Evaluating the influence of development on mule deer migration and phenology tracking

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How do migrating deer respond to development?

**Movement rate:** increased

**Stopovers:** avoid development

**Route fidelity:** generally maintained
Nutrition

- Winter: Low fiber, High protein
- Spring: Low fiber, High protein
- Summer: High fiber, Low protein
- Autumn: Low fiber, High protein
Nutritional quality of early phenology

% dry-matter digestibility of herbs, shrubs, and total forage estimated for migrant and resident elk May to October.

- Hebblewhite, Merrill and McDermid, 2008

Decline in crude protein (%) of graminoids and herbs grazed by red deer.

- Albon and Langvatn, 1992
Why migrate?
Does development alter the ability of mule deer to surf the green wave?
Phenological mismatch?

Day of peak

Date occupied

Day of peak

Date occupied
Phenological mismatch

Day of peak

Days from peak

Bischof et al. 2012
What is perfect surfing?

Perfect surfer = 1
Timeline of Atlantic Rim development

- **2005**: Low development (phase I)
  - Roads: 0.56 km
  - Well pads: 0.77 km

- **2006**: Development Expansion (phase 2a)
  - Road: 1.07 km - 1.49 km
  - Well pads: 1.49 km

- **2008 Spring**: Roads: 1.92 km, Well pads: 2.82 km

- **2008 Summer**: Roads: 1.92 km, Well pads: 2.82 km

- **2009**: Post Development (phase 2b)
  - Roads: 1.92 km
  - Well pads: 2.82 km

- **2010**:
Surfing ability

2005

2005
Surfing ability

2006
Surfing ability

2008

Date used

Date peak IRG

2008
Surfing ability

Date used vs. Date peak IRG for the year 2010.
Evaluation of green wave surfing by year

- 2005: Minimal data
- 2006: Low data
- 2008: Moderate data
- 2009: High data
- 2010: Highest data

Estimated Slope
- Values range from 0.8 to 1.1
Summary

Deer track phenology

Rapid development = mismatch

Tracking ability decreased through time
Management and Conservation
Thank You

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