Fish and Wildlife Population Ecology:

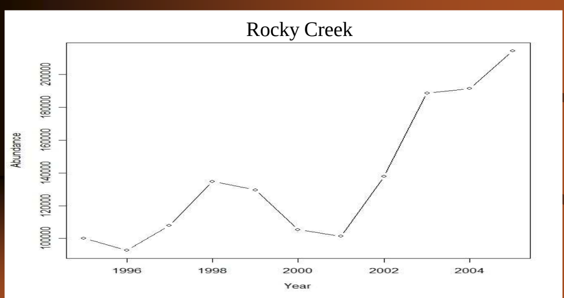
The End Game…

Okaloosa Darters…

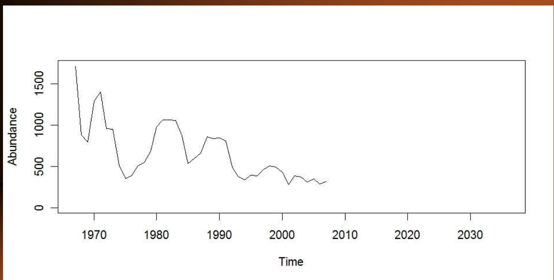
How are they doing?

- Choctawhatchee Bay drainage in Florida
- Inhabit vegetated sand runs of clear creeks
- Listed as Endangered June 4, 1973
- Fish and Wildlife Service has recommended downlisting to Threatened
- How would you determine their status??

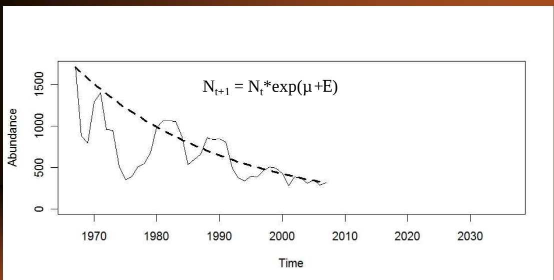
Time Series of Abundance Estimates



Population Projection



Population Projection



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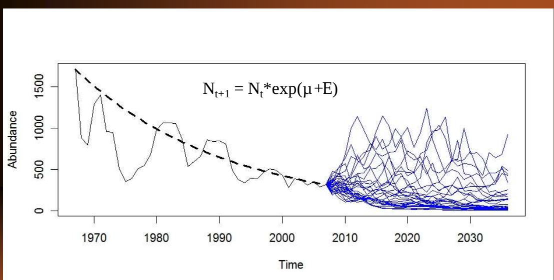
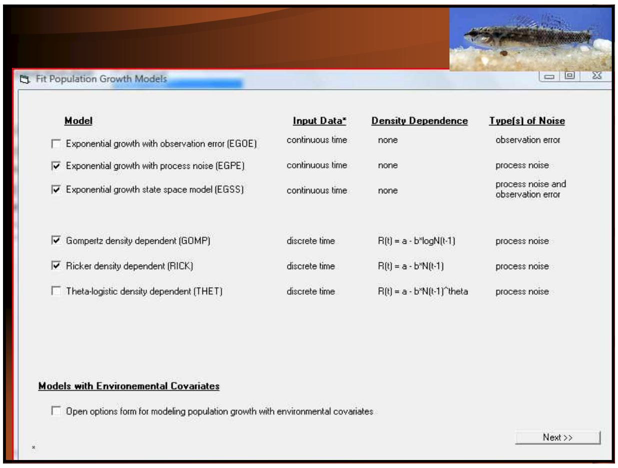
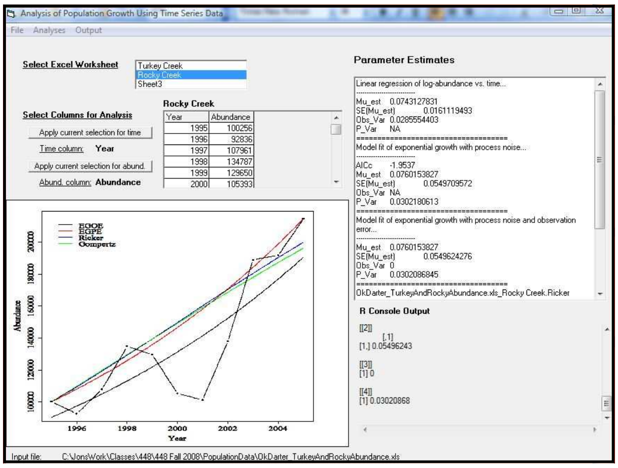
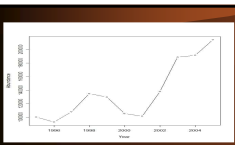




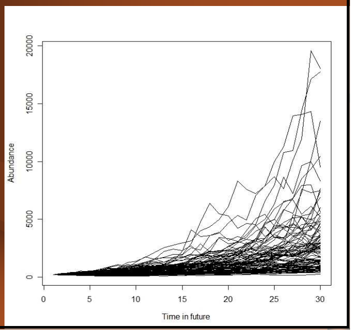


Which Model??

Model	AICc	DeltaAICc
Exponential	-1.953	0
Gompertz	2.21	4.19
Ricker	2.24	4.16
Theta-logistic	8.24	10.19



Past Abundance Data

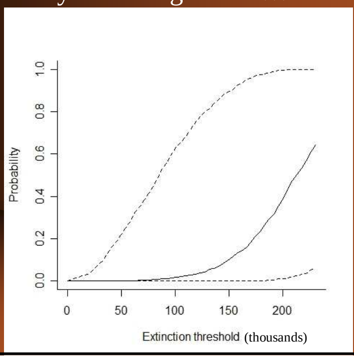


Future Projection

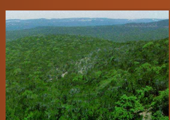
-Based on past data and an assumed model of growth

OK, Now What?

