Name: _____

Changing Planet: Adaptation of Species (Birds and Butterflies)

Please answer the following questions based on the movie Changing Planet: Species Adaptation: Butterflies:

1. When we think of protecting Earth's animal populations, many large animals come to mind – elephants, jaguars, tigers, and polar bears. Butterflies are beautiful, tiny and very sensitive to climate change impacts on the environment. They are very important to maintaining the health and beauty of our planet. List two reasons why butterflies "add more than just color to our earth":

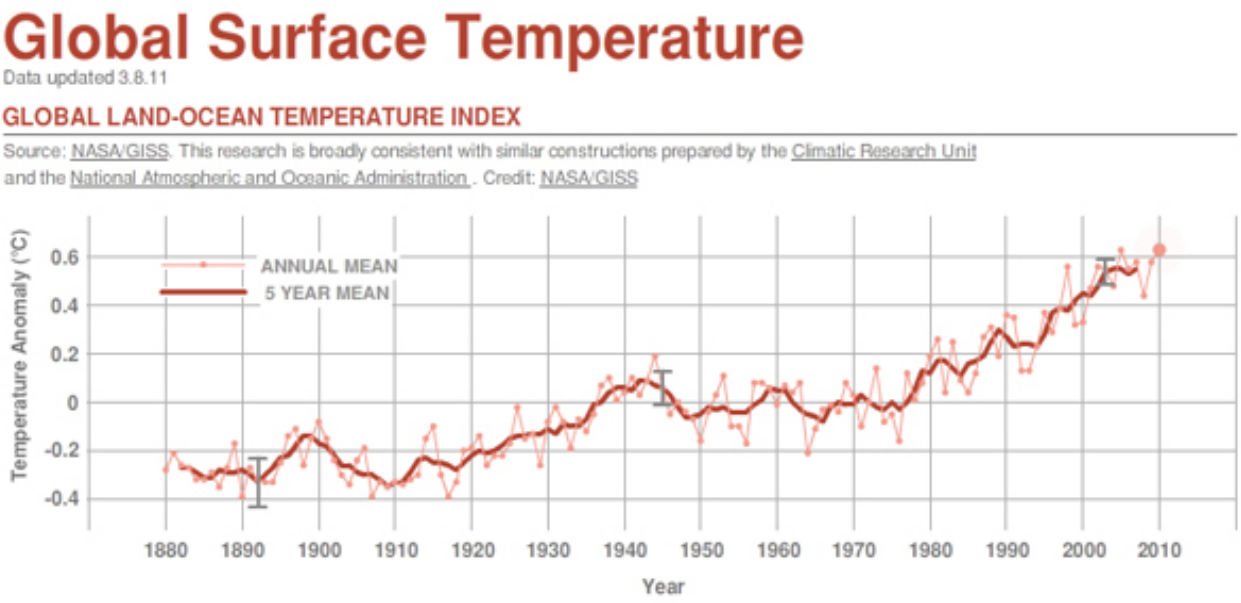
2. Label and draw the four stages of the life cycle of a butterfly.

3. Warmer temperatures are causing some host plants to dry up earlier than usual. This means that when caterpillars hatch from eggs, they have nothing to feed upon. The plant population affects the whole butterfly reproduction cycle. Name another way that warmer temperatures are affecting butterfly populations. Explain your answer.

4. Use the graph below, Global Surface Temperature, to estimate the amount temperature has risen in degrees Celsius in the time period from 1910-2010. Use the 5 Year Mean line.

Estimate for temperature rise (1910-2010): _____

It has been forecast that the next decade (2010 to 2020) will be the warmest on record globally. Scientists predict a warming of at least 0.1 degrees Celsius in this next decade. Extend the graph to include this rise in temperature on your graph.



