

EARTHWATCH INSTITUTE

Fourth Year Research Report

PI Name: William Newmark and Eric Rickart

Project title: Wildlife Trails of the American West

Date Completed: January 27, 2009

Period covered by this report: from June 2006 to June 2008

Progress towards objectives

Objective 1

What are the landscape attributes (e.g. slope, aspect, elevation, cover, food availability, snow depth, and distance to high risk predation zones and water) of wildlife trails?

Expected completion date:

Red Butte Study Site 1: December 2008;

Red Butte Study Site 2: December 2010;

Trail Gulch: December 2009;

Little Sheep Creek: December 2009;

Joseph Creek: August 2010

In Red Butte Study Area 1, we have determined that the most important landscape predictors of ungulate movement pathways at a scale of 70 m are open habitats and distance to water. We have also determined that elk and deer pathways are also significantly less steep than local terrain. Our results indicate that predator avoidance, water requirements, and to a lesser degree energy expenditure are important determinants of elk and deer movement in Red Butte Canyon at an intermediate spatial scale.

In Red Butte Study Area 2, which is a considerably larger study area than Red Butte Study Area 1, we are still gathering data on food availability and ground-truthing cover type maps.

In Trail Gulch, which is a winter range site for the Beaverhead elk population, the best landscape predictors of movement pathways for elk are forest cover and distance to water suggesting that predator avoidance is the primary determinant of intermediate scale movements on their winter range. At Little Sheep Creek, which is a migratory site for the Beaverhead elk population, the best predictors of movement pathways for elk are forest cover and elevation indicating that the primary determinants of migratory movements are avoidance of predation and energetics (elk and deer are following ridgelines while migrating).

At Joseph Creek, we are still gathering data on food availability, ground-truthing cover type maps, and developing summary statistics of landscape features.

Objective 2

How do non-landscape features such as predator distribution and abundance interact with landscape features to affect ungulate movement?

Over the next three years, we will compare landscape predictors of ungulate movement in Red Butte Canyon where the principal predator is the mountain lion with those in the Beaverhead Mountains where the principal predators are the mountain lion and wolf.

Objective 3

How does the relative importance of landscape and non-landscape features vary seasonally?

We have developed a preliminary model of ungulate movement in the Red Butte Study Area 1 during the winter when the study site is snow covered. The best landscape predictors of mule deer and elk movement during this season are open and high cover suggesting that avoidance of predation and thermal regulation are the most important determinants of movement during this season. This result when compared to those presented under Objective 1 indicates that determinants of ungulate movement in Red Butte Study Area 1 vary seasonally.

Objective 4

How does the relative importance of landscape and non-landscape features vary with scale of movement?

In May 2007, we received a grant from the National Geographic Society to purchase very high resolution (6 cm) aerial photography of Red Butte Canyon. We have recently completed hand digitizing all of the wildlife trail segments in Red Butte Canyon and over the next 12 months we plan to complete the assessment of food availability and ground truthing of cover height in the remainder of the canyon. Over the next two years, we plan to develop and compare predictive models of ungulate movement pathways in Red Butte Canyon at 70 m and 210 m spatial scales.

Non-technical overview of results

Data collected

Wildlife Trails

Between June 2006 and June 2008, we mapped the spatial distribution of more than 480 wildlife trail segments in Red Butte Canyon, Trail Gulch, Little Sheep Creek, and Joseph Creek study areas.

Documenting carnivore presence

Between June 2006 and June 2008 we set up and monitored a remote-sensing camera for assessing carnivore presence at Trail Gulch and Joseph Creek. During this period we photographed black bear at Trail Gulch. We also documented through sightings and/or spoor the presence of mountain lion in Red Butte Canyon, and presence of both mountain lion and wolf at Trail Gulch, Little Sheep Creek, and Joseph Creek.

Vegetation analysis

Between June 2006 and June 2008, Earthwatch volunteers recorded food plant cover within more than 6000 1 m² quadrats in Red Butte Canyon, Trail Gulch, Little Sheep Creek, and Joseph Creek study areas.

Emerging Patterns

In Red Butte Canyon Study Area 1, we have developed a number of predictive models of ungulate movement pathways. The best models indicate that animals are more likely to move in open habitat and in regions close to water. Elk and deer pathways are also significantly less steep than local terrain. Our results suggest that predator avoidance, water requirements, and energy expenditure are important determinants of elk and deer movement pathways at an intermediate scale during the spring, summer, and fall in this study area. We have also developed a preliminary model of ungulate movement pathways in Red Butte Canyon Study Area 1 during the winter when the semi-permanent trail network is snow covered. Open and high cover are the best predictors of ungulate movement pathways during this season. This finding indicates that landscape predictors of ungulate movement in Red Butte Canyon vary among seasons.

Preliminary results from Trail Gulch, which is a winter range site for elk and mule deer migrating from Montana to Idaho, indicate that animals here are more likely to move through areas that contain forest cover and avoid riparian areas suggesting that predator avoidance is the primary determinant of intermediate scale movements on their winter range; while at Little Sheep Creek, a migratory site for elk and mule deer, animals were more likely to move through areas with forest cover and to follow ridge lines that parallel drainages suggesting that avoidance of predation and energetics are the primary determinants of ungulate movement while migrating between the winter and summer ranges.

