, whereas proportion of tolerant individuals and proportion of tolerant reproductive guild individuals increased with increasing anthropogenic stress. We propose that this IBI can be used as a quantitative measure of ecosystem integrity for use in management of Montana prairie streams faced with threats such as introduced species, agriculture, and coal bed methane extraction.