Activity #9: *The Tale of Chipilo*
Population Studies

Wildlife biologists studying Golden-cheeked Warblers (GCWA) monitor their populations over many years. Measuring populations of birds is not easy to do. Birds readily fly and could be counted twice in a population count. Rather than determining specific numbers of birds, wildlife biologists often keep track of populations calculating averages for the number of birds that are seen or heard per location each year. Then they compare the average from one year to another year to determine population trends (change in the average number of birds detected at points over time).

Mean Detection per Point:

Scientists return year after year to pre-determined locations called **points** to count Golden-cheeked Warblers. A bird is counted when it is either seen or heard at these locations. For several weeks beginning in early April and ending in mid-May, wildlife biologists count the number of Golden-cheeked Warblers at the points. When the count period is over, the biologists will then calculate the "mean detection per point" each year. This will be the total number of Golden-cheeked Warblers detected at all the points divided by the total number of points sampled each year. It can be written as the following equation:

$$\text{Mean detection per point} = \frac{\text{Total number of GCWA seen or heard}}{\text{Total number of points}}$$

Controlling Variables:

Scientists strive for precision in their work. To do this, they try to keep many **variables** the same throughout their work. Variables that wildlife biologists try to keep the same throughout their work include conducting the count during the same timeframe and under similar weather conditions each year. Another important variable is **standardized** training of field workers so they collect data in the same way. This means all the field workers are given the same training and use the same techniques in detecting birds each year. Controlling variables helps scientists to obtain the most precise estimates in their work.

While scientists can't always be sure of exact population counts, mean detection per point helps them to see trends in populations over time. From these data, biologists can better determine causes in population change over time and find better ways to help ensure the survival of the Golden-cheeked Warbler.

Golden–cheeked Warbler Population Studies

Below are data collected over a nineteen-year span at a site in the Texas Hill Country.

Golden-cheeked Warbler count data, 1992-2010

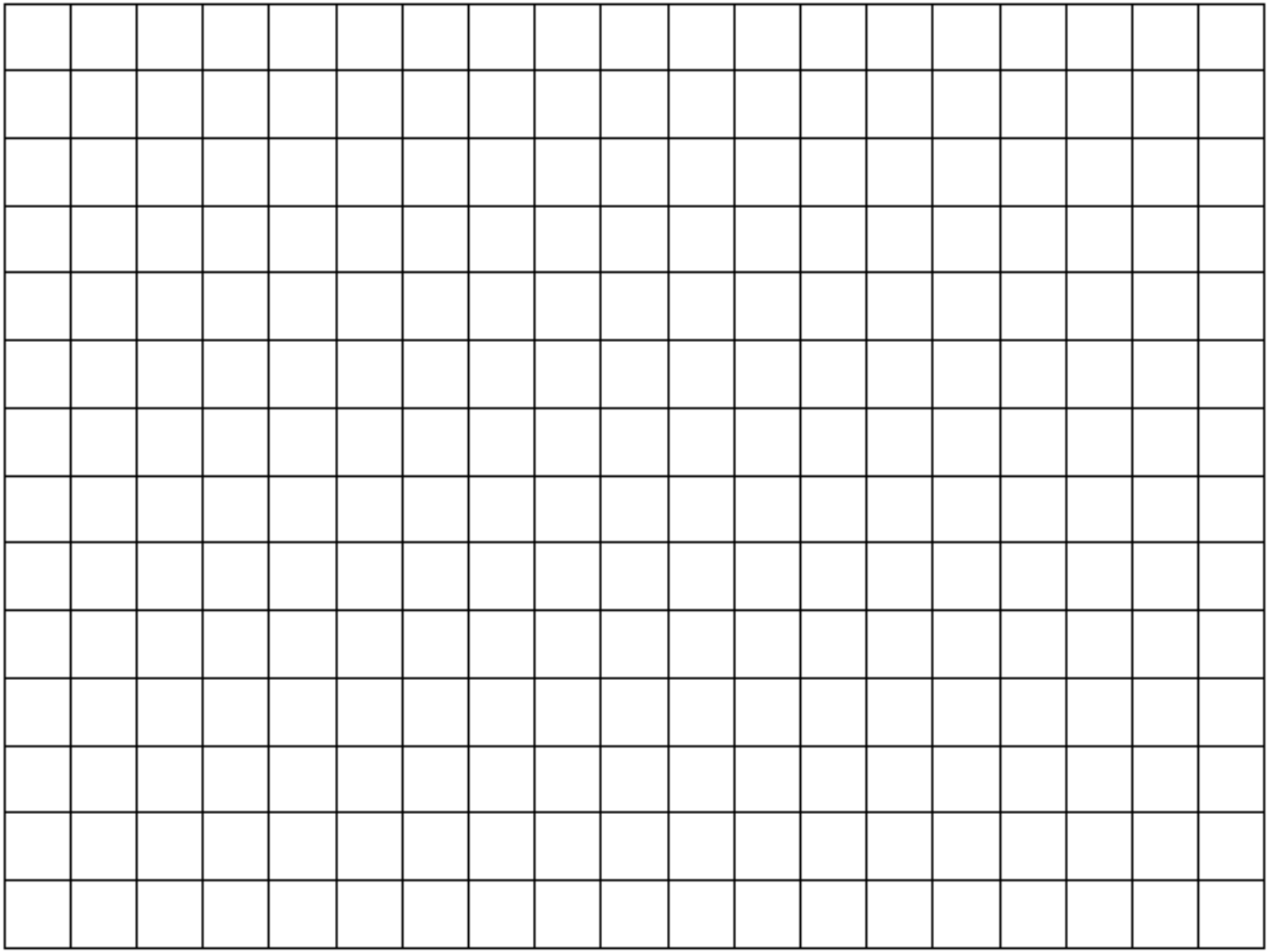
Year	Mean Detection per Point
1992	0.55
1993	0.58
1994	0.71
1995	0.79
1996	0.70
1997	0.77
1998	0.77
1999	0.84
2000	0.90
2001	0.93
2002	0.73
2003	0.93
2004	0.99
2005	1.15
2006	0.63
2007	0.98
2008	0.77
2009	1.01
2010	0.80

