

Forest Succession, Disturbance, and the Sustainability of Beavers (*Castor Canadensis*)

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Theory suggests that territorial species should share many of the same dynamical characteristics as metapopulations, including: asynchronous local dynamics; potential for stochastic extinction of the population when rates of successful dispersal fall below mortality risk; and critical importance of the ratio of suitable to unsuitable habitat for long-term persistence. I tested these propositions on a population of beaver (*Castor canadensis*) in Algonquin Provincial Park, Ontario, which has been continuously monitored over 11 years. My results showed that the total population was considerably less variable than local abundance at 14 beaver colonies, due to asynchrony among local populations. This suggests that local ecological interactions were more important in determining year-to-year variation in beaver numbers than broad-scale environmental processes, such as weather. 20% of the local colonies were never abandoned over 11 years, although there was considerable turnover among adults. Offspring production exceeded adult abundance at five source colonies, which did not quite compensate for negative net production at nine sink colonies. These observations were consistent with predictions of spatially-structured models of territoriality, incorporating local variation in habitat suitability. Mean colony size and probability of recurrence from year-to-year were associated with local food availability, indicating that trophic interactions were important in determining local population dynamics. The beaver population in Algonquin declined steadily over the study period however, suggesting that spatial and demographic processes were insufficient to stabilize abundance over time. This is consistent with predictions of spatially-structured models of territoriality in which suitable and unsuitable habitats are interspersed. I hypothesize that long-term decline in habitat suitability is induced by acceleration of woody plant succession due to selective foraging by beavers. Management actions to ensure sustainability of beavers should include some source of disturbance, natural or otherwise, to restore early successional stand characteristics.

Long-term Fluctuations of Small Mammals in Upland Habitats in Algonquin Park

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Since 1952, small mammals have been trapped on the same standard traplines (10 stations of 2 traps each at 10 m intervals) and 2001 will be the 50th year of this study. Such long-term studies are useful in monitoring abundance and diversity, and in testing hypotheses regarding ecological and demographic patterns. Hypotheses can be tested either by direct analysis of the data, or by using such studies to generate hypotheses that can be tested by specific experiments. Some basic patterns in abundance and diversity of the eight most common species of small mammals will be discussed, particularly in relation to weather and mast production. As well, long-term trends will be viewed in the context of 50 years of undisturbed growth of the mixed and hardwood forests of southern Algonquin. Lastly, an argument will be made that long-term studies should be an important priority of our provincial parks to enhance both understanding and conservation of biodiversity.