5. What other environmental factors are affecting butterflies (and many other animals)?

6. Which environmental factor do you think needs to be addressed first and why?

7. Brainstorm a list of ideas that could be used to help maintain butterfly populations:

Butterflies are not the only species affected by global climate change - in fact, most animals are and will be! You will now investigate how birds adapt to different food sources being available and look into one effect of climate change – drought.

First round of activity (many types of food available)

GROUP MEMBERS:

Bird 1:

Bird 2:

Bird 3:

Adaptation Investigation
Student Data Table

Directions:

- Each member of your group is a bird who needs to collect food particles to survive! You will use your "beak" to collect food.
- Collect as much food from the plate as you can in 30 seconds using only your "beak" and placing the food particles into your cup. (Each bird should have its own cup.)
- Count the amount and type of food you have collected and enter the information into the table below for each bird in your group.
- As a group, calculate totals and averages for each type of food.

	Rice	Seeds	Marbles	Marshmallow	TOTAL Number of food particles collected
Bird 1					
Bird 2					
Bird 3					
Total					
Average (=total/3)					

Rules for food collecting:

1. Food can only be collected using your beak.
2. Your free hand can not assist with food collecting.
3. Food can not be stolen from someone else's cup.
4. All types of food have the same nutritional value.

Please answer the following questions about the first round of activity:

1. Which type of bird was able to eat the most food particles? Why?

2. What type of bird ate the least food particles? Why?

3. Which type of food was most difficult for your bird to eat?

4. Which type of food was easiest for your bird to eat?

5. Using this part of the investigation and the class discussion, do all the birds have the same diet? Site at least two examples of local birds and how their diets differ (or if you are not familiar with local birds, use the birds pictured in the Powerpoint presentation to explain your answer). How does diet affect beak morphology (shape) of your bird examples?

<u>Second round of activity (drought conditions)</u>

1. Did your bird survive the drought conditions? Which birds were best adapted to survive?

2. How is this investigation like the natural world and how is it unlike what occurs in nature? Explain.

Analysis and Conclusion (*your teacher may assign these*)

1. In the video "Why I Became a Biologist" by Camille Parmesan, she discusses why she became a field biologist. Keep in mind biologists (working in the field or in a lab) are typically required to get a 4-year STEM undergraduate degree (science, technology, engineering or math), a PhD (~5 year program) and usually complete at least a two-year postdoctoral "internship". Many biologists have a starting salary of $75-90,000/year.

Given the requirements outlined above, would you be interested in becoming a biologist? Explain.

How is the work of a field biologist different from a lab biologist or medical doctor? What are the benefits and drawbacks of each? What would be your preference? Explain.

2. Use the web site Journey North http://www.learner.org/jnorth/maps/monarch_spring2011.html to look at where Monarch butterflies have been sighted in their annual migration. Hypothesize how their migration patterns (timing and location) will change based on information learned from this lesson:

3. Some conservation biologists like Jessica Hellman are beginning to look into the possibility of 'assisted migration'. This is a possible solution to this big problem of species not being able to live in their original ecosystem due to climate change or habitat destruction. It involves removing a species from its original ecosystem and purposely moving it to another location. Discuss the merits and challenges that you can foresee in assisted migration. Be sure to give examples.

4. The impacts of global climate change are many and varied. Some of the impacts include warming global temperatures, rising sea level, melting Arctic sea ice, warmer sea-surface temperatures, warmer lake temperatures, heavier rainfall, extreme drought, crops withering, increased storm intensity, more frequent heat waves, and more acidic seawater. Choose one of these impacts to explore and research how this one impact is affecting a certain animal species. The options here are endless. Just a few examples include how more acidic seawater affects ocean coral, how warmer lake temperatures affect lamprey populations, how melting Arctic sea ice affects polar bears, or how warming global temperatures affect tropical frogs. Please clear your intended topic of research (and species affected) with your teacher before beginning. Present your findings to class in a short Powerpoint presentation. Include the issue, how it impacts the species, and possible ways to 'fix the problem'.