1) What is the lowest mean detection per point? _____

2) What is the highest mean detection per point? _____

3) What is the range? _____

4) Make a line graph of mean detection per point from 1992 to 2010. Be sure to label the x- and y-axis and give the graph an appropriate title.



Funding to develop these instructional resources was provided by Texas Parks and Wildlife Department contract #409330 and U. S. Fish and Wildlife Service Section 6 grant TX E-133-R

Class Discussion:

There are many factors that could affect population trends, so create a discussion by asking the students to give some possible reasons for changes in population size over time as shown in the graph. What could affect population changes from year to year?

Here are some potential factors that could affect a population of Golden-cheeked Warblers:

- Wintering grounds–weather, food sources, mortality rates
- Did more birds die over the winter?
- Did they survive the winter better?
- Survivorship during migration
- Local conditions on the breeding grounds each given season
- Birds will shut down reproductively if conditions are not right – hormones stimulated by rain, food supply
- Previous years conditions; productivity from previous year
- Loss of habitat
- Numbers of Brown-headed Cowbirds
- Too much competition for the available food source because populations are high or food source is low

Alignment:

Grade 3 (red) Grade 4 (blue) Grade 5 (green) Grade 6 (purple)

English Language Arts & Reading student expectations: 1(A-E), 3, 4(A,B), 13(A-D), 15(A,B); 1, 2(A,B), 11(A-D), 13(A,B); 1, 2(A,B), 11(A,B), 13(A,B); 1, 2(A,B), 12(A,B)
Mathematics student expectations: 1(A,B), 3(B), 16(A,B); 1(A,B), 3(A,B), 16(A,B); 1(A,B), 3(B), 13(A-C), 16(A,B); 2(B), 10(A,B,D), 11(A), 13(A,B)
Science student expectations: 2(C,D,E), 3(A,D), 9(A,B); 2(C,D), 3(A,D), 9(A,B); 2(D,E,G), 3(A,D), 9(A-D); 2(D,E), 3(A,D), 12(E,F)
Social studies student expectations: 4(D), 17(C,E,F), 18(B); 9(C), 21(A-E), 22(A,D); 6(B), 24(A-C), 25(A,D); 3(A,B,D), 6(A), 21(A-C,F), 22(A,D)

