Date: _____

Your Name: _____

HUBBARD BROOK RESEARCH FOUNDATION
ENVIRONMENTAL LITERACY PROGRAM

Suggested Answer Guide

Grade 8

Science Inquiry Task

Trends in Bird Abundance

Prepared by S. Turtle (HBRF) with input from Geoff Wilson (HBRF) and Jackie Wilson (HBRF). All data was provided by Dr. Richard T. Holmes through funding from the National Science Foundation. Template created by K. Murray (LHS).

Directions:

You will be completing an extended-response inquiry task called Trends in Bird Abundance. Explain the reasons for all your answers. You may include a drawing or labeled diagram to help explain your answers.

There are 3 parts to the task.

Part 1:	Part 2:	Part 3:
Forming a prediction	Organizing, Presenting, and Analyzing Data	Using Evidence and Applying What you Learned

Word Bank

Bird Abundance	A measure of the total number of birds.
Species	A group of organisms that can interbreed.
Population	Individuals of a species that share the same place at the same time.
Survey	A gathering of a sample of data.
Transect line	A line set up in study area along which samples are collected.
Replicated study	The repetition of a study to increase the significance or precision of results.

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Trends in Bird Abundance

The White Mountain Middle School is located right next to the White Mountain National Forest. Students started a Bird Club six years ago, with the help of their science teacher. Once a week students meet before school to walk around the school property and identify birds. They keep track of what type of species they see and how many they see.

One morning Susan, the club president, brought the following article to share with the other members.

Bird News
September 27, 2010

Birds are Declining Across the United States

Bird researchers are learning that bird populations are declining all over the United States of America. Scientists have learned this from information sent in through science programs where people keep track of the birds along roadsides and at their feeders and send their information to scientists. People have been collecting information at their bird feeders for 20 years and sending it to scientists at the Bird Lab where the information has been analyzed. The results of these observations show that there has been a noticeable decline in the number of birds over the past 20 years. Although 20 years may seem like a long time to conduct a study scientists said the abundance or number of birds in a population can change a lot from year to year naturally. To observe any long term changes in bird population size scientists need long term data. It is therefore necessary to study bird abundance for many years.

The students are very concerned about the information presented above. Does this mean the birds in their area are declining as well? Students in the Bird Club want to know if bird populations are declining in their town. They decide to examine the data they have been collecting.

Part 1. Forming a Prediction

1. Based on the information in the article, write a prediction about how the abundance of birds might be changing in their town. Use information from the news article to explain your prediction.

Broad Area of Inquiry: *Formulating Questions and Hypothesizing*
Inquiry Construct 1 (DOK 3): *Analyze information from observations, research, or experimental data for the purpose of formulating a question, hypothesis, or prediction.*

Student's prediction need not be correct but should be reasonable based on the information provided in the article.

Example answer: *If birds are declining all over the United States I predict that bird abundance is declining in the town.*

Part 2. Organizing, Presenting and Analyzing Data

The Bird Club has been gathering data on the school property for 6 years.
First they organize the data into the table below.

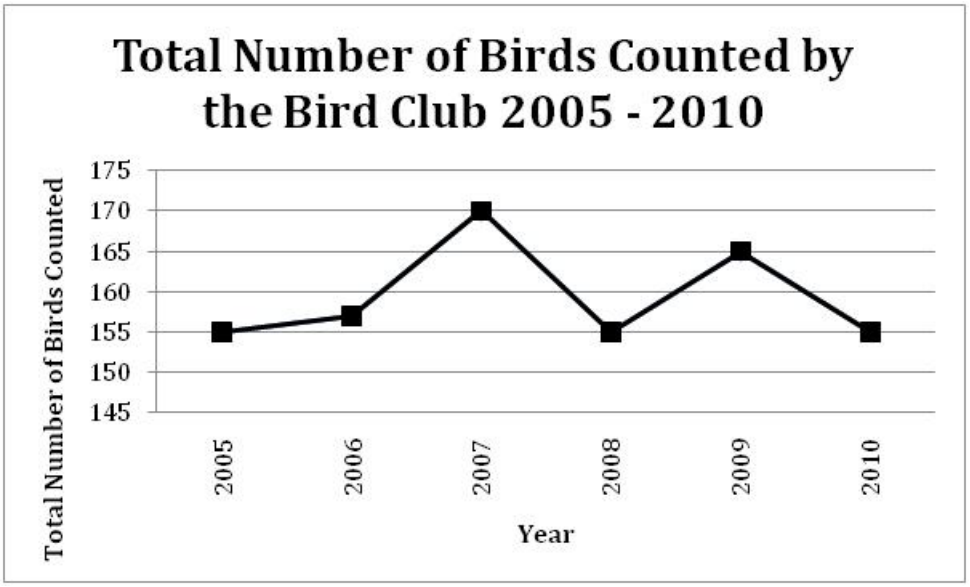
Table 1: Total Number of birds observed each year by the bird club.

