Management of stiltgrass and deer at Catoctin Mountain Park

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Monitoring in the National Capital Region Network

- **Forest Vegetation** – Trees, shrubs, vines, pests/diseases, exotic plants, CWD
- **Water Quality** – Discharge, pH, DO, ANC, SC, Nitrogen, Phosphorus
- **Aquatic Macroinvertebrates**
- **Fish**
- **Amphibians**
- **Birds**
Deer Management at Catoctin: Timeline

- 1980’s: Managers become concerned about deer impacts
- Late 1990’s: Exclosure studies confirm impact of deer
- 2000: Deer Counts Begin
- 2006: I&M Monitoring Begins
- 2008: Deer Management Plan and Environmental Impact Statement Completed
- Fall 2009: Deer Management Begins
Deer Management at Catoctin: Goals

1) Reduce deer browsing to ensure tree regeneration to sustain a native and diverse eastern hardwood forest.

2) Maintain and restore native herbaceous plant species and reduce invasive exotic plant species through deer management.

3) Maintain a viable white-tailed deer population while protecting other resources.
Estimated due to Hurricane Sandy (Horsley et al, 2003)

Deer / km² in Catoctin Mountain Park

Culling begins

Target 8 Deer / km²
Questions

1. Did tree seedling density increase?
2. Did Microstegium density change?
3. Does the cover of *M. vimineum* influence tree seedling recruitment?
Forest Vegetation Monitoring

- 49 permanent plots in ~2500 ha (~6100 acres)
- 4 year cycle
  - Pre-Cull: 2006-09
  - Post-Cull: 2010-13
  - Post-Cull2: 2014-17
- 12 1m² quadrats
  - Tree seedlings >15cm tall
  - Exotic plant cover

Bayesian Generalized Mixed Models (glmm)

Software
R 3.4.3 (R core team, 2014)
rjags 4-6 (Plummer, 2016)
Seedlings/ha Pre-Cull

Legend

Tree seedlings / hectare
- : 0
- : 0 - 2500
- : 2500 - 5000
- : 5000 - 7500
- : 7500 - 10,000
- : 10,000 - 20,000
- : 20,000 - 40,000
- : 40,000+
Change in Seedling Density
<table>
<thead>
<tr>
<th>Cycle</th>
<th># of Seedlings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1: Pre-Cull</td>
<td>10</td>
</tr>
<tr>
<td>Cycle 2: Post-Cull</td>
<td>210</td>
</tr>
<tr>
<td>Cycle 3: Post-Cull 2</td>
<td>380</td>
</tr>
</tbody>
</table>

Tree Type:
- **Exotic**
- **Fraxinus**
- **Overstory**
- **Understory**
% Cover of *Microstegium vimineum* Pre-Cull
% Cover of Microstegium vimineum 2014-2017
Change in % Cover of *M. vimineum*
Both cycle and % cover have non-zero coefficients.

Increase in seedlings over time.

Positive relationship with *M. vimineum*. 

**Tree Seedlings and Microstegium**

![Graph showing predicted number of seedlings per quadrat versus % cover of Microstegium over different cycles.](image-url)
Conclusions: Deer Management Goals

1) Reduce deer browsing to ensure tree regeneration. ✔

2) Reduce invasive exotic plant species through deer management. ✔

3) Maintain a viable white-tailed deer population. ✔
But ... Change in Sapling Density
Acknowledgements

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