Name_____

DATA Nugget

Bye Bye Birdie? Part II

Featured scientist: Richard Holmes from the Hubbard Brook Experimental Forest

In Part I, you examined the patterns of total bird abundance for the Hubbard Brook Experimental Forest and determined that the total numbers of birds have declined since 1969, but is this true for every species of bird at Hubbard Brook? You will now examine four species of birds to see if each of these species follows the same trend.

View of the Hubbard Brook Experimental Forest

It is very hard to study migratory birds because they are at Hubbard Brook only during their breeding season (summer in the northern hemisphere). They spend the rest of their time either in the neotropics, or migrating back and forth between their two homes. Therefore, it can be difficult to tease out the many variables that affect bird populations. To start with, scientists decided to focus on what they could study, which were the habitats at Hubbard Brook and how they might affect bird populations.

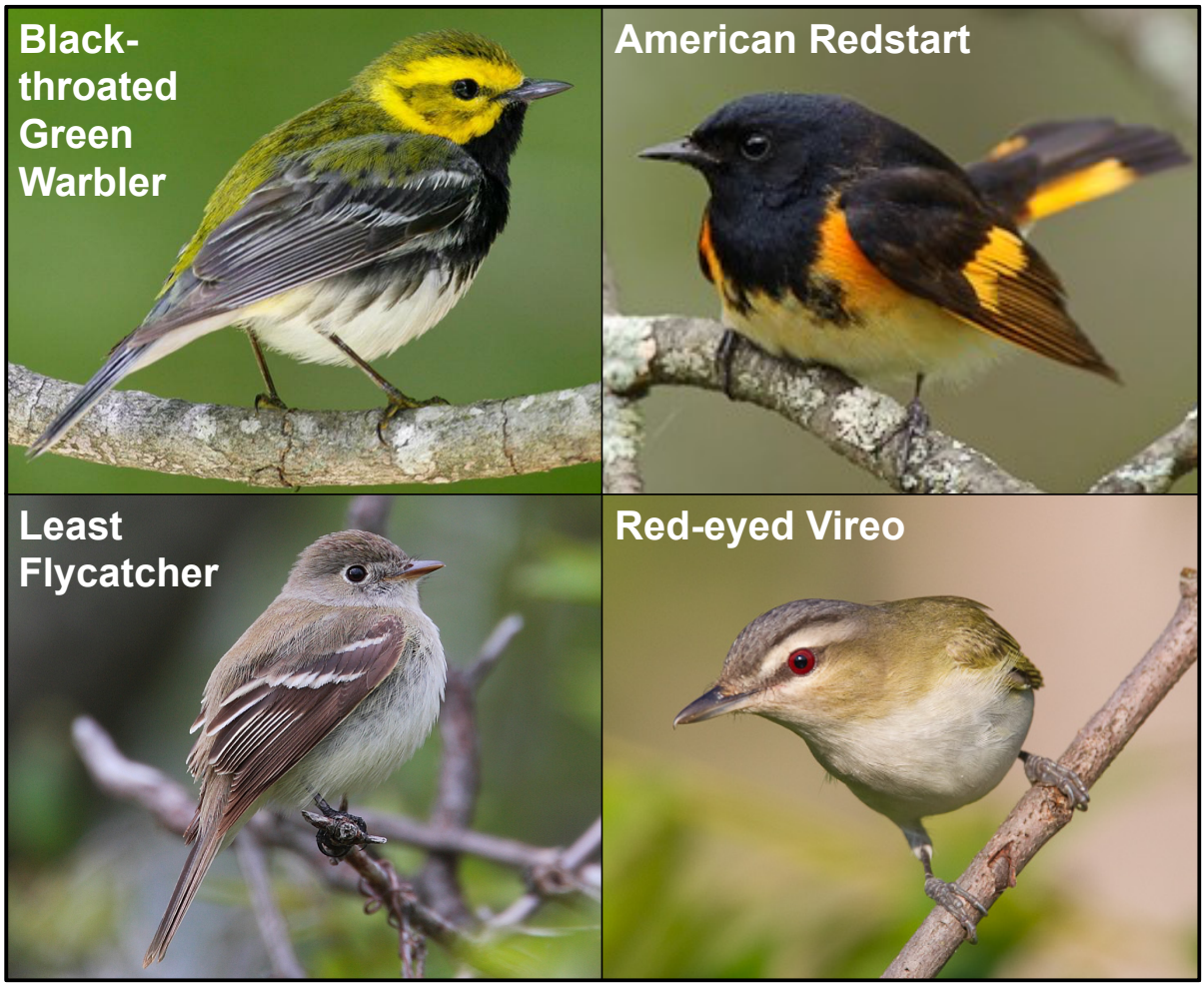
Research Background: Habitat Preferences for Four Bird Species

