USDA United States Department of Agriculture

Elk Responses to Recreation on Public Forests

Recreation and Wildlife Resources Workshop

May 7, 2018, Corvallis, OR

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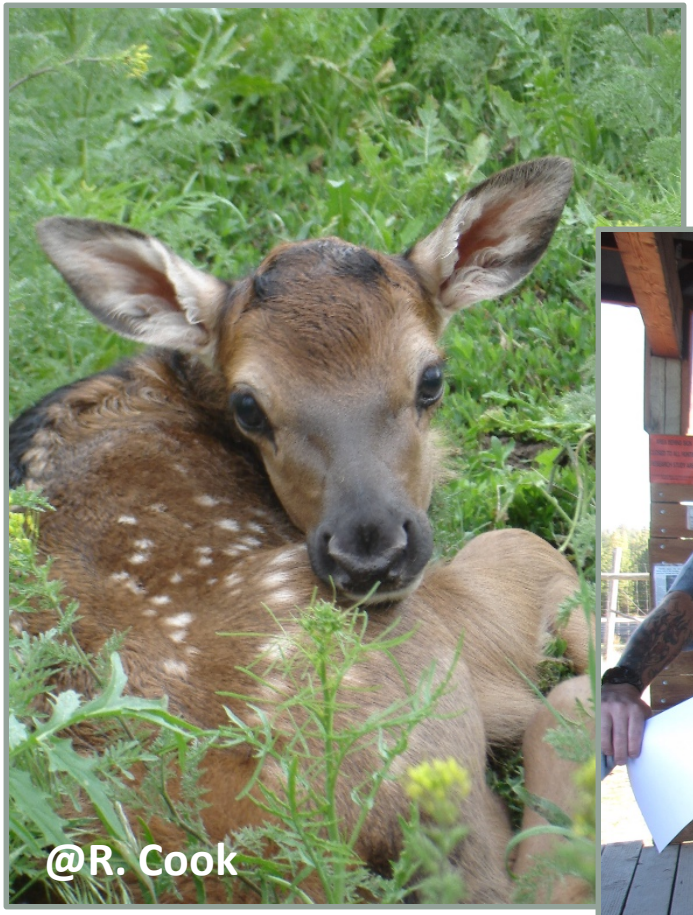
Today's Presentation

- Overview of recreation impacts on elk
- Starkey study of trail-based recreation and elk
- Starkey elk hunting research
- Conclusions and way forward

Why Elk as a Focus of Recreation Research?



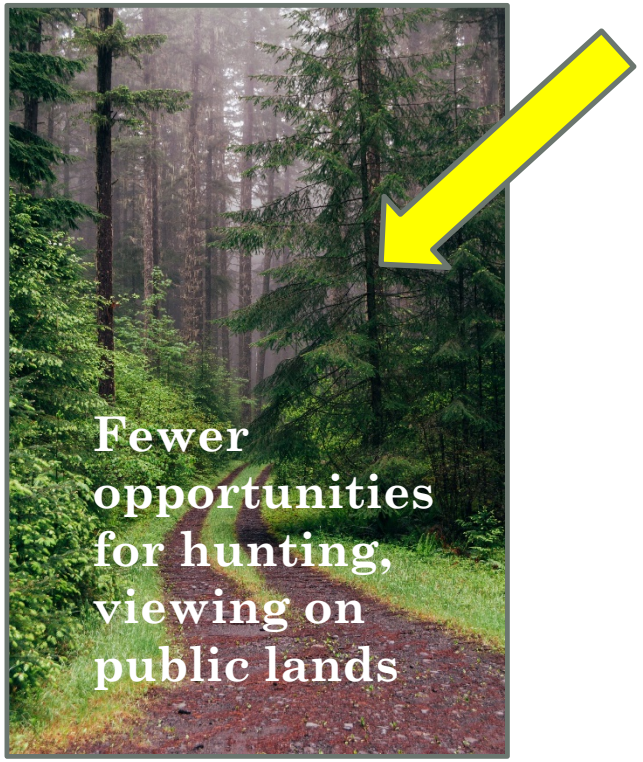
Socio-economic value

- Highly prized as a game animal and First Food in the Pacific NW
- Elk hunters contribute substantially to rural economies
- Elk viewing and shed hunting
- People (most) love elk – witness Rocky Mountain Elk Foundation
  - 17,000 members in Oregon alone in 30+ chapters
  - $57 million spent to date on conservation efforts
  - Nearly 800,000 acres affected

Rocky Mountain ELK FOUNDATION

Other Reasons

- Elk are widespread in the PNW and locally abundant
- Elk distribution issues, often stemming from human disturbance, lead to conflict
  - Higher density of open roads and recreationists on public lands can push elk to private lands



Moreover…

- Prior research has shown sensitivity of elk to recreation and roads
- Sensitivities ≈ other ungulates, thus relevant to managing recreation and other wildlife
- How elk respond to recreation on public lands is relevant to broader "all-lands" planning and population management

Integrated Management Essential

- State agencies manage elk herds through hunting (= recreation) to meet population objectives
- Tribal members hunt elk on ceded lands and manage habitat on reservations
- US Forest Service and Bureau of Land Management manage recreation and the majority of PNW elk habitat, especially summer and transitional ranges

Washington Department of FISH and WILDLIFE

OREGON Fish & Wildlife

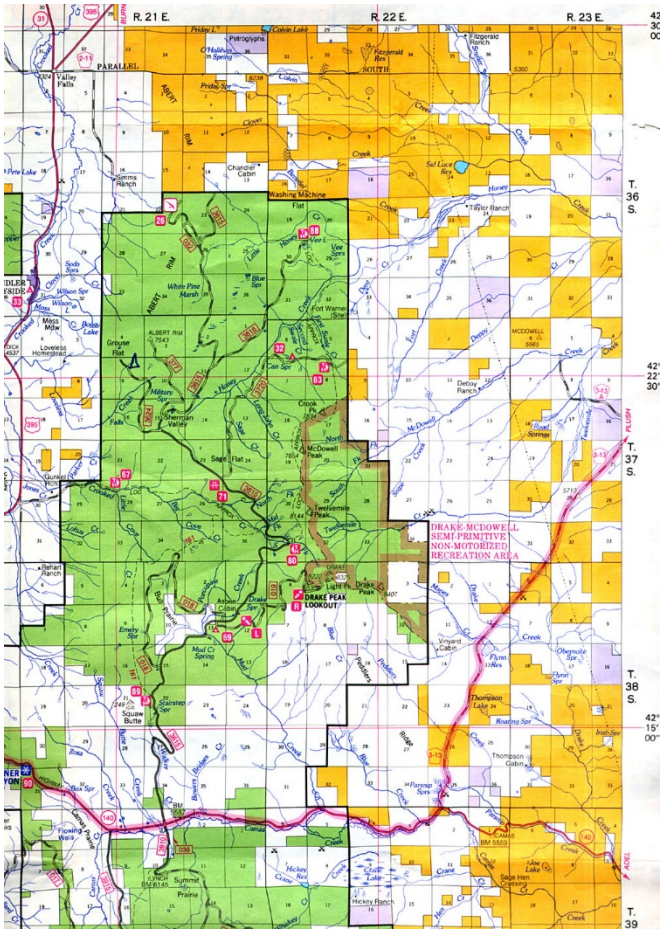
MUCKLESHOOT INDIAN TRIBE

THE CONFEDERATED TRIBES OF GRAND RONDE

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

Recreation Impacts on Elk



- Elk occupy every national forest and many BLM districts in OR and WA
- Any recreation tied to road or trail use is a potential impact
  - ATV use, “mudding,” other motorized activities on roads or trails
  - Roads offer access to recreation sites

What Kinds of Recreation Affect Elk?

- Hunting
- Mountain biking
- ATV use
- Hiking
- Camping
- Horseback riding
- Cross-country skiing
- Snowmobiling
- Others…

Direct Effects of Recreation on Elk

- Hunting (consumptive)
  - Mortality
  - Wounding loss
  - Poaching
- Road kill or injury
- Behavioral: habitat avoidance or displacement
- Physiological: stress / increased energetic costs from flight responses or vigilance

Indirect Effects on Elk Habitat

- Outright loss of habitat from construction of roads and trails for recreation access
- Habitat fragmentation from roads/trails
- Foregone foraging opportunities

What Factors Influence Effects?

