INTERMODULAR DESCRIPTION SHEET:	UMAP Unit 764
TITLE:	Of Mites and Models: A Temperature-Dependent Model of a Mite Predator-Prey Interaction

AUTHORS:

John B. Collings
Mathematics Dept.
University of North Dakota
Grand Forks, ND 58202–8376
collings@plains.nodak.edu

David J. Wollkind
Dept. of Pure and Applied Mathematics
Washington State University
Pullman, WA 99164–3113

MATHEMATICAL FIELD:	Mathematical modeling, differential equations
APPLICATION FIELD:	Population biology
TARGET AUDIENCE:	Students in differential equations or mathematical modeling courses that cover phase-plane analysis.

ABSTRACT: We analyze the qualitative behavior of a model for a mite predator-prey interaction. This model is based on a simple system of differential equations, and the model parameters are assigned values determined for a specific interaction between two species of mites. Several of these parameters are functions of temperature, and temperature is treated as a bifurcation parameter in the analysis of the model. It is shown that, depending on the temperature value, the model exhibits a stable fixed point, a stable limit cycle, or both (bistability). The model is used to illustrate population outbreaks.

PREREQUISITES:	Familiarity with the qualitative analysis of systems of differential equations (phase-plane analysis), and availability of an ODE solver with an adaptive step size (e.g., a Runge-Kutta-Fehlberg method).