

Presentation Information

Presenter	John Loomis
Title	Surprises from an Integrated Interdisciplinary Analysis of Human and Ecological Interactions on a River-Road Network in Two Tropical Watersheds in Puerto Rico
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Abstract:

Our interdisciplinary project analyzed interactions between natural physical features (waterfalls, elevation), human systems (road crossings, visitor use) and ecological integrity (biotic diversity and water quality) in tropical watersheds in Puerto Rico. All three categories of variables were sampled by hydrologists, biologists and social scientists at the same river-road crossings to investigate reciprocal interactions. We initially hypothesized negative interactions between road crossings and visitor use on water quality and biotic diversity, but no negative interactions were found. Given the ability of freshwater shrimp to climb up waterfalls of >3.5 m, bridges across rivers had little effect on biotic diversity of fishes and decapods as long as stream flows were present. During low flows, road culverts posed temporary barriers to dispersal. Decapod diversity was higher in pools above waterfalls where predatory fishes were unable to occupy. Visitor use had little adverse affect on decapod diversity mostly because visitors were active during the day, and decapods migrated at night. At normal river flows, visitor use levels had no statistical effect on turbidity or harvest of shrimp and fish. The presence of large number of visitors had no significant affect on ammonium, dissolved nitrates, or total nitrogen in the river water below recreation areas. Although roads provided increased visitor access, most visitors avoided river segments crossed by large roads due to the high levels of traffic. The major surprises were that anthropogenic factors such as visitor use and roads had little impact on presence/absence or diversity of diadromous fauna such as shrimp or water quality at normal stream flows. Our metrics of impact (e.g. changes in nutrient concentrations and biotic diversity) rather than more fundamental ecosystem processes (e.g., rates of production) may be insufficient to detect differences. Alternatively, the diadromous fauna may be well adapted and resilient to impacts from visitor use and roads.