- Speed of approach and noise level of recreationists
- Visibility (viewshed for animal)
- Habitat type
- Animal sensitivity (individual behavior)
- Availability of "escape terrain" or security cover
- Group size/density of recreationists

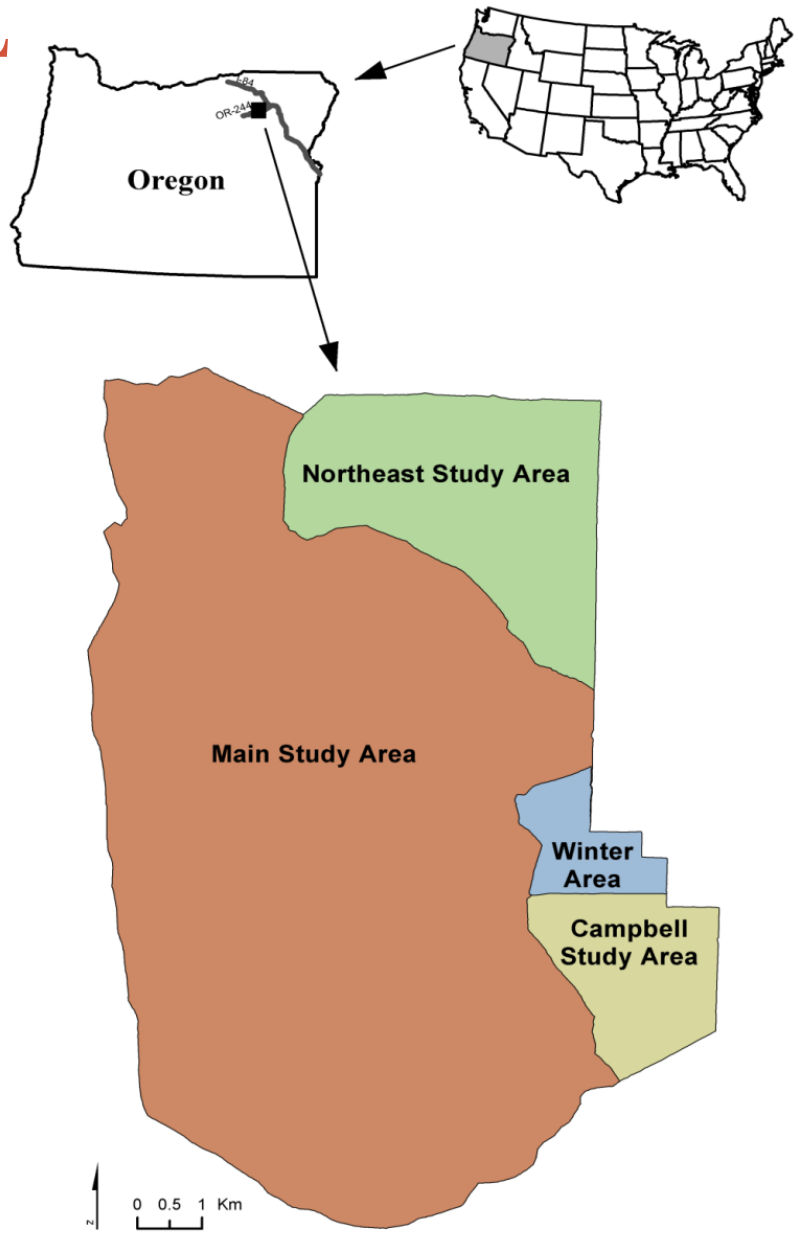
Larson et al. 2016. Effects of recreation on animals….. *PLoS ONE.*

Starkey recreation Research

Effects of Trail-based Recreation on Elk

Starkey Experimental Forest and Range

- Manipulative research conducted in controlled environment
- Game-proof fence encloses main research areas
- Total area ~ 25,000 acres
- Typical dry interior forests of Blue Mts. Province

