



Stakeholders Workshop Report

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USA National Phenology Network Stakeholders Report

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EXECUTIVE SUMMARY

The USA National Phenology Network (USA-NPN; hereafter “Network”) is a national biological science and monitoring initiative intended to organize and centralize spatiotemporal phenological data and information. The Network functions as a partnership between federal agencies, the academic community, and the general public, and brings together citizen scientists, government agencies, non-profit groups, educators, and students of all ages to monitor and record their phenological observations of plants and animals in the United States. Through the accumulation and analysis of daily observations of the natural world, the Network will facilitate an understanding of how plants, animals, and landscapes respond to environmental variation and climate change.

The Network could not succeed without the support and participation from its partners, stakeholders, citizens, and society as a whole. To better understand and serve their needs, the National Coordinating Office (NCO) of the Network hosted a workshop in September 2010 to determine stakeholder needs, establish strategic directions, and maximize opportunities for partnership and collaboration. Fifty representatives from key stakeholder groups participated in the workshop, including scientists, educators, natural resource managers, representatives of public agencies, nongovernmental organizations (NGOs), specialized networks, and Native American tribes.

The perception of the current status and future directions of the Network was generally very positive. The National Coordinating Office (NCO) of the Network was described as inclusive, flexible, and open to ideas. The NCO efficiently and transparently coordinates the development and promulgation of rigorous science-based monitoring methods and standards for adoption by a variety of organizations, provides important data management services for the Network, and has created an on-line, multi-taxa monitoring program embodied in *Nature’s Notebook* that is seeing increased use across the nation.

Although participants recognized the high productivity of the Network and the NCO since its inception in 2007, they suggested a number of improvements focused on strategic planning, communications and marketing, and identity. For example, the NCO should develop a data stewardship and sustainability plan that includes assurance and control of data quality. In addition, the Network should develop strategic plans for education activities, outreach, marketing and communications. Stakeholders also requested better differentiation among the activities of the Network per se, the NCO, and *Nature’s Notebook*. Last but not least, the Network can serve as a focus or impetus for the development of specific communities of practice related to data management, monitoring protocols, citizen science program development, network operations, education and outreach, provision of information for planning and adaptation to environmental variation and climate change.

In sum, the workshop and discussions therein provided critical information that helped the NCO better understand stakeholder needs across the entire spectrum of the Network. This information is already being used to contribute to the development of the Network.

INTRODUCTION

Importance of Phenology

Phenology is the study of recurring plant and animal life cycle stages such as leafing and flowering of plants, maturation of agricultural crops, emergence of insects, and migration of birds. Many of these stages are sensitive to climatic variation and change, are relatively simple to observe and record, and are vital to the public interest. As described by an international group of interdisciplinary scientists, “Phenology...is perhaps the simplest process in which to track changes in the ecology of species in response to climate change.”¹

Although phenology is an integrator of environmental science, its role as a driver and regulator of ecosystems structure and functioning is poorly understood. Critical questions include how environmental factors, such as climate and hydrological processes, affect the phenology of different species and species interactions, and how these factors vary in importance on different spatial and temporal scales. Moreover, we need to know how phenology affects the abundance and diversity of organisms, their ecological functions, and their effects on fluxes in water, energy, and chemical elements at various scales. With sufficient observations and understanding, phenology can be used as a predictor of important ecological processes at local to global scales, and can drive a variety of ecological forecast models with both scientific and practical applications. Phenological information can be used to detect and, ultimately, predict wildfire and allergen activity, inform the timing of festivals, as well as shed light on shifts in species distributions, declines in abundance of native species, spread of invasive species, and changes in carbon cycling in forests.

The detection, attribution and predictive potential of phenology data require a new data resource: a national network of integrated phenology observations and the tools to access and analyze them at multiple scales. The USA National Phenology Network was developed to perform these critical functions.

Overview of the USA National Phenology Network

The USA National Phenology Network (USA-NPN; hereafter “Network”) is a national biological science and monitoring initiative intended to organize and centralize spatiotemporal phenological data and information. The Network functions as a partnership between federal agencies, the academic community, and the general public, and brings together citizen scientists, government agencies, non-profit groups, educators, and students of all ages to monitor and record their phenological observations of plants and animals in the United States. Through the accumulation

¹ IPCC, 2007. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

and analysis of daily observations of the natural world, the Network will facilitate an understanding of how plants, animals, and landscapes respond to environmental variation and climate change.

The vision of the Network is to encourage people of all ages and backgrounds to observe and record phenology as a way to discover and explore the nature and pace of our dynamic world. The mission of the network is to serve science and society by promoting broad understanding of plant and animal phenology and its relationship with environmental change.

Phenology information, tools, and methodologies developed by the Network are freely available and are being used by research scientists, land resource managers, decision makers, educators and outreach specialists, communication and media specialists, non-profit organizations, human health organizations, science and monitoring networks, specialized networks and thousands of U.S. citizens across the nation. The phenology data, models, and related information available through the Network have great potential to empower scientists, resource managers, and the public in decision-making and adapting to variable and changing climates and environments.

USA-NPN National Coordinating Office

The efforts of the Network are organized through a National Coordinating Office (NCO), established in 2007 at the University of Arizona with support from the U.S. Geological Survey. The NCO has developed an information management system, a national phenology monitoring system for plants and animals, an Internet-based reporting system, key collaborative partnerships, and education/outreach materials. In addition, the NCO facilitates research and the development of decision support tools for human adaptation to climate change.

***Nature's Notebook* and other Web-based tools and online services**

A key feature of the Network is the development of an online interface for phenology monitoring called *Nature's Notebook*. Data collected using this interface follow the Network's national phenology monitoring standards and are submitted to the national phenology database maintained by the NCO. This database includes monitoring standards and methodologies for over 500 key plant and animal species nationwide. To date, over 3,000 people – mostly members of the public – have registered as participants and have submitted online almost 500,000 observations on plant and animal phenology. Real-time data and associated metadata from *Nature's Notebook* are now available online. Other Web-based tools and online services provided by the Network include a metadata editor for registry of historic datasets, a phenology data set search tool, an educators' clearinghouse, a bibliography of phenology publications, a decision-tree for prospective partners, a searchable database of other phenology observation programs, training resources, and a media center.

DESCRIPTION OF THE USA-NPN STAKEHOLDERS WORKSHOP

Purpose

The Network could not succeed without the support and participation from its partners, stakeholders, citizens, and society as a whole. To better understand and serve their needs, the NCO hosted a two-day workshop on September 21-22, 2010 in Milwaukee, Wisconsin. Support for the workshop was provided through a National Science Foundation (NSF) Research Coordination Network Grant. The purpose of the workshop was to determine stakeholder needs, establish strategic directions, and maximize opportunities for partnership and collaboration.

Participants

Fifty representatives from key stakeholder groups participated in the workshop, including scientists, educators, natural resource managers, representatives of public agencies, nongovernmental organizations (NGOs), specialized networks, and Native American tribes. The participant names and affiliations are in Appendix A.

Logistics

The workshop agenda and materials for participants were developed by a Steering Committee that included a professional workshop facilitator, Leni Wilsmann, of Conservation Impact. Prior to the meeting, workshop participants were encouraged to visit the Network website (www.usanpn.org) to become familiarized with the most up-to-date information and relevant reports and documents. Participants were also provided the link to the workshop's meeting website to download the agenda and other reading material (www.usanpn.org/rcn-2010).

The workshop itself started with two presentations that provided a review of current phenology science and applications, and an overview of the Network progress to-date. The remainder of the workshop focused on three sessions: (1) assessment of the current status and future directions of the Network; (2) discussion of emerging topics which participants identified at the workshop; and (3) discussion on the needs, contributions, and collaborative opportunities from an organizational perspective (Appendix B).

