

An Evaluation of Observer Engagement Strategies for *Nature's Notebook*

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An Evaluation of Observer Engagement Strategies for *Nature's Notebook*

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INTRODUCTION

The USA-National Phenology Network (USA-NPN) seeks to engage volunteer observers to collect phenological observations of plants and animals using consistent standards and to contribute their observations to a national data repository. To guide the effort, the USA-NPN National Coordinating Office, based in Tucson, Arizona, has developed *Nature's Notebook*, a national-scale plant and animal phenology program. The purpose of this document is to reflect on the recruitment, training, and retention efforts that we have undertaken since the inception of *Nature's Notebook* and to identify actions that influenced participation and activity within the program. These findings will shape future *Nature's Notebook* recruitment, training, and retention efforts, and may provide lessons applicable to other efforts.

Phenology refers to recurring plant and animal life cycle stages, such as leafing and flowering, maturation of agricultural plants, emergence of insects, and migration of birds. It is also the study of these recurring plant and animal life cycle stages, especially their timing and relationships with weather and climate. The Intergovernmental Panel on Climate Change report (2007) notes that plants and animals respond to changes beyond their tolerances by shifting the timing of life-cycle events, shifting range boundaries, changing morphology, or becoming extirpated or extinct. The report states that “phenologyis perhaps the simplest process in which to track changes in the ecology of species in response to climate change.” Understanding the phenology of a species includes understanding the influence of seasonal and interannual variation in climate on the life-cycle events and activities of the species.

The USA National Phenology Network

The USA National Phenology Network (USA-NPN; www.usanpn.org) monitors the influence of climate on the phenology of plants, animals, and landscapes. We do this by encouraging people to observe phenological events and by providing a place for people to enter, store, and share their observations. We also work with researchers to develop tools and techniques to use these observations to support a wide range of decisions made routinely by citizens, managers, scientists and others, including decisions related to allergies, wildfires, water, and conservation.

The USA-NPN is comprised of many partners including federal, state and local agencies, universities, colleges and schools, non-governmental organizations, citizen volunteers, and many others. Our participants range from individual observers making observations in their backyards to professional scientists monitoring long-term plots. A key objective of the Network is to collect and organize contemporary organismal phenological data across the nation, for a variety of plant and animal species according to standardized methodologies and protocols. Because the data are inherently place-based, and because of the need to collect information across the entire nation with sufficient spatial and

temporal resolution to understand both local and broad patterns of organismal phenology, the Network must recruit both professional and volunteer observers to participate in the national, multi-taxa plant and animal observation program *Nature's Notebook*.

Nature's Notebook is the USA-NPN's plant and animal phenology observing program. Through *Nature's Notebook*, observers can register as an observer with the Network, register one or more sites where they are observing plant and/or animal phenology, register one or more individual plants under observation, create a checklist of animals they are observing, and enter phenology observations.

A prototype plant phenology monitoring program was unveiled in 2008. In March 2009, the National Coordinating Office staff implemented an online monitoring program for plants. In March 2010, animal monitoring was added and the program was named *Nature's Notebook* and given a unique identity. Abundance and intensity measures were added in 2011, and in an effort to engage more participants and better meet partner needs, additional plant and animal species were added in both 2011 and 2012.

Input from members of our Advisory Committee, representatives of other citizen science programs, and "lessons learned" from relevant literature shaped our program. Feedback from participants in *Nature's Notebook* and from data users and preliminary analyses of our data set informed periodic changes and improvements to the program.

Importance of recruitment, training, and retention

A long-term goal of the USA-NPN is to develop a national, standardized phenology data set on 360 species of plants and animals (focal species). Meeting this goal requires a large pool of enthusiastic, committed, and knowledgeable observers. We recognize three important phases to engaging and maintaining observers:

- **Recruitment** refers to bringing new observers to *Nature's Notebook*.
- **Training** gives observers the information and tools they need to be successful in submitting reliable, high-quality data.
- **Retention** refers to maintaining observer activity levels over months and years.

Our investment in recruitment, training and retention has increased since the program's inception, as our resources and abilities have allowed.

The role of overarching scientific questions in *Nature's Notebook*

Plainly stating scientific questions that data collected by citizen scientist observers can help answer is one of several recently articulated guidelines for successful citizen science programs (Bonney et al. 2009, Prysby and Super 2007). A clear articulation of the question(s) in mind can guide sampling design questions such as how many observers or observations are needed, the frequency at which should observations be made, the desirable spatial distribution of observations, and which species or taxa should be emphasized. However, as has been the case with so many other citizen science programs (Silvertown 2009), the Network has been learning by doing; we have been actively recruiting and

training observers even as we've been evolving the program. At the establishment of the Network, it was understood that a nationwide, species-rich data set collected at fine temporal resolution could be a valuable resource for a wide range of questions pertaining to how species, taxa, and communities are responding to climate change, as well as a variety of other management questions at various scales. At that time, more specific scientific questions that *Nature's Notebook* observations could answer were not articulated.