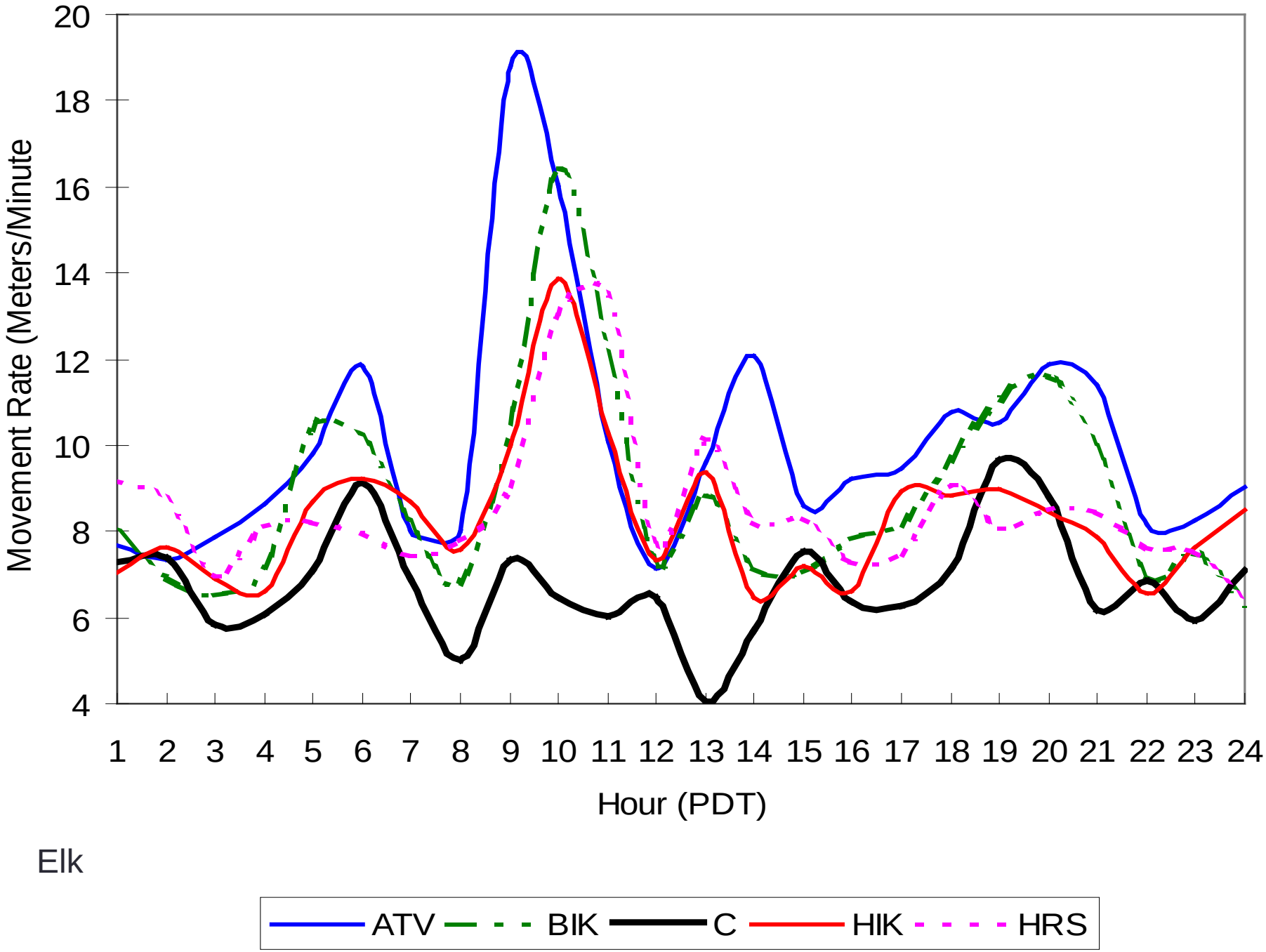


Northeast Recreation Study

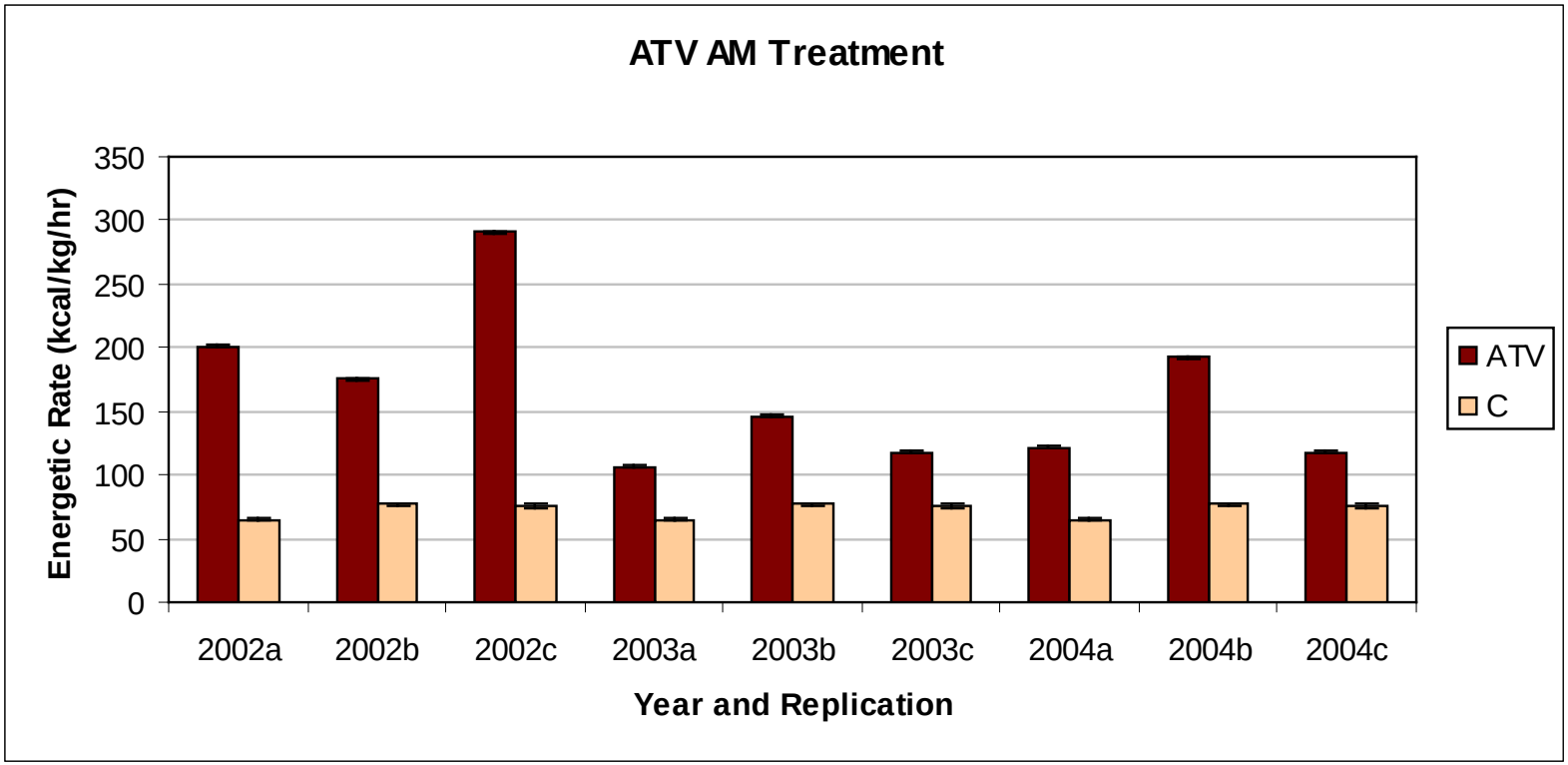
- Evaluated responses of mule deer and elk to 4 trail-based recreation activities:
  - ATVs
  - Mountain biking
  - Hiking
  - Horseback riding

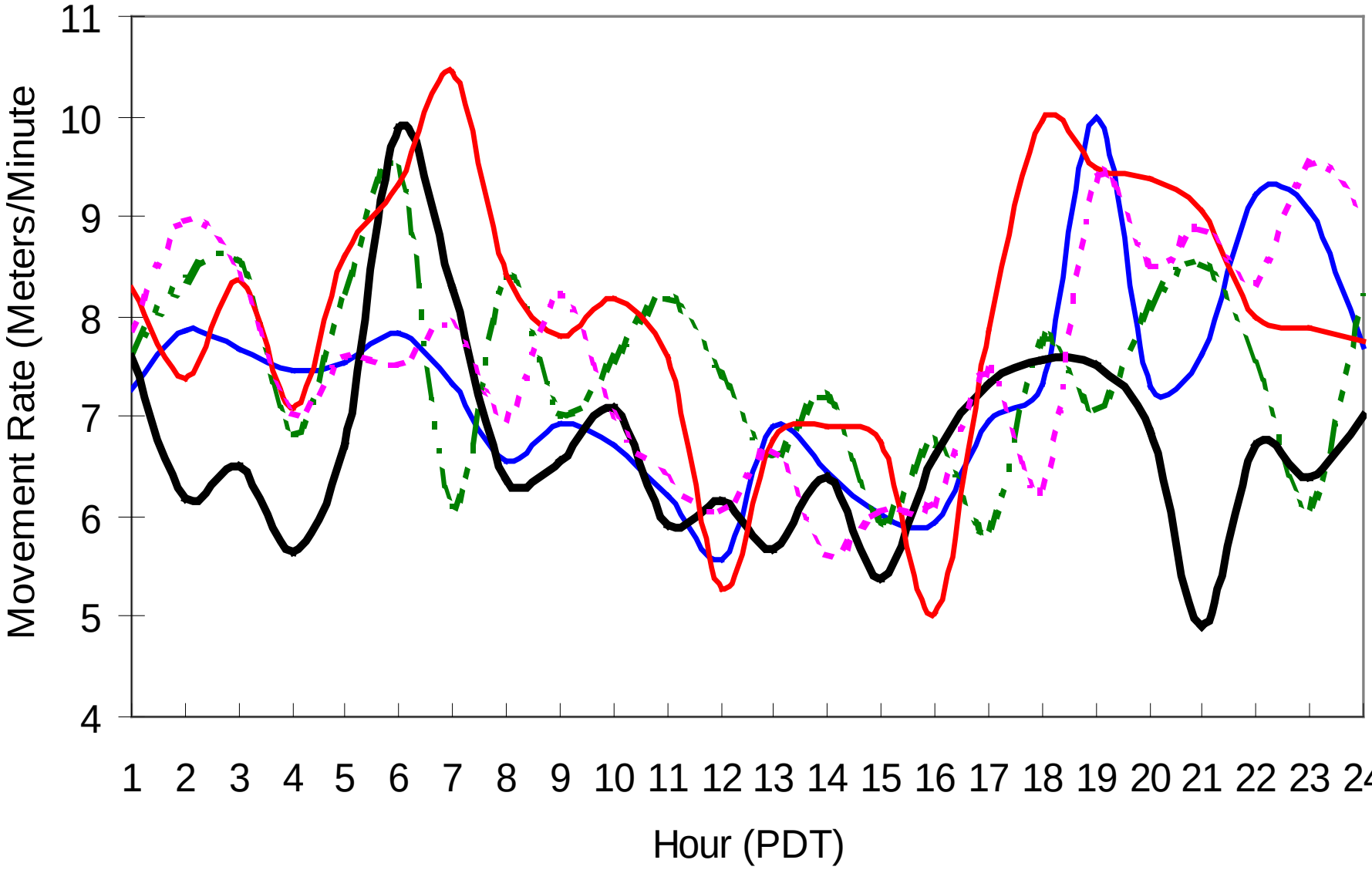
- Metrics included:
  - Movement rates
  - Probability of flight response and flight distance
  - Shifts in spatial distribution of animals