To maximize discussion and participation by all individuals, each session had seven breakout groups each with an average of seven participants. Participants were pre-assigned to breakout sessions (1) one and three. After listening to the participant discussions on the first day, the Steering Committee decided that the participants should have additional opportunities to identify emerging topics and so moved session two to the final afternoon. Participants selected emerging topics breakout groups based on a list of emerging topics developed and prioritized by the entire group at the workshop (Appendix C).

Before the workshop, the Steering Committee developed a series of questions for each of the three sessions (Appendix B). A paper copy of all the session questions was handed out to each participant at the meeting, and an electronic copy was provided to a representative of each breakout group. Breakout groups were asked to select a facilitator and recorder and they were asked to capture their notes electronically in the thumb drive provided and submit them to the workshop organizers at the end of their discussions.

At the end of each session, the breakout groups reconvened in the main workshop conference room. For the first session, a round-robin approach was used to gather input from the breakout groups, whereas during the other two sessions each breakout group presented their most salient points to the main audience. The four sections of this report below highlight the major and common issues presented by the breakout groups for each of the three workshop thematic sessions.

Towards the end of the workshop on the second day, participants generated an additional list of key issues that had been identified throughout the workshop (Appendix D). Through a vote, participants prioritized the top three issues as:

1. Defining relevance of the Network through more examples of how phenology affects everyday life, especially health and economics (23 votes)
2. Using phenology data for decision-making (22 votes)
3. Driving data collection toward important issues using complementary data collection on a variety of taxa, e.g., to assess ecological interactions (15 votes)

PARTICIPANT ASSESSMENT OF CURRENT STATUS OF USA-NPN

Workshop participants were asked to provide an assessment of Network activities based on the presentations at the workshop, their experiences with the Network, and their review of relevant documents including the 5-year strategic plan. The following sections address the responses to questions about (1) what is working well, (2) what is not working well or needs improvement, and (3) what is missing or needs clarification (see Appendix B).

Participant assessment of what is working well

- Willingness to be inclusive, flexible, and open to ideas
- Development of rigorous monitoring methods that others can use
- Development of *Nature's Notebook*, an on-line, user friendly, national phenology monitoring system
- Establishment of the Network National Coordinating Office (NCO)
 - engages a wide range of partners
 - identifies common problems and solutions across diverse partners and clients

- responsive to requests
- sensitive to and avoids reinventing existing framework and existing capabilities
- develops and provides access to communication materials that are clear and well-presented
- Ability to be a network and pull different groups together
- Provide one-stop shop for phenology, including a communication hub for phenology-related topics
- Serve as important role for organizations that do not want to manage their own phenological data
- Recognition of the uniqueness of partner perspectives and relationships
- Provide cyberinfrastructure and a rich Web interface
- Exploration of emerging technologies for data input and data dissemination
- Serve as focal point for organization and coalition building, including building partnerships and identifying groups interested in phenology
- Dissemination and standardization of protocols
- Coordination of networking meetings which contribute towards building a coalition of organization and communication among partners

Participant assessment of what is not working well or needs improvement

Data Management and Planning

Better data management and planning needs to be established. This includes developing a stewardship plan, establishing a quality assurance/quality control (QA/QC) plan, better integration of biotic and abiotic data, and establishing a legacy data management plan. This also includes helping the community overcome data-sharing obstacles and defining the relative roles of the NCO in terms of serving as a data clearinghouse and/or data repository.

Education Program Development

A better educational program development plan needs to be established. There are a number of opportunities to engage youth and to provide formal and informal educational opportunities to groups at the national level. The plan should include a needs assessment to better identify gaps in educational opportunities related to phenology at a national scale.

Better Communication with Partners

Participants suggested that communication with partners needs to be improved. This includes establishing regular communications with partners (e.g., through teleconferences, newsletters, forums), targeting communication by partner, providing regular updates on activities, developing project-specific interactions with citizen observing projects, and increasing two-way communication with partners. Participants emphasized that the NCO should not compete with its partners for participants or data and that it should not duplicate existing efforts but should instead complement, or dovetail into, those existing efforts. The NCO could consider the development of audience-

specific fact sheets and success stories for promoting the Network, and should engage partners in this activity where possible. Participants also proposed that a survey of the Network's partners would not only help build a two-way communication system, but would also help focus the efforts and prioritize what the Network should tackle first in terms of plant and animal data as well as phenology-related information.

Better Identity for the Network and *Nature's Notebook*

Participants indicated that the Network needs to better establish its identity and correspondingly its legal status as an organization. Along these lines, participants also suggested that the Network needs to better articulate its relationship with *Nature's Notebook*. Some proposed suggestions included developing a separate identity for *Nature's Notebook*, which could entail separate marketing, Web redesign, and/or a separate website for the program.

Improved Training Resources

Participants asked the NCO to develop shorter and more concise training resources for *Nature's Notebook* and other online tools. Although the Network has several online training courses available, these need to be shortened to meet the needs of its stakeholders.

Participant assessment of what is missing or needs clarification

Demonstrate Usefulness of Phenology Data

Workshop participants indicated that the NCO needs to better describe how phenology data are useful for research, management, and decision-making. Participants suggested the Network could better define its relevance to society by providing more examples of how phenology affects everyday life, especially human health and economics. However, results and success stories need to be clearly communicated to both scientific and non-scientific audiences. To improve communication and engagement, participants proposed better visualization tools, such as interactive and near-realtime maps, to allow data providers and observers immediate feedback on the value (within a larger context) of their individual contributions. In addition, the NCO could better demonstrate the value of phenology information by developing analytical tools to manipulate, explore, and analyze the data.

Participants acknowledged that existing programs developed by the NCO focus on collecting organismal-scale plant and animal phenology data using standard methods at sites across the nation. Participants suggested leveraging this strength by driving data collection towards ecological interactions (e.g., campaigns targeted at plant-pollinator interactions or relationships between predators and prey).

Assessment of Partner Needs

Participants suggested the NCO conduct an assessment of partner needs and develop a prioritization process for meeting those needs. Some of the mechanisms proposed by the participants for the needs assessment included conducting a survey of partner needs, developing partner services tools,

targeting audience materials, ensuring attribution and description of partner involvement, and refining tools to direct website users to available resources. Because the Network is relatively new, some of the workshop participants could not determine whether the Network has been meeting partner needs. However, it was suggested that by conducting an assessment now, it will help later determine whether partner needs are being met. Along these lines, participants suggested the NCO provide a better definition of “citizen science” and broadly communicate this definition, as well as identify and prioritize markets including the data user and the data provider.

Gap Analyses to Define Observer Markets and Data Needs

Workshop participants suggested the NCO conduct a gap analysis to identify groups of people who could be participating in phenology observation programs. A separate gap analysis could be used to determine which plant and animal species are not yet on the Network’s standardized protocol observation list, but for which data are needed, particularly in the context of the work already being conducted by partners.

Develop Marketing and Business Plans

A comprehensive marketing plan should be established to highlight what the Network has to offer and how the Network plans on garnering participation to collect data. In addition, a business model and plan needs to be developed to establish and communicate the need for the sustainability of the Network.

Develop Targeted Campaigns

The Network should consider developing targeted campaigns, termed “flagship campaigns,” to demonstrate the value of phenology data and to enable the Network to become more visible and recognizable. These targeted campaigns would be particularly effective if coupled with activities, projects or campaigns planned or already underway by Network collaborators.

CHALLENGES, ISSUES, AND OPPORTUNITIES

Workshop participants identified several current and future (i.e., 5-10 year) challenges, issues, and opportunities for the Network as it seeks to create an effective and sustainable network (Appendix B). While some of these have already been identified in the previous section, the discussions below explore these ideas in greater depth or have different sets of ideas.

Rapid Growth

Although participants recognized that the Network has been very productive in a short period of time, they cautioned it not to become too broad too quickly and highlighted the potential for mission drift. Participants suggested that the Network specialize rather than generalize its efforts by

focusing on questions and issues important to society and that fit the Network's mission and capabilities.

