Reconstruct Population Dynamics of White-tailed Deer in Suburb Chicago under Intensive Culling

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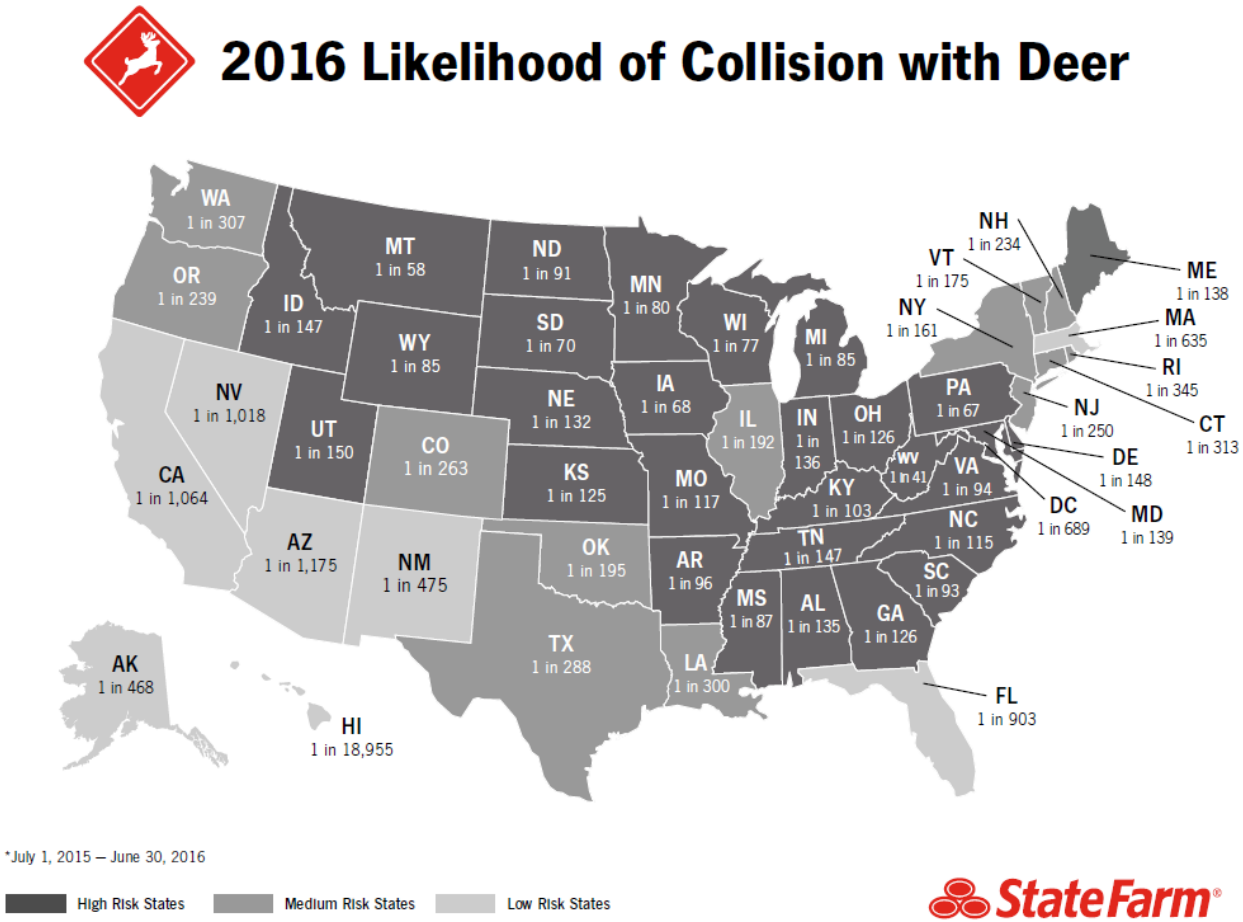
Introduction

