Title: USA-NPN Phenology Activity (Non-Formal) for Grades 5 through 12

Through the *Nature's Notebook* citizen science project, scientists, students, and others are learning about the influence of climate on plants, animals, and landscapes. Phenology data from *Nature's Notebook* are freely available to anyone interested in analyzing and interpreting environmental change. The more complete the dataset becomes, the higher its value for research and for decision-making in fields such as natural resource management, agriculture, and health. Participation can occur in schoolyards, urban green spaces, or larger natural areas such as wildlife refuges or parks.

Phenology education activities/lessons for the USA National Phenology Network should broadly achieve the USA-NPN Education Program vision to increase science and climate literacy through creating an understanding of how phenology is an indicator of the health of the environment and influences species interrelations, encourage people to spend time in nature, and encourage accurate data collection for the citizen science program *Nature's Notebook*. The best lessons are those that not only meet the USA-NPN Education goals but also weave in elements of existing programming to demonstrate how phenology is part of a larger system. Lessons also need not only be utilized in science classrooms.

This worksheet is provided to help you formulate a lesson plan of your own using *Nature's Notebook*. We also have a sample of a completed lesson plan for you to use. If you would like to share you lesson plan with the USA-NPN program, please do so! We would be glad to post it on our website for others to use. Have fun!

Background
This section should provide context and background information on how the lesson will be incorporated into your existing classroom or program activities.

Overview
The overview of your phenology lesson should describe how it will achieve the USA-NPN Education Program goals of **increasing science and climate literacy**, **encouraging people to spend time in nature**, and **encouraging participants to accurately collect data** for our phenology database.

Real world connection/concept
How is this activity connected to real-world concepts? For example, is the activity/lesson related to climate change? Seasonal variation? Botany? Life-cycles of animals? Pollinators? Precipitation amounts?

Learning Objectives
What are the specific objectives that will be achieved at the end of the activity? Learning Objectives usually begin with a verb. For example:
Students will be able to:
- Observe the same plant across two seasons and describe the changes using text and illustration
- Enter data in the *Nature's Notebook* online interface
- Describe changes that have occurred in the garden during the school year
- Analyze data in the deciduous tree dataset
- Identify how data collected for *Nature's Notebook* in your schoolyard helps us understand how local conditions vary from year to year.
- Explain how your data also helps scientists with their research about a changing climate.

Standards of Learning (SOLs) or Core Curricula Met in this Lesson
Remember, **phenology lessons need not only be part of a science and math curriculum**. Thinking outside of the box and encouraging mastery in subjects such as English/language arts (journaling, writing skills, descriptive writing), social studies (historical connections, ethnobotany, cultural studies), art (drawing, illustration, journaling), music (be creative!)

Linking the activity to national standards, when possible, is best. National Science Standards are under review and can be accessed on this website: http://nextgenscience.org/search-standards
Standards for math and English language arts can be found here: http://www.corestandards.org/the-standards. For other subject matter standards please visit your state Department of Education website.

If you need help understanding how your lesson fits with the standards, contact LoriAnne Barnett, USA-NPN Education Coordinator: lorianne@usanpn.org.

Citizen Science Connection
Does the activity incorporate any citizen science activities other than *Nature's Notebook*? If not, list *Nature's Notebook* here.

Resources Needed
What materials are needed to conduct this activity?

Time Required/Location
How long will the lesson take to complete? An hour? A day? A week? A semester? 2 years? The longer the activity can be repeated, the more meaningful the activity will be for the students. Consider partnering with other teachers in your school to create a multi-year experience, having older students conduct data analyses at the end of their time on site.

Conducting the Activity
Describe the steps necessary to complete the lesson. Experiential activities, learning by doing, and hands on activities are encouraged and are very applicable to working with *Nature's Notebook* in the field. Below is an outline of the Experiential Learning Model coupled with the **5E Learning Cycle to be used as a guide for activity design.**

Experience
ENGAGE
- Interest students in the topic by using an opening activity or an exploration of the tagged species
- Incorporate discussion questions to set the stage
- Assess what the students know and what they need to learn

EXPLORE
- Perform the main hands-on activity
- Create hypotheses for outcomes
- Collect data

Share
EXPLAIN
- Participants review the experience and reflect on outcomes
- This step may include a variety of sharing methods: verbal, illustrative, etc.

Process and Generalize
ELABORATE
- Participants may hypothesize about future Nature's Notebook experiences in the short and long term.

Apply
EXTEND
- Participants may draw similarities between current experience and past knowledge

REFLECTION
- Ask students to draw connections between this experience and other similar ones they have had.
- Ask students about what they liked and disliked about this assignment. If they had to share the experience with someone else, what would they say?

Evaluate the Activity
The use of reflective practice is critical to understanding. Examples of reflection questions include:
Share one new thing you learned from this experience.

Share one thing you still have a question about.
Share something that you learned which will be useful in the future.
Share something that I (the instructor) could have done differently.

**For assistance on creating the experiential learning model and reflection questions, contact LoriAnne Barnett, Education Coordinator at USA-NPN.

Additional resources
List any additional resources you used to create you activity, which may be helpful to others including background reading or websites.