Modeling Patterns and Dynamics of Species Occurrence Course
4.5-day Agenda

Day 1

Background

- Why, what and how
  - why is there interest in the population
  - what to estimate
  - how to estimate: basic principles
- Occupancy applications
  - areas were such techniques could be useful
- Statistical methods
  - concepts and notations
  - probability
  - Maximum likelihood and Bayesian estimation
  - logistic regression, covariate modelling and odds ratios
  - hypothesis testing
  - model comparison and multi-model inference
  - computer exercises in Excel

Single-season model (part I)

- basic sampling situation (data type)
- model history and development
- missing observations
- covariates

Introduction to PRESENCE

- worked single-season example (no covariates)
- examination of the output
- results and interpretation

Day 2

Single-season model (part II)

- model assumptions
- dealing with heterogeneity
- small sample/finite population inference
- modelling spatial correlation in occupancy

Design matrices and fitting custom single-season models in PRESENCE

- worked single-season example (with covariates)
- examination of the output
- results and interpretation
- second worked example with covariates
- using results to develop species distribution maps with PRESENCE and *R*

Introduction to RPresence
- fitting occupancy models with PRESENCE via R

Day 3

Single-season study design
- site selection
- allocation of effort
- design comparisons
- survey timing
- miscellaneous issues
- covariates
- GENPRES

Sample size exercises

Multiple-season model (part I)
- basic sampling situation (data type)
- model history and development
    - implicit dynamics
    - explicit dynamics
- missing observations
- covariates

Multiple-season models in PRESENCE
- worked multi-season example
- examination of the output
- results and interpretation

Day 4

Multiple-season model (part II)
- alternative parameterizations
- characterizing occupancy dynamics
- modelling spatial correlations in occupancy dynamics

Worked multiple-season examples and computer exercises
- incorporating hypotheses of occupancy dynamics into modelling
- worked example

- examination of the output
- results and interpretation
- alternative parameterizations
- second worked example
- creating maps of occupancy dynamics using PRESENCE and *R*

Multiple-season study design
- relationship with single-season designs
- long-term design
- adding sites over time

Advanced topics
- multi-state occupancy
- integrated habitat-occupancy dynamics
- modelling multiple 'species' simultaneously
- species richness and community dynamics
- species co-occurrence
- other extensions

Day 5 (until noon)

Summary and Discussion
Consulting session
- analyze own data
- ask specific questions of the instructors
- address design issues