



## **FT 13 - Plant and Animal Phenology Monitoring on the Mississippi River**

Monday, August 5, 2013: 5:30 PM-7:45 PM

Organizer:

Theresa M. Crimmins

Trip Leaders:

LoriAnne Barnett , Rebecca A. Montgomery and Christopher R. Buyarski

Observing plant and animal life cycle events, or phenology, is a great way to increase the connection between nature and people of all ages and backgrounds. The USA National Phenology Network's phenology monitoring program, Nature's Notebook, is being used in thousands of locations by individuals and organizations to track phenology. Nature's Notebook monitoring sites have been established at the Mississippi National River and Recreation Area, not far from the ESA conference site. We'll walk along a trail with marked plants at the Recreation Area, make phenology observations using Nature's Notebook using paper data sheets and mobile apps, and discuss the variety of ways that Nature's Notebook can be used by individuals, groups, and organizations. We will also discuss available tools (from USA-NPN) and preparations needed for establishing a phenology monitoring trail. The trail runs through floodplain forests at the confluence of the Mississippi and Minnesota Rivers. The site is dominated by forests of cottonwood, ash and silver maple and by open wetlands.

Registration Fee: \$30

Equipment and Attire: Sturdy walking shoes, water, paper and pencil, smart phone or iPad (if you have one)

Itinerary: 5:30pm: leave Convention Center to arrive by 5:45pm. 5:45: arrive at monitoring site, walk along trail, make observations 6:45: snacks and discussion 7:30: Leave monitoring site, return to Convention Center to arrive by 7:45.

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## **COS 90-1 - Making meaning out of science: Using *Nature's Notebook* to engage citizens in exciting and relevant research**

Thursday, August 8, 2013: 8:00 AM

L100F, Minneapolis Convention Center

LoriAnne Barnett , USA National Phenology Network, Tucson, AZ

## **Background/Question/Methods**

Many site-based educators (nature centers, Cooperative Extension, schools, arboretums) struggle with developing and implementing cohesive projects into their existing programming. Moreover, projects that are not meaningful to participants often have little or no long-term impact.

The USA National Phenology Network's (USA-NPN) Education Program provides phenology curriculum and outreach to educators in formal, non-formal, and informal settings. Materials are designed to serve participants in grades 5-12, higher education, and adult learners. Phenology education can inform science, environmental, and climate literacy.

Education and educator instruction materials were designed and field-tested to implement a long-term phenology-monitoring program, *Nature's Notebook* (NN), at sites. Materials demonstrate how to incorporate monitoring for public visitors, long-term volunteers, and school groups, while meeting the goals of USA-NPN and the site. Materials encourage long-term data collection, interaction between educators, and offer information about how educators can ask and answer science questions.

Do site-based NN training materials engage students and meet NN and Master Gardeners (MG) objectives? Phenology monitoring was added to Pima MG Training during 2012, 2013. MGs receive 40-50 education hours and return 40-60 volunteer service hours annually. Using this case study as an example, this talk will demonstrate how to successfully implement NN at a site.

## **Results/Conclusions**

The course was changed during the second year to better reflect participant needs. Year one content included phenology and observation using NN. Second year additions included ecology, biogeography, climate, and garden phenology applications. Both classes collected weekly data for NN and were offered an opportunity to review data during a follow-up lesson.

Thirty percent of year one participants were very likely to continue NN observations while 48% of year two participants were very likely to continue. Forty percent of participants were very likely to attend an advanced training on NN and 55% of second year participants responded positively.

Evaluations from year one indicated a need to be more explicit about phenology application in gardening. Comments included: "This does not seem helpful for MG, but...interesting," "...information not relevant to helping...community garden." Conversely after year two, students better understood phenology's relationship to gardening. Comments included: "...makes you more aware," "Very informative... motivate(s) me to record more than...when I hear the first cicada," and "Phenology

touches everything...brings to light...connecting you already know...tests your new insights [that will] make it more meaningful.”

In conclusion, effective education materials holistically and explicitly incorporate personal meaning. Directed content creation helps form an engaged volunteer corps.

