Incorporating landscape attributes into dynamic population models.

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Abstract: Dynamic populations models such as the Lotka-Volterra model have been widely studied from both a mathematical perspective and in ecological applications. They are effective at giving researchers insights into how changes in various population parameters will influence the changes in the population dynamics. One area of interest is how the model parameters change across some ecological gradient. We propose using a hierarchical Bayesian framework model the influence across the ecological gradient. Furthermore, and possibly more importantly, be able to understand how future changes in the environment will affect the population dynamics with associated uncertainty quantification. This will be illustrated using two simulated datasets: one concerning the standard Lotka-Volterra predator-prey model and another concerning growth rates and carrying capacities. Using a dataset from the Daly river in Australia we show how impactful this type of analysis can be.