### Eigenvalues and eigenvectors

* Show how they are calculated, linear algebra
* Why is the dominant eigenvalue the growth rate?
* Transient dynamics
* Negative eigenvalues
* Asymptotic vs. non-asymptotic growth

### Interpretations of reproductive value

* Different "versions" of reproductive value. Confusion?
* Residual reproductive value.

### sens/elast

* Lower-level
* Disadvantages with sens. & elast. analysis

### Stochastic sens & elast (mean + variance)

### Compare Leslie and Lefkovich matrices

* Does the Leslie/Lefkovich models assume that all demographic events occur simultaneously, or?
* Combine age & stage structured models? Absorbing age classes?
* Truncated age-structures - compare eternal life (i.e. Leslie vs. Lefkovich matrices)
* Break down matrices to "sub-matrices", one matrix for each demographic stage/age. This allows for comparison of different ordering of events.

### Pre-breeding versus post-breeding

* The problem seems to stem from the use of hybrid age-stage models, that is models with an absorbing age class.
* For strictly age-structured populations, the life table approach is easy.
* For stage-based, the main problem is within-stage survival
* Mixing age with stage is what causes concern for most students !?
* Mills får en klass mer på post-breeding. När behövs detta?
* I mina exempel nu har jag gjort matriserna med samma dimensioner. Rätt eller fel?
* Red ut begreppen; kontinuerlig tid, diskret tid och relationen med life table:
  + Age (1), age-class (0-1), age-specific vital rates och hur dessa hänger i hop med life tables och matriser
  + x & i
  + Hur påverkas age-classes av pre- eller post-breeding census.
  + Life-cycle graph (difference for pre- and post-breeding?)
* Genomgång av olika källor - var finns bra exempel?
  + Caswell. Formlerna finns på sid. 25-29
  + Gotelli kapitel 3 är bra, men har bara exempel för post-breeding
  + Matthiou?
  + Edelstein-Keshet?
  + Section 8.4 in Williams, Nichols & Conroy (p. 143-157) – Bra
  + Donovan & Welden exercises 13-14, p. 177-213 [only post-breeding]
  + Morris & Doak - chapter 6 (p. 206-210,
  + Tuljapurkar & Caswell - inget särskilt av nytta
  + Yodzis, section 9.2.1 (p. 258-263), inget om pre vs. post
  + Owen-Smith, Chapter 4 discusses pros & cons for age vs. stage, but not so much on matrix construction.
  + Otto & Day (chapter 10, section 10.6.1 nämns pre/post) good on analysis, less on construction of matrix models
  + Case?
  + Mills - ch. 7, especially p. 135-137 (focus on stage, not on age-stage composites)
  + Stevens - ch. 2 (p. 48, only one paragraph
  + McCallum (p. 146, short discussion)
  + Artiklar? [ex. Noon & Sauer is highly recommended reading, McDonald & Caswell 1993 is also good, but not as good Noon & Sauer). I think Case is similar to Noon & Sauer?

### Model age at first breeding

* Model variation in age at first breeding, and effects on lambda.
* Incorporate effects of age at first breeding and breeding experience?

### Calculate time in each stage (stage duration)

* Varying time in stage (turtle example)

### Relationship between Leslie matrix, characteristic equation and Euler-Lotka equation

### Decomposing total variance into process variance

* Of biological interest and sampling variance is particularly important when estimating parameters for use in matrix models that are aimed at modeling population viability

### Reproductive value in stochastic models

### Periodic matrix models

### Order of demographic events

* Decompose demography (see Buckland et al 2007)
* But what if order differs? Importance? Density-dependence?
  + reproduction - dispersal – survival
  + survival - dispersal – reproduction
  + Include hunting and management in matrices?
  + periodic models, add vectors with reintroductions (example peregrine)

### Multipatch models

* Peregrine example
* Hunter & Caswell (vec-permutation matrix)

### Is the effect of variance in growth rate always "negative"

* structured vs. non-structured populations
* covariance between demographic rates + autocorrelation
* Functions for generating correlated variables
* stochastic simulations, correlations between variables

### Life-Stage Simulation Analysis

* Desired output: Fig: 12.2 in Mills (2007), p. 256
* Example on LSA

### Demographic stochasticity

* compare demographic and environmental stoch.
* How to model demographic stochasticity
* Simple version of Lande's work