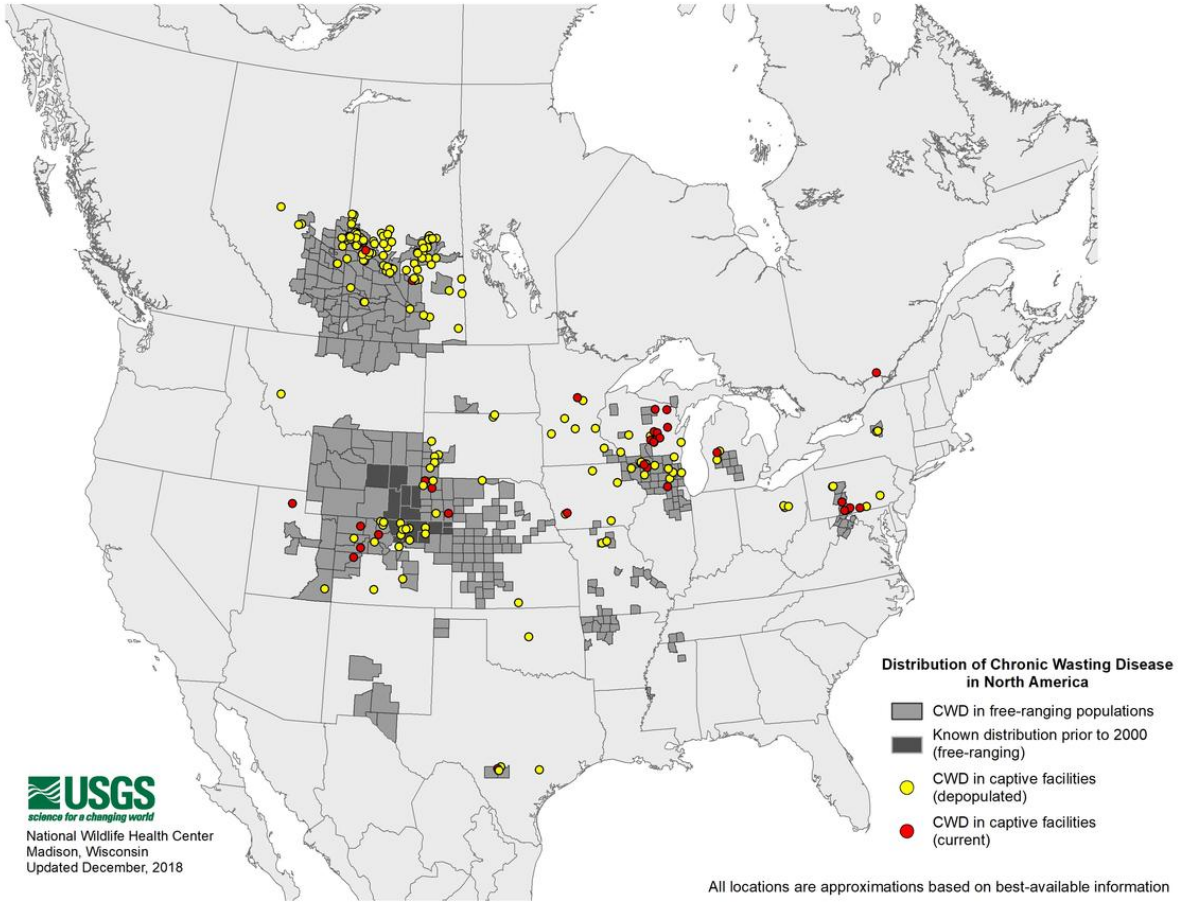
- Suburb Deer Problem
- Intensive Culling

Deer are There: Fawn Found in Chicago

Overabundant Deer is a Problem: Collision



Overabundant Deer is a Problem: CWD



How do People do in Chicago

- Intensive Culling!

The Big Problem: Did It Work?

- Population Dynamic?
- After Culling Population?
- Density Dependent?

