You are invited to attend the presentation of the

Final PhD Defense
of
Samuel Fischer

Date January 16, 2020

Time 11:00 a.m.

Location CAB 657

Quantitative Methods for Controlling the Spread of Invasive Species

Invasive species and infectious diseases distributed by means of human traffic and trade cause significant harm all over the world. Our ability to effectively reduce the spread of such invasive species and diseases depends on reliable predictions of traffic. In this talk, I present a set of tools to both assess the traffic of potential vectors through road networks and to optimize control measures hindering the propagation of biological invasions and epidemics. I introduce a method to compute potential vector pathways and incorporate the resulting routes in a hybrid vector traffic model that accounts for both the travel incentive and the route choice of potential vectors. I use the model's estimates to determine optimal locations to control potentially infested vectors. Along with the model, I introduce statistical tools to test modelling assumptions and the credibility of parameter estimates and predictions. These tools include an efficient algorithm to compute confidence intervals. The algorithm is robust even in situations in which earlier methods are error prone. I apply all developed methods to the prevention of potential zebra and quagga mussel (Dreissena spp.) introductions to the Canadian province British Columbia. Dreissenid mussels are invasive in North America and have negative effects on both ecosystems and their value to humans. The methods presented in this talk apply approaches from graph theory, transportation research, stochastic processes, statistical inference, economics, and optimization to invasive species control, and thus provide a striking example for the potential of interdisciplinary approaches to environmental management.