

# Discover Birds – Changing Populations

## For Grades 3-5

### Math Learning Goals

Students will be able to:

- Read a data table
- Fill in a bar chart with data from a table
- Attend to precision in making a bar graph
- Analyze and interpret a bar graph
- Make, discuss and support conclusions based on a bar chart
- Apply mathematical terms and concepts in a real world situation with real data

### Additional Goals

- Language arts and science connections

### Introducing the Activity

Ask the students if they have ever observed interesting birds.

Perhaps some students have bird feeders, maybe some are hunters, or some have noticed some interesting ones on school grounds. Explain that there are many people that like to count birds. Why would someone want to count

birds? [Bird watching, hunting, conservation, wildlife management, scientists that want to understand birds]

Citizen scientists are people like you and me that are helping to do science. In this activity we're going to look at some real bird data from Tennessee citizen scientists. Watch this video of two citizen scientists doing what is called a breeding bird survey. How are they counting the birds? [Driving a route each year, spending a certain amount of time at certain points and listening and looking for birds in each spot until a timer goes off]

<https://www.youtube.com/watch?v=v5sR-djYj5k>

### Think-Pair-Share

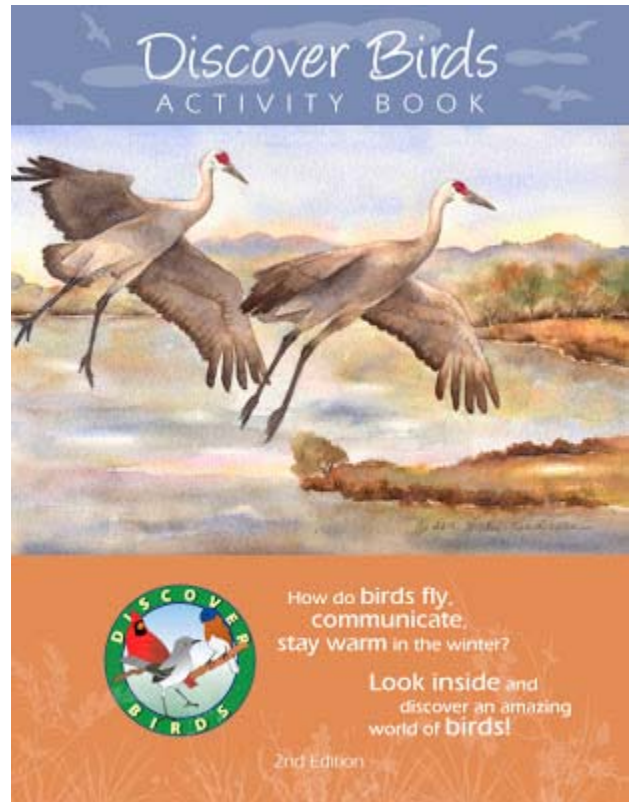
Pass out Changing Populations Activity Sheets. Have students read through the activity and then start the worksheet at the end. Ask them to only do the Bluebird graphs and questions to start. Students that finish quickly can continue to the other graphs.

Have students pair up and share with each other their graphs and their answers to the questions about bluebirds. Have them exchange their answers and allow them to add each others' ideas that they like to their own worksheet, and help each other make their graphs as precise as possible.

After the class has completed the pair and share, write the worksheet questions from the worksheet on the board.

### Class Discussion

Ask the class to share, What is happening to the bluebird population over time?



Write down student answers on the board as stated. For each one, ask the student how they know. For example, if they answer "The population is increasing", on what is this based (are the numbers getting bigger over time, the bars in the bar graph are getting taller over time, etc.)?

Ask the students to be more specific than just "increasing". Increasing by how much? How many more birds are there in the last year than the first year? How do you describe what happened in between the first and last years? Use your math vocabulary to help describe what is happening – try to get the students to use words like data, table, graph, rate (the term for when something changes over time), estimate, rounding, change, double, triple, time, specific numbers for the differences, a range, on average, etc. Encourage students to add to their answers on their worksheets. They can use additional paper if necessary.

After writing student words on the board verbatim, ask the students to help you circle what words are "math words." Use some of these as points of discussion – what makes a word a "math word"?

### **Individual Practice**

After class discussion, have them finish the worksheet for turkeys and bobwhites.