Method

- Matrix Model
- Bayesian Reconstruction

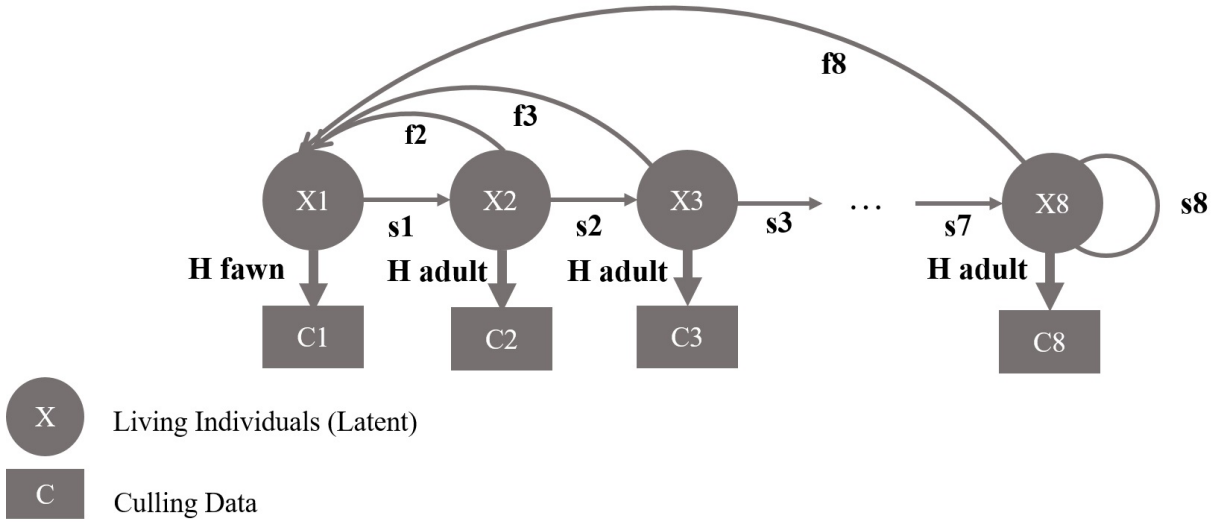
Leslie Model

- Uniqueness: Culling is the main mortality source!
- Data is Age-at-Harvest
- We used a modified projection model for culling:

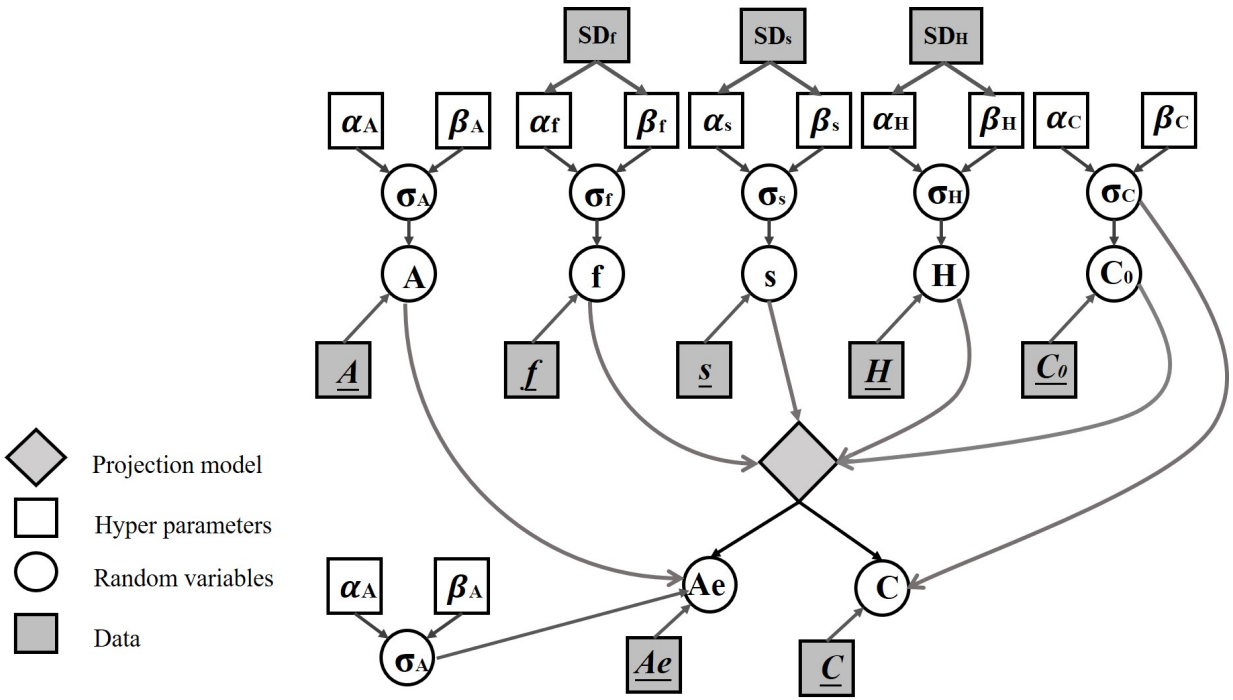
$$\mathbf{C}_{t+1} = \mathbf{H}_{t+1}\mathbf{L}_{t+1}(\mathbf{H}_t^{-1} - \mathbf{I})\mathbf{C}_t \quad (1)$$

