

## Manatee Status & Threats Analysis 2012 Results

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## Core Biological Model

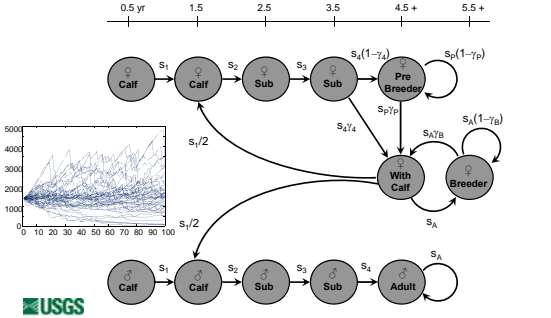
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- Population Viability Analysis
  - Age- and sex-structured
  - Stochastic
    - Demographic
    - Environmental
    - Catastrophic
  - Density-dependent
  - Parametric and structural uncertainty
- Custom-built




## Manatee Demography

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The diagram illustrates the life cycle stages of a manatee: Calf (0.5 yr), Calf (1.5 yr), Sub (2.5 yr), Sub (3.5 yr), Pre Breeder (4.5+ yr), With Calf, Breeder (5.5+ yr), and Adult. Transitions between stages are labeled with survival probabilities (s<sub>1</sub> through s<sub>8</sub>). A small inset graph shows population size over 100 years, with a y-axis from 0 to 5000.



## Modeling Threats

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- Watercraft, WCS, Marine debris
  - To simulate removal of these threats, reduce mortality by fraction due to the threat (increases avg survival)
- Red tide
  - To simulate removal of this threat, we set the probability of a severe occurrence to 0 (background rates remain)
- Warm-water loss
  - To simulate removal of this threat, hold warm-water capacity constant at current levels (no drop)
- The effects of the rescue/rehab program are assumed to continue indefinitely

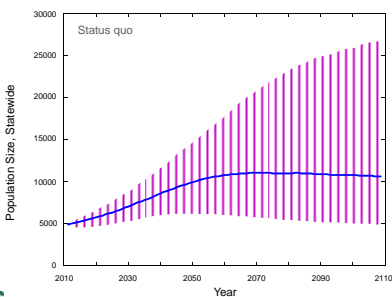


## Results


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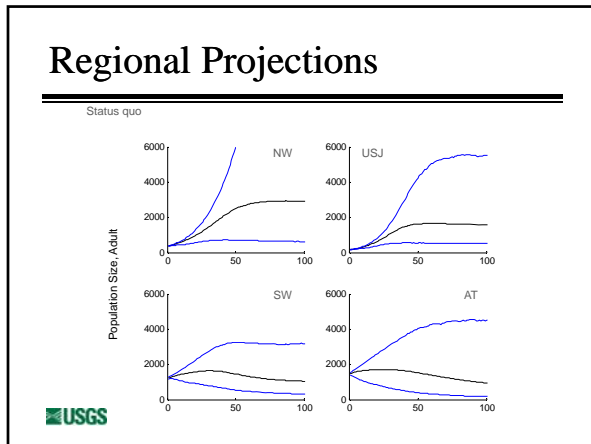
## Population Projection

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The graph plots Population Size, Statewide (y-axis, 0 to 30,000) against Year (x-axis, 2010 to 2110). A blue line represents the 'Status quo' projection, which rises from approximately 5,000 in 2010 to a peak of about 11,000 around 2070, then slightly declines. A purple shaded area represents the range of uncertainty, which widens significantly over time, reaching between approximately 5,000 and 25,000 by 2110.





### Strength of Threats

- Probability of the adult population falling below **500 animals** on either the Gulf or Atlantic coast over **150 yr**
- “Status quo”—all threats remain at current levels (with anticipated loss of WW)
- Consider full removal of threats 1-at-a-time

<b>Status quo</b>	○	<b>0.92%</b>
–Watercraft		0.06%
–Warm-water		0.10%
–Red tide		0.64%
–WCS		0.82%
–Marine debris		0.82%
–Watercraft & WW		0.00%

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## Discussion

### Demographic Status

- Compared to 2007, our perception of the demographic status of Florida manatees has increased
  - Estimates of survival rate have increased (and become more precise)
  - Estimates of carrying capacity have increased
  - Estimates of the current population size have increased

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### Forecasting

- But the status of manatees also depends on our inferences about future trends
  - Will red-tide mortality become more frequent?
  - Will cold-related mortality increase?
  - Will watercraft-related mortality remain at current rates?

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### Limitations

- 2012 Analysis did not account for
  - Severe cold events, 2009-10, 2010-11
  - Southwest red tide, 2012-2013
  - Loss of seagrass in Indian River Lagoon, 2011-12
- Photo-ID data were only available through 2008-09
- Initial population size was based on 2011 synoptic (4834); recent estimates are even higher (6350)
- Does not include effects of climate change

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## Next Steps

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- 2012 CBM results will be published in the next several weeks (May 2015)
- Updates to the model and the parameter estimates are underway. Results expected early 2016