Participants encouraged the Network to reconcile potential competition with other citizen science observation projects. The Network should be sensitive to duplication of efforts (e.g. *FrogWatch* and *Nature's Notebook*), and avoid requesting that volunteers make the same observations with two different protocols (e.g., *Project Budburst* and *Nature's Notebook*). Reconciling the potential for competition would ease relationships with partner organizations and avoid confusing or alienating potential observers and funders.

One model for growth of the Network is to *a priori* identify data gaps and develop programs to fill those gaps. Under this model, the Network would need to communicate whether it intends to build its own community of observers, or tap into existing communities to achieve critical mass of contributors, and whether it intends to link to existing broad-scale ecological initiatives like the Landscape Conservation Cooperatives (LCCs). Workshop participants suggested that the Network develop a plan for short- and long-term wins for research and management applications. Within this framework, the Network can explore opportunities to capitalize on new available infrastructure (e.g., Climate Science Centers and LCCs), and be the conduit for articulating user needs.

Network Identity

A recurring theme expressed by the workshop participants was that the Network needs to establish and define its identity in terms of structure and governance. Although the Network receives base support from the USGS, it also garners financial support from other partners (including federal and non-federal sources). Clarifying and communicating its identity and its legal status will help partners understand its role, help establish its credibility and the legal limits to its actions, and help determine how the Network can better serve its partners.

In addition, a determination of identity will help resolve uncertainties about diversified funding opportunities the Network can pursue. This will help the Network determine whether it can pursue federal funding sources, in-kind contributions, or grants from either federal and foundation sources. This issue is increasingly critical as the competition for funding increases. The Network could also explore its role in the re-organization of federal agencies to accommodate climate change emphasis, potentially including the creation of Phenology Cooperative Ecosystem Study Units (because CESUs are topically rather than regionally organized USGS units). To clarify all of these elements, the Network was encouraged to develop both business and financial plans.

Data Quality, Synthesis and Integration

Maintaining data quality was identified as another major challenge for the Network. The stated vision of the Network is to encourage people of all ages and backgrounds to observe and record phenology. In this role, the Network must ensure that the data entered and ultimately made

available to the public domain remain credible, especially if it to be used for decision-making purposes. One approach to improving data quality may be to identify observers by skill level, from beginner to expert. Regardless, a data quality assurance/quality control plan should be prepared for *Nature's Notebook*.

Synthesis of biological and physical data were considered to be both a challenge and an opportunity for the Network. Linking physical changes to biological responses requires considerable effort from both data collection and scientific analysis points of view. At the same time, this undertaking is critical for illustrating important linkages between phenology and changing environmental conditions, another challenge identified by the workshop participants.

Stakeholder Relationships

Maintaining strong stakeholder relationships was another challenge identified by workshop participants. While most participants agreed that the Network does an admirable job communicating, coordinating and collaborating with a broad variety of stakeholder groups, the maintenance of these relationships may require large investments of staff time. Engaging formal and informal education groups at the national level, while connecting to professional societies and non-traditional groups is a challenge that also presents numerous opportunities. For instance, the Network could garner support and participation by engaging the National Science Teachers Association or the Nature Explorers Classroom Network.

ORGANIZATIONAL PERSPECTIVES

During a session of break-out groups, workshop participants were grouped by type of organization and asked to discuss needs, contributions, and collaborations from the perspective of their sector (Appendix B). The sections below combine all of the discussions that emerged from the stakeholder groups for each question.

Information, services, and tools needed from the USA-NPN

Delivery of Phenology Information

Workshop participants suggested the Network provide and interpret phenology information in meaningful ways for different audiences, including university researchers, the press, policy-makers, and the general public. Participants envisioned the dissemination of this information through outreach efforts, data visualization, interactive decision support tools, spatial products, fact sheets, information on particular species, standardized protocols, and by providing specific information on a species of interest.

Data Management and Integration

Participants suggested the Network consider provision of services for long-term repository of data sets. This is critical because many research institutions do not have the capacity to maintain or catalog long-term data records. Participants suggested that this could also include serving as the repository of other program data (e.g., The North American Bird Phenology Program), as well as the curation of legacy data. Workshop participants also suggested that the Network help develop methods to facilitate rescue and storage of historical data sets that may contain different types of data in terms of source, method, and format. The Network can leverage existing data resources by piloting data integration, with appropriate versioning and documentation as well as context (e.g., stories, applications). There is also an opportunity for integration of ground observations with other types of data, including climatological and remotely sensed data. Regardless, data should remain neutral, be freely and readily available, and policies for data use should be established, documented and distributed.

The Network should determine and define to what extent it will be serve as a data repository. This role will define the bounds of responsibility associated with such an effort, including ingesting legacy data sets, overcoming a variety of data formats (i.e., data catalogs, metadata), establishing spatial scales, establishing financial commitment of agencies, providing a long-term link to other programs (e.g., Ocean Data and Information System (ODIS), National Biological Information Infrastructure (NBII)), providing links to national archives (e.g., National Climatic Data Center (NCDC)), and being a model for data storage and cataloging for organizations.

Partner Case Studies

Participants in the breakout groups suggested that the Network develop case studies of how partners are contributing to and using Network resources. These examples could lead to a community of best practices, increasing the level and quality of involvement and strengthening participation across a variety of data provider and data user groups. A demonstration of value-added partner contributions would show the relevance of the Network and enhance its sustainability.

Partner Communication

Participants requested a list of frequently asked questions, e.g., through a user forum, that would include answers to broad questions about climate change. The Network could refine its presentation of materials and certain aspects of methods to meet specific user needs, and could package outreach materials and relevant stories about iconic species in dominant habitat types, as well as target particular audiences. Transparency in communications with partners was also emphasized, e.g., by sharing funding opportunities, providing a listserv, or developing tools or methods for regular partner engagement.

Consulting Services for Project Monitoring

Participants suggest that the Network and its NCO could act as a consultant, or serve in a technical advisory role, for agencies on issues related to study design, data management, and protocol

development. Participants also suggested the NCO could answer resource management questions, or that it could identify appropriate research questions related to phenology and climate models. For example, the NCO could develop a collaborative process to determine what species and interactions need to be monitored to support relevant questions or issues.

Partner Coordination

The Network is well positioned to identify synergies between various partners or stakeholders who are collecting or using similar or complementary data. Participants suggested that the Network website could include a clearinghouse for existing programs, e.g., by developing a tool to allow potential observers or organizations to search for a program or project most appropriate to their needs.

The Network can also provide a platform for the sharing of data that allows for attribution to data collectors as appropriate. Participants suggested that the Network could promote partner projects that produce phenology data, either online or through presentations at conferences. Web-based tools that enable integrated (or at least joint) analysis or visualization of data from *Nature's Notebook* and data collected by Network partners would demonstrate the value of cooperation and collaboration across the Network.

Phenology monitoring can be an important value-added component for existing nature-related programs where phenology is not currently a focus (e.g., The Arbor Day Foundation). Participants suggested that the Network develop a strategy to close the gap between traditional science and citizen science, e.g., by facilitating connections between scientists, partner organizations, museums, and schools.

Science Support and Decision Making

Participants indicated that the Network could improve its relevance to society through the provision of support for science and decision-making. First, the Network is well-situated to serve as a platform and framework for government projects requiring *in situ* information from citizen scientists. For example, data from the Network could be used for calibration or validation of satellite imagery. Second, the Network could focus its monitoring program on priority species for state and federal programs, species that are critical to decision-making, or species that have a human dimension. Third, although economic incentives may be necessary, the Network could consider cultivating relationships with private landowners. This could include helping resource managers develop environmental incentive programs to encourage landowner participation in monitoring specific priority species that are used for decision making purposes. For example, landowners could monitor the phenology of ground-nesting birds to inform decisions about mowing times. Fourth, the Network can play a supportive role for data end-users, by helping them learn how to access or use different types of data, as well as understand relative levels of uncertainty.

