



USA-NPN ESA 2012 Presentations

Jake Weltzin, #33690, *“Hot, flat and crowd-sourced: Citizen-scientist collaborations to tackle global change”*, has been scheduled for:

Symposium: Observation and Life On Earth: The Changing Face of 21 Century Ecological Science

Date: Monday, August 6, 2012

Time: 2 PM

Location: Oregon Convention Center Portland Blrm 253

Background/Question/Methods

Earth is changing in unprecedented ways in response to human population growth and activity, e.g., global warming, changes in chemical composition of the atmosphere and waters, biological invasions, extinctions. But commensurate with these changes, which portend an oncoming perfect storm, the internet and associated forms of technology have facilitated a meteoric rise in access to, and the sharing of, information. From this, “crowd-sourcing” and “citizen science” have arisen from a concatenation of needs: those of small groups of people (e.g., scientists) to accomplish tasks at broad spatial or temporal scales, and a much larger group of self-selected contributors or collaborators interested in performing tasks, solving complex problems and contributing with relevant and fresh ideas. Within the fields of science and natural resource conservation, unprecedented public access to technology and information (e.g., though on-line herbariums and species identification tools, mobile applications for image capture, data entry, and community discussions), has enabled people without scientific training to make significant contributions to scientific knowledge, thereby “flattening” science. This fact, combined with an increasing awareness by scientists that their numbers are far too few to adequately answer continental and global-scale questions in a rapidly changing world, has led to the development of “citizen science.”

Results/Conclusions

Today, in fields as varied as ecology, ornithology, astronomy, and public health, scientists are collaborating with the public to collect and organize otherwise inaccessible information and data, while advancing scientific knowledge that can help us adapt to a hotter, flatter, and more crowded Earth (apologies to Thomas Friedman). Perhaps more important, the inclusion of the broader public in the process of science can improve science literacy, and for applications related to climate change, help improve climate literacy and move people beyond the “gloom and doom of climate change” by engaging them in the process of discovery, analysis and application. One such project that teams citizens with scientists is the USA National Phenology Network (USA-NPN; www.usanpn.org). The Network integrates science and education by encouraging people to make phenology observations that connect them with nature and involve them in the scientific process, and at the same time capture data that scientists are eager to use. Thus, by engaging a willing public in a meaningful scientific activity in collaboration with expert scientists, the Network capitalizes on a flattening of science though the use of new technology and memes while providing quality information critical to sustainability in our changing world.

Alyssa Rosemartin, #37900, “Answer Questions at Multiple Scales with Data Provided by the USA National Phenology Network”, has been scheduled for:

Contributed Poster Session 77: Climate Change: Ranges And Phenology

Date: Thursday, August 9, 2012

Time Slot: 4:30 PM - 6:30 PM

Location: Exhibit Hall DE

Background/Question/Methods

The USA National Phenology Network (USA-NPN) 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. Participants in USA-NPN's *Nature's Notebook* have contributed nearly one million observation records encompassing four years of plant phenology observations and three years of animal phenology observations. Data are available for exploration and visualization at www.usanpn.org/results/visualizations and for download at www.usanpn.org/results/data.

Participants in *Nature's Notebook*, who include naturalists and professional scientists, follow vetted protocols that employ phenological “status” monitoring rather than “event” monitoring. On each visit to a site, observers indicate the status of each phenophase (e.g., “breaking leaf buds” or “active individuals”) for individual plant or animal species with a ‘yes’ if the phenophase is occurring or a ‘no’ if it is not. 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. We demonstrate several types of questions that can be addressed with this type of data, and with this national scale observation program and database, including variability and change across space, through time, and in community level interactions.

Results/Conclusions

Patterns in the data collected by *Nature's Notebook* participants are beginning to emerge demonstrating the value of this data resource. Plant phenology is closely tracking seasonal changes in climatological variables, with spring phenophases in the northeastern US clearly showing earlier activity under warmer spring conditions. Further patterns are emerging related to animal migration, invasive species ecology and management and species interactions.

The data housed in the National Phenology Database are expected to be useful to a variety of stakeholders interested in the spatial and temporal patterns of plant activity on a national scale; through time, these data should also empower scientists, resource managers, and the public in decision-making and adaptation to variable and changing climates and environments. We encourage researchers and decision makers to take advantage of this rich new data resource. Real-time raw and synthesized data are available from the USA-NPN website, and include documentation of methodology and QA/QC, data-use and attribution policies, and FGDC-compliant metadata.

