Environmental Workshop

Spring 2019

February 26 and 28, 2019

Bald eagle population modeling

**Environmental question we’re answering this week using data:**

***How does a bald eagle population change over time at a winter migratory stopover and which factors influence its abundance?***

Posted in the course folder: ‘eagle data’ workbook

**Background:**

The availability of long-term data on bald eagles (*Haliaeetus leucocephalus*) provides a unique opportunity to study the population dynamics of this culturally and ecologically important bird. In conservation biology, the bald eagle provides a unique example of a species that has overcome the imminent threats of extinction (Grier 1982). Because of its endangered status in the early 1970s (Buehler 2000), several agencies and biologists initiated long-term surveys. Some of these surveys have been implemented at a local scale, and others are nationwide, such as the Midwinter Bald Eagle Survey (Steenhof et al. 2008). Some of the data from these long-term surveys have been analyzed (Arizona *see* Grubb 2003, Western Washington *see* Dunwiddlie and Kuntz 2003, and Glacier National Park *see* McCelland et al. 1994), but other data sets have yet to be fully investigated.

Several of these long-term data sets have been gathered during the winter migration when bald eagles aggregate at stopover sites on lakes and rivers along their migration routes. In the U.S., the eagles move from their summer resident locations in the north towards the south. The primary hypothesis for this movement is that the food supply (primarily fish and, to a lesser degree, ducks) becomes less available as winter approaches and drives the eagles south (McClelland et al. 1994). Several factors influencing bald eagle populations along their migration stopovers have been studied, including weather (Grubb 2003), feeding site characteristics (Dunwiddie & Kuntz 2003; Mull and Wilzbach 2007) and human disturbance (Stalmaster and Kaiser 1998; Dunwiddie and Kuntz 2003). Long-term patterns may also differ among adult versus immature eagles (see McClelland et al. 1994; Dunwiddie and Kuntz 2003; Grubb 2003).

The data sets we use in this activity come from the Bureau of Land Management in Northern Idaho. Since 1974, they have counted migrating bald eagles every midwinter at Lake Coeur d’Alene. The eagle counts are taken on a weekly basis at several sites on the northeast end of the lake. The adult and immature eagles are counted separately. Additional data on the kokanee salmon (*Onorhynchus nerka*) abundance in the lake, weather events, and site characteristics have been assembled.

**References**:

Buehler D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). *In* A. Poole and F. Gill, editors. The Birds of North America. Philadelphia. No. 506, The Birds of North America, Inc., Philadelphia, PA.

Dunwiddie P. W., and R. C. Kuntz II. 2001. Long-term trends of bald eagles in winter on the Skagit River, Washington. The Journal of Wildlife Management 65:290-299.

Grier J. W. 1982. Ban of DDT and subsequent recovery of reproduction in bald eagles. Science 218:1232-1235.

Grubb T. G. 2003. Wintering bald eagle trends in Northern Arizona, 1975-2000. The Southwestern Naturalist 48:223-230.

McClelland B. R., L. S. Young, P. T. McClelland, J. G. Crenshaw, H. L. Allen, and D. S. Shea. 1994. Migration ecology of bald eagles from autumn concentrations in Glacier National Park, Montana. Wildlife Monographs 125:3-61.

Mull K. E., and M. A. Wilzbach. 2007. Selection of spawning sites by coho salmon in a Northern California stream. North American Journal of Fisheries Management 27:1343-1354.

Stalmaster M. V., and J. L. Kaiser. 1998. Effects of recreational activity on wintering bald eagles. Wildlife Monographs 137:3-46.

Steenhof, K., L. Bond, and L. L. Dunn. 2008. The midwinter bald eagle survey results and analysis 1986-2005. U.S.Geological Survey, National Biological Information Infrastructure, and Northwest Alliance for Computational Science and Engineering. Available on-line at http://www.nacse.org/nbii/eagles. (Accessed November 22, 2010.)

**First,**

Open and examine the data. Explore the data.

Which data are continuous and which are categorical?

How does this influence what kinds of hypotheses and models you can test?

**Second,**

Your team’s mission is to use the data provided to answer the questions: *how are bald eagle populations changing over time and why?* Using the data provided and the table below, hypothesize and test specific models (at least 2) informed by your question.

|  |  |
| --- | --- |
|  |  |
| Question: |  |
| Prediction (then): |  |
| Hypothesis (If): |  |
| Assumptions: |  |
| Experimental Design |  |
| Independent variable(s): |  |
| Dependent variable(s): |  |
| Type of graph (line or bar): |  |
| How will you know whether your model is a good fit? |  |

Graph tested models results and include legends, labeled axes, and captions.

**To turn in:**

1) Answers to questions in this document (team)

2) Completed tables (team)

3) Completed graphs (team)

3) Model and self evaluation (individual)

**Rubric:**

 70% deliverables

 Questions answered completely and appropriately

Correct answers based on the data provided (there are many possible correct answers)

Complete tables

Complete and appropriately labeled and described graphs

 30% model and self reflection

 Questions answered completely and appropriately

**Credits:** Modified from Julie Beckstead, Alexandra N. Lagasse, and Scott R. Robinson. U.S. Department of the Interior, Bureau of Land Management, Coeur d'Alene Field Office, archived data.