When we compare these results to what we have observed in Red Butte Canyon Study Area 1, these patterns strongly suggest that the composition of the predator community strongly influences movement patterns of ungulates. In Red Butte Canyon, where the principal predator is the mountain lion, ungulates prefer to move through open habitats while at Trail Gulch and Little Sheep Creek, where the principal predator is the wolf, ungulates prefer to move through more closed forest cover.

How do these data contribute to achieving conservation impacts?

Enhancing ecological connectivity among habitat isolates is an important means to minimize the adverse impacts of habitat fragmentation. This study will provide conservation practitioners with important guidelines for more effectively designing wildlife corridors and enhancing ecological connectivity among national parks and related reserves and other habitat isolates.

This is the first study as far as we are aware to conduct a multivariate analysis of landscape predictor of large mammal movement at an intermediate spatial scale. The results of this study should be extremely valuable in linking studies of ungulate movement conducted at finer and coarser scales; and in more effectively designing wildlife corridors and enhancing ecological connectivity among habitat isolates.

What is/ are the significance/ benefits of your research at the following levels?

- **Local (to the area of the research site)**

A number of local residents in Gibbonsville, Idaho have expressed a keen interest in learning more about the project and even possibly participating in the project. Local residents have

also been invited to attend lectures about the project. In addition, over the last three years, graduate and undergraduate students in the Department of Biology at the University of Utah have participated in field activities in Red Butte Canyon.

- **National / Regional**

Our results should be extremely useful to land managers in western North America in designing more effective wildlife corridors and enhancing ecological connectivity among habitat isolates. This project has had broad regional impacts that extend beyond individual National Forests. William Newmark was invited in October 2007 to testify as an expert witness to the U.S. House Committee on Natural Resources on the importance of ecological connectivity and wildlife corridors with regard to a Congressional hearing on the North Rockies Ecosystem Protection Act. This act would designate for the first time federally protected wildlife corridors among national parks in the northwest (Idaho, Montana, Wyoming, Washington, Oregon) and would protect over 23 million acres of wilderness.

- **International**

This is the first study as far as we are aware to use wildlife trail networks to identify landscape predictors of large mammal movement. Furthermore this is the first study to conduct a multivariate analysis of landscape predictors of ungulate movement at an intermediate-scale which serves as an important bridge between studies of ungulate movement that have been conducted at both finer and coarser-scales. The results of this study are broadly relevant to other species and ecosystems and therefore should be extremely valuable in more effectively designing wildlife corridors and enhancing ecological connectivity among habitat isolates in regions outside of North America.

Dissemination of results

Printed:

Books / book sections; peer reviewed scientific publications; reports, management plans or policies; fact sheets, brochures, leaflets, pamphlets, posters, academic dissertations, annual reports, proceedings of conferences or workshops; letters; newsletters.

Publication type (from the list above): peer reviewed scientific publications

Author: Newmark, W. D. and Rickart, E.A.

Newmark, W. D. and Rickart, E.A. (in review). Intermediate-scale Landscape Predictors of Ungulate Movement Pathways. *Journal of Wildlife Management*.

Audience: Scientific and conservation practitioners

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Publication type (from the list above): peer reviewed scientific publications

Author: Newmark, W. D. and Proffitt, K.M.

Newmark, W.D. and K.M. Proffitt. (in prep.) Do Landscape Predictors of Elk Movement Vary Over a Migratory Cycle?

Audience: Scientific and conservation practitioners
Acknowledged Earthwatch? Y/N: Y
PDF submitted? Y/N: N

Visual: artwork; visitor centre, poster or display, slides, photographs

Publication type (from the list above): Poster for Earthwatch Conference
Acknowledged Earthwatch? Y/N: Y
Photographs submitted? Y/N: Y

Digital: database; internet - websites, email group/ blog/forum; CD Rom, e-newsletter

Publication type (from list above): GIS database
If website/ blog/ forum provide URL:
Acknowledged Earthwatch? Y/N:
Copies submitted? Y/N:
Free text box for extra detail: We have developed a GIS database for each of the study sites. These databases are managed by the DIGIT laboratory at the University of Utah.

Mass media: broadcast production; film; TV, radio, print (newspaper/ magazine coverage);
Press releases; press conference; interview, article creation; press trip

Publication type (from list above) book
Author: Caroline Fraser
Title: *Rewilding the World: The Race to Save Wildlife*
Audience: General public and conservation community
Acknowledged Earthwatch? Y/N:
PDF submitted? Y/N:
Free text box for extra detail: Caroline Fraser, a journalist from Santa Fe, New Mexico, interviewed William Newmark and participated in field activities in June 2005 as part of research for a book she wrote on large-scale wildlife corridor projects entitled "Rewilding the World: The Race to Save Animal Life." This book, which is published by Metropolitan Books, will be released in 2009.

Meetings and conferences: presentations/ lectures; conferences; workshops; training sessions; discussions; local community meetings and events.

