Mathematical Biology Seminar/ AMI Seminar

Friday, January 17, 2020
3 pm – 657 CAB ***Please note date and location***

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Number of source patches required for population persistence in a source-sink metapopulation

Take a digraph of N locations (patches) in which a single species lives. The digraph structure represents movement of individuals between locations, with movement being instantaneous when it takes place. Assume patches can be favourable (sources) or detrimental (sinks) to species survival. Clearly, if all patches are sinks, then the population must go extinct, whereas if all patches are sources, the population must persist. One can therefore ponder whether there exists $S_c<N$ such that when the number S of sources is less than S_c, the population goes extinct in all patches, while when $S>S_c$, the population persists in all patches. I will show that the (positive) answer to the local version of this question is very easy but leads to a variety of interesting questions when one considers the problem in a little more detail. The cast of characters involved includes matrix theory, a theorem of Hirsch on monotone flows as well as equitable partitions. Finally, I will discuss the underlying ecological framework as well as the implications of the results in terms of control or preservation.

This is joint work with Nicolas Bajeux and Steve Kirkland (both at U of Manitoba).