### **Extension or Homework**

Have the students write a short 2-3 paragraph story for the Tennessee Wildlife Resources Association newsletter where they describe what has happened to one of the birds species' population over time and recommend something that an ordinary person can do to help conservation of that bird species. Their story must have at least 5 math words or concepts – these words must be circled!

### **TN Math Standards**

All grades – Mathematical Practice Skills:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attention to precision

#### *Grade 3*

Use place value understanding to round whole numbers to the nearest 10 or 100.

Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

#### *Grade 4*

Use place value understanding to round multi-digit whole numbers to any place.

Developed by Kelly Sturner, Virginia Parkman, and Suzanne Lenhart

# Birds Champions

All birds have interesting facts to know about them but some are champions! Who is the tallest, the fastest? What birds really go the distance?

## Birds by the Numbers: Break the Code!

You are communicating with a bird expert from the Tennessee Ornithological Society (TOS) via email, but every time she answers your questions some parts are broken up by numbers. It's a secret code! Can you break the code and find out the bird champions?

**You: What is the fastest bird in the world?**

**TOS:**  $\frac{19}{19} \frac{11}{11} \frac{14}{14} \frac{11}{11} \frac{21}{21} \frac{14}{14} \frac{8}{8} \frac{13}{13} \frac{11}{11}$  — it can  $\frac{6}{6} \frac{5}{5} \frac{15}{15} \frac{22}{22} \frac{4}{4} \frac{13}{13}$   $>200$   $\frac{7}{7} \frac{19}{19} \frac{2}{2}$   
 in  $\frac{19}{19} \frac{1}{1} \frac{14}{14} \frac{20}{20} \frac{1}{1} \frac{8}{8} \frac{17}{17} \frac{4}{4} \frac{6}{6} \frac{19}{19} \frac{14}{14} \frac{11}{11} \frac{10}{10}$ .  
 You can see them in  $\frac{17}{17} \frac{11}{11} \frac{13}{13} \frac{13}{13} \frac{11}{11} \frac{20}{20} \frac{20}{20} \frac{11}{11} \frac{11}{11}$ !



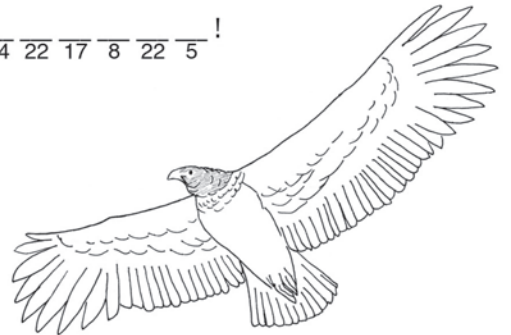
**You: What bird migrates the farthest?**

**TOS:**  $\frac{5}{5} \frac{14}{14} \frac{22}{22} \frac{17}{17} \frac{8}{8} \frac{22}{22} \frac{17}{17} \frac{11}{11} \frac{14}{14} \frac{13}{13}$  — it weighs less than an  $\frac{5}{5} \frac{19}{19} \frac{19}{19} \frac{15}{15} \frac{11}{11}$ ,  
 but travels  $> 44,000$   $\frac{7}{7} \frac{8}{8} \frac{15}{15} \frac{11}{11} \frac{20}{20}$   
 $\frac{3}{3} \frac{8}{8} \frac{21}{21}$  —  $\frac{3}{3} \frac{5}{5} \frac{21}{21} \frac{21}{21} \frac{8}{8} \frac{13}{13} \frac{21}{21}$  from Greenland to  $\frac{5}{5} \frac{13}{13} \frac{17}{17} \frac{5}{5} \frac{14}{14} \frac{22}{22} \frac{17}{17} \frac{8}{8} \frac{22}{22} \frac{5}{5}$ !



**You: What bird has the largest wingspan in North America?**

**TOS:**  $\frac{22}{22} \frac{5}{5} \frac{15}{15} \frac{8}{8} \frac{6}{6} \frac{4}{4} \frac{14}{14} \frac{13}{13} \frac{8}{8} \frac{5}{5} \frac{22}{22} \frac{4}{4} \frac{13}{13} \frac{16}{16} \frac{4}{4} \frac{14}{14}$   
 — an  $\frac{11}{11} \frac{13}{13} \frac{16}{16} \frac{5}{5} \frac{13}{13} \frac{21}{21} \frac{11}{11} \frac{14}{14} \frac{11}{11} \frac{16}{16}$  bird with wings  $\frac{20}{20} \frac{19}{19} \frac{5}{5} \frac{13}{13} \frac{13}{13} \frac{8}{8} \frac{13}{13} \frac{21}{21}$   
 $> 9$   $\frac{6}{6} \frac{11}{11} \frac{11}{11} \frac{17}{17}$ , it weighs over  $23$   $\frac{19}{19} \frac{4}{4} \frac{1}{1} \frac{13}{13} \frac{16}{16} \frac{20}{20}$ !