Educational Tools and Activities

Workshop participants indicated that the Network is well positioned to provide educational tools and activities for groups of all ages, from K-12 to college students and senior citizens. This includes educational tools and activities focused on how to collect data and why phenology is important. A strategic plan for education activities related to phenology would help define and prioritize opportunities for the Network. Collaborations across the Network could also be an appropriate approach to leverage on resources available across the network.

Integrated Early Warning Systems

The Network could invest in the development of early warning systems or monitoring programs (e.g., forest threat assessment, pollen early warning systems), or simply develop as more of a resource for informing vulnerability assessments at different scales. The Network could integrate information across ecoregions (e.g., in collaboration with the new Climate Science Centers or Landscape Conservation Cooperatives) to compare and contrast trends across different jurisdictions. This would require close collaboration with several federal agencies (e.g. BLM, USFS, FWS, NPS monitoring programs).

Advancing Collaborations

Stakeholders identified the following activities where the Network can advance the work that is being addressed collectively or collaboratively in the different sectors:

Strategic Observer Recruitment and Retention

Participants acknowledged that although the Network has accomplished many things in a short period of time, they indicated that it would be important to develop a strategy for managing its observers who participate via *Nature's Notebook*. The Network could establish project-focused observational recruitment efforts including strategies for long-term observer recruitment and retention.

Priority Species Expertise

Participants felt that the capacity and expertise of the Network could be used to help inform priority species for decision-making, including providing easy search tools for particular species, interactions, and information. A suggestion was to work with state and federal agencies and large scale partnerships (e.g., State Wildlife Action Plan coordinators, Joint Ventures, LCCs, and the National Fish Habitat Action Plan) to identify which species should be added, identify what data are available, and recommend the foci for species/interactions.

Standards Development

The Network is already developing standard protocols for monitoring and recording phenological observations. Participants suggested a collaborative approach to developing standard operating procedures, formal protocols, consistent definitions and terminology, and tools and techniques for

data analyses. As definitions are standardized, the Network should ensure these are user friendly and accessible to all stakeholders.

Data Validation

Participants felt that the Network is ideally positioned to lead the efforts for ensuring that data has been validated and that quality control and quality assurance checks have been conducted. Due to limited Network resources, participants recommended that partners also perform some validation of data or assign this to their constituents.

Communication, Coordination, and Collaboration

Stakeholders identified the following expected levels of interaction between the Network and the different organizations:

Communication Among Network Participants and Diverse Audiences

Participants proposed that the Network is ideally suited to serve as a phenology communications conduit for diverse audiences. Participants recommended a series of different activities that the Network could offer, including: (1) providing forums for different sub-networks (e.g., e-mail lists); (2) highlighting upcoming events and activities to provide advance notification for partners so they garner support from their constituents; (3) serving as the nexus from which collaboration happens, to include communicating frequently, clearly, and transparently with partner organizations and supporting joint funding opportunities; (4) developing newsletters, including ones customized for different groups; (5) creating a phenology day/week to highlight phenology activities and studies; (6) providing metadata access on relevant programs (e.g., partner fact sheets and case studies); (7) providing validation and recognition of citizen scientists (since some may not consider their collected data as being “good” data); and (8) creating national-scale research questions or flagship projects that groups can rally around.

Facilitation of Information Exchange

Workshop participants recommended that the Network serve as a facilitator and advisor to establish a process, dialogue, or two-way communication for those that use phenology data (e.g., managers and planners). For example, the Network could encourage the use of phenology data to inform private landowners on how and why to change land management practices. Similarly, the Network could facilitate the exchange of information on phenology and climate models, including integration of biological and climatological data.

Participants suggested that the Network could work with other national initiatives (e.g., Landscape Conservation Cooperatives, the National Climate Change and Wildlife Science Center and accompanying Climate Science Centers, Inventory and Monitoring Programs managed by the National Park Service and Fish and Wildlife Service) to prioritize phenology projects or to provide assistance developing competitive projects for these initiatives. In this capacity, the Network could encourage data sharing and integration, whereby broad data sharing could lead to higher quality

data management and data storage behaviors as well as raise awareness of the significance of phenology. Workshop participants also suggested that the Network serve as a conduit for identifying the appropriate citizen science programs, recruit volunteers, and initiate other activities to encourage phenology monitoring.

Communities of Practice for Network Stakeholders

Workshop participants suggested that the Network develop a platform to allow for searching and networking among partners for different types of activities. This would enable partners to identify one-another to minimize overlap and to maximize opportunities for communication, coordination and collaboration. Further, such a platform would facilitate the development of communities of practice, and it could lead to the development of toolkits for organizations monitoring similar events and targeting similar audiences to help share ideas and ways to address specific challenges. Finally, this platform could be searchable by region and or theme and could include a directory of projects, periodic workshops or webinars, and annual or biannual national and regional meetings.

EMERGING TOPICS

Participants were asked to identify “emerging topics” that should be considered by the Network as it develops. The full set of topics suggested by the participants is listed in Appendix C; from this list, workshop participants worked collectively to select six topics for additional discussion within break-out groups: (1) observer markets, (2) formal and informal education, (3) data sustainability, (4) flagship projects, (5) short-term demonstration project, and (6) landscape-scale management from a federal agency perspective. A summary of each break-out group discussion or activity is provided below.

Observer Markets

Participants identified the three most important individual observer market segments to the Network as: (1) outdoor hobbyists including gardeners, native plant enthusiasts, invasive plant groups, butterfly enthusiasts, and birders; (2) hunting and fishing enthusiasts; and (3) resource managers, including natural resource agencies, organizations, and their employees. Workshop participants suggested individuals within each market segment might be interested in contributing phenology information for a variety of reasons:

Outdoor Hobbyists are motivated by personal passion, would like to add meaning to existing interests and practices and work to develop community and social interaction around shared interests.

Hunting and Fishing Enthusiasts are motivated to perpetuate the hunting and fishing opportunities they enjoy; by participating in phenology monitoring may contribute information and understanding for their immediate or later benefit.

Resource Managers are particularly interested in the availability of Standard Operating Procedures for monitoring; in addition, they need consistent guidelines and tools that can help answer questions and may be interested in packaged opportunities for participation. This group sees the value of not having to reinvent infrastructure.

Participants recognized that the Network depends on these and other market segments for data, sustained participation, and large numbers of participants. In turn, they recognized that the Network is interested in providing a number of services to this market segment, including increasing awareness, providing learning opportunities, tapping into existing knowledge and expertise, and promoting stewardship and conservation action.

Participants identified a number of strategies for engaging, developing, and retaining active participants across these primary market segments:

- Find partners that already engage and work with these constituencies – take advantage of existing social networks to recruit participation, both from groups and individuals
- Provide template materials for specific audiences and their interests based on the input from partners and known interest groups; develop presentations and materials that can be customized
- For resource managers, present the program as a solution to their monitoring mandates by making it easy to implement locally
- Provide up-to-date information and technology tools to enable participation by a variety of users
- Provide feedback to project participants; feedback helps observers understand the value of their particular contribution and provides opportunities for growth that appeal to the interests of the various market segments

The participants of this breakout group identified *eBird* and the Avian Knowledge Network (AKN) as the best examples of a networked data-development organization that performs a good job of engaging, developing, and retaining network partners. It was suggested that one of the reasons for the success of *eBird* and AKN was because they create opportunities for participation that appeals to individual interests rather than to altruism, the latter of which only garners ongoing participation from a limited group of people.