Carolyn Enquist, #37767, “Observed changes in phenology across the US: A regional review for the National Climate Assessment”, has been scheduled for:

Contributed Poster Session 77: Climate Change: Ranges And Phenology

Date: Thursday, August 9, 2012

Time Slot: 4:30 PM - 6:30 PM

Location: Exhibit Hall DE

Background/Question/Methods

The 2013 National Climate Assessment (NCA) process calls for the identification of national indicators of change within geographic regions and sectors as a mechanism for establishing consistent methods of evaluation for future assessments. Phenology, the study of seasonal life cycle events in plants and animals (e.g., timing of leaf-out, blooming, hibernation, migration), is a well-recognized indicator of climate change impacts on people and nature. In an effort to synthesize climate-linked regional variation in phenological events across the United States, we conducted a review of the recent phenology literature as a Technical Input Report for the 2013 NCA. Specifically, we compiled studies that met the following criteria: (1) appears in the peer-reviewed literature between 2002 and the present; (2) provides documented analyses of long-term (at least 10 years) phenology data sets; (3) includes concurrent analyses or other consideration of temperature and/or precipitation; and (4) focuses on non-marine, field-based, community-level observations of individual organisms or of landscapes captured by remote instrumentation. We organized this information into eight geographic regions specifically delineated by the NCA: Alaska and the Arctic, Great Plains, Hawaii and the Pacific Islands, Midwest, Northeast, Northwest, Southeast, and Southwest.

Results/Conclusions

We reviewed over 175 studies and found that most published reports of recent long-term phenological patterns occurred in the Southwest region (ca 45 publications), whereas the Hawaii and the Pacific Islands region had the fewest published studies (ca 2 publications). Overall, the majority of studies documented an advance in springtime phenological events across species. In contrast, organisms in the Southeast typically showed great variability in onset of spring events. This may be the result of a recently described 'warming hole' in the southeastern U.S. (Meehl et al., 2012). Bird and plant taxa were well-represented in the reviewed studies, whereas there was a paucity of phenological information for mammals and, in particular, insects and reptiles. We also found a growing body of research focused on examining the phenomenon of trophic mismatch, which can result from differential phenological responses to climate or other cues. Though few studies documented the specific consequences of asynchronous species interactions, most predicted population declines, local extirpations, and the emergence of novel biotic interactions. Our review not only highlights the existence of broad directional shifts in phenology, but also indicates a regional variability in response to climatic changes that ultimately has implications for ecosystem processes and services.

Theresa M. Crimmins, *Anomalous warm spring of 2010 advances deciduous forest leaf-out: Application of the Nature's Notebook dataset and visualization analysis tool*

Contributed Poster Session 76: Climate Change: Ranges And Phenology

Date: Thursday, August 9, 2012

Time Slot: 4:30 PM - 6:30 PM

Location: Exhibit Hall DE

Background/Question/Methods

Phenology, the timing of seasonal life cycle events of plants and animals, is closely tied to climatic conditions. Warmer late winter/early spring conditions can advance time of leafing and flowering in plants, which can be observed across scales ranging from organisms to landscapes or regions. Although remote sensing can be used to detect spatial and temporal patterns of phenology on landscape to regional scales, in-situ observations of organismal phenology are relatively limited across the US, with the exception of occasional long-term datasets typically for relatively few species and at relatively few locations. Moreover, non-standardized observational protocols constrain data integration and application across broad

spatial scales. Finally, in-situ observations can be used to detect patterns of phenology (e.g., flowering, leaf initiation) not observable using other observing platforms. The USA National Phenology Network (USA-NPN; www.usanpn.org), established in 2007, has developed and implemented a national phenology observation program, called *Nature's Notebook*, which provides internationally standardized methods and protocols for phenological status monitoring for over 800 common plant and animal species. Here, we describe preliminary results of this national program, with a focus on in-situ eastern deciduous forest tree phenology between the years 2009 and 2011, bracketing the anomalously warm spring of 2010.

Results/Conclusions

Nature's Notebook and the associated National Phenology Database provide real-time raw data for plants (from 2009 to present) and animals (from 2010 to present), including FGDC-compliant metadata and vetted and documented methodology. A new data visualization and exploration tool that premiered in spring 2010 allows sophisticated graphical visualization of integrated phenological and meteorological data. We used this tool to conduct a preliminary analysis of timing of leaf emergence for 10 common overstory deciduous trees across the eastern deciduous forest in 2009-2011; observed patterns suggested phenological advancement for several, but not all, target species in 2010 relative to 2009 and 2011. Subsequent statistical analysis using generalized linear models indicated earlier leaf emergence in 2010 for all species combined, and (by 2-3 weeks depending species) for 4 of the 10 species when examined individually; two other species showed a tendency toward earlier leaf-out in 2010 relative to 2009 and 2011. These results illustrate the value of (1) the USA-NPN visualization and analysis tool for exploring patterns in the data housed in the National Phenology Database, and (2) an integrated approach to standardized, in-situ phenological observations on a national scale with potential for a posteriori application at local to regional scales.