**You: What is the smallest bird in North America?**

**TOS:**  $\frac{22}{22} \frac{5}{5} \frac{15}{15} \frac{15}{15} \frac{8}{8} \frac{4}{4} \frac{19}{19} \frac{11}{11} \frac{2}{2} \frac{1}{1} \frac{7}{7} \frac{7}{7} \frac{8}{8} \frac{13}{13} \frac{21}{21} \frac{12}{12} \frac{8}{8} \frac{14}{14} \frac{16}{16}$  — only  $3.25$   
 $\frac{8}{8} \frac{13}{13} \frac{22}{22} \frac{2}{2} \frac{11}{11} \frac{20}{20}$  long and  $0.1$   $\frac{4}{4} \frac{1}{1} \frac{13}{13} \frac{22}{22} \frac{11}{11} \frac{20}{20}$ . You could  $\frac{7}{7} \frac{5}{5} \frac{8}{8} \frac{15}{15}$   
 10 for the price of  $1$   $\frac{19}{19} \frac{4}{4} \frac{20}{20} \frac{17}{17} \frac{5}{5} \frac{21}{21} \frac{11}{11} \frac{20}{20} \frac{17}{17} \frac{5}{5} \frac{7}{7} \frac{19}{19}$ .



# Birds Champions

You: What is the tallest bird in North America?

TOS:  $\frac{18}{2} \frac{4}{4} \frac{19}{8} \frac{13}{21} \frac{22}{14} \frac{5}{5} \frac{13}{11}$  — almost

5  $\frac{6}{11} \frac{11}{17} \frac{17}{5} \frac{15}{15}$ , a very rare endangered bird

you can sometimes see at the  $\frac{2}{8} \frac{18}{5} \frac{20}{20} \frac{11}{11}$

$\frac{14}{11} \frac{6}{1} \frac{21}{11} \frac{17}{11} \frac{13}{13} \frac{11}{11} \frac{20}{20} \frac{11}{11}$  in \_\_\_\_\_!



## Break the Code!

LETTER	ANSWER THESE QUESTIONS TO FIND THE CODE	CODE
A	$(15 \div 5) + (1 \times 2)$	
B	$(26 \div 2) - 1$	
C	$(2 \div 0.5) + 18$	
D	$9 + (7 \times 2) - 7$	
E	$(5 \times 3) - 4$	
F	$1 + 9 - 4$	
G	$(7 \times 4) - 7$	
H	$4 \times 0.5$	
I	$(9 \times 0) + 8$	
L	$(4 \times 4) - 1$	
M	$(7 + 7) - (14 \div 2)$	
N	$20 - 10 + 3$	
O	$16 \times 0.25$	
P	$(5 \times 4) - 1$	
R	$(3 + 4) \times 2$	
S	$(12 \div 3) \times 5$	
T	$(5 + 2) + (20 \div 2)$	
U	$(5 - 4) \times 1$	
V	$(16 \div 8) + 7$	
W	$3 \times 3 \times 2$	
Y	$(11 \times 2) - 12$	
Z	$(7 \times 2) - (11 \div 1)$	

## Make Your Own Coded Message!

TOS wants to know ... what's your favorite bird? Put it in code here:

