Data Analysis IIIB: Environmental Sampling and Monitoring using R (CSP4230)

National Conservation Training Center (NCTC)
Shepherdstown, West Virginia, USA
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Description:

This course will develop the participant's skills needed to monitor species trends and distributions, and assess changes due to management actions or impacts in the environment. The design aspects used in class will address the ecological and predictive capacity of prospective approaches, with the overall aim of increasing the predictive power of the analyses and reducing the error associated with modeling the environment. The overall goal of the course is to familiarize the participants with the statistical sampling concepts and definitions, and the "where", "when", and "how" of sampling. The six primary objectives of the course will include: site selection designs, stratification, panel rotation designs, field methods and their influences on detectability, status estimation, and trend estimation.

Data Analysis IIIB course will explore the principles and application of analytical approaches and design techniques important to the management of threatened and endangered plant and animal populations. Emphasis will also be placed on the development of design and analytical skills, and the estimation of status and trends. The course is designed for the students to learn the concepts and techniques through lectures, exercises, and working with data sets. The aim of these exercises is to familiarize students with the mathematical notation, statistical approaches, and modeling techniques frequently used in designing and implementing field studies.

Concepts and techniques covered in class will include: (1) haphazard and convenience sampling; (2) terminology; (3) site selection and variable probability sampling; (4) stratification and "soft" stratification using GRTS: (5) panel rotation designs and concept of connectedness; (6) field

methods and using repeat visits for presence; (7) bootstrapping and computer simulation; (8) status estimation using quadrat and distance methods; and (9) trend estimation for both abrupt and long-term trends.

Goals: To introduce and familiarized participants with the following:

1. Statistical sampling concepts useful in environmental sampling and monitoring.
2. Statistical methods dictating the "where", "when", and "how" of environmental sampling
3. Basic statistical analyses designed to estimate status and trend.

Requirements:
Data Analysis II: Ecological Modeling using R

Access to a computer containing Excel and R.

Course Syllabus:

Half hour breaks will be taken each morning and afternoon. One-hour lunch breaks will occur at approximately noon each day.

NOTE: THE COURSE SYLLABUS HAS NOT BEEN FINALIZED. THE FOLLOWING SYLLABUS IS SUBJECT TO REFINEMENT.

Session	Title	Topics
Day 1 Early Morning	Introduction and Motivation	The motivation for probability surveys • Definitions of judgment, haphazard, and convenience sampling • Hazards associated with these plans
Day 1 Late Morning	Terminology	Definitions of: • Population • Sample • Probability sample • Frame • Frame errors an inference • Exercises
Day 1 Afternoon	Site Selection Designs	The "where" of environmental surveys • Simple random sampling • Systematic sampling • Generalized Random Tessellation Stratified (GRTS) sampling • Variable probability sampling • Exercises
Day 2 Morning	Stratification	The "why" of stratification: • Strata definitions • Pros and cons of stratification • Sub-populations • Modern "Soft" stratification using GRTS • Estimation • Exercises
Day 2 Afternoon	Panel Rotation Designs	The "when" of environmental surveys • Always repeat ([1-0]) • Never repeat ([1-n]) • Repeat some, rotate others ("split panel designs", [1-x, a-b]) • Concept of connectedness • Exercises
Day 3 Morning	Field Methods and Analyzes there of	The "how" of environmental surveys • Quadrat (enumeration) methods • Delectability • Line transects

		• Point counts • Repeat visits for presence • Bootstrapping • Computer Simulation • Exercises
Day 3 Afternoon	Exercises and Projects	Hands-on experience implementing site selection, panel rotation, and field methods • Computer or in-class hands-on experiments • Project on the grounds of NTC
Day 4 Morning	Status Estimation	Point and confidence interval estimation for: • Quadrat methods • Distance methods • Bootstrapping revisited • Exercises
Day 4 Afternoon	Trend Estimation	Estimation of abrupt change and long-term trend • Definitions (abrupt change vs. long term steady change) • Detection of abrupt change • Detection on long-term trend • Bootstrapping revisited. • Exercises
Day 5 Morning	Wrap-up	Question and answers, review, or clarification of any topic in the course.