Year	Total Number of Birds
2005	155
2006	157
2007	170
2008	155
2009	165
2010	155

2. Organize the data from Table 1 on the graph below to show changes in total bird abundance.

Broad Area of Inquiry: *Conducting Investigations*
Inquiry Construct 8 (DOK 2): *Use accepted methods for organizing, representing, and manipulating data*

Students should represent data accurately in an appropriate graph. Bar graph or line graph work well to show counts. They should include a graph title and axes labels. Labels should be clear and use scientific terminology. Axes should have appropriate scales.



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3. Do the data presented in the Bird Club's graph support your prediction from Question 1? Explain why or why not.

Broad Area of Inquiry: *Developing and Evaluating Explanations*
Inquiry Construct 12 (DOK 3): *Use evidence to support and justify interpretations and conclusions or explain how the evidence refutes the hypothesis.*

Students need to use evidence from the graph to support or refute the prediction from question 1. Their response needs to show an understanding of the observed trend.

Example answer: *The total number for birds counted changes from year to year but does not show a declining trend from 2005 – 2011. The total number of birds counted is 155 in 2005. It increases to 170 in 2007, decreased to 155 in 2008, increases again to 165 in 2009, and then decreases back to 155. The data do not support the prediction.*

4. Use what you learned from the news article to answer the following question. What data can the students collect or continue to collect to help them learn more about the abundance of birds at their school? Why?

Broad Area of Inquiry: *Planning and Critiquing of Investigations*
Inquiry Construct 4 (DOK 2): *Identify information/evidence that needs to be collected in order to answer the question, hypothesis, prediction.*

Response explains the need for long term data sets to answer questions about population trends. Show a general understanding of what needs to be collected to show a pattern of change over time.

Example answer: *Students need to collect data for many years to learn if there is a declining trend because bird abundance can change a lot from year to year.*

They decided to search the internet for more information on changes in bird abundance in the White Mountain National Forest.

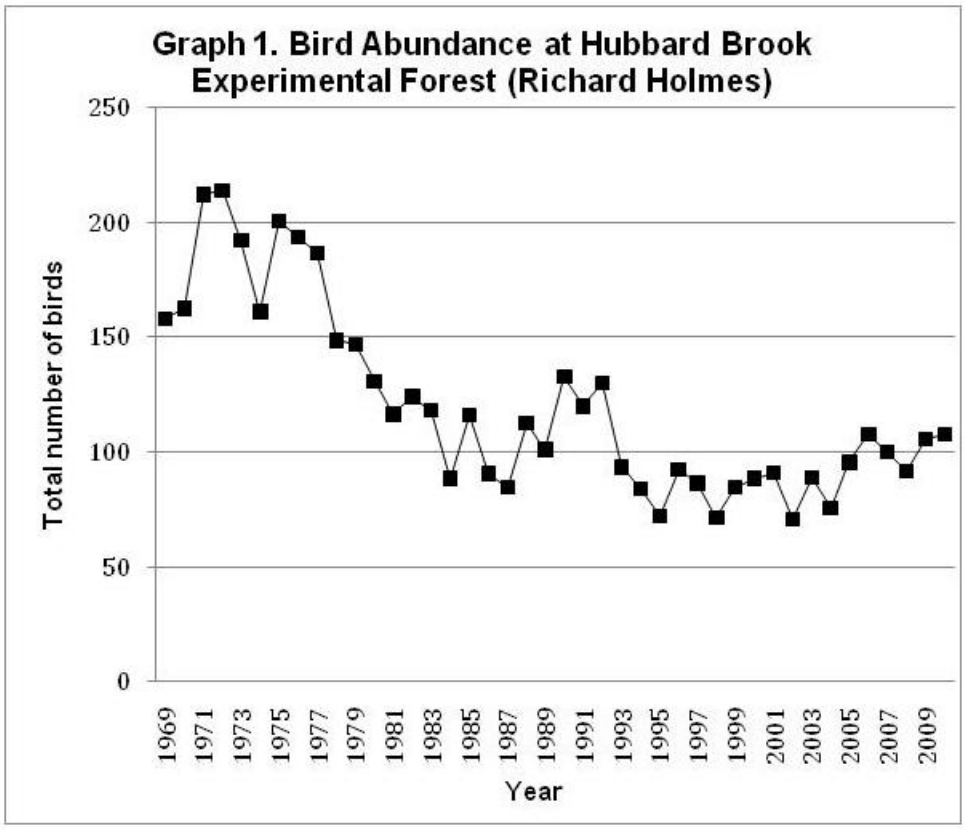
Students found that scientist Dr. Richard Holmes had the same interest in New Hampshire birds. To learn about bird population size in the White Mountain National Forest, he started surveying the birds at a place called the Hubbard Brook Experimental Forest. This study site is located within the White Mountain National Forest.