## Changing Populations

### Eastern Bluebird (*Sialia sialis*)

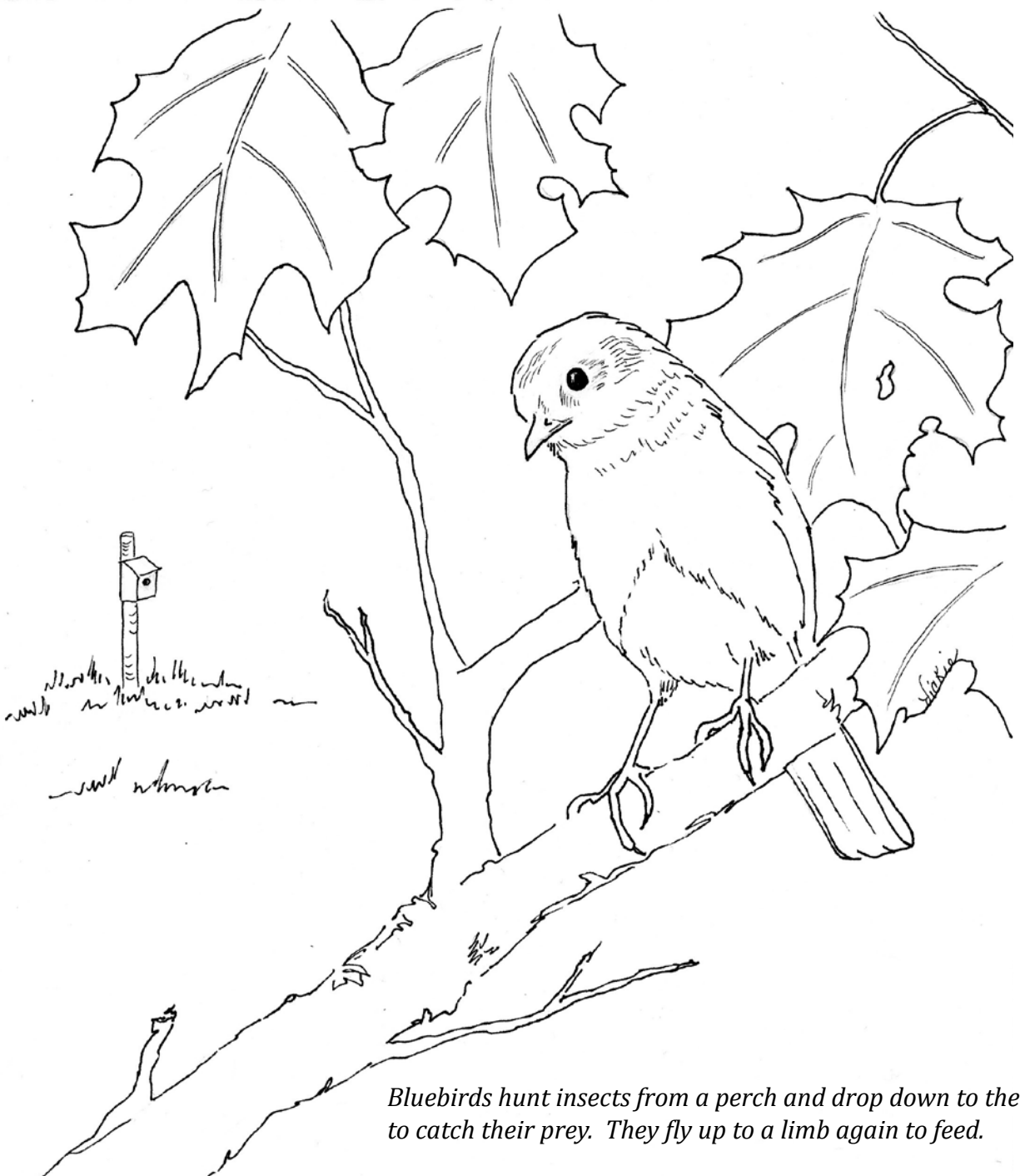
This is the beautiful blue bird you see on Watchable Wildlife license plates in Tennessee. They are year-round residents here.

**Habitat:** Bluebirds like open habitats without much groundcover such as orchards, open woodlands, parks, and lawns in suburban and rural areas.

**Food:** Insects and small fruits

**Nesting:** Bluebirds are cavity nesters, meaning they nest in holes in trees. Nest boxes are a substitute for tree holes, and bluebirds make good use of them. Young leave the nest after 15-18 days.

**Conservation considerations:** Bluebirds must compete with European Starlings and House Sparrows for available nest sites.



*Bluebirds hunt insects from a perch and drop down to the ground to catch their prey. They fly up to a limb again to feed.*

# Changing Populations

## Wild Turkey (*Meleagris gallopavo*)

Turkeys are the largest bird that nests in Tennessee. They spend a lot of time on the ground, but they can fly. They roost in trees at night. Turkeys are often hunted.

Wild Turkey do not grow down feathers. Instead, they have a second feather that grows on the feather shaft. This feather is called an after-shaft feather and may help keep the turkey warm.