Publication type (from list above): Congressional Testimony
Title: Testimony on behalf of the Northern Rockies Ecosystem Protection Act HR 1975.
Audience: House Committee on Natural Resources
Audience size: 25
Acknowledged Earthwatch? Y/N:
PDF submitted? Y/N:
Free text box for extra detail: William Newmark was invited to testify on 17 October 2007 as an expert witness on the value and importance of wildlife corridors to the House Committee on Natural Resources that was holding a hearing on the Northern Rockies Ecosystem Protection Act HR 1975. This bill would establish 23 million acres of new wilderness in Idaho, Montana, Wyoming, Oregon, and Washington and would designate for the first time federal lands as wildlife corridors.

Publication type (from list above): presentations/ lectures

Publication type: discussion booth

Title: Ungulate Movement in Red Butte Canyon

Audience: school children and general public

Audience size: ~ 150 children and adults

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Free text box for extra detail: William Newmark and Eric Rickart developed a poster describing the Red Butte study during an "open house" at the Utah Museum of Natural History and answered questions about the project from the general public. Eric Rickart also designed a game for school children that demonstrated the threat that blocking migratory routes pose to the Red Butte elk and mule deer populations.

Publication type (from list above): Public lecture

Title: Ungulate Movement in Red Butte Canyon

Audience: general public

Audience size: 45

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Free text box for extra detail: In March 2004, William Newmark presented a lecture at the Oakland Zoo about this project. The lecture was sponsored by the Oakland, California Earthwatch Chapter.

Publication type (from list above): Public lecture

Title: Designing Nature Reserves: Lessons from western North America and East Africa.

Audience: general public and faculty and students

Audience size: 75

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Free text box for extra detail: In November 2007, William Newmark presented a public lecture at the Monte L. Bean Life Science Museum at Brigham Young University entitled "Designing Nature Reserves: Lessons from western North America and East Africa".

Educational resources: lesson plans; resource packs, other

Publication type (from list above): Powerpoint Presentation

Author: William D. Newmark

Title: Wildlife Trails of the American West

Audience: Earthwatch volunteers

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Free text box for extra detail: William Newmark has developed a Powerpoint presentation which he presents to all Earthwatch teams that describes the project, its objectives, and volunteer activities.

Other (specify):

National Geographic Society Final Report

Title: Final Report on Grant 8249-07: Use of Wildlife Trail Networks to Identify Landscape Predictors of Ungulate Movement in the central Rocky Mountains

Audience: Committee for Research and Exploration

Audience size: n/a

Acknowledged Earthwatch? Y/N: Y

PDF submitted? Y/N: N

Free text box for extra detail: The National Geographic Society provided a grant to William Newmark and Eric Rickart to purchase very high resolution aerial photography of Red Butte Canyon. This is the final report to the National Geographic Society for this grant.

Partnerships and Collaborations

1. The National Geographic Society provided a grant to William Newmark and Eric Rickart to purchase very high resolution aerial photography of Red Butte Canyon.
2. The DIGIT laboratory at the University of Utah has managed the GIS database and has developed summary statistics of landscape parameters for each of the study sites.
3. The Wildlife Nutrition Laboratory at Washington State University has conducted a diet analysis for elk and mule deer at each of the study sites.
4. The U.S. Forest Service wildlife biologists have recommended study sites on the Salmon-Challis National Forest in Idaho and the Beaverhead-Deerlodge National Forest in Montana.
5. The Utah Water Conservancy, U.S. Forest Service, and the Department of Biology at the University of Utah have provided permission to the PI's to conduct research in Red Butte Canyon Research Natural Area.
6. The Utah Museum of Natural History has provided logistical support.

Educational Opportunities and Capacity Building

a) If appropriate, provide a brief report on how the project has created or enhanced educational opportunities for project stakeholders, including the local community (excluding Earthwatch volunteers)

Over the period of this report, Dr. Kelly Proffitt, a post-doctoral fellow at Montana State University, and Mr. John Roberson, an elementary school teacher from Salt Lake City, Utah, served as field staff. Their performances were outstanding and they greatly assisted the volunteers in all aspects of the project. Kelly Proffitt is currently collaborating with William Newmark on a manuscript that examines variation in landscape predictors of ungulate movement pathways over a migratory cycle.

b) If appropriate, explain how the project has increased capacity to work towards a sustainable environment in the local area/country

Over the period of this report, several elementary teachers and retirees requested copies of the project's Powerpoint presentation so that they could share this presentation with their students; or so that they can contact the editor of their local newspaper about the importance of conserving biodiversity. Over the period of this report, a mid-career volunteer who participated was inspired to return to graduate school and study biology.

Sustainability of the Project

If measures have been taken to secure the future sustainability of the project (e.g. securing funding, implementation of management plans etc) please provide a brief report here:

Over the course of this report, the National Geographic Society has provided a grant to the PIs to purchase very high resolution aerial photography of Red Butte Canyon. Furthermore, there are plans to reintroduce the Northern Rockies Ecosystem Protection Act in Congress which will designate critical wildlife corridors among protected areas in Idaho, Montana, Wyoming, Oregon, and Washington. Under the Obama Administration there is a very good possibility this legislation will pass.