Bike Routes, Northeast Study Area

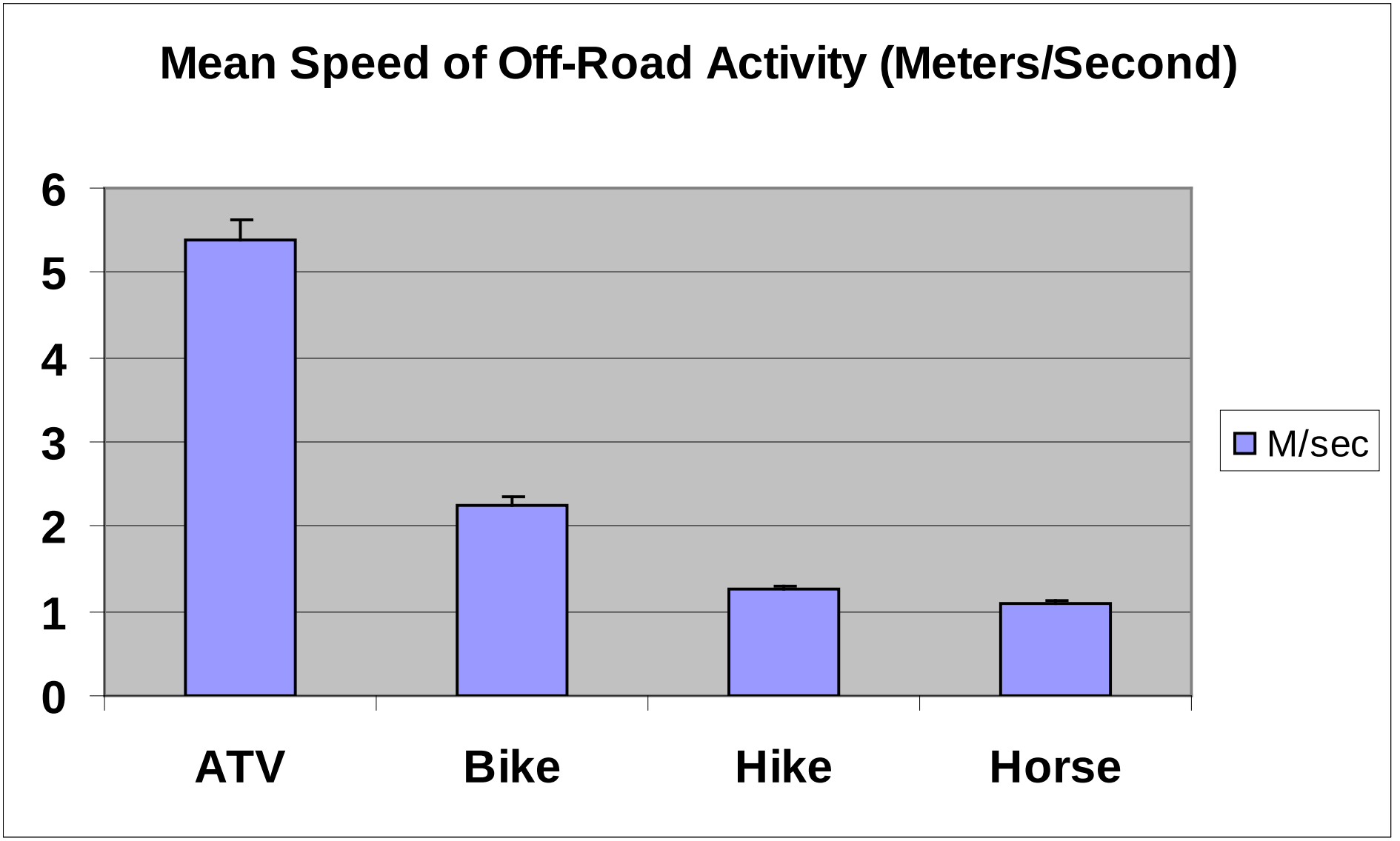

20
18
16
14
12
10
8
6
4
Movement Rate (Meters/Minute
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour (PDT)
Elk
ATV
BIK
C
HIK
HRS

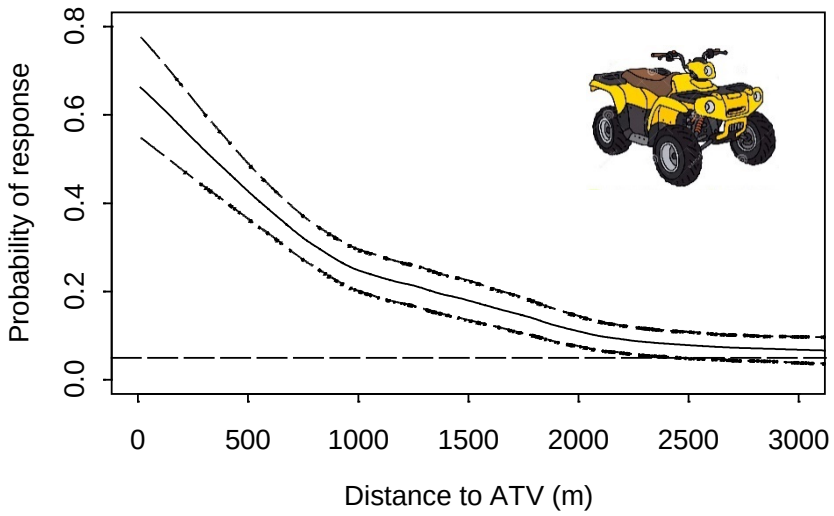
Effect of ATVs on Energetic Costs for Elk

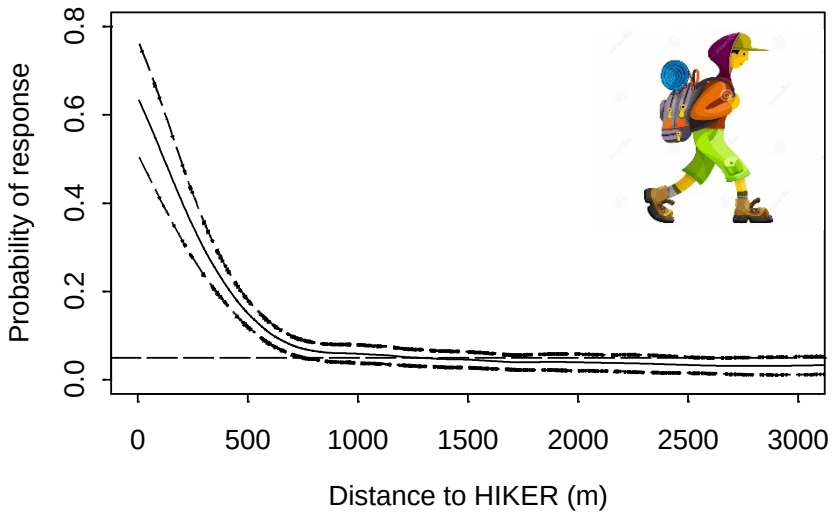


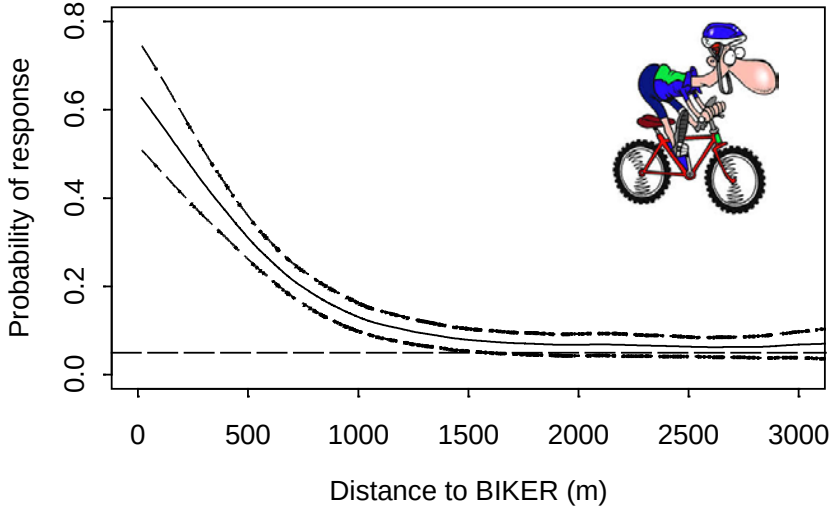

Movement Rate (Meters/Minute
11
10
9
8
7
6
5
4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour (PDT)
ATV
BIK
C
HIK
HRS