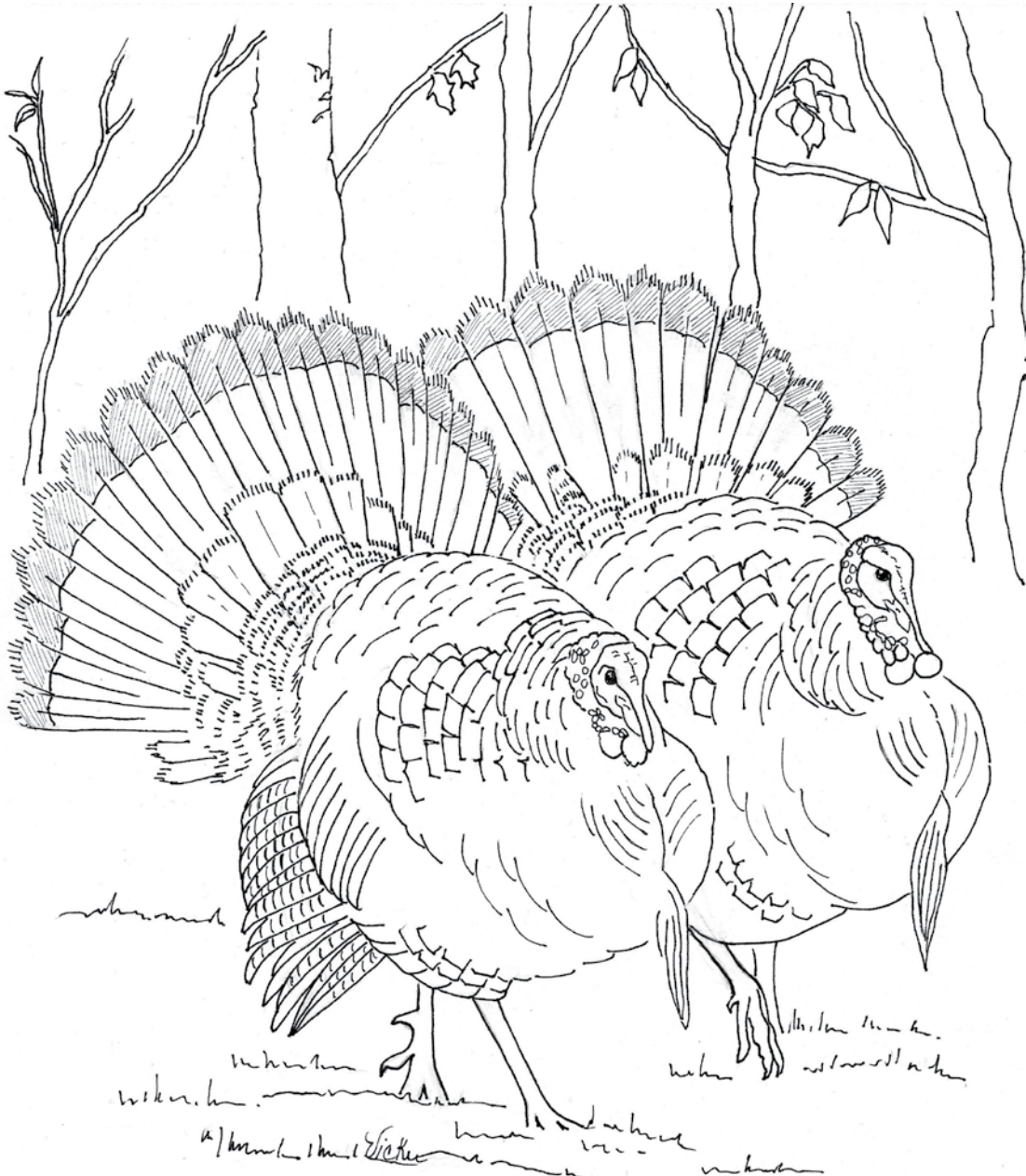


**Habitat:** Mature woodlands with scattered openings or fields.

**Food:** Acorns, nuts, seeds, fruits, and insects.

**Nesting:** Turkeys nest on the ground where they lay 7-14 eggs. The chicks leave the nest shortly after hatching.

**Conservation considerations:** Over-hunting eliminated turkeys from much of their range in the early 1900s, but modern wildlife management has allowed populations to bounce back throughout Tennessee.