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## **COS 90-4 - Researcher-driven campaigns engage *Nature's Notebook* participants in scientific data collection**

Thursday, August 8, 2013: 9:00 AM  
L100F, Minneapolis Convention Center

[Theresa M. Crimmins](#) , USA National Phenology Network, Tucson, AZ  
Andrew J. Elmore , Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD  
Alfredo Huete , University of Technology, Sydney, Australia  
Stephen Keller , University of Maryland Center for Environmental Science, Frostburg, MD  
Estelle Levetin , University of Tulsa  
Jeffrey Luvall , NASA  
Orrin Myers , University of New Mexico, Albuquerque, NM  
Cathlyn D. Stylinski , Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD  
Peter K. Van de Water , CSU Fresno  
Ana Vukovic , University of Belgrade, Serbia

### **Background/Question/Methods**

One of the many benefits of citizen science projects is the capacity they hold for facilitating data collection on a grand scale and thereby enabling scientists to answer questions they would otherwise not been able to address. *Nature's Notebook*, the plant and animal phenology observing program of the USA National Phenology Network (USA-NPN) suitable for scientists and non-scientists alike, offers scientifically-vetted data collection protocols and infrastructure and mechanisms to quickly reach out to hundreds to thousands of potential contributors.

The USA-NPN has recently partnered with several research teams to engage participants in contributing to specific studies. In one example, a team of scientists from NASA, the New Mexico Department of Health, and universities in Arizona, New Mexico, Oklahoma, and California are using juniper phenology observations submitted by *Nature's Notebook* participants to improve predictions of pollen release and inform asthma and allergy alerts. In a second effort, researchers from the University of Maryland Center for Environmental Science are engaging *Nature's Notebook*

participants in tracking leafing phenophases of poplars across the U.S. These observations will be compared to information acquired via satellite imagery and used to determine geographic areas where the tree species are most and least adapted to predicted climate change.

### **Results/Conclusions**

Researchers in these partnerships receive benefits primarily in the form of ground observations. Launched in 2010, the juniper pollen effort has engaged participants in several western states and has yielded thousands of observations that can play a role in model ground validation. Periodic evaluation of these observations has prompted the team to improve and enhance the materials that participants receive, in an effort to boost data quality. The poplar project is formally launching in spring of 2013 and will run for three years; preliminary findings from 2013 will be presented. Participants in these special campaigns benefit through direct engagement in science.

This form of researcher partnership has now been successfully pilot-tested and implemented in several instances, and provides a template for future research project campaigns.

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## **COS 84-7 - When is the onset of a phenophase? Calculating phenological metrics from status monitoring data in the National Phenology Database**

Thursday, August 8, 2013: 10:10 AM  
101J, Minneapolis Convention Center

Jherime L. Kellermann , National Coordinating Office, USA National Phenology Network, Tucson, AZ

Katharine L. Gerst , National Coordinating Office, USA National Phenology Network, Tucson, AZ

[Carolyn A.F. Enquist](#) , The Wildlife Society & USA National Phenology Network, Tucson, AZ

### **Background/Question/Methods**

Detecting large scale phenological signals of climate change requires expansive datasets. *Nature's Notebook*, developed by the USA National Phenology Network (USA-NPN) is a national on-line program that facilitates scientists and citizens in collecting ground-based phenology data through standardized protocols. However, data can be limited across spatial, temporal, and ecological resolutions, creating challenges for estimating phenological metrics such as onset of phenophases (e.g. leaf-out). To address this challenge, we have developed criteria for calculating phenological metrics at differing spatial and temporal resolutions using status monitoring data within the National Phenology Database (NPDb). Standardizing the calculation of

fundamental metrics is essential for performing subsequent statistical analyses to determine trends in spatiotemporal phenological responses within and among ecological communities. Here we present three case studies utilizing five increasingly conservative criteria for extracting individual phenophase records from the NPDb, the first positive record, first positive preceded by a negative record, the midpoint between the negative and positive, and the first positive and midpoint date only for observations with < 8 days between the negative and positive. We examined differences among metric estimates (e.g. mean onset date), their variance, and sample size at local, state, and bioregional spatial scales for species and functional types including bud break and flowering of temperature-sensitive deciduous trees and shrubs in the northeastern US and mid-Atlantic and flowering and fruiting of shrubs in water-limited ecosystems of California.

### **Results/Conclusions**

Although the most conservative criteria had the lowest mean standard deviation across metric estimates, it also had the lowest sample size, excluding up to 87% of data used in the least conservative method. Metric estimates within spatial scales varied from <1 to 33 days. Differences between criteria are minimized by frequent sampling, at least once per week. The balance between sample size and variance depends on the spatiotemporal scale and species or community of interest, particularly the inherent variability of ecosystems (e.g. repeated flowering events throughout the year). We make recommendations on criteria usage for data users of the NPDb based on the scientific question or management goals of interest and desired applications of the metric produced (e.g. general phenology calendar, annual interpolated maps).

