

STAT 8801 – Case Study 4: Eagle Wing Flaps

Group 4: Rachel, Joel, Zhou, Alain, Emily (Many thanks to my awesome group!)

February 17, 2012

Recap of Situation:

The client is studying bald eagles and is interested in how their flight patterns are related to the weather. They have already collected data in which they visited a preserve each week for the last six months and recorded the temperature and the number of wings flaps of the first 30 seconds of the flight of each observed bird. The client wishes to know if the number of flaps is associated with temperature.

Questions for the Client:

- What is the purpose of the study? How will the results be used? Is this just a fun fact?
- Why do you believe the number of wing flaps is associated with temperature? (It seems more intuitive that the number of flaps would be more closely associated with wind speed than temperature.)
- Do you believe there is a direct relationship or an inverse relationship between temperature and wing flaps and why?
- Why did you collect data over the last six months? If you believe that eagle wing flaps are associated with temperature, why not collect data over an entire year (and, thus, a larger range of temperatures)?
- Did you go out at the same time each day or did the time of day vary over the study?
- How was the temperature recorded? Was the temperature recorded once each day or at the start of each observed flight?
- Are there multiple observers? Do they watch different birds or do they watch the same bird as a sort of verification check?
- Are the observers watching from some perch above the tree line or from the ground?
- Why are you concerned that 25% of the flights were just soaring? Isn't it true that when migrating or searching for food, they primarily soar?
- Are you going to the same part of the preserve each week or different areas?
- What part of the birds' year is being observed? Does data collection occur during migration or mating season? Do you feel this has an effect on the number of flaps observed and the number of birds observed?
- What if the eagle flew out of sight during the 30 seconds? What if the observed flight did not last a full 30 seconds?
- Does it matter if we are wrong?

Concerns About the Study and Data Collection:

- Data may be biased in that flapping draws attention to the bird, so the observers may be more likely to notice those birds that are flapping than those that are not.
- Define flap. The number of flaps counted depends on how one defines what a flap is. Are the observers trained to count flaps in the same way?
- This may not be a random sample of birds. In the course of the hour of observation, it is possible the same bird is observed more than one time. If the observation team returns to the same area each week or more than once over the course of the study, the same birds may be observed multiple times. This may or may not be of concern to the researchers.
- This may not be a random sample of flight times. If the data is collected as soon as the bird is spotted, it is possible that most observations occur at the beginning of the bird's flight when there may be more flapping than in the middle or end of the flight when there may be more soaring. The portion of the flight observed may not be representative of the entire flight.

Methods of analysis:

- Simple averages – Combine temperatures into groups (say 0.1-10, 10.1-20, 20.1-30, etc) and average the number of wings flaps in each group to see if there is a trend.
- Test for independence – Combine temperatures as above and combine the number of wing flaps into groups (say 0-9, 10-19, 20-29, 30-39, 40+), then perform a chi-square test for independence.
- Regression – Plot temperature and number of wing flaps observed and perform regression. Linear regression is standard, but a check for curvature may be done. This may be the best option because it is easy to understand and it is probably what the client expects.