

Modeling Complex Interactions of Overlapping River and Road Networks in a Changing Landscape

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Abstract. The objectives of this project are:

1. Evaluate the Direct Effects of Roads on River Hydrology and Aquatic Species
2. Evaluate the Indirect Effects of Roads on Water Quality and Aquatic Species from the recreation visitation roads make possible

Hypothesis

As road connectivity increases, habitat connectivity decreases because of the increase in the number of breaks in ecological connections disrupts migratory species such as shrimp.

Sampling and Data

The three watersheds in Puerto Rico provide varying degree of road densities, recreational uses and stream-size classes provide a continuum of river - road network complexity that is suited to test our hypothesis. Road-size and stream-size classes with recreational- use levels provides the sampling matrix.

Preliminary Analyses

Analysis of the first summer of sampling suggests that shrimp species richness and average visitor use of rivers are inversely related. Thus, the direct physical effects of roads and indirect effects of recreational-visitor use made possible by roads may have an adverse effect on shrimp species diversity.

Future Work

Using data from 2004 and 2005 we will develop rule curves that describe the behavioral responses of shrimp, visitors and river flows to each other. These will be programmed into SWARM, individual agent based model to identify the emergent properties of this system. Then the model will be used to make predictions for the relatively unroaded Río Fajardo watershed. During 2006, data will be collected to compare SWARM model predictions to actual data. Teacher and manager workshops as well as interdisciplinary graduate seminars will be held to discuss the results.