Kate Macaulay
Data Integration Assignment
Due: June 27, 2018

a.) Data Sources:

National Phenology Network: https://www.usanpn.org/home
Specific Link for Data Access:
https://www.usanpn.org/geoserver-request-builder
Layer Name: Spring Indices, Historical Annual (1981-Previous Year)-First Leaf-Spring Index "Spring First Leaf Data Maps" 1981, 2000, and 2016

Phenology is the study of cyclic and seasonal natural events, especially in relation to climate and plant and animal life.

The USA National Phenology Network consists of research scientists, citizen scientists, educators and policy makers. It is a network established in 2007 to collect and share phenology data and information.

NASA Global Climate Change:
https://climate.nasa.gov/vital-signs/global-temperature/
NASA provides an interactive map showing the change in global temperatures from 1884 to 2016. As you play the animation it shows that the global temperature is increasing and that the 17 hottest years on record have occurred since 2001. You can pause the animation on 1981, 2000, and 2016.

New York Times Article that inspired these data sources:
https://www.nytimes.com/2018/04/04/climate/animals-seasons-mismatch.html
The life cycles of different species of plants and animals are affected by environmental cues. Many of these species are in synch because they rely on one another for survival. For example, a flower will bloom just as its insect pollinator is emerging. As the climate warms though, many of these species are falling out of synch, are not adapting fast enough, and thus are affecting the ecosystems that they are a part of. For example, as birds migrate north to feast on a supply of insects, if those insects have emerged too early, they will not be an available food source for the birds. This article focuses on 5 different plants and animals that phenologists have collected data on, and which are showing signs of being out of synch with their changing ecosystems.

b.) Lesson Enhancement:

I currently teach a unit on ecosystems to 3rd grade. As part of the unit, students learn about the interdependent relationships in ecosystems and how humans can impact biodiversity. The human impact is usually talked

about in a pretty general way, as in overfishing or overhunting because these are tangible and relatable to the students. We can do a group food web, and eliminate a particular organism, and see the impact this has on the other organisms in the constructed web. It's so much harder for students at this level to grasp the impact humans have on the ecosystem via climate change. The students themselves cannot feel the change in climate, and they are too young to have witnessed their environment "feeling" or "looking" any differently. This is why I am so excited to use this National Phenology Network data and NASA global temperature data with my students. By comparing the Spring First Leaf Data Maps from 1981, 2000 and 2016 it becomes clear that Spring is arriving much earlier today than it once was. Then, to compare these maps to the interactive Global Temperature map, the correlation can be made between rising temperatures, and the earlier arrival of Spring. This will hopefully lead students to generate questions such as, "Why is the temperature rising?", and "What happens when Spring arrives earlier?", and "Is this a problem for humans or other living things?", and "What can we do about this?". I would then introduce the students to portions of the New York Times article as a start to researching the answers to their questions.

Comparing the arrival of Spring data to the NASA global temperature data, addresses many NGSS cross-cutting concepts: 1. Cause and effect relationships can explain change. 2. Scale, Proportion and Quantity: Observable phenomena exist from very short to very long, time periods. 3. A system can be described in terms of its components and their interactions. 4. It is the nature of Science, that science assumes consistent patterns in natural systems.

Using data, allows a lesson to be set in a real-world context. It gives authenticity to the content and sets the stage for engineering design challenges that address current needs in society. Students are always more engaged when they can see the relevance in their learning. In addition, data can make the abstract, tangible. Observable phenomena can happen over long periods of time and that can be hard for elementary-aged students to comprehend, but when you introduce data, you can take the concept of passage of time, and created a visual model that makes it easier to understand.

c.) Interdisciplinary Context:

English Language Arts: Reading a newspaper article and looking for source validation, and reading an article and discussing main idea and supporting details. Creating persuasive posters/writing about how we can change our behaviors to have a more positive impact on the ecosystem.

Social Studies: What is being done in the local communities or around the world to combat climate change. How are ecosystems in other countries/biomes effected. (3rd grade studies countries around the world)

Math: Reading a map with a “color ramp” as a key. Layering a map with migration paths. Observing phenology data as a citizen scientist (for example, leafing and budding) that can then be used to create visual representations/mathematical models.