Formal and Informal Education

Workshop participants identified and described a market for formal and informal education including: (1) K-12 educators, (2) non-formal educators, (3) programs for educators, and (4) youth contributors. These groups could benefit from a number of services provided by the Network, including:

- Database or data entry infrastructure for new projects
- Gap analyses for different phenology education resources
- A clearinghouse of information for network members (with an attractive landing page) including a topical listing of projects with featured projects on home page. To do this, the NCO would collect metadata from projects, or create infrastructure to allow projects to register themselves; in turn, projects would list themselves as members of the Network on their own websites.

The group suggested that the NCO reach out to educational organizations and re-engage working groups to: (a) report on data that are relevant to students and educators, (b) report on outreach impacts, and (c) provide descriptions of projects that are appropriate for different age groups.

This market segment brings many important elements to the table, including education resources, networks of educators, future citizens and scientists, links to Science, Technology, Engineering and Mathematics (STEM) education funding, and important citizen science projects focused on children and learners of all ages. Break-out group participants also suggested that good collaboration with the educator community would ensure that projects are age appropriate. In addition, they suggested that non-formal groups bring diversity to projects, which can add experience to learning as well as engage families and underrepresented groups.

The Network and the educator community can strengthen their relationship by establishing working groups; facilitating linkages between projects; collecting, compiling, and disseminating metadata on projects; and co-developing a strategy for funding, which includes writing proposals and providing letters of support.

Data Sustainability

Participants noted that the NCO should work to develop data sustainability through data stewardship planning. The critical elements identified for a sustainable data system included: (1) analytical tools and APIs to enhance access and use; (2) backup systems and estate planning; (3) quality control systems that combine automated and human (i.e. crowd-sourcing) review and documentation; (4) data use/attribution policy that gives credit to data contributors and organizations; and (5) incentives to encourage funded projects to use the Network's data repositories.

A number of organizations and agencies were identified as good examples of a successful sustainable data network, including: ORNL DAAC, Ameriflux/ARM, ICPSR, GBIF, NatureServe, NCEAS, and AKN. Participants suggested that automation or outsourcing could be employed to reduce operating costs, and that sources of revenue for continued data management, aside from agency support or an endowment, could include subscriptions for the provision of value-added products.

Flagship Projects

Participants from this emerging topic breakout proposed four flagship projects that the Network could launch to maximize its effectiveness and sustainability:

- *A National Phenological Assessment (NPA)*: Although the scope of an NPA has already been defined and proposals have been submitted to competitive grants programs, participants felt that the Network should continue to seek these competitive grants opportunities and pursue a parallel but more political route. Participants suggested the Network develop a glossy prospectus to describe and justify the NPA; the prospectus could be vetted among Network partners to maximize buy-in and participation and could be submitted as an appropriations request.
- *Improved understanding of the end of the season*: Participants felt that the majority of research and education/outreach efforts are focused on the start of the growing season (i.e., spring), and that as a result the end of the growing season has been understudied in phenological science. One proposed corrective measure is to promote a national effort to record autumn phenology (e.g., with a focus on trees, crops, and grasses to get at the timings of coloring, senescence, and leaf abscission).
- *National one-day or short-term campaigns*: Participants suggested that the Network could develop short-term campaigns to ask observers to contribute well-defined simple observations on a critical day in the spring or the fall. Participants proposed mapping observations to show the power of high-density observations, further commenting that this would be a powerful public relations medium.
- *Allergen phenology campaigns*: Because the Network is already participating with the NASA Juniper Pollen Project, participants suggested that the Network enlist partners to help advance this project. The Network could also promote the value of phenological observations in forecasting pollen production and transport for the most problematic allergens, and perhaps establish targeted campaigns focused on phenology of allergenic species on local, regional or national scales.

Short-term Demonstration Projects

Workshop participants in this break-out group selected phenology-pollinator gardens as a short-term demonstration project to showcase the national infrastructure of the Network. A number of similar, already established projects were identified. However, participants identified research questions that could be used to justify the development of a national network of phenology-

pollinator gardens, including, for example: (1) what is the relationship between plant population and plant community phenology and pollinator visitation and pollination success?, and (2) what are the spatial and temporal patterns of pollinator abundance and diversity across the nation within the context of changing environments and other extrinsic factors (e.g., colony collapse disorder)?

Workshop participants suggested that the Network engage citizen scientists and others to start recording observations on bees and bee-pollinated plants. The group identified a set of steps to develop such a project, including:

- Inventory existing gardens and plant lists for those gardens
- Survey groups who are interested in collaborating
- Reconvene group to focus goals, species, and sampling methods
 - Involve people who are already doing this type of work
 - Identify what has worked and what has not worked
 - Focus on pilot year and just get phenology data at a suite of gardens
 - Include caterpillars
- Get existing phenology gardens to collect data on plant phenology
- Set goal of a certain number of gardens submitting data in the first and subsequent years.

Landscape-scale Management by Federal Agencies

Federal agencies are focusing on landscape-scale management. Participants in this group provided a number of ideas that could be used to (1) advance the goals and objectives of the Network, (2) make the Network more sustainable, and (3) provide value to the resource management and agricultural agencies in their landscape-scale initiatives by linking phenology to broad-scale decisions:

- Create habitat to lure migratory wildlife away from threats (e.g., oil spills).
- Identify early successional emergent habitat for fall shorebirds.
- Provide information on timing of alternative food sources of migratory wildlife if host and prey schedules become asynchronous.
- Identify placement of wind farms using phenology information to guide locating or operating turbines.
- Predict payments for services to farmers and other groups (e.g., when payments may be necessary to conduct flooding, seeding and other activities).
- Provide information for invasive species management.
- Provide early warning systems for phenology-related events (e.g., pollen, fire, insect outbreaks).
- Plan for fire management activities (e.g., identify when to burn given broad-scale conditions and occurrences of other events, such as breeding of threatened species).
- Predict timing for sampling peak densities of species.
- Predict timing of watchable wildlife programs.

- Identify which remote sensing products to prioritize in terms of research and product development.

Participants identified several challenges and opportunities for adequately addressing this issue, including:

- Develop tools for sampling design and where to sample, not just protocols.
- Sponsor workshops with federal and state land managers to identify priorities.
- Provide continuing communication, education, and outreach.
- Link phenology, climate, geology, and remote sensing to develop products useful for making decisions.
- Provide consistent climate information used by various groups developing tools so that differences are comparable given the same assumptions (e.g., temperature, humidity).
- Identify indicators of ecosystem health to monitor, with a focus on specific taxa or communities that inform decisions.
- Emphasize and focus on historical uses of phenology data (e.g., historical uses for agriculture).

Participants of this emerging topic group agreed that the Network is already well-positioned to address these issues. However, the participants made several recommendations that may increase effectiveness of the Network:

- The Network should not be too focused only on customers and should instead develop an infrastructure to serve the overall community.
- Although it is okay for the Network to recognize the public as customers, it needs to link programs from citizen science back to state and federal agency actions.
- Better communication is needed about how phenological data can help inform actions that affect people's daily lives (e.g., food availability)
- It will be important to make phenology relevant at the state and federal director level, in ways that allow them to set the directions of their agencies based on that information.
- Limited time and resources suggest that the Network be as strategic as possible, even with the development of citizen science and passive data collection programs.
- Linkages between various taxonomic groups should be investigated as potential campaigns for particular purposes (e.g., ticks, deer and lyme disease; pollinating bees and insects; hummingbirds and nectar plants).
- The Network should where possible work to create a dialogue among LCCs, Climate Science Centers, and other semi-autonomous groups working on climate and related issues.

SUMMARY

Participants of this workshop were particularly engaged, and provided invaluable information that will help shape the future direction of the Network. The assessment of the current status of the Network was generally very positive, and participants indicated many activities that they felt are working well, including the willingness of the NCO to be inclusive, flexible, and open to ideas; the development of rigorous monitoring methods for wide use; the development of *Nature's Notebook*; the ability to garner participation from different groups; services related to data management; the dissemination and standardization of protocols; and the exploration of emerging technologies.