In the absence of clear scientific questions, we have recognized one clear data-collection goal: amass as many phenology observations on the focal species as possible. We have used the following guidelines to shape our efforts:

- **Frequency of observations:** To date, we have encouraged participants to make observations at least once a week during the growing season. We have recognized the trade-off between temporal resolution of observations and the associated error and the potential for observer fatigue. Additionally, few published papers have shown how to evaluate status monitoring data for trends and rates of change (however, see Crimmins et al. 2010 for one approach).
- **Seasonality of observations:** We have emphasized the importance of making observations during spring and autumn, as the start of spring and the end of autumn have shown change around the globe (Menzel et al. 2006). Such changes have subsequent impacts on ecological patterns and process important to human society (e.g., changes in carbon uptake period, allergy seasons).
- **Distribution & density of observations:** Until 2012, rather than focusing on specific regions of the country, we encouraged observations from all states. Data are more prevalent in regions with active observers and especially active networks, such as the California Phenology Project (CA) and Signs of the Seasons (ME).
- **Long-term, repeated observations:** Multiple individuals of the same species at a given location, and multiple years of data on the same individual plants, are needed to attenuate the effects of microclimatic and genetic variation among individual plants and to control for interannual variation. We have developed our program, training and information infrastructure to support and encourage frequent, repeated observations of multiple individual plants at sites.
- **Importance of calibration species:** We assume that a small number of nationally distributed native plant species are necessary to capture plant response to climate signals at the national scale, so the focus on calibration plant species continues to be important.
- **Phenophases** selected for observation should follow Aldo Leopold's requirements for "good phenological items": (1) low effort/simple to observe; (2) distinct/sharp; (3) abundant/common; (4) high degree of accessibility; (5) reliability of recurrence; (6) continuity; (7) evidence of newness; (8) locally determined dynamics; (9) sufficient prior knowledge to identify the unusual (Leopold and Jones, 1947).

The Network is now able to articulate and refine scientific questions that observations housed in the NPDb are intended to answer. The USA-NPN Research Coordination Network meeting in May 2012 is designed to organize information needs, by focusing on grand challenge questions for phenology, definition of data products, and definition of the critical minimal data set for the Network. Clearly articulated scientific questions and data needs, like those expected to emerge from this meeting, will result in clearer observation distribution, density, frequency, and species needs and will therefore guide our future engagement efforts.

RECRUITMENT, TRAINING, AND RETENTION EFFORTS TO-DATE

Since the inception of *Nature's Notebook*, we've steadily increased and improved our efforts in the areas of recruitment, training, and retention. Below we describe our efforts specific to each of these areas. Table 1 shows the progression of our efforts in these areas over the past several years. In addition to these efforts, we hosted a stakeholder workshop in fall of 2010 and invited participants from across the country to express and prioritize their needs (USA-NPN National Coordinating Office 2011). We also have remained active within the citizen science community, participating in citizen science working groups through DataONE, the US Geological Survey and Cornell Lab of Ornithology, as well as the Citisci.org and SciStarter.com online communities.

Table 1. Recruitment, training, and retention efforts undertaken by USA-NPN National Coordinating Staff, 2009-2012.

Strategy	Objective	2009	2010	2011	2012
Mass Media (press releases, pitches and interviews with newspaper, web and radio journalists)	Recruit				
Articles in targeted venues (e.g. LTER Newsletter and Journal of Extension)	Recruit				
Outreach presentations	Recruit				
Print material and promotional items	Recruit				
Social Media (Facebook and twitter)	Recruit				
Targeted Campaigns (e.g. Lilacs, Juniper)	Recruit				
Special Events (e.g. Science Festivals, BioBlitz)	Recruit				
Training workshops and webinars ^a	Train				
Website training pages, videos and handbooks	Train				
Templates for local projects (e.g. Biosphere2, Pima County Extension)	Recruit, Train, Retain				
Engagement with national membership organizations (e.g. AARP, Ecological Research and Education Network)	Recruit, Retain				
Engagement with site-based leadership programs (e.g. Extension and NPS)	Recruit, Train, Retain				

Partner Web Tools (e.g. shared sites and geographic affiliate tool)	Recruit, Train, Retain				
Education materials (high school & up, non-formal)	Train, Retain				
Individual observer email support	Retain				
Quarterly observer newsletters	Retain				
Biweekly reminders to observe	Retain				
Results available (e.g. visualization tool)	Retain				
Reporting results to contributors (analysis in newsletters)	Retain				
Leaderboards	Retain				
Expressions of gratitude to observers	Retain				

Recruitment

Until spring 2011, our recruitment efforts were primarily opportunistic and consisted mainly of presentations by members of the NCO staff at scientific meetings and periodic media coverage. During the development phase of our program, protocols and interface (2008-2010), we hesitated to recruit intensively, recognizing that exposing observers to frequent changes to the program could be difficult to weather and detrimental in the long run. However, the USA-NPN Executive Director was a guest on NPR's *Science Friday* in spring 2009, resulting in a huge spike in registrations over several days.

In 2011, we cultivated relevant media outlets, reached out to many new partners and organized a campaign with Scistarter.com focused on American robins. These efforts met with limited success, and in June 2011 we hired a Communications Specialist to significantly advance the efficacy and professionalism of our recruitment and retention tactics. This additional capacity, combined with an unusually early and warm spring in 2012, resulted in dramatic increases in media coverage in 2012. In addition, two campaigns were orchestrated in spring 2012, one focused on cloned and common lilacs across the nation, and the second focused on deciduous tree leafing from Missouri to Maine.

