AN ABSTRACT OF THE DISSERTATION OF

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Transition matrix models are one of the most widely used tools for assessing population viability. The technique allows inclusion of environmental variability, thereby permitting estimation of probabilistic events, such as extinction. However, few studies use the technique to compare the effects of management treatments on population viability, and fewer still have evaluated the implications of using different model assumptions. In this dissertation, I provide an example of the use of stochastic matrix models to assess the effects of prescribed fire on *Lomatium bradshawii* (Apiaceae), an endangered prairie plant. Using empirically derived data from 27 populations of five perennial plant species collected over a span of five to ten years, I compare the effects of using different statistical distributions to model stochasticity, and different methods of constraining stage-specific survival to #100% on population viability estimates. Finally, the importance of correlation among transition elements is tested, along with interactions between stochastic distributions and study species, on population viability estimates.

Fire significantly increased population viability of *L. bradshawii*, regardless of stochastic method (matrix selection or element selection). Different processes of incorporating stochasticity (i.e., matrix selection vs. these statistical distributions for

element selection: beta, truncated normal, truncated gamma, triangular, uniform, and bootstrap) and constraining survival (resampling vs. rescaling procedures) yielded divergent estimates of stochastic growth rate, and there was a significant interaction between these methods. These effects were largely explained by the degree of bias the different methods caused in transition elements. Incorporating correlation among elements caused a significant, but small, reduction in estimated stochastic growth rate in two of five species examined, yet there was no interaction with stochastic method in this effect. Much of the variation in average response to correlation structure among species was due to the relative balance between positive and negative associations among the vital rates. Although alternative techniques may lead to very strong differences in estimates of population viability, conclusions about the relative ranking of populations or treatments are robust to differences in stochastic methods.