

BIO 480 Exam 2 Topics

Includes Haefner Ch 4 & 6, Keen & Spain handout (Silver Springs Model)

Model development - Quantitative Methods

FDE *versus* DE models

Compartment Models

Developmental approach

diagrammatic

mathematical

differential equations, forcing functions

transfer functions - What are the possible types?

solution requirements

computer (modelmaker program, external flows)

Silver Springs model

description

predator-prey style of feeding functions

external flows

behavior

strengths/weaknesses

Quantitative numerical methods for DEs

Numerical errors in computing

Euler's method for solving DEs

How does it work?

Effects of time step size on errors

Better methods? (Runge-Kutta second order)

Logistic model - the DE version

Effects of time step size on solution behavior

Root Finding Methods (square root of 7 example)

Why needed? What is a root?

Linear Interpolation Method

How does it work?

Newton's Method

How does it work?

Analytical vs. numerical derivatives

Exit tests

Variables and precision (float vs. double)

Organism-Environment Interactions & Energy Budget Models

What environmental factors are important?

Steady-state budgets (constant flows, in=out, what is ignored?)

Energy exchange processes:

Radiation exchange – visible solar vs. infrared

Emitted radiation (Stefan-Boltzmann Law)

emissivity

Convection

convection coefficient, effects of wind speed, organism size

Metabolic energy (effects of temperature on)

Evaporative cooling (effects of temperature)

Insulation effects (surface vs. body core temperature)

Total budget for organisms – behavior and general effects

wind

evaporation

air temperature

organism size

radiation

dew formation

humidity