

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Modeling Biotic Causes of Extinction: Vertebrate Case Studies at the Intersection of
Evolutionary Ecology, Paleontology, and Conservation Biology

By

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While the modeling of metapopulation dynamics has illuminated biotic causes of extinction and provided both useful insights and a variety of modeling tools for conservation biology, the techniques of theoretical ecology and mathematical modeling can be directed at evolutionary and ecological topics to assess extinction in so far generally overlooked ways. This dissertation investigates a series of informative modeling case studies dealing with predation and competition in vertebrate systems in order to demonstrate its potential to inform conservation biology and North American restoration.

First, I review Late Pleistocene extinction models in order to develop a more transparent, ecologically realistic alternative and a framework for future modeling efforts. The resulting analysis and model reveal serious limitations in constraining model parameters. My conclusions strongly suggest that existing Late Pleistocene extinction models should be subject to considerable skepticism, both due to their inability to account for survival-extinction patterns in North American species and their inability to differentiate between different extinction scenarios.

Second, I assess the ecological consequences of the loss of a guild's top carnivore by developing a new conceptual model of intraguild competition among North American canids. The model provides a tool for the management of carnivores and their prey and suggests: (1) that mesopredator release in North America, rather than representing a recent ecological novelty, was typical during the Pleistocene; (2) that ecological restoration efforts could in some respects benefit from excluding rather than introducing the largest predators; and (3) that restoration efforts aimed at a pre-European North American benchmark would benefit threatened mesopredator prey species, while a Pleistocene restoration strategy would provide them with little or no advantage over current conditions. These conclusions emphasize the value of a paleoecological perspective in conservation biology and the need for caution in restoration efforts, particularly those that call for the introduction of Old World megafauna as analogs for extinct Pleistocene species.

Date: June 13, 2007

Time: 1:00 P.M.

Place: Life Sciences, Room 038

Program: Ecology and Evolution

Dissertation Advisor: Lev R. Ginzburg