



## Bald Eagle Population - Graphing Changes Over Time

Time Needed: 45 minutes

Ages: 3<sup>rd</sup> – 5<sup>th</sup> (can be easily adapted to other grades)

Season: Any

Materials: Graph paper, writing utensils, ruler, worksheets

### Outline

- I. Introduction – 5 minutes
- II. Graphing Activity – 30 minutes
- III. Wrap up – 10 minutes

**Overview of Lesson:** Students will learn how to make a graph using data about the bald eagle population of the United States.

### Minnesota Math Standards

3.4.1.1 Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.

4.4.1.1 Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.

5.2.1.1 Create and use rules, tables, spreadsheets and graphs to describe patterns of change and solve problems.

5.4.1.2 Create and analyze double-bar graphs and line graphs by applying understanding of whole numbers, fractions and decimals. Know how to create spreadsheet tables and graphs to display data.

## Introduction

Bald eagles historically ranged across the contiguous United States, Canada and Alaska. After Europeans settlement in North America, eagles were sometimes hunted for food, and later because eagles were a perceived threat to livestock and competition for wild game. In 1940 Congress passed the Bald and Golden Eagle Protection Act, making it illegal to disturb or kill eagles.

In the 1950's the insecticide DDT (dichlorodiphenyltrichloroethane) was introduced and was used widely to combat a broad spectrum of insect pests, including mosquitos. DDT is a powerful chemical that also has serious environmental effects, and its chemical by-products persisted in aquatic environments long after the initial application.

In 1962, in her book *Silent Spring*, biologist Rachel Carson detailed the impacts on wildlife and birds of the indiscriminate spraying of DDT. DDT interferes with the calcium processing of birds and results in deformed eggshells. Since bald eagles are at the top of the aquatic food chain and feed primarily on fish, they received concentrated doses of the chemical. When the female eagle laid a thin, deformed eggshell, she crushed it under her own weight when incubating the egg. Since bald eagles pairs breed only once per year, with many bald eagle pairs not reproducing successfully, the bald eagle population declined steeply throughout the 1960's and 1970's.

In 1972, DDT was banned in the United States and the bald eagle was of the first species on the newly established Endangered Species List. Habitat conservation and reintroduction efforts helped ensure the successful recovery of the bald eagle, and in 2007 and they were removed from the Endangered Species List.

For many years, the United States Fish and Wildlife Service (USFWS) conducted annual surveys of the bald eagle population. This lesson uses data from the annual surveys and will allow students to explore the changes in the population over time.

Two data sets are presented. The first is the survey of number of nesting pairs in the lower 48 states. The second data set the number of nesting pairs of bald eagles in the Upper Mississippi River Wildlife and Fish Refuge (Refuge). The Refuge is located in four states: Minnesota, Wisconsin, Iowa and Illinois along the Mississippi River. In total, this refuge covers over 240,000 acres and extends 261 river miles from north to south from the confluence of the Chippewa River with the Mississippi River near Wabasha, MN to Rock Island, Illinois.

*Note* – Both data sets count active nests or nesting pairs, rather than counting individual birds. So, each number represents two individual birds, so the population of bald eagles can be inferred from this active nest data.

## Vocabulary

**Endangered species** – a species that has been identified as under threat of **extinction** or extirpation; In the United States, the [US Fish and Wildlife Service](#) maintains an official list of species that are considered endangered and threatened or of special concern. Internationally, the [International Union for the Conservation of Nature \(IUCN\)](#) maintains listings of more than 49,000 species, subspecies and varieties of flora and fauna and places each in a category based on the level of threats that species is facing in the wild.

## Prior to Teaching:

Gather all materials and make sure you have enough copies of the worksheets for all students.

## Lesson Outline

1. Introduction: Ask students if they have ever seen a bald eagle in the wild.  
Explain to the students that at one time seeing an eagle in the wild was rare and the bald eagle was on the endangered species list. Talk briefly about what the endangered species list is and how we protected eagles.  
Today, the bald eagle population is healthy. Students will use the population surveys done by researchers to explore just how much the population of bald eagle has changed over the last 50 years.
2. Hand out data sheet to students (or pull it up on a smart board). Students will graph bald eagle population numbers. Remind students that they will need to label each axis and title each graph.
  - a. Have students create a bar graph of bald eagle populations in lower 48.
  - b. Using data from the Upper Mississippi River Wildlife and Fish Refuge, students should create a line graph of the bald eagle population.
3. Once students have finished graphing the data, they should answer the questions on the student worksheet.
4. Conclusions: Discuss the answers to the worksheet questions.