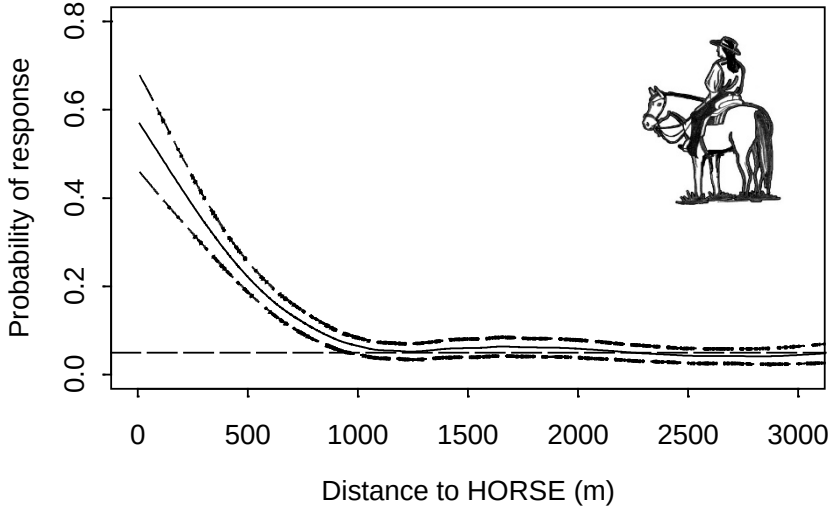
Deer


Mean Speed of Off-Road Activity (Meters/Second)
6
5
4
3
2
1
0
ATV
Bike
Hike
Horse
M/sec

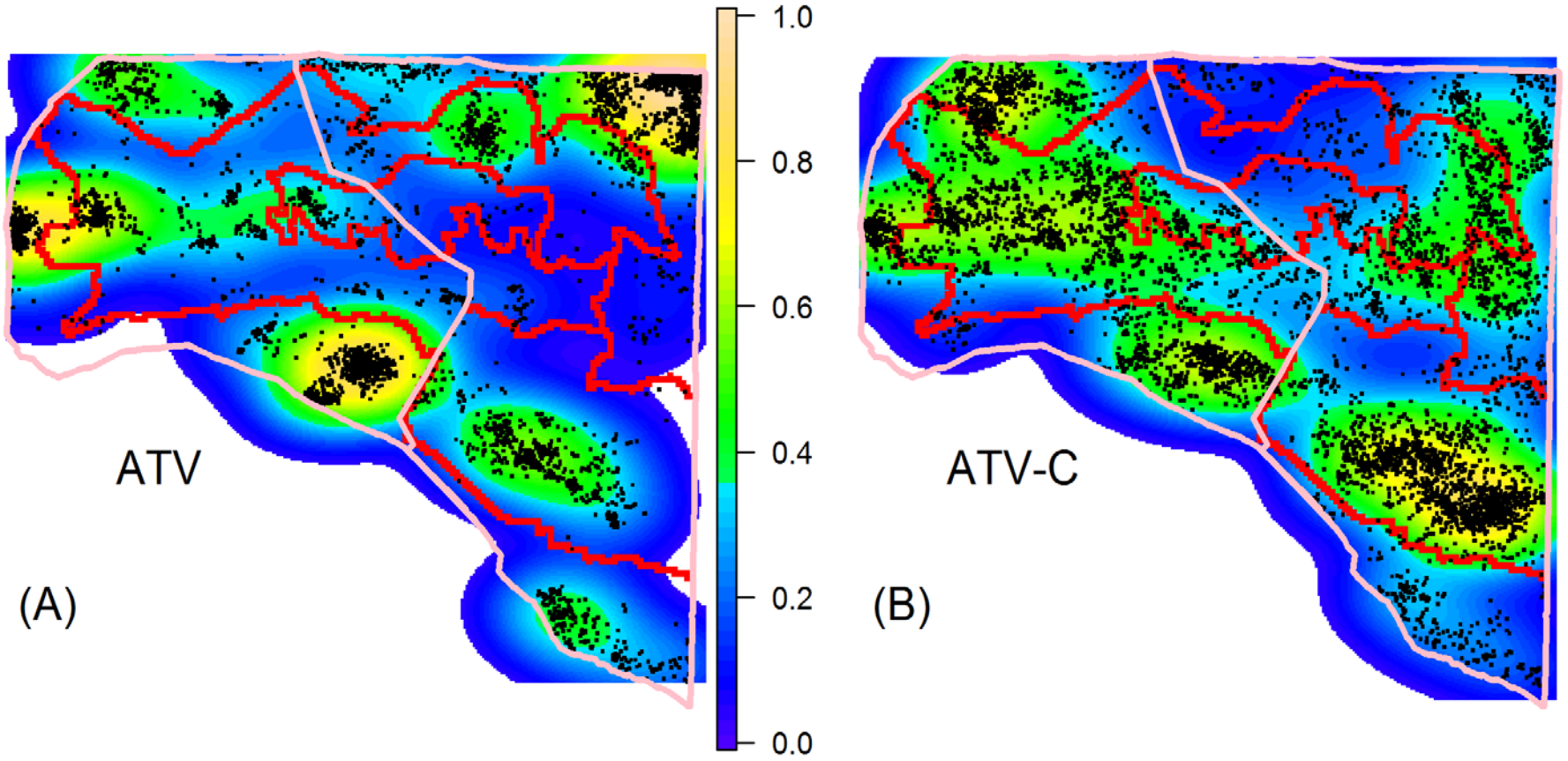

Probability of response
0.0
0.2
0.4
0.6
0.8
0
500
1000
1500
2000
2500
3000
Distance to ATV (m)


Probability of response
0.0
0.2
0.4
0.6
0.8
0
500
1000
1500
2000
2500
3000
Distance to HIKER (m)


Probability of response
0.0
0.2
0.4
0.6
0.8
0
500
1000
1500
2000
2500
3000
Distance to BIKER (m)


Probability of response
0.0
0.2
0.4
0.6
0.8
0
500
1000
1500
2000
2500
3000
Distance to HORSE (m)

Elk distribution in relation to ATV routes



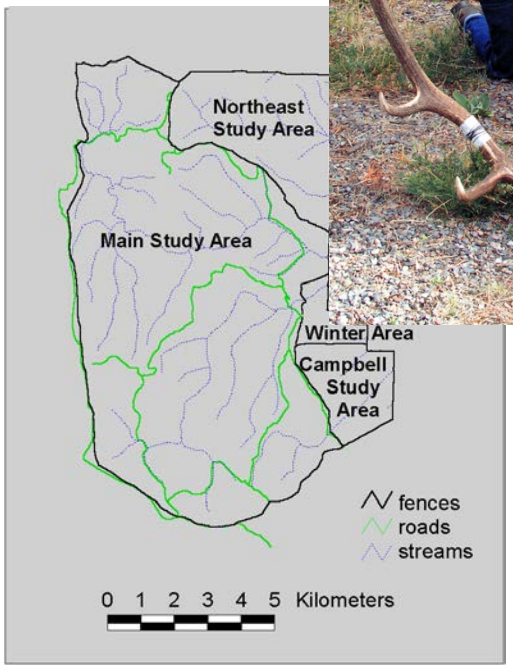
Conclusions

- Elk responded to all four activities
  - flight responses and movement rates were substantially higher during all activities compared to controls
- Movement rates and flight responses of elk to **ATV and mountain bike riding** were stronger than to horseback riding and hiking
  - Foraging time also less during ATV and mountain bike treatments
- Mule deer did not respond strongly to any of the four activities
  - May be hiding instead of running

