Using GPS to Track Livestock on the Landscape

Rangeland Applications for Spatial Technologies

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Disturbance Ecology

- Fire
- Invasives
- Climate
- Herbivory
- Re-Introductions
Water, Fire, and Cattle
Problem

Effects of prescribed-fire vegetation treatments on post-fire cattle distribution and activity patterns in sagebrush-steppe are largely unknown.
Study Areas
Reynolds Creek Experimental Watershed
Owyhee Mountains, SW Idaho

Breaks

Whiskey Hill
Lotek 2200 GPS Collar

Location accuracy:

95% C.I. = +/- 5 meters
Typical = +/- 1 meter

$5,000 ea

Two-axis activity sensor

Air temperature sensor
Cattle Distribution Breaks Study Area

Pre-fire: July 2002  Post-fire: July 2003

Legend:
- Pre-fire locations (1 cow)
- Post-fire locations (1 cow)
- Yellow: Pasture
- Pink: Fire

Pre-Fire

Post-Fire
Pre-Fire

GPS Tracking Trials
Mature Beef Cows, 10 trial
30-day trial each year (July)
10-minute sampling interval

Legend
- Pre-fire 2002 (Collar 196)
  Movement paths
- Roads, unimproved
- Streams, perennial
- Fire treated area
- Pasture, fence (176 ha)

Note: The example data set shown represents data from 1 cow tracked for 30 days.
Collar 196 = 4,147 locations displayed

2nd Yr Post-Fire (2004)

GPS Tracking Trials
Mature Beef Cows, 10 trial
30-day trial each year (July)
10-minute sampling interval

Legend
- Post-fire 2004 (Collar 790)
  Movement paths
- Roads, unimproved
- Streams, perennial
- Fire treated area
- Pasture, fence (176 ha)

Note: The example data set shown represents data from 1 cow tracked for 30 days.
Collar 790 = 4,033 locations displayed
3rd Yr Post-Fire (2005)

Stream Use (Zoom)
July 2005
3 Years Post-Fire

GPS Tracking Trials
Mature Beef Cows, 10 trial
30-day trial each year (July)
10-minute sampling interval

Legend
- Post-fire 2005 (Collar 795)
- Movement path
- Roads, unimproved
- Streams, perennial
- Fire treated area
- Pasture, fence (176 ha)

Note: This dataset represents
from 1 cow tracked for 30 days

5th Yr Post-Fire (2007)

Stream Use (Zoom)
July 2007
5 Years Post-fire

GPS Tracking Trials
Mature Beef Cows, 10 trial
30-day trial each year (July)
10-minute sampling interval

Legend
- Post-fire 2007 (Collar 797)
- Movement path
- Roads, unimproved
- Streams, perennial
- Fire treated area
- Pasture, fence (176 ha)

Note: This dataset represents
from 1 cow tracked for 30 days
Breaks 145 PPT (Wind-Corrected, ppta)

Very wet spring

2005 – 3rd Year Post-Fire

B. Sage Shrublands
- Higher grass biomass
Water, Wolves, and Cattle

Northern Rockies

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Problem

Effects of re-introduced gray wolves on range cattle productivity and resource-use patterns are unknown.
Potential Cascade of Indirect Effects

Increased Encounters → Stress

Vigilance

Foraging

Altered Habitat & Activity Patterns

Bedding
Diet Quality Shifts

Body Condition & Weight Gain/Loss

Altered Reproductive Success
Impacts on Water and Vegetation

Riparian occupation time
- Frequency
- Duration
- Impacts on vegetation

Water Quality

Altered pollutant levels
- Sediment
- Coliforms

Riparian Systems
GPS Tracking

Clark GPS Tracking System

- SD and Micro-SD card data storage.
- 3-axis Accelerometer activity sensors.
- Battery power management capable of delivering 1 year of 5-min GPS locations.
Clark GPS/SATCOMM Tracking System
24/7 Real-time GPS Tracking
Anywhere on the Globe

Iridium Short Burst Data Transmission
Two-Way Email Communication with Deployed Collars

- Download collar GPS data emailed from deployed collars
- Change collar parameters by sending email to deployed collars.
Near-Stream Habitats

- Use of near-stream habitats varied between pastures.
- Use > Availability in some pastures.
- Use = Availability in other pastures.
- Differing topography and riparian composition may play a substantial role.
Riparian area

Upland Day-Bed Site

Upland Night-Bed Site

Cow collar 4529
24-hr Movement path
3 Weeks of 15-min samples
Other responses

Possible Flight Event

Possible Bunching Event

7/5/2006
7/6/2006
7/7/2006
7/8/2006
7/9/2006
7/10/2006
7/11/2006
7/12/2006
7/13/2006
7/14/2006
7/15/2006

July 11, 2006

Same site
• July 11, 2006 (GPS)
• July 17, 2006 (Direct Obs.)
Habitat Use and Activity Patterns
Cattle and Elk

Starkey Exp. Forest and Range
La Grande, Oregon
Cow Unit 121A
Week-long trials
1-second GPS data
Cattle - Summer
Elk - Summer
Cattle - Fall
Water, Khulan, and Livestock
Gobi Desert, Mongolia

Dornogovi Aimag
Livestock Watering-Well Rehabilitation
Interspecific Competition and Resource Impacts?

Project renewal proposal:
The World Bank
Interactions
Herded Livestock - Endangered Ungulates

Cattle

Asiatic wild ass (Khulan) – Red listed

Bactrian camel

Fat-tailed sheep