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## **COS 110-8 - The National Phenology Database: A multi-taxa, continental-scale dataset for scientific inquiry**

Thursday, August 8, 2013: 4:00 PM  
L100I, Minneapolis Convention Center

[Jake Weltzin](#) , USA National Phenology Network Nat'l Coordinating Office, US Geological Survey, Tucson, AZ

### **Background/Question/Methods**

The USA National Phenology Network (USA-NPN; [www.usanpn.org](http://www.usanpn.org)) serves science and society by promoting a broad understanding of plant and animal phenology and the relationships among phenological patterns and all aspects of environmental change. The National Phenology Database, maintained by the USA-NPN, is experiencing steady growth in the number of data records it houses. The majority of the data in the database has been provided by participants in the USA-NPN national-scale, multi-taxa phenology observation program *Nature's Notebook*. Participants, including both professional scientists and volunteers, follow vetted protocols that employ phenological

“status” monitoring rather than “event” monitoring: when sampling, observers indicate the status of each phenophase (e.g., “breaking leaf buds” or “active individuals”). This approach has a number of advantages over event monitoring (including estimation of error, estimation of effort, “negative” or “absence” data, capture of multiple events and phenophase duration) and is especially well-suited for integrated multi-taxa monitoring. Further, protocols and a user interface to facilitate the description of development or abundance data (e.g., tree canopy development, animal abundance) create a robust ecological dataset.

### **Results/Conclusions**

As of January 2013, the 1900 active participants registered with *Nature’s Notebook* had contributed over 1.7 million observation records for plants and animals since. Customizable data downloads are freely available from [www.usanpn.org/results/data](http://www.usanpn.org/results/data). Data are accompanied by FGDC-compliant metadata, data-use and data-attribution policies, vetted and documented methodologies and protocols, and version control. Quality assurance and quality control, and metadata associated with field observations (e.g., effort and method reporting, site and organism condition) are also documented. Data are also available for exploration, visualization and preliminary analysis at [www.usanpn.org/results/visualizations](http://www.usanpn.org/results/visualizations). We demonstrate several types of questions that can be addressed with this observing system and the resultant data, including spatio-temporal variation in organismal activity at both the population and community level at point to continental scales. We also describe recent results from several activities. Preliminary analysis indicates that plant phenology is closely tracking seasonal changes in climatological variables, with spring tree phenophases in the northeastern US clearly showing earlier activity under warmer spring conditions. Other preliminary analyses suggest spatiotemporal patterns in phenology that relate to animal migrations, invasive species ecology and management, and species interactions; additional data-mining and exploration by interested researchers and/or resource managers will likely further demonstrate the value of these data.

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## **OOS 33 - Implications of Climate Change for Ecosystem Processes in the Southwest U.S.**

Friday, August 9, 2013: 8:00 AM-11:30 AM  
101C, Minneapolis Convention Center

Organizer:

Dawn M. Browning

Co-organizer:

Carolyn A.F. Enquist

Moderator:

Carolyn A.F. Enquist

Arid and semi-arid regions of the southwestern USA are especially sensitive to changes in temperature as well as drought frequency and intensity. The region is experiencing predicted changes in climate (i.e., increased variability of rainfall and more frequent extreme events). This reality coupled with expanding growth and the increasing demand for water has positioned the southwestern U.S. as a 'canary in the coal mine.' The objectives for the oral session are to (1) engage ecologists across disciplines to highlight the implications of climate change for ecosystem function in southwestern ecosystems, (2) contribute to a conversation that involves researchers and practitioners formulating adaptation and conservation strategies, and (3) promote the transfer of integrative and relevant information to the public. The session will open with a perspective on the role of humans in defining the footprint of urban environments while providing an overview of the regional report of the National Climate Assessment. The second through fourth talks provide three examples of altered ecological processes tied to ecosystem function: sustainability of freshwater ecosystems, biotic feedbacks linked to altered disturbance regimes, and asynchronous shifts in phenology of plants and their pollinators. Two presentations follow that feature on-the-ground examples of how communities are adapting management strategies to mitigate changes due to climate. Conservation applications are followed by a presentation on the state of science tools and information to serve the growing and pressing need of private individuals and land managers. The session will close with an emphasis on the role of scientists in the exchange of information to facilitate use of the best-available data for decision making.