Starkey recreation Research

Effects of Hunting on Deer and Elk

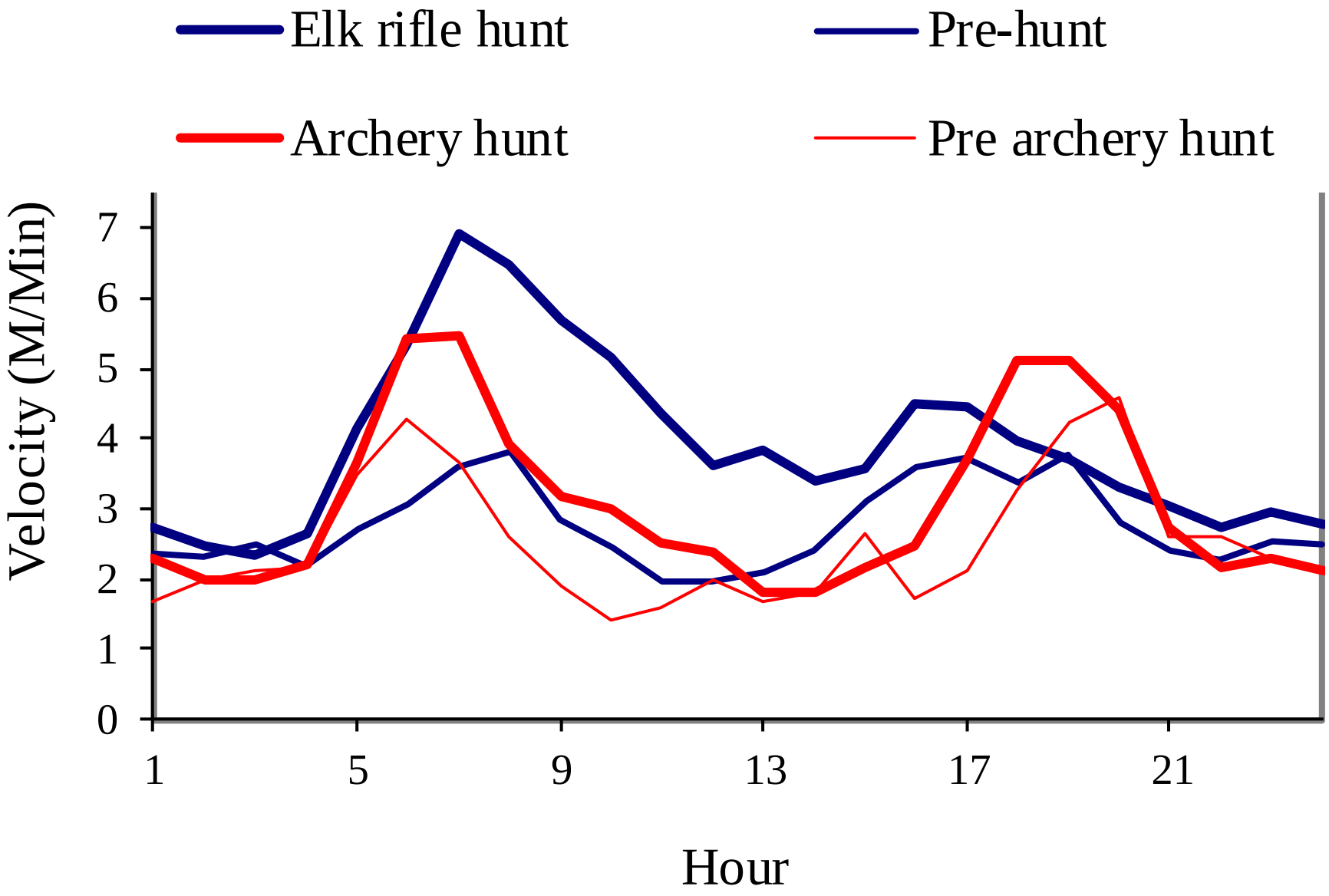
Effects of Hunter Density and Traffic on Female Elk & Mule Deer



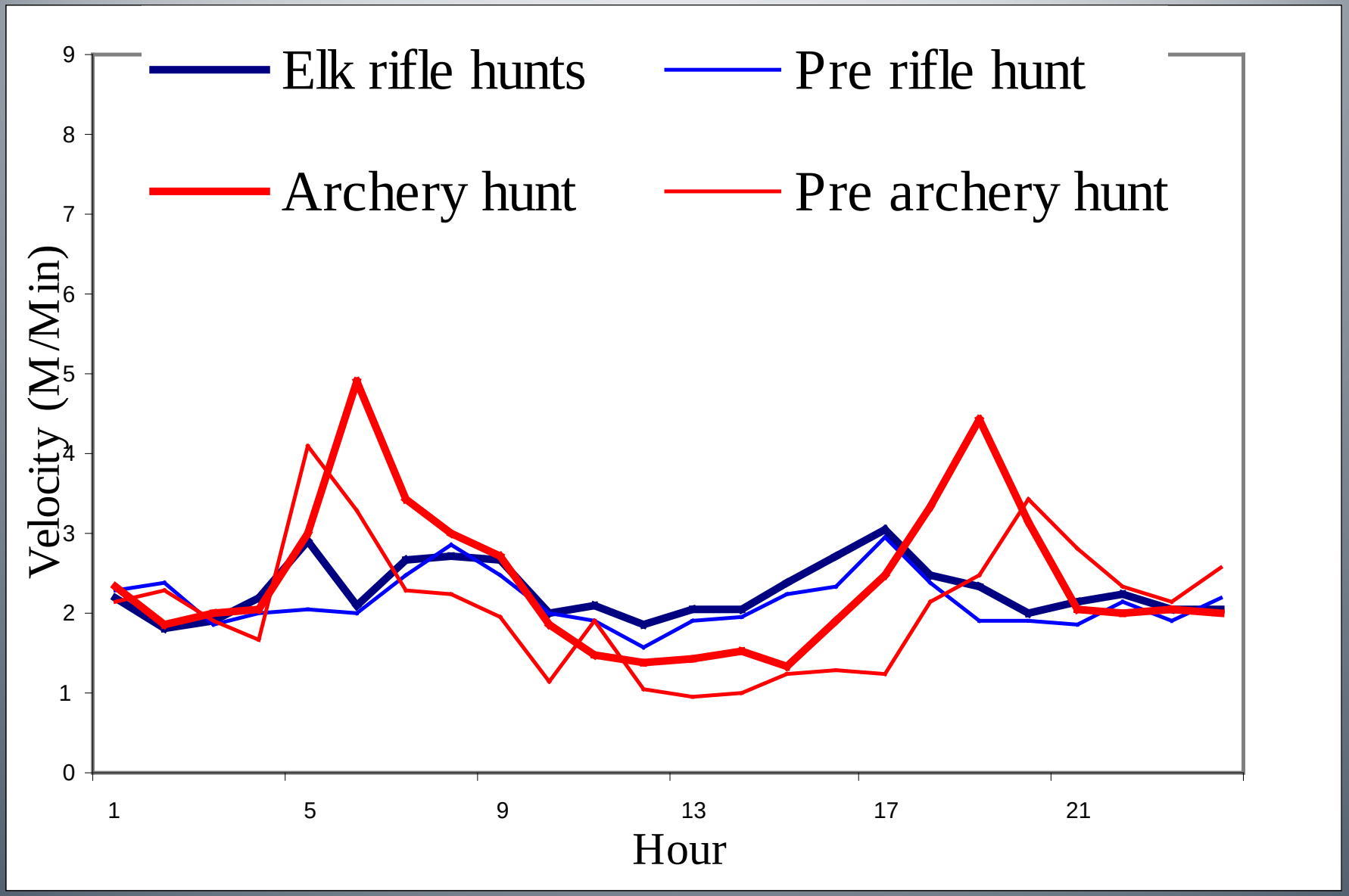
- 10 yrs of hunts (21 rifle, 2 archery)
- Quantified effects of hunter density and traffic on movements and habitat use
  - Archery vs. rifle
  - Elk vs. deer responses
- Energetic cost of a typical hunting season to an elk

Johnson et al. 2005. Elk and mule deer responses to variation in hunting pressure. Transactions of the North American Nat. Resource and Wildlife Conference.

