

Modeling Invasive Purple Loosestrife in a Nonflat Landscape

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Abstract:

Lythrum salicaria, commonly known as purple loosestrife, is an invasive plant species that has damaged ecosystems across of the continental United States and southern Canada. It is most commonly a wetland plant but has also invaded mountainous communities of higher elevation. We modeled purple loosestrife seed dispersal on a non-flat landscape that was simulated using an exponential equation. Calculations were done using FEMLAB and its built-in convection-diffusion equation. In this equation, we utilize partial derivatives of the landscape equation. The advective term in the convection-diffusion equation distinguishes the seed's dispersal from standard diffusion by incorporating the importance of dispersal across water, which is purple loosestrife's primary means of seed dispersal. Limited processing power prevented the development of a model realistic enough to predict invasion speed. However, the model describes the pattern of invasion of purple loosestrife in a mountainous region.