Pacific Institute *for the* Mathematical Sciences

PIMS DISTINGUISHED SPEAKER: MARK LEWIS

Mathematics behind stream population dynamics

Tuesday, March 12 2013

University of Victoria
3:30pm, DSB C118

Human activities change the natural flow regimes in streams and rivers and this impacts ecosystems. In this talk I will mathematically investigate the impact of changes in water flow on biological populations. The approach I will take is to develop process-oriented advection-diffusion-reaction equations that couple hydraulic flow to population growth, and then to analyze the equations so as to assess the effect of impacts of water flow on population dynamics. The mathematical framework is based on new theory for the net reproductive rate R_0 as applied to advection-diffusion-reaction equations. I will then connect the theory to populations in rivers under various flow regimes.

This work lays the groundwork for connecting R_0 to more complex models of spatially structured and interacting populations, as well as more detailed habitat and hydrological data. This is achieved through explicit numerical simulation of two dimensional depth-averaged models for river population dynamics.

MARK LEWIS is a Professor in the Department of Mathematical and Statistical Sciences at the University of Alberta. He holds a Canada Research Chair in Mathematical Biology and a Killam Research Fellowship. His research is mathematical biology, with a focus in spatial ecology and his mathematical models include nonlinear partial differential equations, integrodifference equations and related stochastic spatial processes. Biological problems include modeling the process of territorial pattern formation in wolves, predicting population spread in biological invasions, calculating optimal strategies for biocontrol and assessing the effect of habitat fragmentation on species survival. A significant part of his research involves the formulation and verification of quantitative models, in collaboration with biologists. His mathematical approaches include analytical methods for dynamical systems, perturbation theory and computational methods.

www.pims.math.ca