Although participants recognized that the Network has been very productive in such a short period of time, they felt that some improvements could be made and that there are some elements that are missing. These include the establishment of better data management and planning; a better education program development plan; better communication with partners; a better identity; the development of more useful training resources; a demonstration of the usefulness of phenology data; an assessment of partner needs; and the development of marketing and business plans as well as targeted campaigns.

Workshop participants identified several challenges, issues, and opportunities that should be addressed by the Network to ensure sustainability. These include the potential for a mission drift given the rapid growth of the Network; the need to maintain data quality; and the ability to maintain strong stakeholder relationships without a large investment of staff time.

Stakeholders requested that the Network provide a variety of information, services, and tools. These include the ability to provide and interpret phenology data in meaningful ways for different audiences; the provision of long-term data repository and data integration; the development of case studies of partner usage and contribution to Network resources; provision of technical advice; the coordination of various affiliated data collection efforts; the provision of a framework for science support and decision-making; the provision of educational tools and activities; and the development of early warning systems or monitoring programs. Additionally, the participants identified several activities where the Network can advance the work that is being addressed collectively or collaboratively in different sectors, including the establishment of project-focused observational recruitment efforts and field validation for all types of observers; the development of specific communities of practice; service as a facilitator and advisor for groups or individuals using phenology data; organization and communication for Network participants; the development of additional standards; and tools and techniques for validation of data.

There were also many levels of interaction stakeholders expect between the NCO and different organizations. Regular communications was one of the key issues identified, especially regarding new or upcoming activities that could potentially affect other projects. Once the Network

establishes its identity, participants suggested that it establish a business model to not only move forward strategically, but to also help establish its longevity and credibility. Participants also requested that the NCO help recruit existing observer and citizen science programs that are not currently collecting data or actively tracking species, and that the NCO identify the various complementary roles of Network participants.

There were several emerging topics identified as critical by the workshop participants. These included the definition of observer markets; organization and communication for formal and informal education; planning for data sustainability; design and development of flagship projects; design and implementation of short-term demonstration projects; and planning for landscape-scale management.

CONTRIBUTIONS AND ACKNOWLEDGEMENTS

The development of this report could not have been possible without the valuable contributions from the workshop participants. Vivian Nolan synthesized the content and drafted the report. Jake Weltzin, Alyssa Rosemartin, and Carolyn Enquist shaped subsequent versions of the document.

We gratefully acknowledge and thank Dr. Mark Schwartz, Chair of the USA-NPN Board of Directors, for hosting the workshop. We also thank Leni Wilsmann and Conservation Impact for facilitating the meeting. Last but not least, the NCO extends a very special thanks to all the stakeholders who participated in the workshop. Their recommendations have already proven to be invaluable in the strategic planning and continued development of the Network. A synopsis of this workshop report was published in *Eos* in early 2011.²

² Nolan, V.P. and J.F. Weltzin. 2011. Phenology for Science, Resource Management, Decision Making, and Education. *Eos* 92:15. 11 January 2011.

APPENDICES

Appendix A.

USA-NPN Stakeholders Workshop Participants

USA-NPN Stakeholders Workshop Participant List

UW-Milwaukee SCE Conference Center (CC)/Hampton Inn& Suites
21-22 September 2010, Milwaukee, Wisconsin

(v. September 9, 2010)

First	Last	Affiliation	Email	Break-out groups
Reginald	Beach	NOAA	Reginald.Beach@noaa.gov	1, 11
Douglas	Beard	USGS, National Clim Change Wildl Sci Cntr	dbeard@usgs.gov	2, 9
Julio	Betancourt	USGS, National Research Program	jlbetanc@usgs.gov	3, 11
Rick	Bonney	Cornell Lab of Ornithology	RickBonney@Cornell.edu	4, 13
Jean	Brennan	Defenders of Wildlife	Jbrennan@defenders.org	4, 10
Dawn	Browning	New Mexico State U/Jornada LTER	dbrownin@nmsu.edu	6, 8
Arpita	Choudhury	Assoc. Fish & Wildlife Agencies	achoudhury@fishwildlife.org	6, 14
Steve	Crawford	Passamaquoddy Tribe	stevecrawford@wabanaki.com	1, 14
Miriam	Davis	Univ. of Tennessee	miriams@utk.edu	2, 13
Ellen	Denny	USA-NPN	ellen.denny@yale.edu	3, 9
Clifford	Duke	Ecological Society of America	CSDuke@ESA.org	4, 10
Dennis	Figg	Missouri Department of Conservation	Dennis.figg@mdc.mo.gov	5, 14
Patty	Glick	National Wildlife Federation	glick@nwf.org	6, 9
Wendy	Gordon	Texas Parks and Wildlife Department	Wendy.Gordon@tpwd.state.tx	7, 14
Shelly	Grow	Association of Zoos and Aquariums	sgrow@aza.org	1, 10
Suzanne	Gucciardo	NPS, Lewis & Clark National Hist. Trail	suzanne_gucciardo@nps.gov	2, 12
Brian	Haggerty	UC-Santa Barbara	haggerty@lifesci.ucsb.edu	3, 8
William	Hargrove	US Forest Service	hnw@geobabble.org	4, 9
Kay	Havens	Chicago Botanic Garden	khavens@chicagobotanic.org	5, 12
Sandra	Henderson	NEON	sandrah@ucar.edu	6, 13
William	Hohman	USDA NRCS	William.Hohman@ftw.usda.gov	7, 14
Buddy	Johnson	USFWS	Buddy_Johnson@fws.gov	1, 12
Bruce	Jones	USGS	kbjones@usgs.gov	2, 11
Jeffrey	Karron	UW-Milwaukee	karron@uwm.edu	4, 14
Kevin	Kilcullen	USFWS	Kevin_Kilcullen@fws.gov	3, 11
Keith	Langdon	NPS, Great Smoky Mtn National Park	Kieth_Langdon@nps.gov	4, 12
Ed	Laurent	American Bird Conservancy	elaurent@abcbirds.org	5, 10
Gretchen	Lebuhn	San Fran. State U, Great Sunflower Project	lebuhn@sfsu.edu	6, 13
Jeff	Luvall	NASA	jluvall@nasa.gov	7, 11
Abraham	Miller-Rushing	Acadia National Park	millerrushing@gmail.com	1, 12
Pete	Murdoch	USGS, Climate Effects Network	pmurdoch@usgs.gov	2, 9
Georgia	Murray	Appalachian Mountain Club	Gmurray@outdoors.org	3, 12
Vivian	Nolan	USA-NPN, USGS	vpnolan@usgs.gov	4, 10
Karen	Oberhauser	Univ. of Minnesota	oberh001@umn.edu	5, 8
Peggy	Olwell	BLM	Peggy_Olwell@blm.gov	6, 9
Tim	Owen	NOAA-NCDC	Tim.Owen@noaa.gov	7, 11
Isaac	Park	UW-Milwaukee	iwpark@uwm.edu	1, 8
Alyssa	Rosemartin	USA-NPN, U Arizona	alyssarosemartin@gmail.com	2, 14
John	Rosenow	Arbor Day Foundation	john.rosenow@arborday.org	3, 10
Eliza	Russell	National Wildlife Federation	russell@nwf.org	4, 10
Dolores	Savignano	USFWS	Dolores_Savignano@fws.gov	5, 9
Mark	Schwartz	UW-Milwaukee	mds@uwm.edu	6, 8
Lori	Scott	NatureServe	Lori_Scott@naturereserve.org	7, 10
Elena	Sparrow	University of Alaska-Fairbanks, GLOBE	esparrow@iarc.uaf.edu	1, 13
Esperanza	Stancioff	Univ. of Maine	esp@umext.maine.edu	2, 14
Mark	Stromberg	CA Natural Reserve System	stromberg@berkeley.edu	3, 8
Kathryn	Thomas	USA-NPN, USGS	kathryn_a_thomas@usgs.gov	5, 12
Woody	Turner	NASA	woody.turner@nasa.gov	5, 11
Jake	Weltzin	USA-NPN, USGS	jweltzin@usgs.gov	7, 11
Andrea	Wiggins	Syracuse University	awiggins@syr.edu	7, 13
Leni	Wilsmann	Conservation Impact	leni@conservationimpact.com	-
Lizzie	Wolkovich	NCEAS/UC-San Diego	wolkovich@nceas.ucsb.edu	3, 8
Rong	Yu	UW-Milwaukee	rongyu@uwm.edu	2, 8
Jessica	Zelt	USA-NPN, USGS	jzelt@usgs.gov	1, 13

Appendix B.