Katharine Gerst, #36999, "*Implementing a regional phenology network: The California Phenology Project*", has been scheduled for:

Contributed Oral Session 193: Phenology

Date: Friday, August 10, 2012

Time: 9:20 AM

Location: Portland Blrm 257, Oregon Convention Center

Background/Question/Methods

The California Phenology Project (CPP) was established in 2010 to develop and test monitoring protocols and infrastructure to support a long-term plant phenological monitoring program in California. The CPP is in its second year of data collection and has established over 100 sites in seven pilot National Park units (Santa Monica Mountains NRA, Joshua Tree NP, Golden Gate NRA, John Muir NHS, Sequoia and Kings Canyon NPs, Lassen Volcanic NP, and Redwood NP). These parks represent a range of desert, mountain, and coastal ecosystems. In 2011, the CPP monitored over 650 individual plants across the seven pilot parks, recording over 10,000 observation records and over 70,000 phenophase records. These phenological records will improve our understanding of how plants respond to environmental variation and ultimately inform decision-making by natural resource managers.

Results/Conclusions

Here, we present three preliminary examples of how these records can be used to describe the relationship between phenological patterns and environmental variation at different spatial scales. First, we present leaf phenology data for the widespread tree species, *Populus*

tremuloides, and demonstrate how data collected in California relate to patterns across the United States. Second, we show how flowering phenology of the chaparral shrub *Baccharis pilularis* varies along a latitudinal gradient within California. Finally, we show how flowering of the desert shrub *Larrea tridentata* varies along an elevation gradient within one park. Based on these data, we also identified phenophases that may be particularly useful or problematic for each species, allowing us to refine monitoring efforts for the second year of data collection efforts. These preliminary results will allow the CPP to identify gaps in current monitoring efforts and to better direct future monitoring resources on both temporal and spatial scales. Importantly, these data provide baseline information on plant phenological patterns which we will use to gauge future phenological change.

Elizabeth Matthews, Building a phenological monitoring network in California as a model for the nation

Contributed Oral Session 193- -Phenology

Date: Friday, August 10, 2012

Time: 9:00 AM

Location: Portland Blrm 257, Oregon Convention Center

Background/Question/Methods

Phenology is the study of seasonal biological events such as flowering, leaf-out, insect emergence, and animal migration. Many long-term observational studies have documented that phenological patterns respond to environmental variation and climate change. To assess the potential effects of climate change on California's biodiversity and natural resources, the National Park Service (NPS), the Phenology Stewardship Program at the University of California, Santa Barbara (UCSB-PSP), and the USA National Phenology Network (USA-NPN) established The California Phenology Project (CPP) in 2010. The CPP (www.usanpn.org/cpp) is a three-year pilot project, whose primary goals are to develop and test protocols and to create tools and infrastructure to support long-term phenological monitoring and public education activities in California national parks. Longer-term the CPP will aim to: (1) engage and educate people of all backgrounds and ages in the study of phenology, (2) detect how phenology is linked to climatic conditions that vary over time and space in California, and (3) provide data to support stewardship of wildland ecosystem.

Results/Conclusions

To this end, the CPP has developed a scientific framework and identified scientific questions to guide monitoring efforts across all NPS units in CA, selected a variety of focal plant species, and established monitoring infrastructure in seven pilot parks that represent a range of bioclimatic regions in the state (e.g., semiarid desert, coastal and montane). Focal species were selected based on their ability to address scientific questions of interest and to engage Citizen Scientists; they include native and non-native species, widespread and endemic species, and species of local management concern. The CPP is also adapting and testing standardized phenology monitoring protocols developed in conjunction with USA-NPN for tracking phenological status of 25 common plant species across key environmental gradients (e.g., latitude, elevation, and precipitation gradients). The CPP seeks to build a large phenological monitoring network across the state by working with a wide array of volunteers and other partners including the University of California Natural Reserve System, Naturebridge and the California Native Plant Society. In 2011, CPP observers contributed over 70,000 phenological records to the USA-NPN National Phenology Database. The CPP is being designed and implemented as a potential model for replication across other NPS units or regions, as well as other protected areas, across the nation.

FT 12 - Citizen Science Showcase at Forest Park

Tuesday, August 7, 2012: 5:30 PM-8:30 PM

Martin Luther King Jr., Lobby-ticket booth area, Oregon Convention Center

Organizers: **Alyssa Rosemartin** and Marion Dresner

Trip Leader: Kerissa Fuccillo

Portland Budwatch's publicly accessible observation trail in Forest Park, Portland is a great example of how to implement the USA-NPN's Nature's Notebook program on the ground. We'll walk along the trail, viewing customized signage, and using data sheets and mobile apps to collect and submit phenology data on pre-marked plants. The trail runs through gorgeous temperate rainforest habitat, along a creek with native salmon and trout.

Registration Fee: \$40

Equipment and Attire: The trail has gentle ups and downs and the walk will be a total of 2 miles. Bring a snack and something to drink. You might also consider bringing binoculars or a hand lens.

Itinerary: 5:30 PM: Leave Oregon Convention Center for Forest Park Entrance at NW 29th Ave & NW Upshur ST 5:45 PM: Enter Park, walk to phenology trail, make observations 6:45 PM Snacks and discussion near Park pavilion 7:30 PM - Leave Park to return to Convention Center

USA National Phenology Network Brown Bag Lunch

Wednesday, August 8, 2012: 11:30 AM-1:15 PM

VIP B, Oregon Convention Center