Training

Well-trained observers have better experiences, provide higher-quality data, and are more likely to be retained than observers who have not been trained (Ohrel and Register 2006). Recognizing this, we worked to create a series of training materials shortly after unveiling our monitoring program in 2009. By summer of 2010, we offered a series of narrated training videos, a detailed "How to Observe" handbook, scripted PowerPoint presentations for use by other trainers, and instructions on our website. Our training materials provide resources for the selection of sites and species, the identification of species and phenophases, and the collection of data and its submission online. Over the past several years, we have also hosted numerous in-person and web-based trainings for groups across the country.

Retention

Maintaining participants' interest and acknowledging their efforts are crucial to retaining project volunteers (Prysbly and Super 2007). We have steadily improved our retention efforts as our pool of

Nature's Notebook participants has grown and our capacity to support them has increased. To increase observer satisfaction, and minimize frustration, we have offered support to observers via email since the very beginning of the program, promptly answering any questions we receive.

We began to provide observers more communication and support in the form of quarterly newsletters in fall 2009. Acknowledging the importance of providing them with evidence that their data are indeed being interpreted and used, we began to include summaries of results in early 2012. We undertook surveys of our observers in the fall/winter of 2009, 2010, and 2011 to learn ways to better serve our participants; results from the 2009 survey were published in report form (www.usanpn.org/results/reports). Beginning in April 2011, we sent registered observers a bi-weekly “friendly reminder” to make and submit observations. In August 2011, the content and appearance of these reminders was enhanced, with fresh, interesting article links, specific calls to action, and a cleaner, more professional style.

In fall 2010, the top 50 *Nature's Notebook* observers were notified of their status and were mailed a 2011 *The Wildlife Society* wall calendar in appreciation of their participation.

In January 2011, we initiated newsletters specifically targeted to representatives of partner organizations. The purpose of these newsletters is to keep partners apprised of updates and changes with the USA-NPN and inform them of relevant opportunities.

USA-NPN NCO Models for Engagement

The NCO implements three general models (Figure 1) for recruiting, training, and retaining observers as a part of *Nature's Notebook*. The level and type of recruitment tactics, training, and retention tactics that are employed varies markedly among these three models.

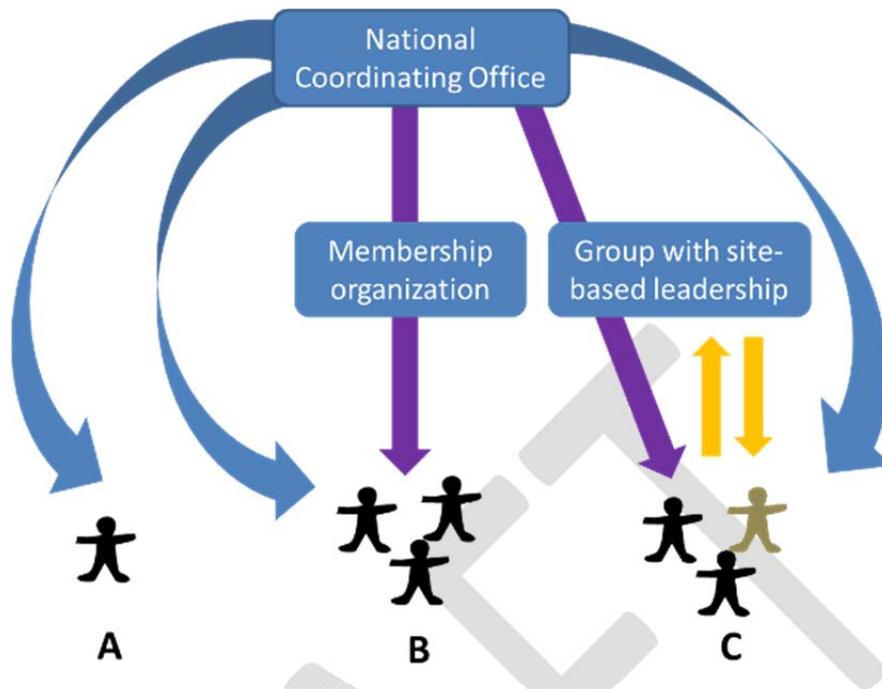


Figure 1. Three models for engagement between individual observers and the NCO. In Model A, participants are engaged directly; in Model B participants are engaged through a membership organization; in Model C participants are engaged through a group with site-based leadership.

In Model A, individuals join *Nature's Notebook* **directly**, as a result of recruitment through newspapers, radio, the internet, professional or personal contacts. They have access to the training and engagement materials on the usanpn.org website; training is self-motivated and self-directed. These participants receive quarterly observer newsletters and bi-weekly reminders to observe. They also receive communications from the NCO via Facebook and Twitter and can communicate directly with NCO staff via email and telephone. These forms of communication are denoted by the blue arrow in Figure 1. This model for engagement has been available to potential observers since the establishment of *Nature's Notebook*.

In Model B, individuals are invited to join *Nature's Notebook* by a **membership organization** with which they have affiliation. These individuals receive all of the communications that participants in the first model receive, and may also receive additional *Nature's Notebook*-related communications or support directly from their organization. Examples of such partnerships that USA-NPN currently maintains are those with the Great Sunflower Project, The Wilderness Society, and YourGardenShow.com. This model was initiated in 2009 with a handful of interested organizations, and has grown as our capacity to engage and support them has developed (Table 1).

Table 1. *Nature's Notebook* partner organizations by year in which they were first active and engagement model.