USA-NPN Stakeholders Workshop Agenda

USA-NPN Stakeholders Workshop Purpose and Agenda

*UW-Milwaukee SCE Conference Center (CC)/Hampton Inn& Suites
21-22 September 2010, Milwaukee, Wisconsin*

(FINAL; v. September 17, 2010)

PURPOSE

The USA National Phenology Network (USA-NPN; www.usanpn.org) consists of a consortium of individuals and organizations that collect, share, and use phenology data, models, and related information. The network is growing rapidly. In particular, the USA-NPN National Coordinating Office (NCO) is expanding its capacity and the services that it provides to the network, including national plant and wildlife phenology monitoring programs, standardized monitoring methods, an information management system, research initiatives, decision support tools, and an educators clearinghouse.

The NCO has also developed a five-year strategic plan to guide our actions and priorities in the next several years. During the development of these programs, projects, and plans, the NCO has sought peer review to ensure their quality and ability to meet the needs of USA-NPN stakeholders. In March 2010, the NCO released major updates to many of these programs and projects. At the present stage in our development, the NCO believes it is important to have a meeting of key stakeholders to review the status of the USA-NPN and to discuss future plans.

For this workshop, about 50 representatives have been invited, covering of the full breadth of USA-NPN stakeholders, including scientists, educators, natural resource managers, and representatives of public agencies, nongovernmental organizations, specialized networks, and Native American tribes (see separate participant list). The primary aim of the workshop is to listen to your ideas as to how the NCO can best meet your needs, how to increase collaborative opportunities, and help shape the strategic direction of the Network as a whole.

The 2-day workshop will occur on **21-22 September 2010 in Milwaukee, Wisconsin**. The workshop will be tightly focused between 8 am and 5 pm each day, so please plan your travel for the day before and the day after the workshop. USA-NPN, with support from a National Science Foundation Research Coordination Network Grant, will cover travel, food, and lodging expenses associated with the workshop.

USA-NPN Stakeholders Workshop Agenda
21-22 September 2010, Milwaukee, Wisconsin

(FINAL; v. September 17, 2010)

Monday September 20

All Day **Registration at *Hampton Inn Front Desk (pick up packets)***

Day 1 – Tuesday September 21 – Review of Existing Structure and Plans

6:00 – 7:45 am **Full Breakfast** (provided for guests in *Hampton Inn Lobby*)

8:00 – 10:15am (*CC Room 7970*)

Introductions

- Welcome (Bruce Jones, Chief Scientist, Biology, USGS) – 5 min
- Introduction (Jake Weltzin, Executive Director, USA-NPN) – 5 min
- Logistics (Mark Schwartz, Chair, USA-NPN Board of Directors and Workshop Host) – 5 min

Framing the workshop (Leni Wilsmann, Facilitator, Conservation Impact) – 10 min

- Workshop framework
- Round-robin introductions for workshop participants – 20 min

Phenology science and the USA-NPN

- *Why is phenology important? The scientific perspective* (Abraham Miller-Rushing, NPS)
 - 30-min presentation
 - 10-min questions
- *Current status and future directions for USA-NPN* (Jake Weltzin, USA-NPN)
 - 50-min presentation

10:15 – 10:45 Break (30 min)

10:45 – 12:00 Question and answer session about USA-NPN (*CC Room 7970*) (75 min)

12:00 – 1:15 Lunch provided – *CC Room 7820* (75 min)

1:15 – 3:00 **“Assessment of current status and future directions of USA-NPN”**

- Charge to break-out groups, introduction to goals and process, clarifying Q & A (*CC Room 7970*) (15 min)
 - Goals
 - Diverse break-out groups discuss and provide feedback on the current status, proposed strategic direction (short- and long-term),

and anticipated market and operating environments of USA-NPN based on the morning presentation, associated documents, and their own experience with the network.

- Process
 - Break-out groups of five to seven – pre-assigned
 - Organization: each group to assign facilitator and recorder/reporter. Will discuss roles and responsibilities for each.
 - Synthesize, prioritize, summarize, and record ideas electronically
- Topics for discussion include:
 - Provide an assessment of USA-NPN activities to date and proposed strategies. For example:
 - What is working well?
 - What is not working well or needs improvement?
 - Will the proposed strategies accomplish what is needed?
 - Are partner needs being met?
 - What is missing or needs clarification?
 - What challenges, issues, and opportunities (e.g., institutional, operational, financial) do you see for USA-NPN today and over the next 5-10 years as it seeks to create an effective and sustainable network?
 - What “emerging markets” for USA-NPN information should be considered?
 - How can USA-NPN gather the financial resources to accomplish its goals and objectives? Consider:
 - Are there unexplored sources of funding?
 - Are there appropriate funding strategies that have not been attempted?
- Break-out group discussions in individual rooms (90 min)

3:00 – 3:30 Break (30 min)

3:30 – 5:00 Break-out group reports and discussion (*CC Room 7970*)

- Round-robin reporting, each group gives one idea at a time without duplicating ideas that have already been presented.
- We will address each discussion category separately, including areas that need clarification.
- We will develop a suite of “emerging topics” that will define the topics for the breakout groups tomorrow morning.

6:30-8:30 **Guest speaker and supper**

- 6:30 p.m. **Welcome Program** (Carlos Santiago, Chancellor, UW-Milwaukee); *Hampton Inn Crystal Ballroom*
- 7:00 p.m. **Supper** (provided); *Hampton Inn Crystal Ballroom*

Day 2 – Wednesday September 22 – Planning for the Future

6:00 – 7:45 am Full Breakfast (provided for guests in *Hampton Inn Lobby*)

8:15 – 10:15 “Emerging Topics” (*CC Room 7970*)

- Introduction to goals and process, finalize emerging topics, Q & A, and form topical working groups (15 minutes)
 - Goals
 - Building on yesterdays break-out groups, identify emerging topical issues that need more detailed discussion or analysis
 - Break-out groups identify, describe and analyze particular topical issues
 - Process
 - Break-out groups: newly formed, self-identified, variable size
 - Organization: need facilitator and recorder/reporter for each group
 - Synthesize, prioritize and record ideas electronically
 - Questions for each topic include:
 - Please describe the emerging topic and how it should be considered by USA-NPN. How will addressing this issue advance the network or make it more sustainable?
 - What are the challenges and opportunities in adequately addressing this issue?
 - Is USA-NPN well positioned to handle this issue? If not, what should USA-NPN do to better address the issue?
 - What resources are needed to effectively address the issue, e.g. funding, capacity, expertise, data, and/or partners? Which organizations would likely be most interested in collaborating on this topic?
- Break-out group discussions in individual rooms (105 minutes)

10:15 – 10:45 Break (30 min)

10:45 – 12:00 Continue “Emerging Topics”

- Break-out groups report out (*CC Room 7970*)
- Discussion

12:00 – 1:15 Lunch provided – CC Room 7820 (75 min)

1:15 – 3:00 “The Organization Perspective: Needs, Contributions, and Collaborations”

- Introduction to goals and process, and Q & A (*CC Room 7970*) (15 minutes)
 - Goals
 - What does your organization need to conduct phenology-related activities? (e.g., what information, services, tools?)
 - Prioritize specific tasks and services
 - How could your organization contribute to and collaborate with the USA-NPN?