• **Goal of Dr. Richard Holmes' study:** Observe changes in bird abundance in the White Mountain National Forest over a long period of time to detect any patterns.

• **Site Description:** The forest study site is located in the Hubbard Brook Experimental Forest, which is part of the White Mountain National Forest. It is an undisturbed site so there are no roads or buildings in it.

• **Methods:** Birds were counted weekly every year between late May through early July. Observers would walk along transect lines counting every bird they saw or heard. This study was started in 1969 and is still continuing.

The information from Richard Holmes' study is presented on the following graph.



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5. Although bird abundance can change a lot from year to year, what conclusion can you make about the overall changes in bird abundance at the Hubbard Brook Experimental Forest from 1969 - 2010? Use the data shown in Graph 1 to answer this question.

Broad Area of Inquiry 3: *Conducting Investigations*
Inquiry Construct 10 (DOK 2): *Summarize results based on data.*
Students need to provide a general explanation of the trend shown in the graph. In their response they refer to the data in the graph to explain the observed trend.

Example answer: *Bird abundance changes a lot from year to year from 1969 – 2010 but there is large decline from just over 200 birds in 1971 to under 100 birds in 1984. From 1984 – 2010 the bird abundance stays near 100. There is an overall decline in bird abundance from 1969 – 2010.*

6. After looking at the graph, the Bird Club members wonder if the results of this study represent the whole White Mountain National Forest or only the Hubbard Brook Experimental Forest. Can scientists use the data from this study to make conclusions about the whole White Mountain National Forest? Why or why not? If not, what data might they need?

Broad Area of Inquiry 2: *Planning and Critiquing of Investigations*
Inquiry Construct 6 (DOK 2): *Provide reasoning for appropriateness of materials, tools, procedures, and scale used in the investigation*