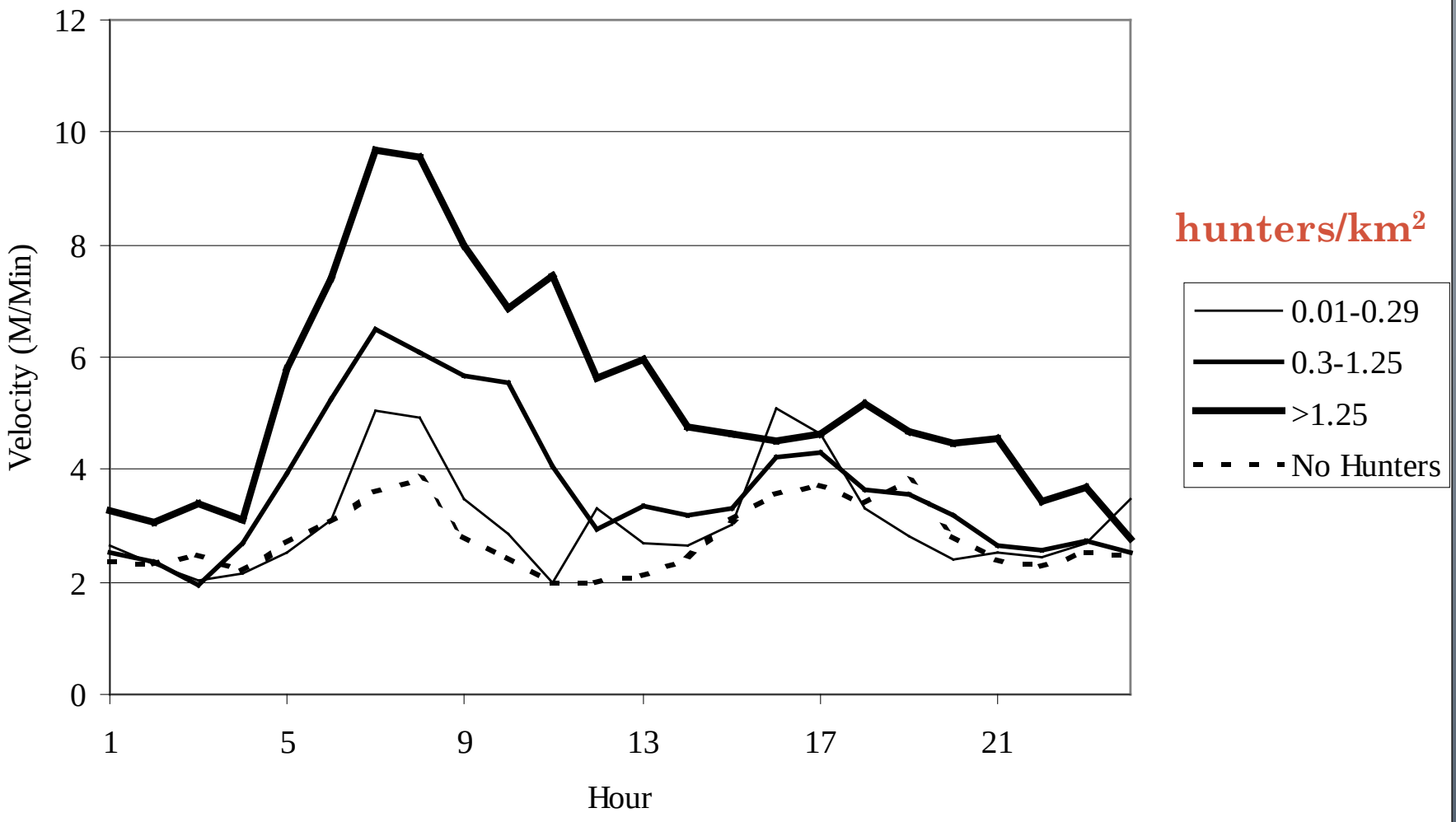
Elk Velocity During Elk Hunts



Deer Velocity During Elk hunts



Hourly Elk Velocity by Hunter Density (Rifle Elk Hunts)



Energetic Cost of Hunting on Elk

- Under average hunter densities for rifle hunts: an additional 9 kcal/g fat = **53 g** of fat per day
  - Conservative estimate because we assumed travel was on level ground
- For elk on units outside Starkey, **1.9 kg of fat** lost for 63 days of big game hunting
  - This can be up to 10% of body fat for a female elk

- If animals move to sites with sub-optimal foraging conditions during hunts for security, total cost from hunting disturbance possibly higher
- Cumulative effects? No accounting for other disturbance to elk remainder of year

Starkey Archery Research

- Increasing archer densities
- Hypothesized that archers could be affecting elk pregnancy rates and/or conception dates
- 13 years of data with 3 archer densities (high, low, none)

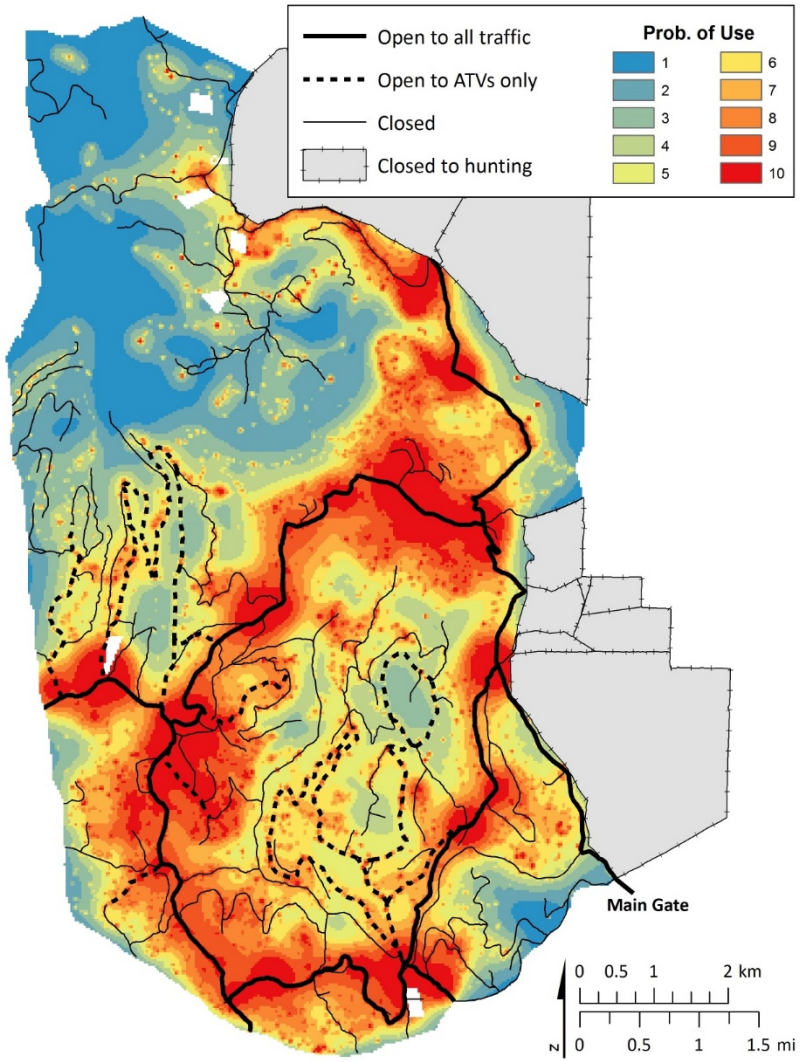
Davidson et al. 2012. Effects of archer density on elk pregnancy rates and conception dates. J. Wildlife Management.

