

USGS Data Exploration Unit: Bald Eagle Activity 1 Student Workbook

Hypothesis for Bald Eagle Activity 1

You will be given a dataset containing data for DDE concentrations in bald eagle eggs collected in the US from 1969 to 2000. What is the hypothesis you will investigate?

Something to the effect of:

By the year 2000, DDE concentrations did not decrease below a harmful concentration (< 3ug/g ww) in bald eagles eggs collected from the United States.

How does your hypothesis specifically define your investigation?

Species = Bald Eagle

Matrix (body part) = egg content

Location = United States

Harmful concentration of DDE = $\geq 3\text{ug/g ww}$

Time frame = < 3ug/g ww by the year 2000

Wiemeyer, S.N. et al., 1984. Organochlorine pesticide, polychlorobiphenyl, and mercury residues in bald eagles, 1969-1979, and their relationship to shell thinning and reproduction. Arch. Environ. Contam. Toxicol., 13, 529.

Activity Questions

These questions refer to steps you will follow as you manipulate and graph your data in Excel. Answer each question after you complete the section to which the question refers.

Section A. Compiling and sorting your data

1. What records did you remove when you sorted your data by species? Why did you remove these records? What type of bias would you have introduced if you kept the records?

Species do not necessarily accumulate DDE in the same way due to differences in the type of animals they eat and physiological differences that cause DDE to be processed differently. Some species will accumulate more or less DDE than other species even if fed the exact same food. In order to insure we are comparing data in a non-biased manner we should pick only one species. We would have introduced sampling bias.

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2. What records did you remove when you sorted your data by units? Why did you remove these records? What type of bias would you have introduced if you kept the records?

We cannot compare DDE concentrations taken in different units for such a comparison is meaningless. It would be like treating 2 inches and 2 cm as the same length. We would have introduced measurement bias.

3. What records did you remove when you sorted your data by matrix? Why did you remove these records? What type of bias would you have introduced if you kept the records?

The concentrations at which contaminants accumulate in the body differs by body organ. DDE concentrations may be low in the brain but high in eggs. As with units, we must only compare DDE concentrations in the same matrix in order for the comparison to mean anything. A 2 ug/g ww DDE concentration in the brain is fairly high while a 2 ug/g ww DDE concentration in egg content is fairly insignificant. We would have introduced measurement bias.

Section C. Calculating DDE averages

1. What does the number under the column, “DDE” represent?

It represents an average value for the DDE concentration present in “N” eggs.

2. Why must you multiply “N” by “DDE” in order to calculate an average for each year group?

In the average we calculate for each year group, we want each individual egg to count equally in determining the average value. In order for this to be true, we first need to multiply “N” by “DDE” for each record.

- 3. After you have organized your data and calculated your DDE averages for each group, print out your spreadsheet before continuing on to section D. Attach your spreadsheet to this workbook.**

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Section D. Graphing your results

1. Fill in the table below based on your calculations in section C.

Bald Eagle Activity 1: Average DDE in bald eagle eggs by year			
Year	Average DDE (ug/g ww)	N	States represented in sample
1969-1974	17.5	10	AK, MD, ME
1975-1977	15.1	16	AK, DE, MD, ME
1978-1979	13.2	12	DE, MD, ME
1980-1981	6.3	14	FL, MD, ME
1982-1983	5.9	15	FL, DE, MD, ME
1984-1986	3.5	7	FL, MD, ME
1989-1991	16.5	17	CA, ME
1992-1993	8.5	62	AK, CA
1994-1996	15.6	15	CA, ME
1997-2000	18.4	15	CA

2. After you have finished making your graph in Excel, print out your graph and attach it to this workbook.

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Refer to the workbook, graph, and datasheet from Bald Eagle Activity 1 and answer the following questions. You may add additional sheets of paper as needed.

1. Does your graph support your hypothesis for Bald Eagle Activity 1? Why or why not?

Yes. DDE levels did not decrease below harmful concentrations by 2000. In fact, DDE levels were higher in 2000.

2. What does your graph suggest about the effectiveness of the DDT ban in reducing the concentration of DDE in bald eagle eggs?

The graphs suggest the ban had no effect on reducing DDE concentrations in bald eagle eggs.

3. Look at the value for N for each year group. Do different year groups have relatively similar values for N? How might differences in N between year groups affect the accuracy of the averages you calculated? Based on the value of N for each year group, what year groups do you think have averages that are more likely to be accurate and what year groups have averages that are less likely to be accurate?

While most groups have relatively similar values for N, around 15, some groups have significantly less or more. Based on the value of N alone, the averages for the groups that have significantly less, 1969-1974 and 1984-1986 and perhaps 1978-1979 are thus less likely to be accurate. The average for the group that has more, 1992-1993, is more likely to be accurate.

4. During what year groups does your bald eagle graph show a trend similar to that seen in the osprey graph? During what year groups does your bald eagle graph show a trend different to that seen in the osprey graph?

From 1969 through 1986, the bald eagle graph resembles the osprey graph. After 1986, the bald eagle graph shows an increase in DDE concentrations where the osprey graph continued to show a decrease in DDE concentrations.

5. Look carefully at the data records you used to make your graph. Refer to the worksheet, “baldeagle”, that contains the records you organized and from which you calculated your year group averages. What do you think might account for the difference in the osprey and bald eagle trends? Is there anything that sticks out about the data collected after 1986?

Data used to make up the graph was not collected equally throughout the US. Thus difference between locations may influence the trend observed, especially given the small sample sizes. Data collected after 1986 is dominated by data from CA, in particular from only one location in CA, Santa Catalina Island. There is no data from this location or

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from CA for years before 1992. The data from Santa Catalina might account for strange trend observed in the bald eagle graph.

6. Do you think the trend you observed in the bald eagle graph represents an accurate trend across the United States?

No, sample sizes are too small and from too few locations to be able to make a statement about a trend across the US. Also, it seems that the trend observed in our graph was heavily influenced by records from a single location, Santa Catalina Island.

7. Suggest a new hypothesis to explain the high DDE concentrations in bald eagle eggs after 1986.

Something along the lines of: DDE concentrations are high in specific location(s), ie. Santa Catalina, and this is influencing the group averages calculated based on year.