Partner Organization	First Active Year	Engagement Model
Monarch Watch	2009	B
Project BudBurst	2010	B
HoneyBeeNet*	--	B
Great Sunflower Project	2009	B
Juniper Pollen Project	2012	B
National Park Service, no affiliation with park unit	2010	B
The Wilderness Society*	--	B
Arbor Day Foundation	2011	B
Northeast Temperate Network		
Acadia NP*	--	C
Boston Harbor Islands NP	2009	C
Marsh-Billings Rockefeller NP*	--	C
Appalachian National Scenic Trail*	--	C
Saratoga Springs NHP*	--	C
Saugus Ironworks NHS	2010	C
California Phenology Project (12 park units)	2011	C
Great Smoky Mountains National Park	2012	C
HJ Andrews*	--	C
Signs of the Seasons	2011	C
Wisconsin Phenological Society	2012	C
RMSSN Academy	2010	C
PennPhen*	--	C
New Mexico Master Naturalist Program	2011	C
Portland BudWatch	2012	C
Florida Bluebird Society*	--	C
Tucson Phenology Trail	2012	C
Appalachian Trail Conservancy	2012	C
Mount Grace Land Conservation Trust	2012	C
Appalachian Mountain Club	--	C
NatureBridge	2011	C
St Olaf College	2012	C
Great Basin Bird Observatory	2012	C
New Hampshire Audubon*	--	C

*Members of organization have not yet begun participating in *Nature's Notebook*

In Model C, observers are engaged in *Nature's Notebook* through their participation in a **group with site-based leadership**. Individuals in this category receive all of the above forms of communication (denoted by blue and purple arrows), and also receive personal training, support, and communication from their

local leader. Because this is likely to be a face-to-face interaction, there is room for two-way communication between the participants and the leader, denoted in yellow arrows. Examples of this sort of partnership that the USA-NPN maintains include those with individual Master Gardener or Master Naturalist chapters, the Signs of the Seasons project based out of Maine SeaGrant Extension, and local phenology-based groups.

Each model of engagement requires different kinds and amounts of investment. In the interest of maximizing our efficiency and success, with few dedicated staff members, we asked the following questions:

- What have the patterns of **recruitment** of participants for *Nature's Notebook* been over the course of the program's existence and across the three models of engagement?
- What have the patterns of **retention** of participants for *Nature's Notebook* been over course of the program and across the three engagement models?
- Are there differences in the **quantity of data** submitted by participants associated with the three engagement models?

Training for observers is a critical component of our success. The in-depth, in-person training that is characteristic of Model C likely improves retention and data quality outcomes.

RESULTS

Recruitment

We evaluated recruitment for each of the engagement models using two metrics: 1) the total number of new registrants in each year and 2) the proportion of those new registrants that submitted one or more observations in the year of registration. Partner organizations that contributed fewer than 10 observation records in a particular year were excluded from analysis.

In every year, direct engagement has resulted in the greatest numbers of new registrants (Figure 2). The number of individuals joining *Nature's Notebook* directly showed a distinct spike in 2009. This is the result of our executive director appearing on NPR's *Science Friday* in March, 2009. Registration via this engagement model has been steadier in subsequent years, showing slight growth from 2010 to 2011. It appears this growth is continuing; the number of new participants registering in 2012 as of May 1 is nearly equal to that for the entirety of 2011.

Individuals joining *Nature's Notebook* via partner groups (Models B and C) has grown steadily since the program's inception (Figure 2). The rate of growth in new participants has been greater for groups with site-based leadership than in partner groups advocating on our behalf.