## Extensions

Using data from other wildlife surveys to graph and compare population trends of other species to that of the bald eagle.

Data can be obtained from:

- National Audubon Society's annual Christmas Bird Count. This survey provides many years of data and can be searched for an individual species.  
<http://netapp.audubon.org/CBCObservation/>
- Cornell Lab of Ornithology organizes citizen science programs, including Project FeederWatch. Project FeederWatch is a winter-long survey of birds that visit feeders at backyards, nature centers, community areas, and other locations across North America. The project website allows you to explore the data by region, graphs over time or compare multiple species.  
[http://feederwatch.org/?\\_hstc=75100365.6520550224e20212314a3a88451f1ce5.1386009813946.1431888859407.1432412743751.33&\\_hssc=75100365.2.1432412743751&\\_hsfp=2543048349#\\_ga=1.183721122.503355958.1386009813](http://feederwatch.org/?_hstc=75100365.6520550224e20212314a3a88451f1ce5.1386009813946.1431888859407.1432412743751.33&_hssc=75100365.2.1432412743751&_hsfp=2543048349#_ga=1.183721122.503355958.1386009813)

## Resources

Bald Eagle information:

United States Fish and Wildlife Service

<http://www.fws.gov/midwest/eagle/index.html>

National Eagle Center

<http://www.nationaleaglecenter.org/learn/faq/>

USFWS Bald Eagle Breeding Pairs in the lower 48 states

<http://www.fws.gov/midwest/eagle/population/chtofprs.html>

Upper Mississippi Wildlife Refuge Population Data from 2014 Bald Eagle Nesting Activity on the Upper Mississippi River NW&FR

Upper Mississippi River Wildlife and Fish Refuge website:

[http://www.fws.gov/refuge/Upper\\_Mississippi\\_River/about.html](http://www.fws.gov/refuge/Upper_Mississippi_River/about.html)

Bald Eagle Population Survey of the lower 48 states

Source: USFWS

<b>Year</b>	<b>Number of nesting pairs in the lower 48 states</b>
1963	487
1974	791
1981	1188
1984	1757
1986	1875
1987	2238
1988	2475
1989	2689
1990	3035
1991	3399
1992	3749
1993	4015
1994	4449
1995	4712
1996	5094
1997	5295
1998	5748
1999	6404
2000	6471
2005	7066
2006	9789
2007	11,040

Upper Mississippi Wildlife and Fish Refuge - Nesting Bald Eagle Data

Source: USFWS

Year	# of active bald eagle nests
1986	9
1987	12
1988	18
1989	20
1990	21
1991	31
1992	34
1993	44
1994	42
1995	49
1996	62
1997	74
1998	78
1999	77
2000	84
2001	81
2002	116
2003	116
2004	136
2005	167
2006	165
2007	180
2008	185
2009	256
2010	246
2011	283
2012	313
2013	311
2014	270

**Student Worksheet**

Using your graphs, answer the following questions.