- Probability of Falling Below…

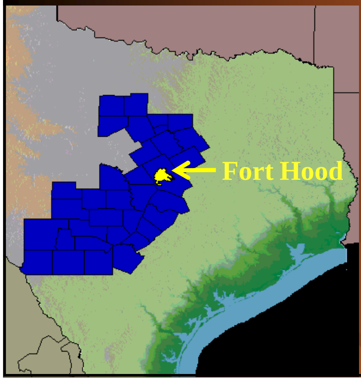


Golden-Cheeked Warbler (*Dendroica chrysoparia*)



- breeds in closed-canopy woodlands, primarily Ashe juniper and oak
- declined due to habitat loss and fragmentation from clearing of juniper for urban expansion, agriculture, and commercial harvest

Fort Hood Army Post



- Largest breeding population
- BIG fire in 1996
- Increased training demands

Recovery Credit System

- Fort Hood “buys” the conservation rights to habitat patches on private lands
- Unintentional loss of habitat on Fort Hood is “offset” by these purchases
- Golden-cheek metapopulation remains “unharmed”

How should off-post patches be valued?

The Model

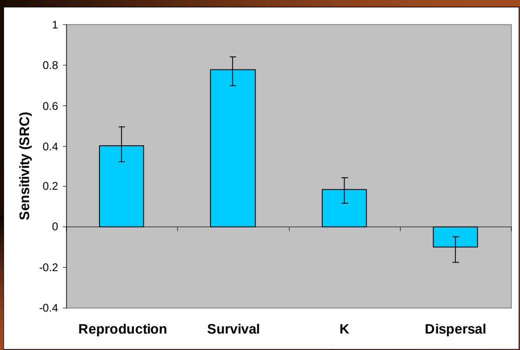
- Stochastic, demographic-based, metapopulation projection model

Stage[a]	*S*	Temporal Variance (*S*)	*F*[b]	Temporal Variance (*F*)
HY	0.40	0.058	0	0
SY	0.57	0.010	1.2	0.024
ASY	0.57	0.010	1.3	0.006

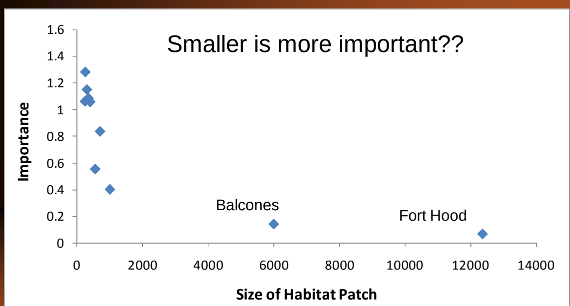
The Model

- Ceiling carrying capacity (K)
- Various dispersal scenarios
- Metapopulation Viability
  - After 20 years…
  - Mean final population size?

Important Drivers of Metapopulation Viability



Importance of Individual Populations



However…

- Changing dispersal assumptions
- Changed conclusions, substantially!

Wolf Reintroduction to Northern Rockies

- What impact are wolves having on elk and deer populations in Idaho?
- What impact in future? – decreasing elk and deer, stable numbers or oscillations?
- How answer?
  - Ask experts and check scientific literature
  - Gather important data
  - Synthesize data and test possibilities with a model

Why model predator-prey interactions?

- Models help us
  1. Define our problem
  2. Identify what might be important
  3. Understand our data
  4. Communicate and test that understanding
  5. Make predictions

Modeling Wolf Effects

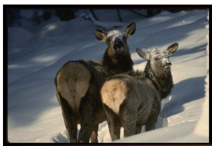
- What is important?
- What would determine their effect on elk and deer?
- Is there a theory of predator-prey interactions that will help us understand, predict and manage wolf predation on deer and elk?

Predicting effects of wolf reintroductions on ungulate populations: Comparing model predictions to observations for elk and wolves in Yellowstone.

– by Edward O. Garton[1], Douglas W. Smith[2], Bob Crabtree[1], Bruce Ackerman[1], and Gerry Wright[1]
– 1. Fish and Wildlife Dept., University of Idaho, Moscow, ID 83844,
– 2. National Park Service, Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, WY 82190

1990 Approach

- Evaluate dynamics of Northern Yellowstone Elk Herd using available data
- Predict characteristics of wolf population growth and predation from literature
- Build an empirically based projection model
- Validate portions of the model by comparing predictions to observed data



- 1990’s predicted success for wolves
- Northern Yellowstone elk herd projected to be stable with high chance of persistence but average abundance depends on
  - Hunter harvest
  - Winter severity

Implications: Hunter Harvest

- Population trend for Northern Yellowstone Elk herd was very sensitive to:
- Human harvest rate
  - @ 9% harvest (‘70-’80s) - Stable with wolves
  - @ 11% harvest (’95-’05) - Declines with wolves
  - @ 7% harvest - Increases with wolves
  - @ 9% harvest - Increases without wolves

Implications: Winter Severity

- Population trend for Northern Yellowstone Elk herd at current size is very sensitive to:
- Winter severity:
  - Average severity: population stable
  - Mild winters: population increases 10% / year
  - Severe winters: population decreases 10% /year
- In 1/3 of years, population either increases or decreases at least 10%