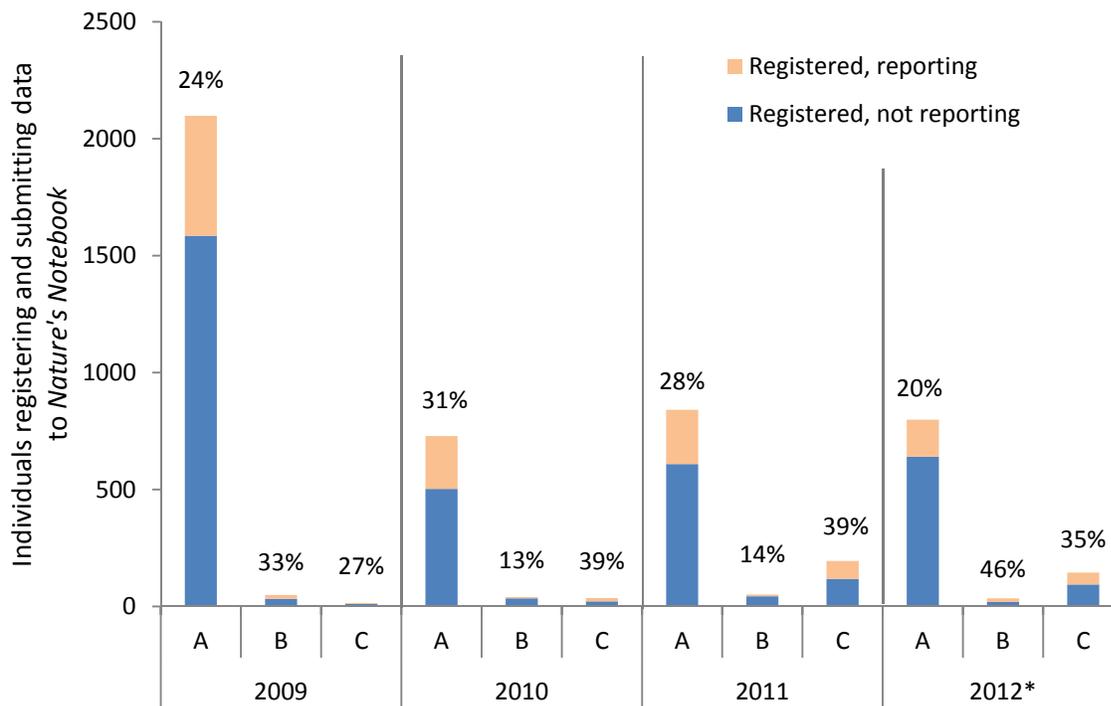


Figure 2. Individuals registering with *Nature's Notebook* and submitting data in the year of registration. A = direct engagement; B = through a membership organization; C = through a group with site-based leadership. *Encompasses Jan 1-May 1, 2012.

Excluding 2012, the proportion of participants submitting observations in the year of registration for individuals engaging directly in *Nature's Notebook* ranges between 24% and 31% (Figure 2). In comparison, the proportion of new registrants that engage via site-based leadership and go on to submit at least one observation showed rates of 27% in 2009 and 39% in 2010 and 2011.

Retention

We evaluated retention using three metrics: 1) the number of years in which an individual submitted observations; 2) the length of time between their first and last reported observation over the period from January 1, 2008 to May 1, 2012; and 3) the length of time between their first and last reported observation within each year.

The slope of the line connecting the number of participants from year to year (Figure 3) represents the rate of observer drop-out. The inverse of this rate is the rate of retention. Individuals participating through partners with site-based leadership show a much higher rate of retention than those participating directly in *Nature's Notebook*. Individuals participating through membership organizations also show a higher rate of retention than individuals participating directly in *Nature's Notebook*, but the total number of individuals participating through this engagement model is quite small.

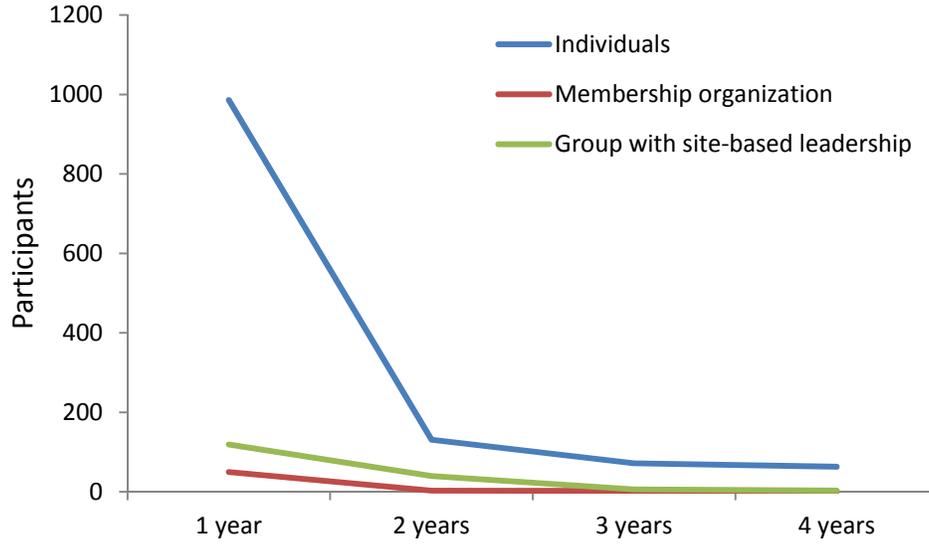


Figure 3. Number of observers who have reported observations over one, two, three or more years.

The number of days between a participant's first and last observation is a related metric. We grouped these by the year an observer registered and then compared the three engagement models. Long-term observer retention was significantly higher for participants that joined via groups with site-based leadership compared to observers that joined *Nature's Notebook* directly in 2010 and 2011 (Figure 4).

