# Day 2 - Introduction

SSA 200

# Data models yesterday…

- We reviewed some methods for analyzing data:
  - Descriptive
  - Occupancy
  - Count data, etc.

    - Focused on estimating population parameters and ecological relationships
    - Also estimated observation uncertainties (e.g., detection) and environmental variation

# Today…

- Making predictions for the future!
  - Use results of previous data analysis (yesterday's focus)

- Accounting for demographic and environmental Stochasticity

- Accounting for "parametric uncertainty"

# All models are wrong, but some models are useful – G. Box
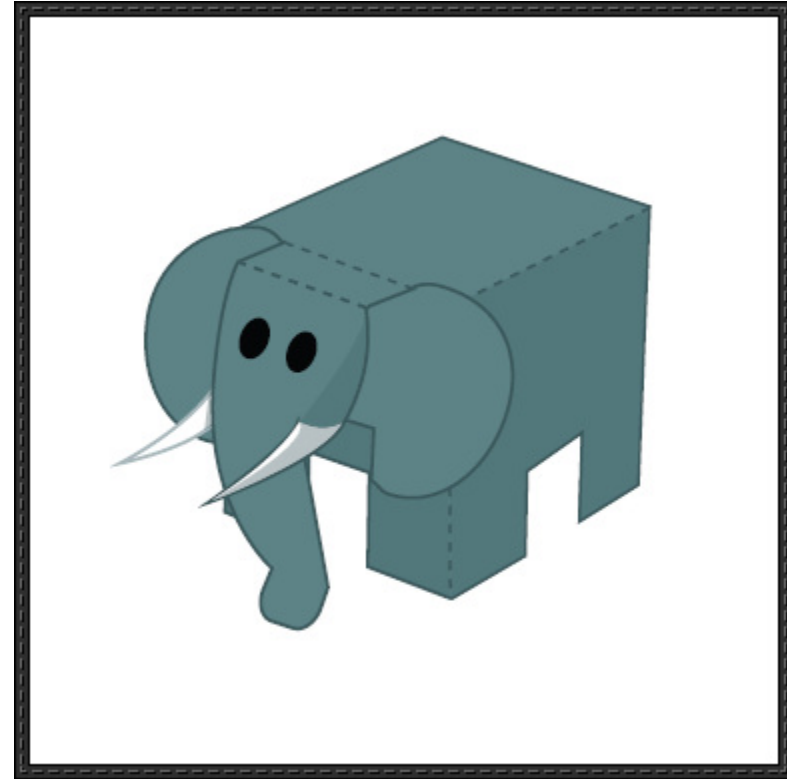
# Projection models are focused on

- Creating useful predictions
    - Do not require all system details
    - Decision context dependent

## As simple as possible to be useful

# Projection modeling platforms

- Rely on repeated execution codes/functions to project over time and replicate the projection

- Programs:
  - MS Excel

  - Netica

  - RAMAS, Vortex, PopTools
  - R, MatLab, SAS, Python, etc.

# Time projections and replications

- Repeat a set of instructions (function) over a number of years
- Replicate that process multiples of times
  - estimate variability in predictions

| | year | | | | | |
|---|---|---|---|---|---|---|
| replicate | 1 | 2 | 3 | 4 | 5 | ... |
| 1 | 200 | 186.6482 | 193.396 | 197.942 | 194.3061 | ... |
| 2 | 200 | 200.9691 | 214.6901 | 224.4521 | 240.7295 | ... |
| 3 | 200 | 180.0984 | 191.3048 | 189.7989 | 195.8254 | ... |
| 4 | 200 | 212.4143 | 235.5381 | 237.627 | 230.6926 | ... |
| 5 | 200 | 204.5244 | 192.3505 | 199.2723 | 196.0467 | ... |
| ... | 200 | 197.8708 | 194.1572 | 188.8351 | 203.3035 | ... |

# Projection models for today

- Occupancy / site persistence models

- Multi-state occupancy models

- $\lambda$ growth models and Poisson projection models

- Demographic/matrix projection models

- Key issues
  - Conceptual → quantitative
  - Linking population parameters to environmental variables
  - Environmental stochasticity and parametric uncertainty
  - Sensitivity analyses

# Questions?