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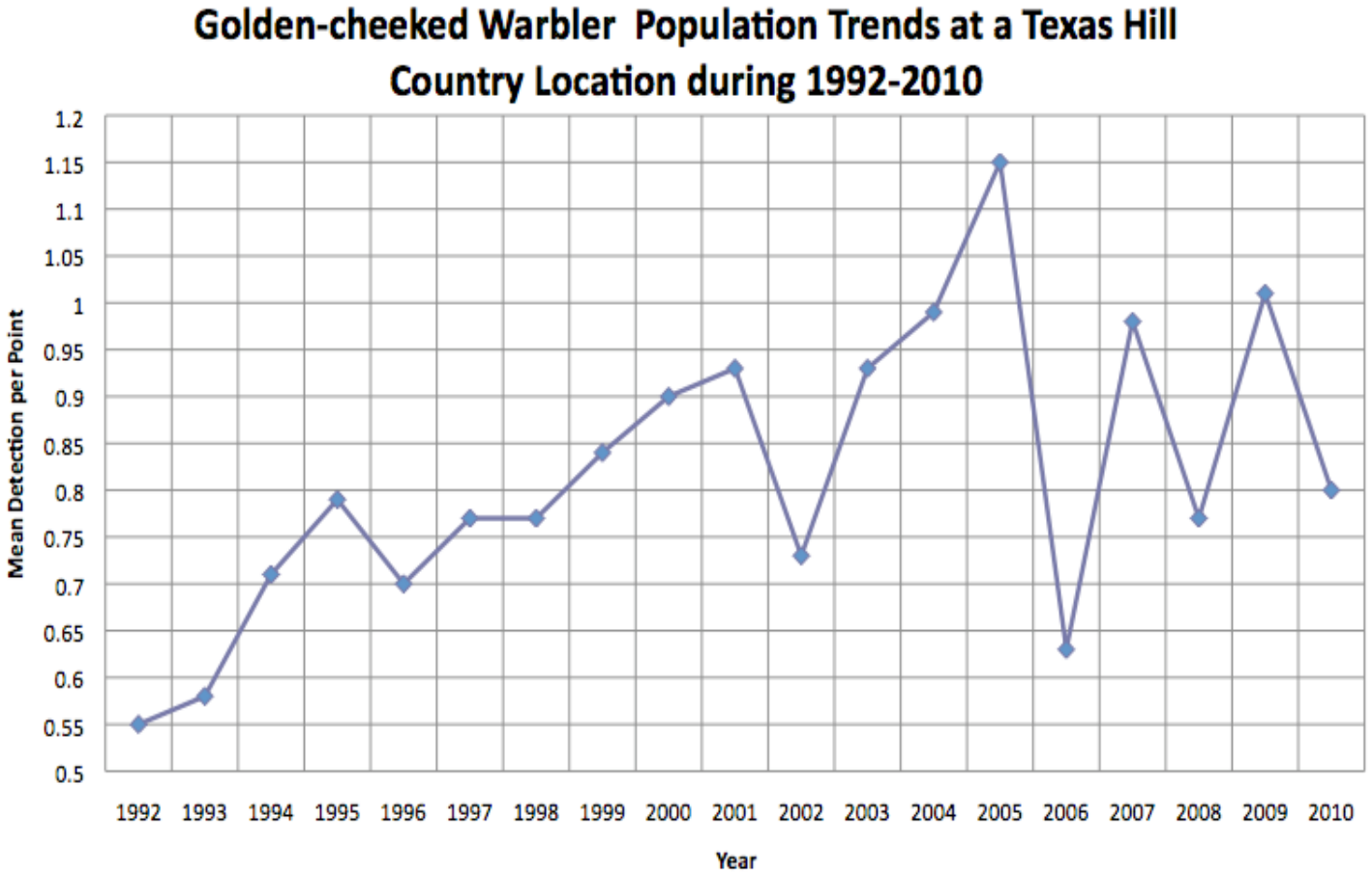
Answer Key Activity #9: *The Tale of Chipilo*−Population Studies

1) What is the lowest mean detection per point? **0.55**
2) What is the highest mean detection per point? **1.15**
3) What is the range? **0.6**
4) The graph should consist of a point representing mean detection per point plotted for 1992 to 2010. The x- axis (horizontal) should be labeled "Year" and the y-axis (vertical) "Mean Detection per point". Appropriate titles include "Golden-cheeked Warbler Population Trends, 1992-2010", "Changes in Golden-cheeked Warble Population Size, 1992-2010", etc.



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