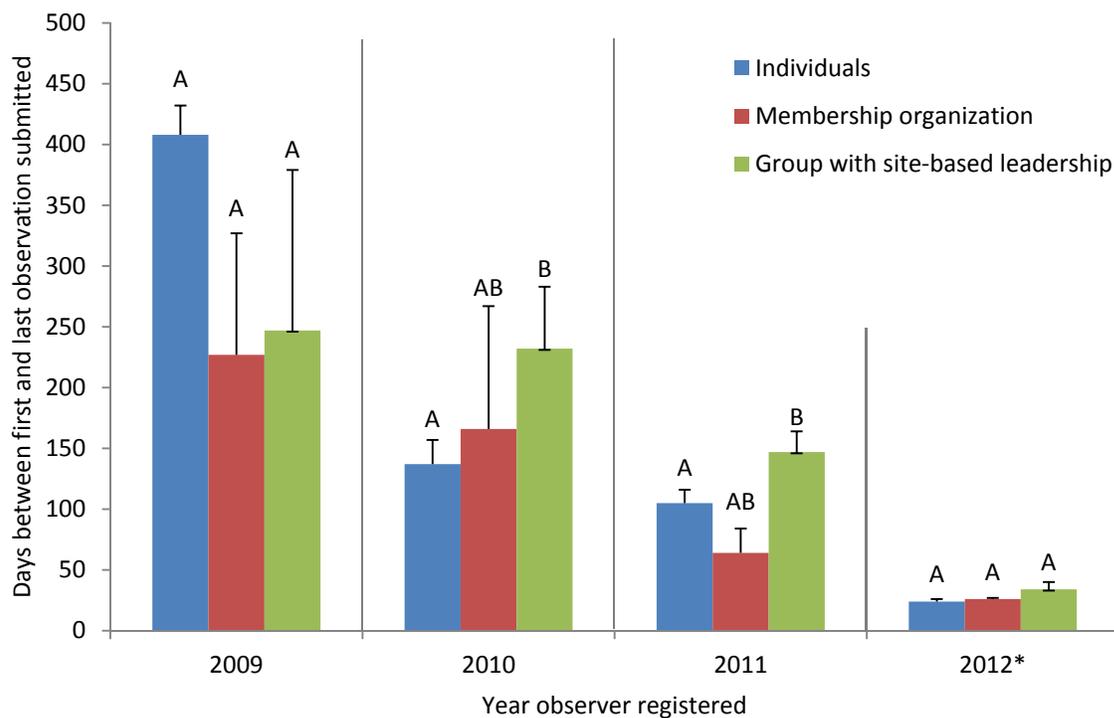


Figure 4. Duration over which participants remained active in *Nature's Notebook*, calculated as the duration of time (in days) between an observer's first and last reported observation over the period from January 1, 2008 to May 1, 2012. Error bars represent one standard error above the mean. Tukey multiple comparisons tests compare values *within* years only. Levels not connected by the same letter are significantly different ($p < .05$). *Encompasses Jan 1-May 1, 2012.

Finally, we compared within-year retention, defined as the first and last observation within the year of registration, for the three engagement models. There were no significant differences ($p < .05$) in within-year retention among the three models, indicating that the approaches perform essentially equally in terms of keeping observers engaged within the year of registration.

Observations submitted to *Nature's Notebook*

We evaluated the quantity of data submitted by observers participating in *Nature's Notebook* via each of the three engagement models using observations submitted by reporting observers. In 2009 and 2010, there were no differences ($p < .05$) among the engagement models in terms of the amount of data submitted (Figure 6). However, in both 2011 and 2012, observers participating via groups with site-based leadership submitted significantly more observations than observers participating directly in *Nature's Notebook*. Another encouraging pattern is that all three engagement models show an increase in the quantity of observations being submitted over the period 2009-2011, with a notable upward trend in individuals participating as groups with site-based leadership (Figure 5).

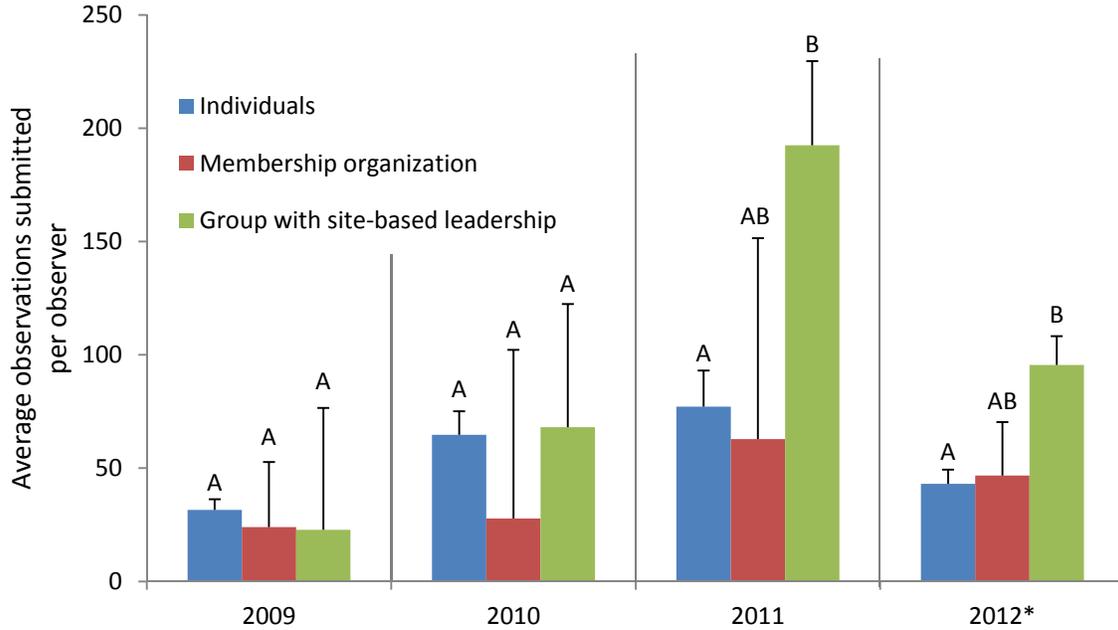


Figure 5. Average number of observations submitted per observer in each of the engagement models in each year. Error bars represent one standard error above the mean. Tukey multiple comparisons tests compare values *within* years only. Levels not connected by the same letter are significantly different ($p < .05$). *Encompasses Jan 1-May 1, 2012.

DISCUSSION

Given that we have been evolving our recruitment and retention efforts for *Nature's Notebook* since the program's launch, it may be somewhat premature to evaluate the impact of different strategies. A careful interpretation of our results in light of our outreach activities through time can still yield insights that can guide our activities moving forward and help us to gain efficiencies.