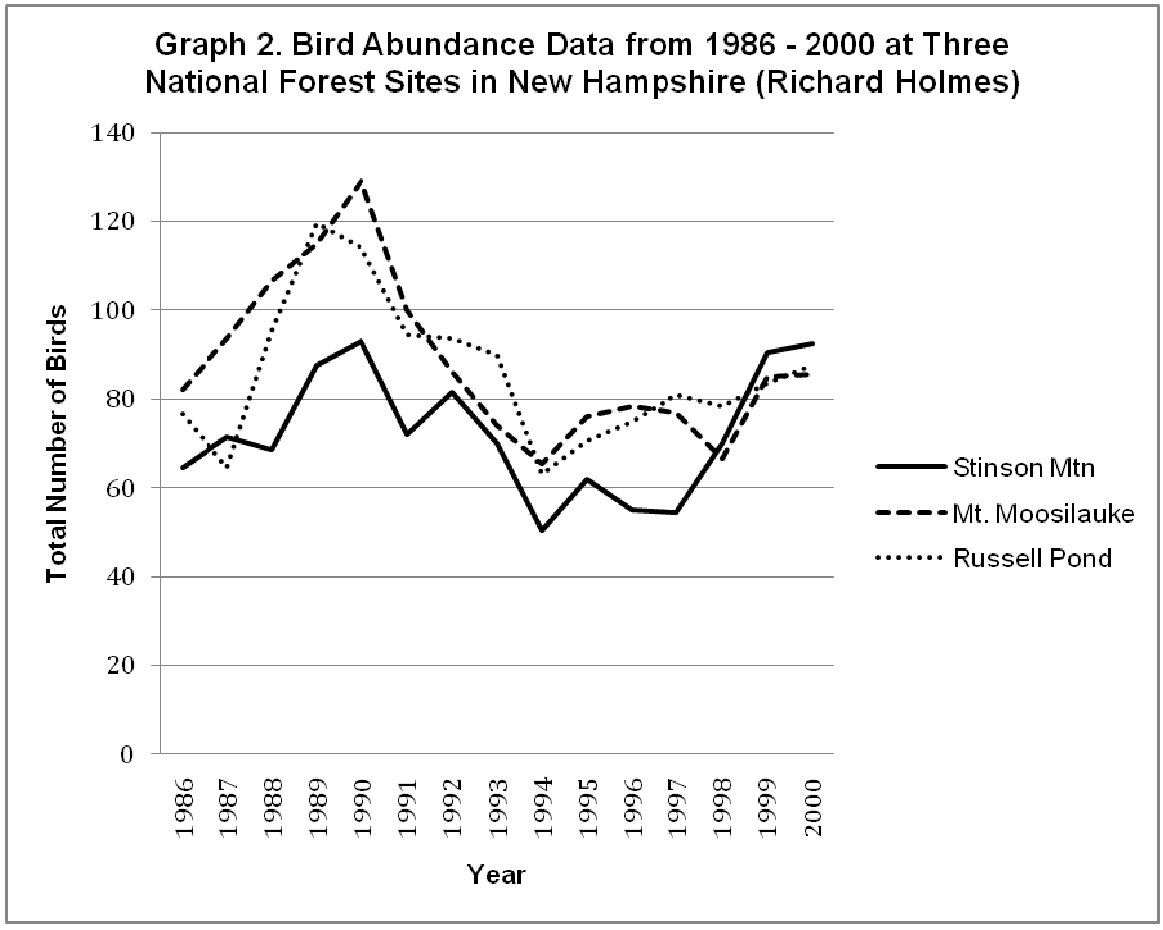
Students need to demonstrate an understanding of the need for replication in scientific experiments to make broad conclusions. Their response needs to show a general understanding of why the conclusion is limited.

Example answer*: Scientists can not use the data from the Hubbard Brook Experimental Forest to make conclusions about the whole White Mountain National Forest because their study only examined one site in the forest. Scientists need to conduct replicate surveys in other parts of the White Mountain National Forest to learn about bird abundance in the whole forest.*

Part 3. Using Evidence and Applying What You Have Learned.

The students search the White Mountain Nation Forest website to see if there was more information on bird abundance in other parts of the White Mountain National Forest. They learned that Richard Holmes replicated his study at three other sites within the White Mountain National Forest from 1986 to 2000. These sites are called Stinson Mountain, Mt. Moosilauke, and Russell Pond. The results from the three sites are shown in the graph below.

The information from Richard Holmes' study is presented on the following graph.



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7. Use the data shown in Graph 2 to answer the following question. What conclusions can you make about the trend in the total number of birds in the White Mountain National Forest from these three new sites. Is the trend similar to the one observed at Hubbard Brook site over the same time period?

Broad Area of Inquiry 3: *Conducting Investigations*
Inquiry Construct 8 (DOK 2): *Use accepted methods for organizing, representing, and manipulating data.*

Students use data from the graph to make reasonable conclusions, showing an understanding of how to interpret the information. They support their conclusions with evidence presented in the graph.

Example answer: *Total number of birds increases at all three sites in the first years of the study, decreases from 1990 to 1997, and then starts to increase again in 1998. Bird abundance changes a lot and in similar ways at all three sites during this study. The changes seem similar to the changes for the same time period at Hubbard Brook. There is no clear increasing or decreasing overall trend at any site. The study period does not cover as long a period of time as the Hubbard Brook data.*

8. The Bird Club members want to design a study that will enable them to collect data and make conclusions about how bird abundance changes in their town and not just their schoolyard. What advice can you give them to help design this study? Think about the methods presented in this test.

Broad Area of Inquiry 2: *Planning and Critiquing of Investigations*
Inquiry Construct 5 (DOK 3): *Develop an organized and logical approach to investigating the question, including controlling variables.*

Response includes only relevant study design features including length of study (long term study) and replicates. Response is written with scientific terminology.

Example answer: *I would advise them to design a long term study because bird abundance can change a lot from year to year. Trends can only be seen if they have many years of data. To make conclusions about bird abundance in their town they should conduct bird counts at more than 1 site.*