# Changing Populations

Ornithologists, people who study birds, count birds to learn how populations are changing. If numbers of a species are going down, ornithologists want to know why. If they can figure out why, it may be possible to solve problems before a species disappears.

The United States Department of the Interior has coordinated Breeding Bird Surveys (BBS) all across the United States, including Tennessee, since 1966. Counters cover a 24.5-mile route, stopping to record all the birds they see or hear for 3 minutes every half mile. The table below shows the number of individuals counted in Tennessee for three species, the Eastern Bluebird, Northern Bobwhite, and Wild Turkey, from 1970-2010.

A good place to look for more information on birds is the Tennessee Wildlife Resources Agency's Tennessee's Watchable Wildlife website (<http://www.tnwatchablewildlife.org/birds.cfm>).

**Table 1. Counts of individuals of three species recorded on BBS routes in Tennessee from 1970-2010**

Year	# of routes	Bird Species		
		Eastern Bluebird	Northern Bobwhite	Wild Turkey
1970	40	200	1200	0
1975	42	300	1200	0
1980	42	125	1150	0
1985	42	250	900	0
1990	39	425	700	0
1995	40	450	500	0
2000	37	575	300	17
2005	41	675	250	52
2010	38	500	150	50
Total	361	3500	6350	119

Data from USGS BBS, November 2012 (<https://www.pwrc.usgs.gov/bbs/>)  
Numbers in the count have been rounded off.



## Northern Bobwhite (*Colinus virginianus*)

The bobwhite was named for its loud whistled “bob-white” call. Bobwhites are non-migratory. These small chicken-like birds are a popular game bird and are hunted, like the wild turkey.

**Habitat:** Native grasslands interspersed with dense thickets near woodlands.

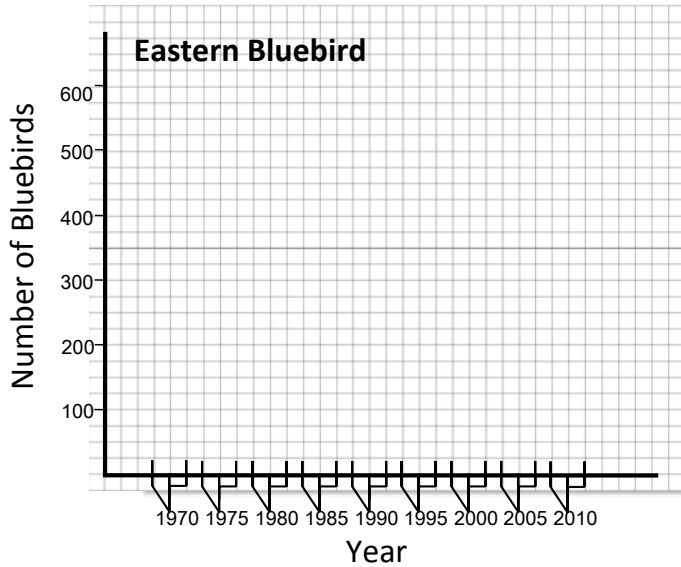
**Food:** They eat seeds and insects, mostly seeds in winter, and mostly insects in summer while raising young.

**Nesting:** Bobwhites nest on the ground where they usually lay 12-16 eggs. The chicks leave the nest within one or two days of hatching and can feed themselves.

**Conservation considerations:** Declining numbers may be due to succession of grasslands and farmlands to forest and changes in agricultural practices.

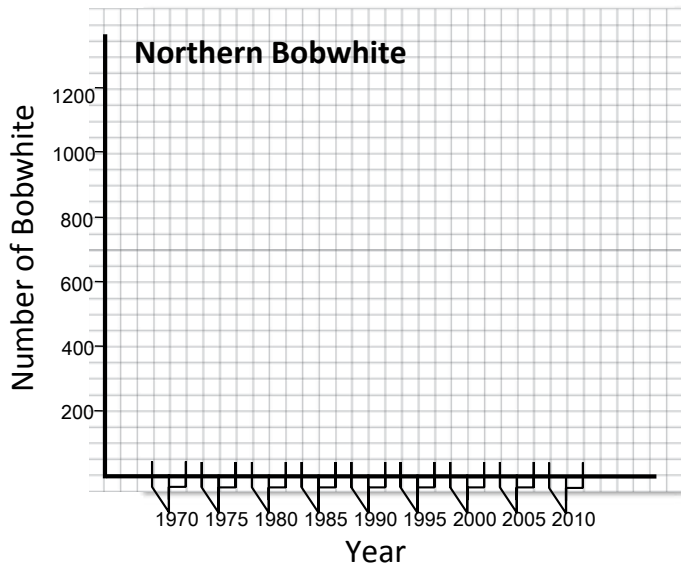
# Changing Populations

Make **bar graphs** to represent the counts for each species to see how populations have changed from 1970-2010.