The results of this analysis demonstrate that all of our models for engagement seem to be valuable for meeting our ultimate goal of developing a national, standardized phenology data set on 360 plant and animal species. There are clear patterns among the three models, where Model A appears to yield few observations from many participants for a short duration, and Model C yields many more observations from far fewer participants, though those participants tend to remain with the program for a longer duration. Model B generally showed mixed responses.

Though the year-to-year retention rates are lowest for participants that engage directly with *Nature's Notebook*, this model has consistently brought many times the number of observers into the program than other models. And though the average number of observations submitted by these participants is lower than those for other models, the fact that there are so many observers participating in *Nature's*

Nature's Notebook through this model demonstrates that these individuals, *en masse*, do provide a large proportion of the data submitted each year.

Models B and C, the two models engaging observers through partner organizations, varied in both the ways they engage observers and in the metrics we evaluated. Two projects that are emblematic of Model C, the National Park Service-led California Phenology Project and Signs of the Seasons, led by Maine SeaGrant Extension, contributed significantly to the growth of the data set in 2011, with 22% and 8% of the total number of observations coming from these two efforts, respectively. In contrast, Model B participants showed high variance in the number of observations submitted and in long-term retention; this was mainly a function of there being very few observers participating in *Nature's Notebook* through this model. It is also possible that observers joining *Nature's Notebook* by way of membership organizations did not always realize that they should affiliate themselves when they register; this scenario would lead to an under-representation of observers affiliated with member organizations. Observers participating via membership organizations either seem to be very committed, submitting large amounts of data and remaining active in *Nature's Notebook* for multiple years, or submitting a small number of observations in a single year.

A key difference between membership organizations and groups with site-based leadership is the level of personal contact participants receive. Groups with site-based leadership tend to offer in-person trainings, personal support, encouragement, and perhaps even incentives to continued participation. In contrast, membership organizations function more similarly to direct engagement (Model A), where members may be encouraged to join *Nature's Notebook* by an organization external to the USA Phenology Network, but likely do not provide training, support, or other follow-up. We know anecdotally that observers who have been trained as part of Model C organizations have more positive experiences participating than observers recruited either through partner organizations or directly into *Nature's Notebook*. It seems logical that the higher retention rates seen among groups with site-based leadership is due to this direct personal contact and to higher participant satisfaction.

We have allocated generally the same level of effort to engage and maintain relationships with membership organizations (Model B) from year to year, as the services and support that we can offer to them has remained fairly constant. In contrast, we have steadily increased the amount of time and resources that we spend developing relationships with groups with site-based leadership. For example, we spent a substantial amount of time collaborating on a grant proposal with National Park Service officials in 2010 that resulted in several years of funding to establish and support the California Phenology Project. Similarly, we invested time and resources in scoping and developing web-based tools such as the “shared sites” functionality within *Nature's Notebook* in 2010. These actions resulted in the notable increases in recruitment and retention among Model C organizations, visible especially in 2011 and early 2012.

Beyond engagement models: Additional factors influencing recruitment and retention

There are many factors beyond the engagement model that influence observers' decisions to join and sustain activity in a citizen science program such as *Nature's Notebook*. Factors motivating both

recruitment and retention may vary with demographics and recent research has highlighted these differences. A study of Master Gardeners in Florida found that a primary motivation for participation was learning and intellectual curiosity, followed by community service (Strong and Harder 2011). A desire to do something meaningful has been found to be a key motivator for retiring baby boomers (Perry 2007) as has belonging to a group and being recognized (Gleeson 2003). Status and reward have also been shown to be key motivators for participants in eBird (Wiggins 2011).

Our current observers are curious, altruistic naturalists and ecologists over 46 years old. Eighty percent of our observers are over 46 years old, over 85% garden, hunt, hike or visit nature centers, zoos or botanic gardens more than once a week, and 40% have a degree in biology or an environment-related field (Crimmins et al. 2010; unpublished data). Observers report that experiencing nature in new ways, expanding their understanding of phenology, as well as contributing to a valuable national effort, are key motivating factors for their participation. Given that our observers seem to match the demographics and motivating factors of participants in other similar citizen science efforts, we plan to make continued efforts to meet these participants’ needs and use language in our communication materials that capitalize on their desire for recognition.

Appealing to volunteers’ self-interest has also been shown to be highly effective in increasing participation. In 2005, program coordinators at eBird changed their message to participants from “participate and help advance science” to “here are tools for you to manage your bird sightings and compete with other birders.” They subsequently saw a dramatic increase in the number of observations submitted (Figure 6, Sullivan et al. 2009). We have not yet ascertained whether an equivalent shift in approach would be appropriate for *Nature’s Notebook*; we raise this point for discussion because this shift appears to have such a positive impact on the amount of data collected.