- How might USA-NPN collaborate and help improve a phenology-related project that is underway or being planned?
 - Process
 - Break-out groups – pre-assigned based on participant organization affiliation
 - Organization: need facilitator and recorder/reporter for each group
 - Synthesize, prioritize and record ideas electronically
 - Topics for discussion include:
 - What information, services, and tools do your organizations need from USA-NPN?
 - Please provide some context for each item and prioritize.
 - How can USA-NPN advance the work that you and others in your field are addressing collectively or collaboratively?
 - Consider a continuum of interactions between organizations: communication, coordination, and collaboration.
 - Define the level(s) of interaction you might expect between your organization(s) and USA-NPN
 - How could this be implemented?
- Break-out group discussions in individual rooms (90 minutes)

3:00 – 3:30 Break (30 min)

3:30 – 5:00 **Wrap ups and Concluding Remarks**

- Break out groups report out (*CC Room 7970*) (75 min)
- Discussion
- Summary (Leni Wilsmann) (10 min)
- Thank you (Jake Weltzin) (5 min)

ADDITIONAL INFORMATION FOR USA-NPN STAKEHOLDERS WORKSHOP PARTICIPANTS

Meeting web-site

- Workshop information (agenda, reading materials, presentations) are posted at <http://www.usanpn.org/rcn-2010>. The final workshop report will also be posted on the website when it is finalized.

Before the workshop

- All attendees are asked to spend 15-20 minutes visiting the web-page (www.usanpn.org) to become familiar with it and the on-line user interface Nature's Notebook (www.usanpn.org/how-observe)
- Workshop logistics materials will be posted at <http://www.usanpn.org/rcn-2010>. **Please download and/or print these materials, and bring them with you if you would like to have copies at the workshop.**
 - Agenda
 - Participant list
 - Reading packet
 - Fact sheet
 - Strategic plan – extracted with link to full document on web-site
 - Annual report for 2009
 - List of current partners and how USA-NPN interacts with them
 - The Wildlife Professional article highlighting the USA-NPN
- Participants may bring laptops to access USA-NPN and other websites, and to take notes during the break-out sessions.

Meals and refreshments

- Continental breakfast, Hampton Inn lobby, starting at 6 am each day
- Lunch provided each day, 12-1:15 in CC Room 7820. Please be sure to complete both your meal and any incidental business during this time period, as we'll reconvene promptly at 1:15 each day.
- Dinner provided on Tuesday, Crystal Ballroom, Hampton Inn, 6:30-8:30
- Coffee, tea, water and other light refreshments will be provided throughout the day in CC 7970

Planned products from workshop

- Report assessing progress of USA-NPN and providing recommendations for the future
- Condensed meeting summary published in topical journal (e.g., EOS or Bull Ecol Soc Am)
- Summary of workshop for the web-site

Workshop Steering Committee

- Jake Weltzin, USA-NPN, Workshop Chair and Executive Director, USA-NPN (jweltzin@usgs.gov; cell phone: 703-485-5138; 520-401-4932)
- Leni Wilsmann, Conservation Impact, Workshop Facilitator and Meeting Manager (leni@conservationimpact.com)
- Vivian Nolan, USGS, Workshop Rapporteur (vpnolan@usgs.gov)
- Mark Schwartz, Workshop Local Host and Chair, USA-NPN Board of Directors (mds@uwm.edu)
- Theresa Algots, Administrative Assistant (algots@email.arizona.edu)

Appendix C.
Emerging Topics & Questions

Emerging Topics

Focus, partner relations, early successes, constituents (partners, clients, funders, etc.), data development and sustainability, business model, redundancy

1. What are USA-NPN's three most important markets for use of phenology data or protocols and what value must it bring to those markets? What is the most important product or service that USA-NPN must deliver to each market? What is an early success or low-hanging fruit that USA-NPN should accomplish for each market? What is the opportunity for accomplishing this work in each market, e.g. key supportive contacts, sources of funds, sources of data?
2. What are USA-NPN's three most important individual observer market segments? What does each market segment want from its role of observer – why do they do it? What does USA-NPN want from each segment? What are strategies for engaging, developing, and retaining active participants in each segment? What is the best example of a networked data-development organization that does a good job of engaging, developing, and retaining network partners and why is it so successful?
3. The K-12 educator community, formal and informal, is a potentially important local, regional, and national partner for USA-NPN. Describe this market segment of potential observers. What is it looking for in a partnership with USA-NPN? What does this market segment bring to the table? How can USA-NPN and the K-12 educator community develop an effective relationship? What is an early success project that could serve as proof of concept for this relationship?
4. What does “data sustainability” mean? What are the critical elements of a sustainable data system? What organization or agency provides a good example of a successful, sustainable, data network? What must USA-NPN do to create a similarly successful and sustainable system?
5. What flagship project should NPN launch? What is the case statement you would use to convince others to invest in it? What types of support and from whom are critical to campaign success (institutional, financial, political, data, etc.)? What is the campaign timeline and what are the benchmarks of progress and success? If this campaign establishes a system that must be sustained beyond the length of the campaign, how will it be supported?

6. What short-term demonstration project(s) could be used to showcase the USA-NPN's national infrastructure? What is necessary to sustain and replicate this project? How will you communicate the success of this project to demonstrate the importance of the use of the NPN infrastructure and phenology data to solve a problem or influence decisions?
7. Federal agencies are focusing on landscape-scale management. How can USA-NPN provide value to Department of Interior and Department of Agriculture agencies in their landscape scale initiatives? What is the most important product or service that USA-NPN must deliver to these agencies? What is an early success or low-hanging fruit that USA-NPN should accomplish to demonstrate value? What are the opportunities for accomplishing this work, e.g. key supportive contacts, sources of funds, sources of data?
8. How can USA-NPN provide value to Department of Agriculture's farm and ranchland programs? What is the most important product or service that USA-NPN must deliver to DoI? What is an early success or low-hanging fruit that USA-NPN should accomplish to demonstrate value? What are the opportunities for accomplishing this work, e.g. key supportive contacts, sources of funds, sources of data?
9. What are the most important information gaps that USA-NPN must fill in order to be relevant? Why? Who needs those data and how will they use them? What redundancies are there between USA-NPN and other organizations? How can they be resolved?
10. What are alternative sustainable business models for USA-NPN? What are the benefits and challenges of each model? What will it take to implement each model and on what timeline?

Appendix D.
Voting Record Sheet

EACH PERSON HAS 4 VOTES. PLEASE PLACE HASH MARKS TO THE LEFT OF THE STATEMENT.

~~|||||~~ | _____ Articulating and communicating unique niche and value added of partners

|| _____ People have heard about it, but identity and sustainability aren't clear

~~||||~~ _____ Address sense of competition for citizen science and scientists among some partners.

~~|||||~~ _____ Gap analysis for where there are gaps in citizen scientists and taxonomic areas needing attention

|| _____ Need process to know what partner needs are

||| _____ Continuing forum for interaction of stakeholders

| _____ NPN partners could produce audience-specific fact sheets and success stories for promoting NPN, a means for partners to contribute

| _____ Analysis of what is needed to understand the data

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~~||||~~ ~~|||||~~ ~~||||~~ ~~||||~~ | _____ Using phenology data for decisions

~~||||~~ | | | | - || _____ Show how phenology data improve existing models

~~||||~~ ~~|||||~~ ~~|||||~~ _____ Drive data collection toward important issues using overlapping measurements, e.g. ecological interactions

| _____ Output formatted for use by nonscientists

~~|||||~~ ~~||||~~ _____ Need data stewardship plan

_____ Training videos are good, but documentary video could be series of short videos

||| _____ Training resources need to be more concise and less wonky