Ultrasonic and radioelectrometry are widely used to study fish ecology and behavior. Most telemetry studies are qualitative in nature and fail to adequately assess whether observed patterns of movement or redistribution are random. We have developed a model, based on various types of random walks, that can be used as a null model in fish telemetry studies. Using results from a previous study of movement by large-mouth bass, we assess the probability that individual fish move at random after capture and release. The model can be used to explore the implications of redistribution of fishes by anglers and the effects of lake morphometry on fish behavior and movement.

### Introduction

We have proposed and developed a very general and flexible individual-based simulation model that can be used as a null model in fish telemetry studies. Our model incorporates several different types of random walks, including autocorrelated walks, and allows for introduction of biases due to habitat heterogeneity and stream flow. This approach differs from models in which diffusion equations are modeled directly (e.g., Kareiva 1983, Skalski and Gilliam 2000). Comparable approaches to the simulation of movement have been applied by Tischendorf and Wissel (1997), Tischendorf et al. (1998), Vermeulen (1995), and Haddad (1999). We used stochastic models to assess the results of a previous study of movement by large-mouth bass in Par Pond (ERDA Savannah River Plant, Aiken, SC), a reservoir receiving heated effluent in one arm of the lake. Dupont tracked the daily movements of 20 largemouth bass for extended periods during both summer and winter periods, reporting the results as numbers of observations per grid cell (e.g., Figs. 2 & 3), but discussed most of the results only qualitatively. We reanalyzed 19 trackings, 10 from summer and 9 from winter. None of the summer trackings differed from random movement, as indicated by 2D-KS tests with p > 0.05. However, 2 of 9 summer trackings differed from random movement, both in the direction of overspersion.

### Current and Future Work

- Current work is being concentrated on the modeling of additional kinds of biological factors, and development of more powerful and statistical tests (including time-series tests).
- Future work will focus on a wider variety of random-walk models and on more realistic treatment of rates of movement.