BIOI 410 Tutorial 7
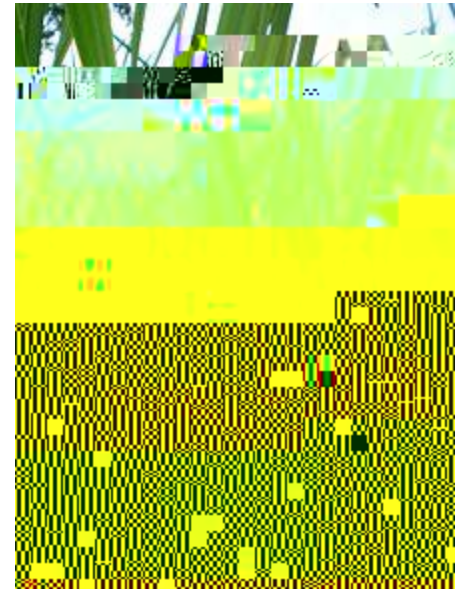
Incidence function model

Meta population dynamics of a marsh plant

Branched bur-reed

Perennial marsh plant

Dispersal via seeds
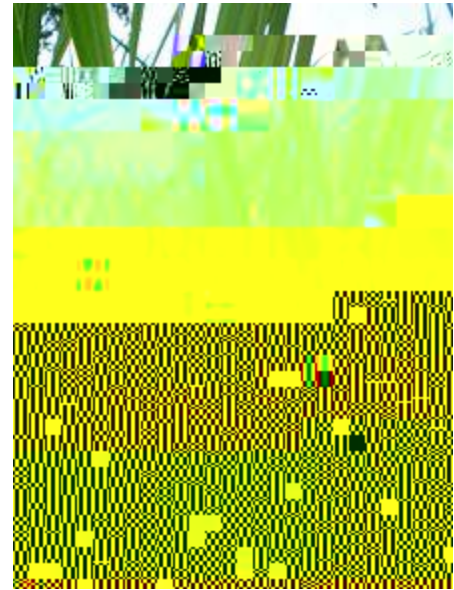
27 ponds where plant is expected

Meta population dynamics of a marsh plant

Dispersal (distance dependent)

$$= \quad (- \quad)$$

Extinction (pond area dependent)

$$= \; ---$$

Estimated parameters

alpha	1	Dispersal kernel param.
x	0.41	Extinction param.
e	0.02	

Incidence function model

Load the script for the incidence function model

    Load the system data (patch coordinates, size, occupancy)

    Load the model parameters and functions

    Plot the dispersal kernel, extinction probability and patch occupancy in 2010

    Load the incidence function model

    Run the model for 200 years (tmax <- 200)

        Plot the changes in system occupancy state

        Plot the occupancy state of patches through time

The model is stochastic, so estimates need to be based on multiple runs

    Run the model 10 times (for 200 years)

    For each run record:

        Is the metapopulation persistent?

        What is the occupancy state after 200 years?

        What is the mean occupancy state (red line)?

        Has the population reached a pseodo-equilibrium state?

Questions

1. If current conditions are maintained, is this population expected to persist?

2. If you run 2000 year simulations instead of 200 years, do your predictions changes?
    Are these better estimates?

3. After a 2000 year simulation, plot the occupancy state of the patches through time. Based on this data consider:
    What are the five most important plots in the system (i.e. if you are a conservation officer which ponds would you make sure to maintain)?
    What are the 10 least important ponds (which ponds can be destroyed)?

4. If the extinction parameter (x) is actually 0.6 (instead of 0.41):
    What is the impact on each patches extinction rate?
    What is the impact on metapopulation dynamics (occupancy, persistence)?

5. If connectivity between the ponds is higher (i.e. the alpha parameter is 0.8 instead of 1):
    What is the impact on the connectivity between patches?
    What is the impact on metapopulatin dynamics?