Starkey Archery Research - Findings

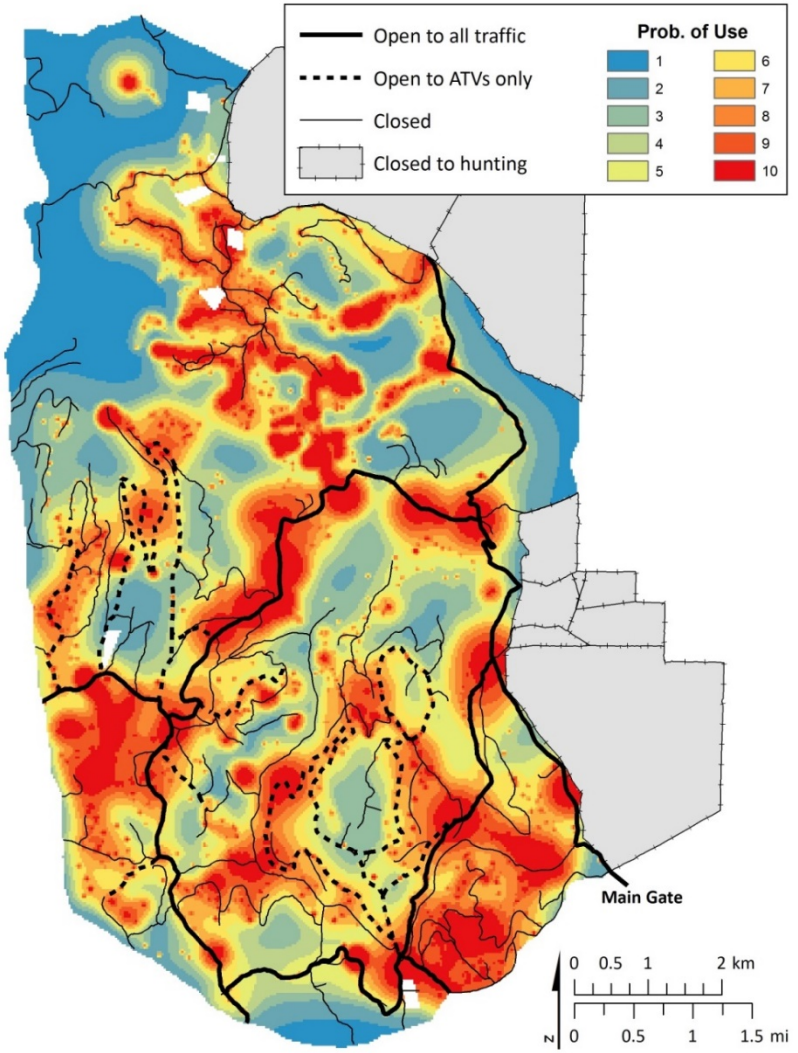
- Pregnancy rates significantly different (~10% lower) between high archer density and no archers
- Condition (kidney fat) was significantly lower under high archer densities
- Conception dates not affected

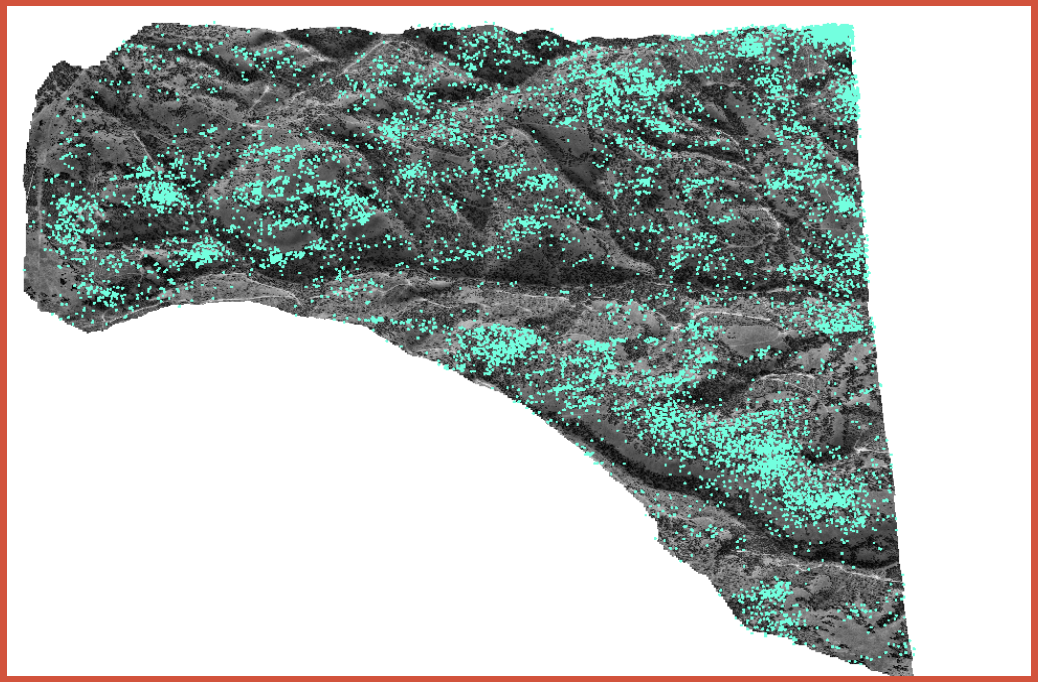
Starkey Hunt Experiment: 2008-2013

Successful rifle deer



Successful rifle elk





Concluding thoughts

Summary- Elk Responses to Recreation

- Elk respond similarly to a variety of recreation activities
- Trail-based recreation ≈ open roads/traffic
- Include shifts in distribution, use of cover, and velocity
- Likely impact animal performance through energetic costs incurred
- Density of recreationists matters
- Trail-based recreation (e.g., mountain biking) effects similar to motorized use

Summary - Elk Responses to Recreation

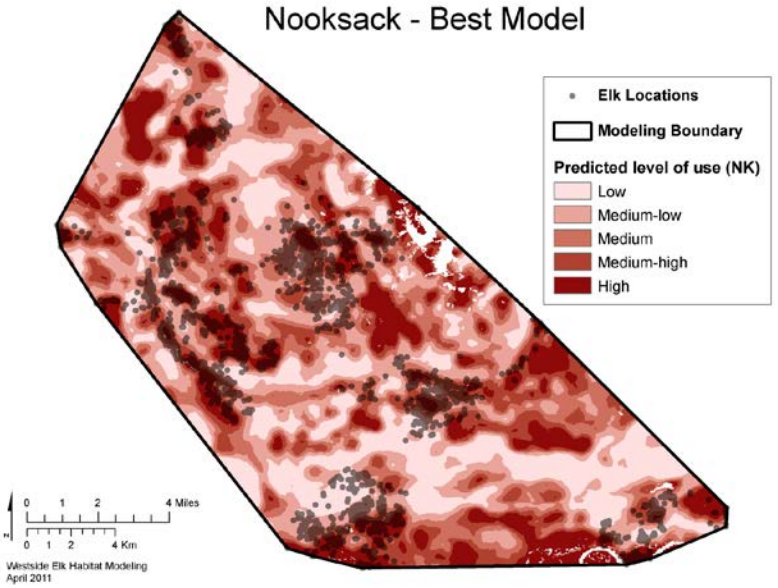
- Deer often respond differently from elk
- Road and trail access underpin nearly all recreation impacts on elk and deer
- Hunters not to be ignored in the recreation equation (effects on breeding animals)
- Close coordination between public land managers and state wildlife agencies is critical for sustainable recreation opportunities and ungulate populations

How Elk/Recreation Tie to 2012 Forest Service Planning Rule

- "The Agency recognizes the important role of NFS lands in providing the habitat for these (game) species…"
- The rule "specifically requires consideration of habitat conditions for wildlife, fish, and plants commonly enjoyed and used by the public for **hunting,** fishing, trapping, gathering, observing, and subsistence…."
- Assumes provisions for sustainable use of both game species and recreation
- Elk or deer are focal species in some forest plans

Tools and Knowledge Gaps

- Some gaps:
  - Effects of varying levels of noise
  - Population level responses in variety of settings
  - New and evolving forms of recreation



- Habitat selection models
  - Predict animal distributions in relation to roads and trails and other features
  - Available for elk in western OR and WA
  - Also for mule deer winter range

A Sample of Starkey Recreation Publications

- Davidson et al. 2012. Effect of archer density on elk pregnancy rates and conception dates. *J. Wildl. Manage.* 76:1676-1685.
- Johnson et al. 2004. Elk and mule deer responses to variation in hunting pressure. *Trans. N. Amer. Wildl. Nat. Res. Conf.* 69:625-640.
- Naylor et al. 2009. Behavioral responses of North American elk to recreational activity. *J. Wildl. Manage.* 73:328-338.
- Preisler et al. 2006. Statistical methods for analyzing responses of wildlife to human disturbance. *J. Appl. Ecol*. 43:164-172.
- Rowland et al. 2000. Elk distribution and modeling in relation to roads. *J. Wildl. Manage.* 64:672-684.
- Rowland et al. 2005. Effects of roads on elk: implications for management in forested ecosystems. *Trans. N. Amer. Wildl. Nat. Res. Conf.* 69:491-508.
- Wisdom et al. 2004. Effects of off-road recreation on mule deer and elk. *Trans. N. Amer. Wildl. Nat. Res. Conf.* 69:531-550
- Wisdom et al. 2018. Elk responses to trail-based recreation on public forests. *Forest Ecology and Manage.* 411:223-233.


Thanks!