

The Department of Fish & Wildlife Resources will offer

**New Approaches to Studies of Home Range,  
Habitat Selection and Space Use**

A workshop presented by  
**Dr. Edward O. Garton, UI Emeritus Professor  
of Wildlife, Ecology, and Statistics**

**March 12-16, 2012  
Moscow, Idaho**

Radio and satellite telemetry has become a nearly essential tool in modern studies of animal behavior, ecology, management and conservation because of the dramatic increases in our technological capabilities to locate animals. It is common to use radio/satellite telemetry to study animal movement, survival, migration, dispersal, space use, home range size, habitat use, and resource selection. The primary objectives of this workshop are to briefly review historic methods for analysis of home range, resource selection and space use and describe new approaches that use information theoretic tools to evaluate multivariate models of animal movement, resource selection and space use based on underlying ecological processes (e.g. defending a territory, provisioning a nest/den, foraging, accumulating knowledge of resource distributions, dispersing) and fundamental theoretical models (e.g. random walks, central place and optimal foraging). Designing and analyzing studies of animals using radio/satellite telemetry will be improved substantially through knowledge of the powerful statistical tools which have been developed for analysis of these data as well as how to apply basic principles of finite population sampling. The secondary objective is to introduce biologists to new software available to analyze radio tracking location data that simultaneously estimates home range and resource selection for independent observations from VHF or non-invasive genetic sampling as well as serially correlated data gathered with GPS or ARGOS satellite telemetry that requires analysis in a multi-core parallel processing environment.

Participants in this five-day workshop (March 12-16, 2012) will explore these powerful tools for estimating space use (home range size, habitat use, and resource selection) by applying them to real data on continuously monitored elk and deer at Starkey Experimental Forest and Range as well as data on mammals and birds from other studies on caribou, moose and Dall sheep. Class size is limited to 24 participants and a minimum of 10 is required. Workshop participants will accrue 32 contact hours toward The Wildlife Society's Professional Development Program. Graduate credit from the Univ. of Idaho College of Graduate Studies is available for an additional fee.

## Work Shop Agenda

Monday - 2:00 p.m. to 5 p.m.

- **Welcome, Introduction, objectives**
- **Research Design for Radio/satellite telemetry**  
Design Considerations  
Biological and Statistical Populations  
Populations and samples  
Estimation overview for home range, dispersal distance, habitat use, resource selection, space use, survival rate and fecundity
- **Elements of Sampling**  
Terminology  
How to select the sample  
Sources of errors  
Simple Random Sampling  
Stratification  
Systematic Sampling with GPS  
Hybrid Designs (2-stage)

Tuesday - 8:30 a.m. to 5 p.m.

- **Home Range Size**  
Concept: History  
Utilization volume/probability of use  
Core areas  
Polygon approaches
- **Lab 1 – Survey Sampling**  
Random, stratified and cluster samples  
Determining optimal sample size

Wednesday - 8:30 a.m. to 5 p.m.

- **Home Range Size (cont.)**  
Performance of estimators

- Survey sampling design:  
Populations  
Design: Animals
- **Lab2 – Intro to ArcView and Animal Movement Extensions for Applying Parametrics and Kernels**
- **New Developments in Home Range Estimation**  
Fractal-based spatial analyses  
Generalized entropy  
Brownian bridges for serially correlated movement data  
Maximum likelihood approaches to parameter estimation, model selection and inference
- **Lab 3 – Using AIC and Cross-validation to choose models**

Thursday - 8:30 a.m. to 5 p.m.

**Habitat Utilization & Resource Selection**

Univariate approaches:  
Chi-square & Bonferroni-CI  
Ratio estimators and CI on preference  
Manly's selectivity index  
Compositional analysis  
Euclidean distance

- **Effect of Sample Size on Performance of Resource Selection Methods**  
Neu et al. (1974) Chi-square  
Friedman (1973) ANOVA on ranks  
Johnson (1980)  
Aebischer et al. (1996)  
Compositional Analysis
- **Lab 4 – Univariate Resource Selection Analysis**

**Multivariate Statistical Approaches**

Discriminant Analysis (MANOVA)

Logistic Regression

Principal components/ factor analysis

Multiple regression

Selection differentials and gradients

Ecological factor niche analysis

Log linear models

Marzluff's resource utilization functions

Polytomous logistic regression

Discrete choice modeling

- **Lab 5** – Brownian Bridges Space Use Modeling

This workshop is designed to be as practical as possible. Thus, the following activities are offered on a voluntary basis during labs or an evening session as desired:

Continuation of the lab exercises

Discussion of individual design problems submitted by the participants

Analysis of data brought by the participants

Individual help from the instructor

**Friday - 8:30 a.m. to 12 noon**

- **Multivariate Statistical Approaches**  
Resource selection probability functions  
Probabilistic approach (see below)
- **Synoptic Model of Space-Use**  
Simultaneous estimation of home range and resource selection
- **Lab 6** Space use analysis using synoptic model
- Survival Analysis Incorporating spatial covariates
- Fitness Estimation Integrating models to estimate survival and reproductive success

## **LOCATION AND TIME**

All meetings will be held at the College of Natural Resources (Room 15), 6th and Line Street, University of Idaho, Moscow, Idaho. Meetings will run from 2:00 p.m. on Monday, through 12:00 noon. on Friday

## **PREREGISTRATION**

The registration fee is \$850 per participant. You may register on-line or print out the registration form and mail with payment to the Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844-1136.

Jump to: [http://www.cnr.uidaho.edu/population\\_ecology/](http://www.cnr.uidaho.edu/population_ecology/)

## **HOUSING**

Housing is the responsibility of the registrant. A block of rooms has been reserved at the University Inn/Best Western. To receive the special rate, please call 208-882-0550 or 800-325-8765 and mention that you are with the Home Range/Habitat Selection Workshop.

## **CREDIT**

Workshop participants will accrue 38 contact hours toward The Wildlife Society's Professional Development Program, or credits toward other societies (AFS, ESA, SCB) continuing education requirements for professionals. One graduate credit for Wlf 503 intersession course is available from the University of Idaho's College of Graduate Studies for an additional fee. Graduate credit requires completing all lab assignments and writing a short paper after the course concludes.

## **QUESTIONS**

For transportation, registration, or logistical information, please call the Department of Fish and Wildlife Resources at 208-885-6434 or [fish\\_wildlife@uidaho.edu](mailto:fish_wildlife@uidaho.edu).