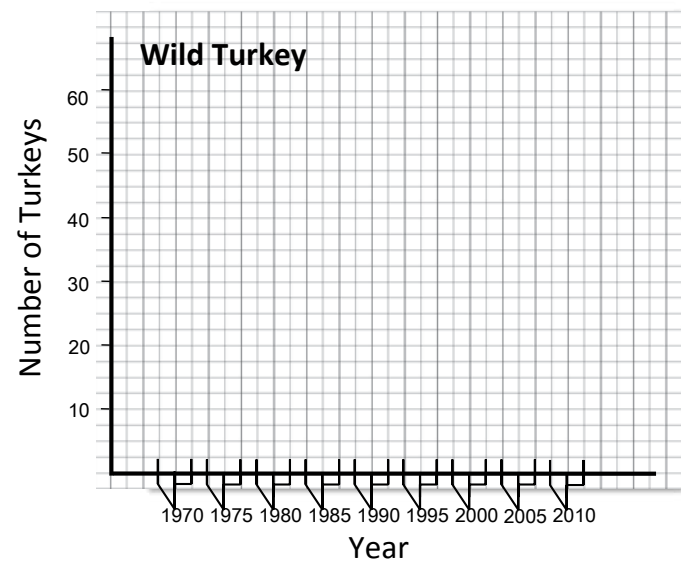
Describe how the number of Eastern Bluebirds has changed over time:

What might have caused this change in Eastern Bluebirds?



Describe how the number of Northern Bobwhites has changed over time:

What might have caused this change in Northern Bobwhites?



Describe how the number of Wild Turkeys has changed over time:

What might have caused this change in Wild Turkeys?



## Answer Key

### Birds by the Numbers: Bird Champions

PEREGRINE FALCON – IT CAN STOOP >200 MPH IN PURSUIT OF PREY. YOU CAN SEE THEM IN TENNESSEE!

ARTIC TERN – IT WEIGHS LESS THAN AN APPLE, BUT TRAVELS 44,000 MILES ZIG-ZAGGING FROM GREENLAND TO ANTARCTICA.

CALIFORNIA CONDOR - AN ENDANGERED BIRD WITH WINGS SPANNING > 9 FEET, IT WEIGHS OVER 23 POUNDS.

CALLIOPE HUMMINGBIRD – ONLY 3.25 INCHES LONG and 0.1 OUNCES. YOU COULD MAIL 10 FOR THE PRICE OF 1 POSTAGE STAMP.

What is the tallest bird in North America?

TOS: WHOOPING CRANE – ALMOST 5 FEET TALL, A VERY RARE ENDANGERED BIRD YOU CAN SOMETIMES SEE AT THE HIWASSEE REFUGE IN TENNESSEE!

