The Use of Graph Theory to Determine the Effect of Loss Taxonomic Diversity on Trophic Function

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Does loss of taxa affect trophic function? To examine this question I estimated taxonomic diversity and trophic function for aquatic insects across streams exhibiting a gradient of habitat degradation and assigned functions to taxa present in the streams. Data were obtained for use from fourteen sites across Iowa, Nebraska, and Kansas with permission from Central Plains Center for Bio-assessment. Taxa loss does not necessarily indicate loss of trophic functions. The hypothesis that loss of taxa of aquatic insects would lead to a decrease in trophic functions was tested. Taxonomic diversity decreased with increased habitat degradation across sites. The site with the most habitat degradation, the site with medium habitat degradation, and the site with the least habitat degradation were explored using Graph Theory. Edges linked taxonomic and trophic groups. Primary, secondary, and tertiary affinities between taxa and function were denoted by edge color. Vertices were weighted by abundance. Shannon-Wiener diversity was calculated for taxa and functional groups. Results show that relationships between taxonomic diversity and trophic functions are more complex in the least impaired site. In the most impaired site, loss of taxa led to the complete loss of some trophic functions and the compression of others. Shannon-Wiener diversity values for taxa and function decreased as habitat degradation increased. Taxonomic and functional diversity were highly correlated at 81%. The implications of this study are that trophic function is directly affected by loss of taxa and that loss of taxonomic diversity directly effects ecosystem function.

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