**Bar graph of the bald eagle population of the lower 48 states**

1. What was the population change of the bald eagle from 1963 to 2007?

2. Which consecutive years show the largest change in the population?

\_\_\_\_\_ to \_\_\_\_\_

**Line Graph using the Refuge data**

3. List 2 years the bald eagle population showed no change:

a. \_\_\_\_\_

b. \_\_\_\_\_

4. Which consecutive years show the largest change in the population?

\_\_\_\_\_ to \_\_\_\_\_

5. Which year has the highest count? \_\_\_\_\_

6. Which year has the lowest count? \_\_\_\_\_

**General Questions**

7. Did the bald eagle population overall: increase, decrease or stay the same?

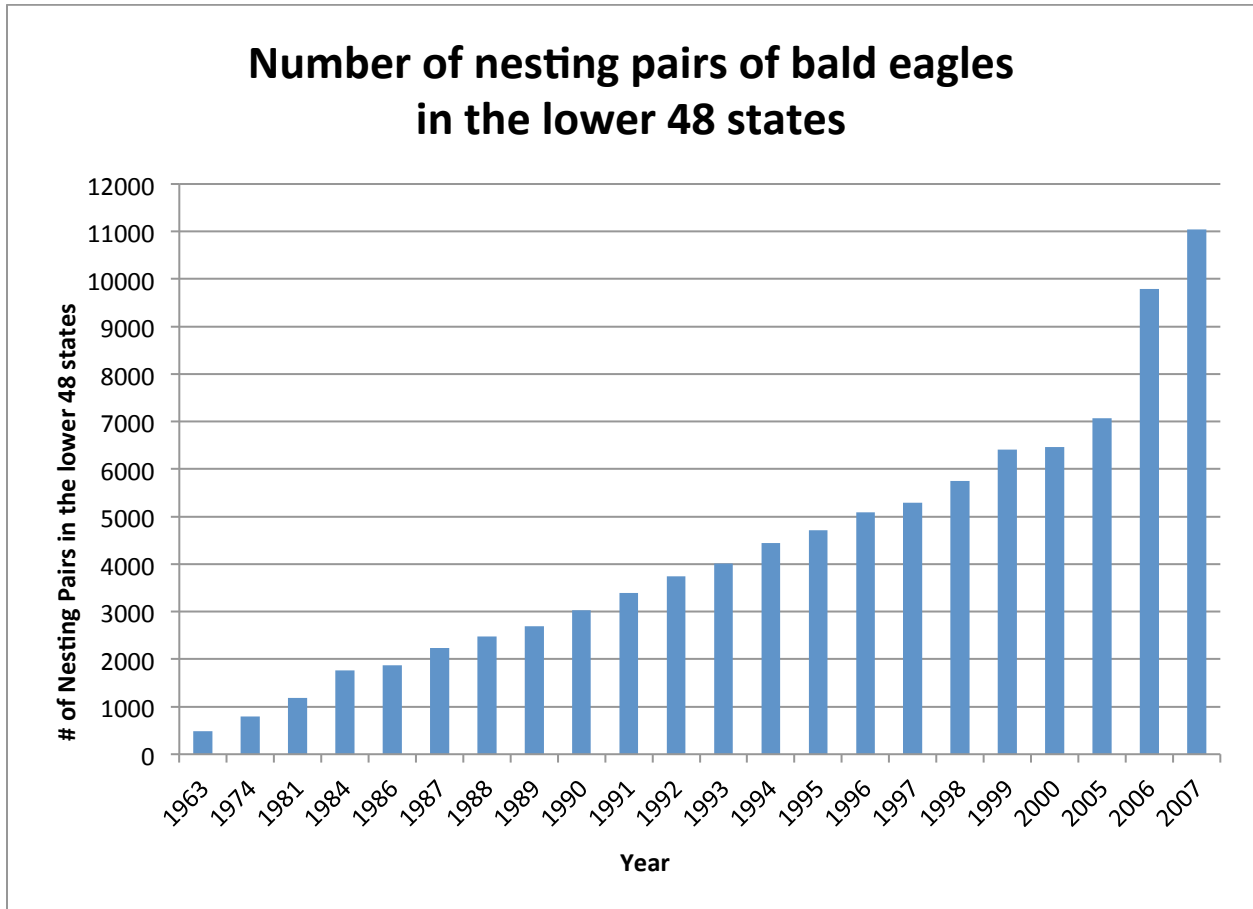
8. Name 3 things that might have led to the change in the bald eagle population over time.