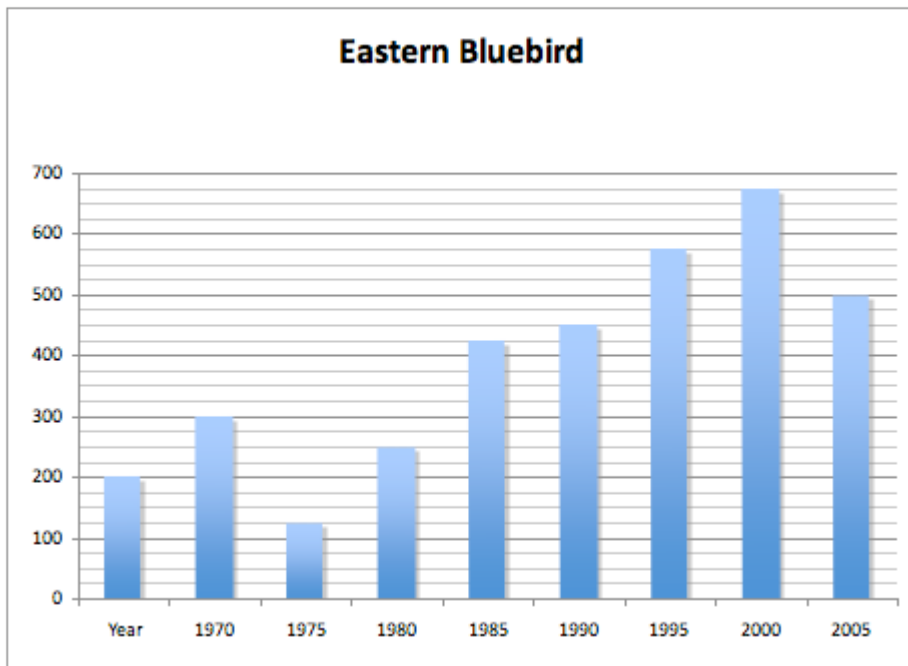
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D	$9 + (7 \times 2) - 7$	16
E	$(5 \times 3) - 4$	11
F	$1 + 9 - 4$	6
G	$(7 \times 4) - 7$	21
H	$4 \times 0.5$	2
I	$(9 \times 0) + 8$	8
L	$(4 \times 4) - 1$	15
M	$(7 + 7) - (14 \div 2)$	7
N	$20 - 10 + 3$	13
O	$16 \times 0.25$	4
P	$(5 \times 4) - 1$	19
R	$(3 + 4) \times 2$	14
S	$(12 \div 3) \times 5$	20
T	$(5 + 2) + (20 \div 2)$	17
U	$(5 - 4) \times 1$	1
V	$(16 \div 8) + 7$	9
W	$3 \times 3 \times 2$	18
Y	$(11 \times 2) - 12$	10
Z	$(7 \times 2) - (11 \div 1)$	3

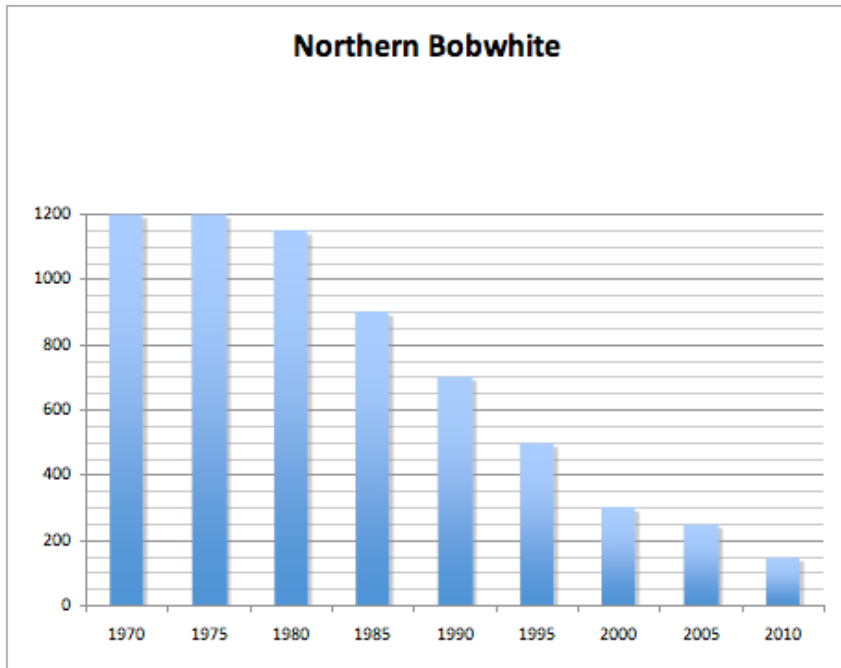
## Discover Birds: Graphing Key

Year	# of routes	Eastern Bluebird	Northern Bobwhite	Wild Turkey
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2000	37	575	300	17
2005	41	675	250	52
2010	38	500	150	50

Year	Eastern Bluebird
1970	200
1975	300
1980	125
1985	250
1990	425
1995	450
2000	575
2005	675
2010	500



<b>Year</b>	<b>Northern Bobwhite</b>
1970	1200
1975	1200
1980	1150
1985	900
1990	700
1995	500
2000	300
2005	250
2010	150



Year	Wild Turkey
1970	0
1975	0
1980	0
1985	0
1990	0
1995	0
2000	17
2005	52
2010	50