- $(\mathbf{H}_t^{-1} - \mathbf{I})\mathbf{C}_t$ solves the post-harvest population

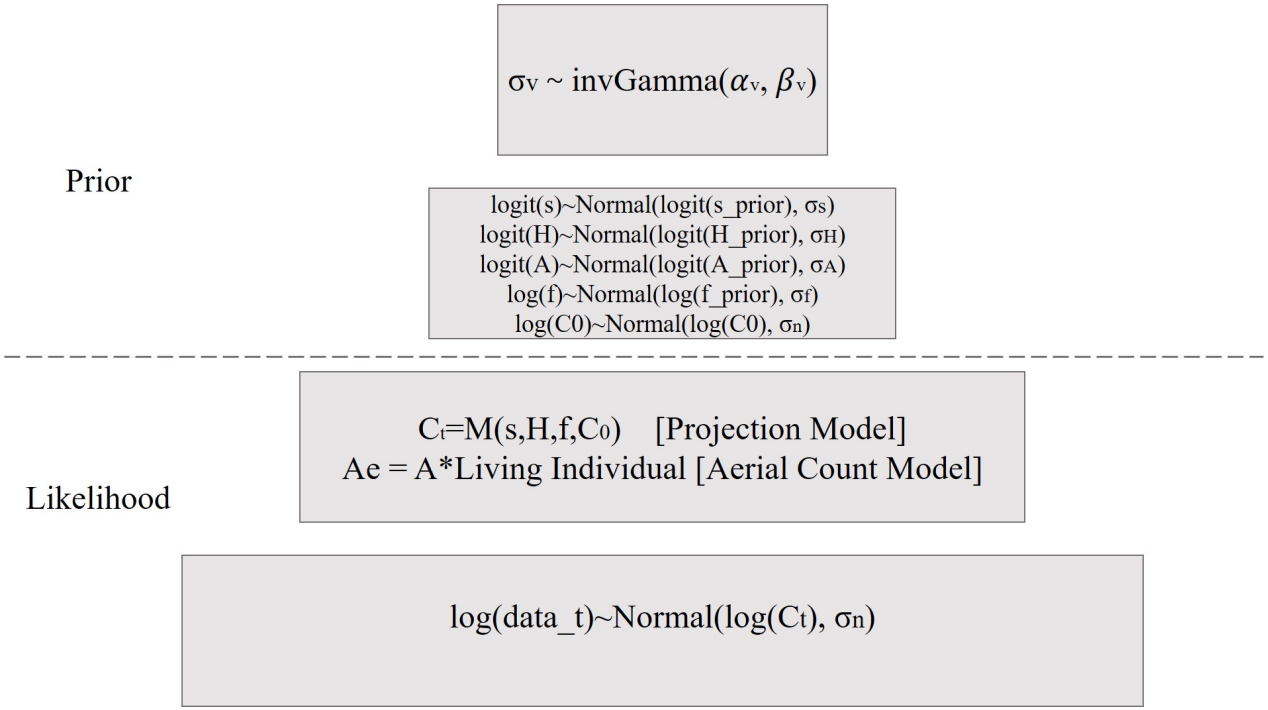
Life History Graph



Bayesian Reconstruction of the Population Dynamics



Bayesian Reconstruction of the Population Dynamics