Hubbard Brook was heavily logged and disturbed in the early 1900s. Trees were cut down to make wood products, like paper and housing materials. When logging ended in 1915, trees began to grow back. The forest then went through **secondary succession**, which refers to the naturally occurring changes in forest structure that happen as a forest ages after it has been cut or otherwise disturbed. Scientists knew that as the forest grew older, the structure of the forest changed: trees grew taller, and there was less shrubby understory. Today, the forest has grown back. It contains a mixture of deciduous (about 80–90%; mostly beech, maples, and birches) and evergreen (about 10–20%; mostly hemlock, spruce, and fir) trees.

Richard and his fellow scientists thought that perhaps certain bird species preferred younger forests and other species older forests. They decided to look into the habitat preferences of four important species of birds: the Least Flycatcher, American Redstart, Black-throated Green Warbler, and Red-eyed Vireo.

Name_____

- **Least Flycatcher:** The Least Flycatcher prefers to live in semi-open, mid-successional forests. The term **mid-successional** refers to forests that are still growing back after a disturbance. These forests usually consist of trees that are all about the same age, have a dense, continuous canopy at the top with few gaps, an open middle canopy, and a denser shrub layer close to the ground.
- **American Redstart:** The American Redstart generally prefers moist, deciduous, forests with many shrubs. Like the Least Flycatcher, this species prefers mid-successional forests.
- **Black-throated Green Warbler:** The Black-throated Green Warbler occupies a wide variety of habitats. It seems to prefer areas where deciduous and evergreen forests meet, and can be found in both forest types. It avoids disturbed forests and forests just beginning succession, and can be found in both mid-successional and mature forests.
- **Red-eyed Vireo:** The Red-eyed Vireo breeds in deciduous forests as well as forest that are mixed with deciduous and evergreen trees. It is abundant deep in the center of a forest. It avoids areas where forest has been cut down, and does not live near the edge. After logging, it often takes a very long time for this species to return.



Name_____

Scientific Questions: How did the population sizes of different species of birds change over time at Hubbard Brook? Do their numbers seem to depend on the types of habitat they prefer?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

	Number of birds counted (# / 10 hectares)			
Year	**Least Flycatcher**	**Red-eyed Vireo**	**Black-throated Green Warbler**	**American Redstart**
1969	26	20	8	12
1970	28	24	9	26
1971	43	29	12	29
1972	50	22	7	29
1973	57	26	6	26
1974	26	23	10	22
1975	30	31	8	39
1976	28	30	8	42
1977	34	24	7	44
1978	22	20	8	33
1979	22	16	9	36
1980	15	13	10	35
1981	1	26	9	22
1982	0	23	9	32
1983	0	22	11	30
1984	0	21	7	14
1985	0	22	15	27
1986	0	22	9	13
1987	0	20	12	11
1988	6	22	17	14
1989	0	23	16	6
1990	0	24	18	19
1991	2	26	14	14
1992	1	15	18	19

	Number of birds counted (# / 10 hectares)			
Year	**Least Flycatcher**	**Red-eyed Vireo**	**Black-throated Green Warbler**	**American Redstart**
1993	0	17	18	13
1994	0	19	14	8
1995	0	18	14	2
1996	0	19	16	11
1997	0	22	9	11
1998	0	17	11	10
1999	0	24	13	10
2000	0	28	16	8
2001	0	29	14	4
2002	0	19	16	2
2003	0	21	13	7
2004	0	21	14	2
2005	0	25	13	1
2006	0	22	18	2
2007	0	19	16	2
2008	0	20	16	3
2009	0	27	25	1
2010	0	24	21	0
2011	0	22	19	0
2012	0	24	17	2
2013	0	28	18	0
2014	0	31	19	0
2015	0	30	17	0