a. \_\_\_\_\_

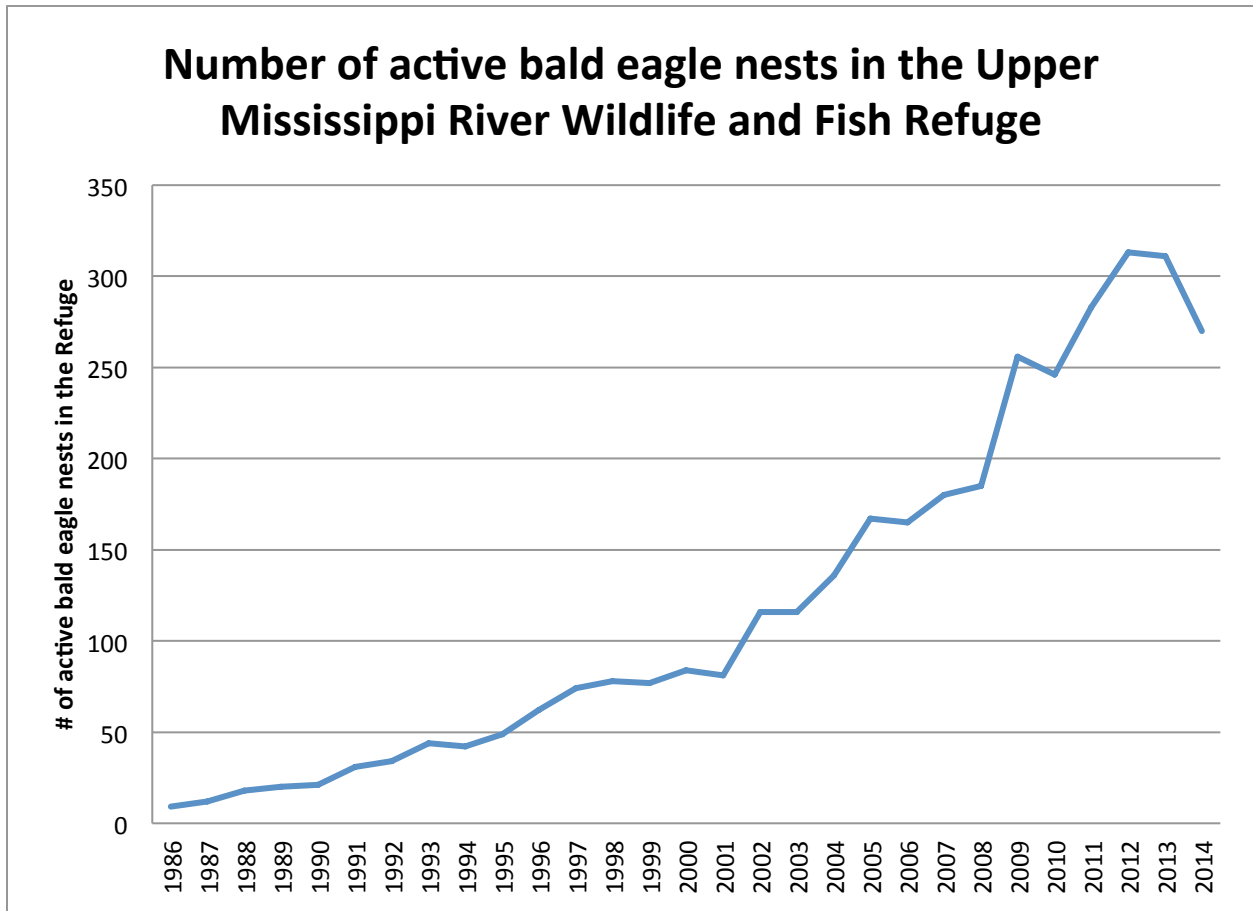
b. \_\_\_\_\_

c. \_\_\_\_\_

Sample Bar Graph







## Worksheet: TEACHER COPY

Using your graphs, answer the following questions.

### Bar graph of the bald eagle population of the lower 48 states

1. What was the population change of the bald eagle from 1963 to 2007?  
11,040 – 487 = 10,553 increase in nesting pairs
2. Which consecutive years show the largest change in the population?  
1999 to 2000 (an increase of 67 nesting pairs)

### Line Graph using the Refuge data

3. List 2 years the bald eagle population showed no change:  
2002 and 2003
4. Which consecutive years show the largest change in the population?  
2013 to 2014 (an increase of 41 nesting pairs)
5. Which year has the highest count? 2012
6. Which year has the lowest count? 1986

### General Questions

7. Did the bald eagle population overall: increase, decrease or stay the same?  
Increase
8. Name 3 things that might have led to the change in the bald eagle population over time.  
Sample answers include: habitat protection; removal of DDT/pollutants; Endangered Species Act; hunting