Model Checking: Culling

Table: Model Checking Indexes for Reconstruction of Culling Data

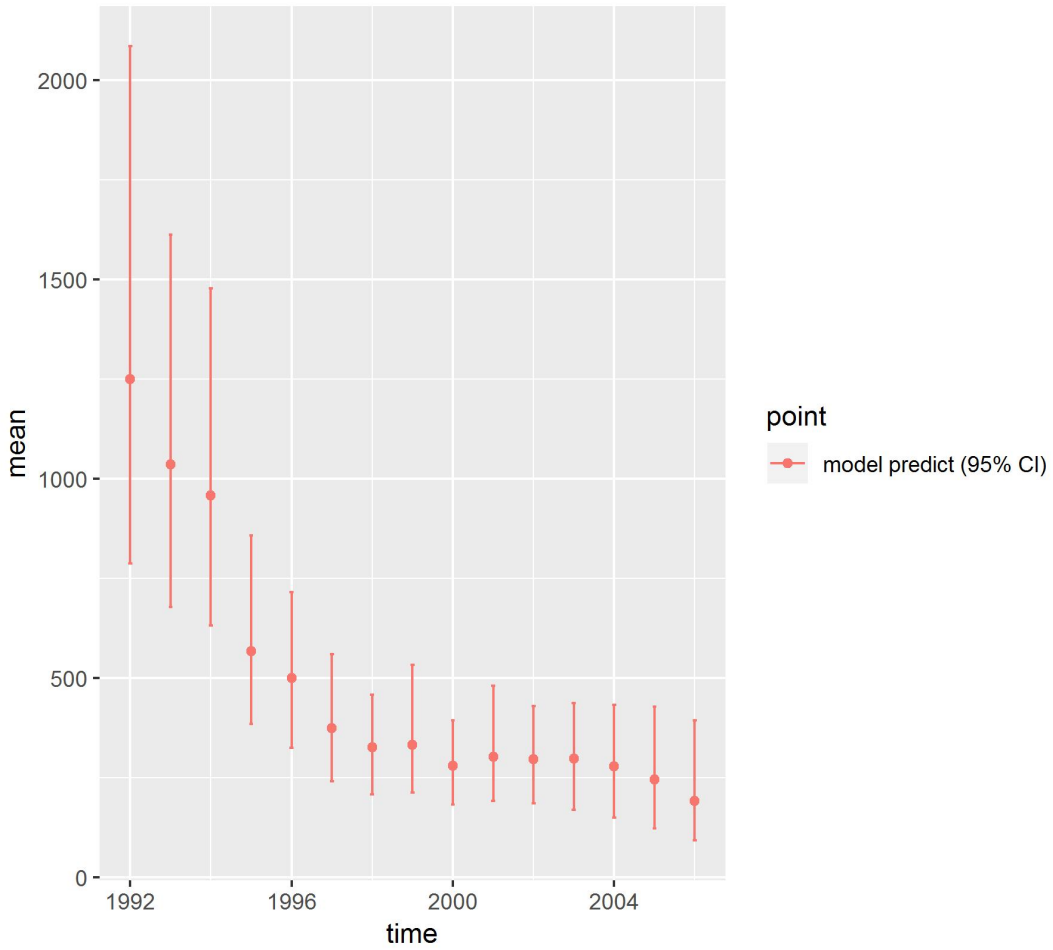
	Mean	Standard Error
Absolute Difference	7.69	0.911
Posterior Standard Deviation	12.28	0.219
Precision	91%	-