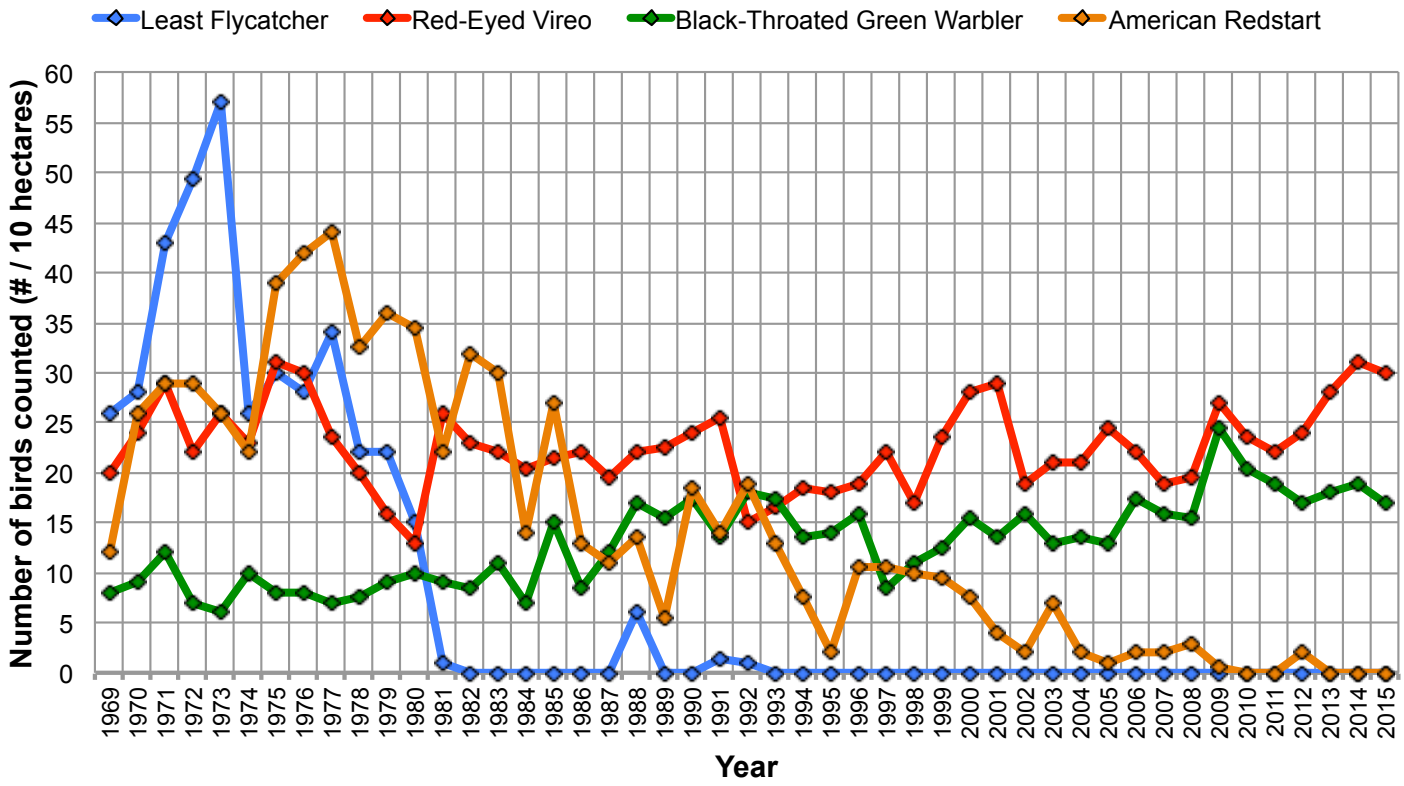
What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Name_____

Below is a graph of the data:



Interpret the data:

What trends, changes, or differences do you see in the table or on the graph?

What is the relationship between the dependent and independent variables? What does the relationship between the variables mean?

Name_____

Make a claim that answers each of the scientific questions.

Support your claim using data as evidence. Reference specific parts of the table or graph.

Explain your reasoning and how the data supports your claim.

What do the data from this study tell us about Richard's hypothesis?

Name_____

What other mechanisms could explain why the abundances of some species of birds have increased while others have sharply declined? Write out your alternative hypothesis.

What future data should be collected to test your hypothesis?

Independent variable(s): _____

Dependent variable(s): _____

For each variable, explain why you included it and how it could be measured.