

Habitat evaluation

- Factors to consider
- 2 steps
 - Reconnaissance
 - Primary survey
- Importance of sampling design
 - How do animal populations respond to resources in habitats used?
- Predicting wildlife occurrence
- Overview of models

Factors to consider

- Geology and topography
 - Slope, aspect, ruggedness, special features
- Soils
 - Productivity, indicator of wetlands
- Weather and climate
 - Precipitation, average temperature, heating days
- Vegetation
 - Species composition, vegetative structure
- Cultural features
 - Towns, roads, fences, human-created structures
- History on the land
 - Grazing, cutting, burning, drought, tillage

2 Steps: reconnaissance & primary survey

- A few days of preliminary survey can save you a year of wasted effort
 - General overview of area with your objectives in mind
 - On the ground surveys to characterize the landscape and vegetation
 - Degree of detail depends upon objectives: species composition, forage availability, type of cover
 - Review aerial photo, topo maps, GIS
 - Provide tests of measurement techniques
 - Estimates of sampling variance to determine needed effort

2 Steps: reconnaissance & primary survey

- Primary survey takes more time, staff, \$\$
- Specific habitat data are collected for specific sites and objectives
- Commonly collected data:
 - Vegetation: species composition, structure, vegetative cover, density of cover, browse intensity,
 - abundance/use of cliffs, caves, snags, cavities
 - Food: availability, use
 - Water: distribution
 - Disturbance: frequency, type, intensity
- Simple descriptions to complex hierarchical classification schemes

Sampling design

- Regardless of variable used to describe habitat, efficient sampling design is needed so adequate measures can be made to determine whether objectives are met.
- Habitat sampling is one of the most costly (people hours) parts of a wildlife study.
- Choosing what to measure, when and how to measure it:
 - Biological concerns
 - Statistical concerns

What to measure: biological concerns

- (Mannan et al. 2002)
 - What to measure
 - When to measure

10 Sampling principles

- *Sampling Design and Statistical Methods for Environmental Biologists*. 1979. R. H. Green. Wiley-Interscience. 257 pp.
 - 1. Be able to state concisely what question you are asking. Your results are only as coherent as your initial conception of the problem.
 - 2. Take replicate samples within each combination of time, space and any other controlled variable. Differences **among** samples can only be demonstrated by comparison to differences **within**.
 - 3. Take an equal number of random, replicate samples for each combination of controlled variables. Collecting data from "representative" or "typical" places is **not** random sampling.
 - 4. To test whether a condition has an effect, collect samples both where the condition is present and where the condition is absent but all else is the same. An effect can only be demonstrated by comparison with a **control**.
 - 5. Carry out some preliminary sampling to provide a basis for evaluation of sampling design and statistical analysis options.

10 Sampling principles

- 6. Verify that your sampling device or method is sampling the population or subgroup that you think you are sampling. Show that this is done with equal and adequate efficiency over the entire range of sampling conditions. Inequality in sampling effort is the most common bias in ecological studies.
- 7. Break large-scale heterogeneous environmental units into smaller, relatively homogeneous sub-areas and allocate samples to each sub-area in proportion to its size.
- 8. Using accepted statistical criteria (your Teaching Fellow will help with this), verify that your sampling effort is appropriate to size, densities, and spatial distributions of the organisms or ecological units you are sampling.
- 9. Frequently ecological data are not normally distributed (e.g., unequal variances with respect to the mean). Test your data for variation among and between ecological units of interest with the appropriate statistical tests. If your data are not normally distributed (i.e., parametric), then you may need to transform your data so that they meet the assumptions of a parametric test, or you may need to use a nonparametric test.
- 10. Having chosen the best statistical method to test your hypothesis, stick with the result. An unexpected or undesired result is **not** a valid reason for rejecting the method and hunting for a "better" one.

What to measure: statistical concerns

- **Variance:** (more variable requires greater sampling effort)
 - Ecological systems are highly variable
 - Differences we wish to detect are often small or involve interaction of multiple habitat components
 - Since research resources are limited, attention to sampling design is essential to collect adequate data to identify or even describe key limiting factors
- **Replicates:** (finding the same thing on many sites increases certainty about important factors)
 - Necessary for estimating effects of treatments
 - Necessary for making inferences to broader areas

Importance of species composition

- 4th order of habitat selection
- Some animals can be linked to specific plants and/or plant communities
- Plants are indicators of habitat
- Plants are indicators of history of land use in a habitat



What kinds of things do we usually want to measure?

- Percent cover
- Density
- Visual obstruction
- Canopy cover
- Special features



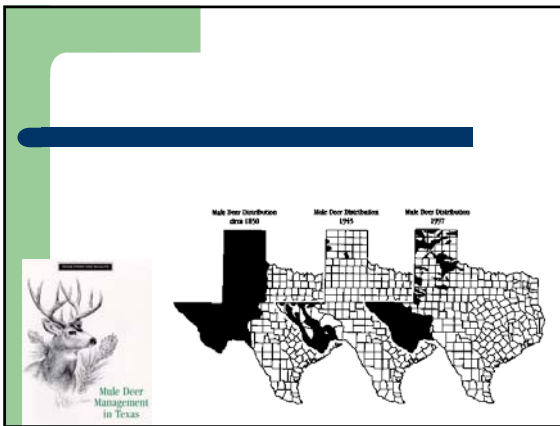
Predicting wildlife habitat use

- Identify 'good' habitat
- Predict results of habitat manipulations
- Predict where species should occur
- Predict where most or best populations should occur
- Predict where populations may be in trouble

Habitat models

(see handout)

- Forest stand and yield models
- Statistical models
- Species – habitat models
- Landscape models
- Cumulative effects models
- Decision aiding/making models
- Monitoring models



6 basic principles for managing habitats

- Specify objectives -
- Determine if they are biologically justified
- Evaluate effects of management on other natural resources and land-use
- Determine if economically practical
- Determine if they simulate natural conditions
- Monitor outcomes to see if you meet objectives