Model Checking: Aerial Counting

Table: Model Checking Indexes for Reconstruction of Aerial Counting Data

	Mean	Standard Error
Absolute Difference	108.81	0.58
Posterior Standard Deviation	94.26	0.96
Precision	100%	-

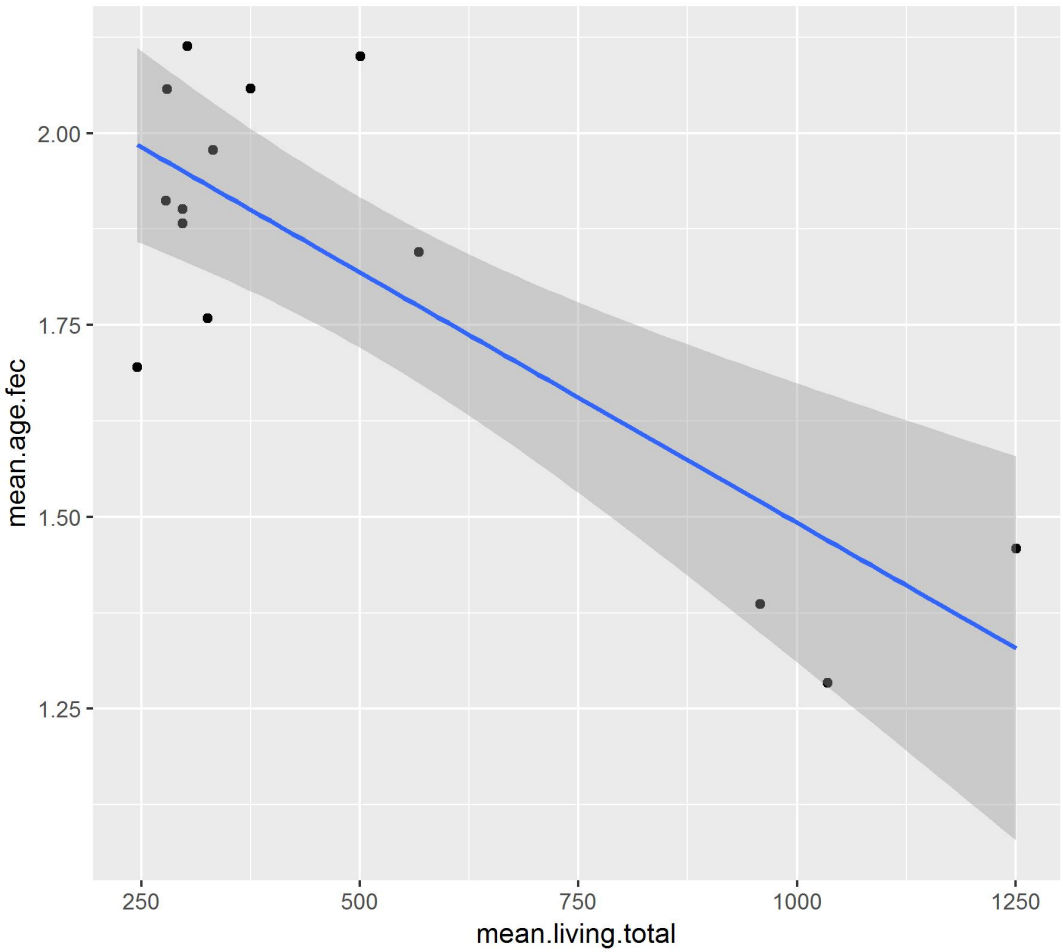
Post-Cull Population



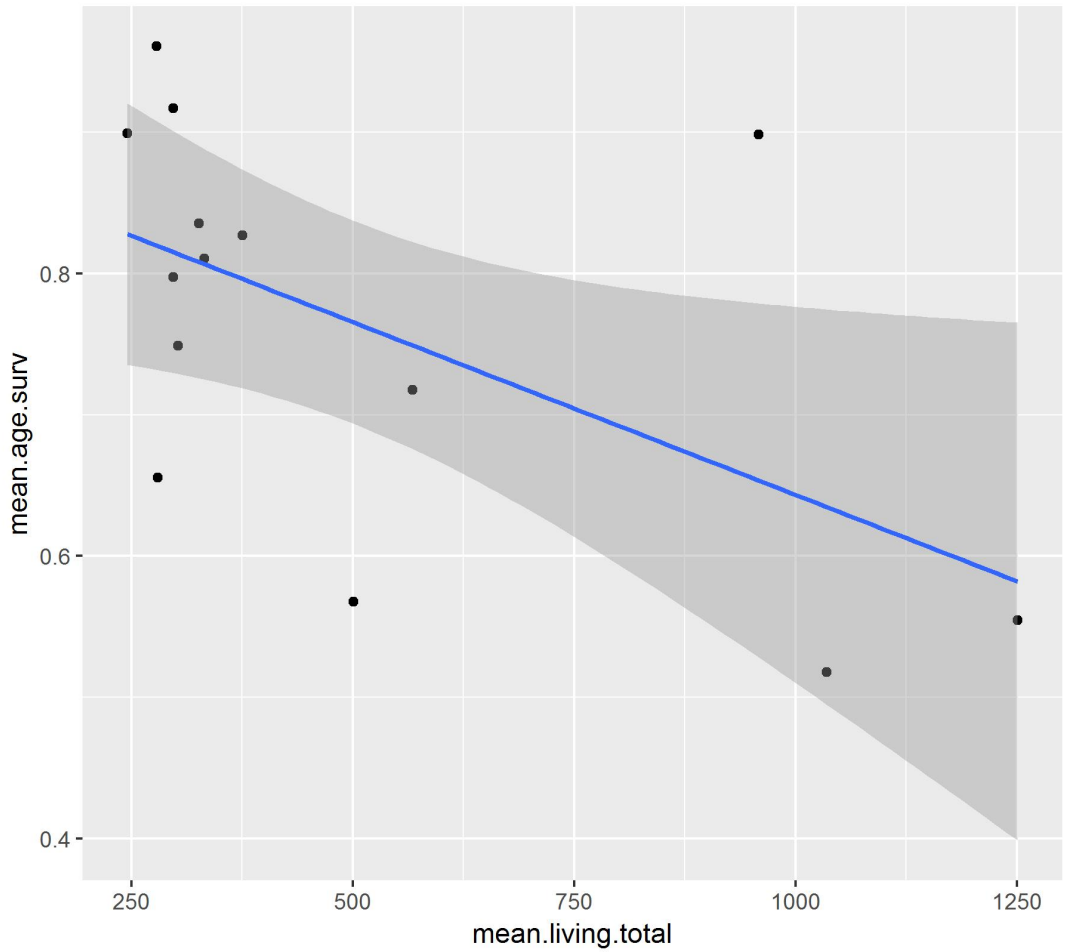
Density Dependency

- We detected density dependency on fecundity of most ages
- Density dependency on male fawn survival, probability because of dispersion

Density Dependency on Fecundity of Yearlings



Density Dependency on Survival of Male Fawn



Density Dependency on Survival of Male Fawn

- Survival of male fawn is lower than female
- White tailed deer is male dispersing.

Further Question from Manager

- What if we skip a year?
- Does density dependency means difficulty in half K?

Questions and Comments are Welcomed!

Thank you