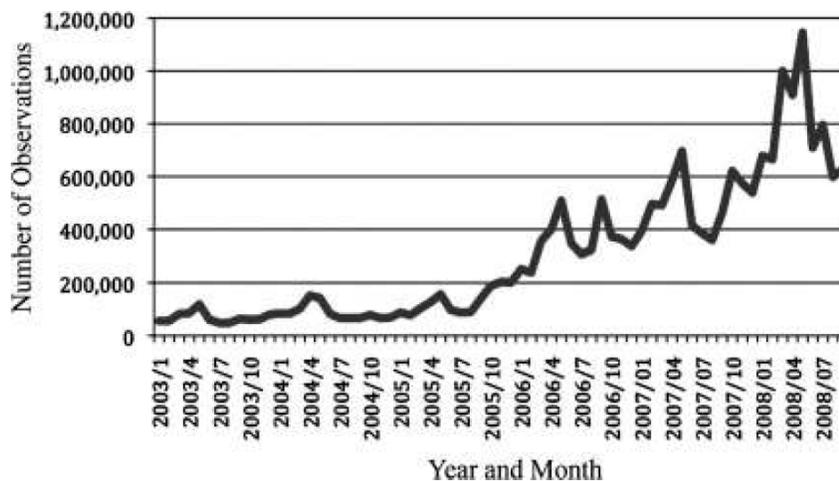


Figure 6. Number of eBird observations submitted per month 2003-2008 (Source: Sullivan et al., 2009).

Looking ahead

We are using the results of this engagement model analysis, together with our knowledge of our current observer base and lessons learned from other efforts, to inform our outreach planning in the remainder of 2012 and into the future. It remains critical for the USA-NPN to develop targets for the data that we will provide, based on prioritized data products to meet stakeholder and societal needs. The Spring 2012 Research Coordination Network meeting will move us toward defining these targets. In the meantime we have established the following goals for our outreach efforts: 1) Increase registered observers by 20% annually; 2) Increase the number of days an observer is active within a year by 3 days and 3) Increase the number of observed individual cloned and common lilacs by 25% annually. In addition to annual summative evaluation of these metrics, we will continue to conduct formative evaluation, through our Data and Participant Summaries, Observer Surveys and web reporting tools (e.g., Google Analytics). We are also collaborating and learning from a citizen science evaluation initiative called DEVISE, led by Cornell Lab of Ornithology and funded by NSF. We will continue to hone in on motivations for different demographics through research and evaluation, across our models of engagement.

Our Outreach team is implementing a series of tactics to reach these goals (summarized in Table 1). While we see projects with site-based leadership as a key way to meet our goals, we will continue to recruit individual observers through mass media. In spring 2012, these included a story on *Nature's Notebook* that appeared the April, 2012 *AARP Bulletin*, reaching 22 million members and a press release on reaching the millionth record in the database and a spring campaign focused on cloned and common lilacs.

Many activities this year support projects with local leadership, including the development of training resources and templates for phenology observation gardens and trails. We are also improving the “shared sites” tool in *Nature's Notebook* online, which allows group leaders to set up sites, plants and animals that multiple group members can concurrently observe. A crucial part of effective retention of volunteers is the demonstration of the value of the data (Prysby and Super 2007, Sullivan et al. 2009), and we are now including research highlights in newsletters and fostering research collaborations that can demonstrate the value of the data we are asking people to collect. More information about the NCO's 2012 activities in these areas can be found in the annual action plan (aligned to our five year strategic plan), as well as in our Communications Plan (all available upon request) and Education Plan (www.usanpn.org/results/reports).

We recognize that placing all of our emphasis on engaging and retaining members from the baby boomer generation will result in difficulties sustaining participation in *Nature's Notebook* in coming decades. We therefore intend to develop aspects of our program that entice younger generations. Ideas include developing a Facebook app for data entry, improving mobile apps, and creating “badges” for observers to earn through achievement in *Nature's Notebook*.

CONCLUSIONS

We found that while we consistently recruit more observers directly, higher rates of retention and participation are attained by partnering with site-based groups. As our program and off-the-shelf materials have matured, we have seen an increase in both the number and success of partners working on the ground. As this model is yielding positive results, and critical to our on-the-ground success as a national organization, we seek to further cultivate these partners, providing needed services, recognition and support. We hope that a multitude of regional efforts, using the same methodology and contributing to the same data set, will result in a rich data resource. As such, we plan to continue to put resources and effort toward supporting groups with site-based leadership.

We also recognize that direct engagement continues to yield many observers, and should not be abandoned. The efficacy of engagement through membership organizations is difficult to evaluate at this time, as the results are mixed. Future efforts could parse the characteristics of membership organizations that are successful in recruiting and retaining observers, and allow us to filter potential partners more effectively.

REFERENCES

- Bonney, R., C.B. Cooper, J. Dickinson, S. Kelling, T. Phillips, K.V. Rosenberg, J. Shirk. 2009. Citizen science: A developing tool for expanding science knowledge and scientific literacy. *BioScience* 59:977-984.
- Crimmins, T.M., M.A. Crimmins, and C.D. Bertelsen. 2010. Complex responses to climate drivers in onset of spring flowering across a semi-arid elevation gradient. *Journal of Ecology* 98:1042-1051.
- Crimmins, T.M., A. Rosemartin, A. Lincicome, J.F. Weltzin. 2010. USA National Phenology Network 2009 Observer Survey Report. USA-NPN Technical Series 2010-003. www.usanpn.org.
- Gleeson, P.B. 2003. Managing and motivating the generations: Implications for the student and the employee. Meeting Report. Texas Woman's University, Houston, TX.
- Kellermann, J.L., T.M. Crimmins, E.G. Denny, C.A.F. Enquist, R.L. Marsh, A.H. Rosemartin, J.F. Weltzin. 2012. USA National Phenology Network 2011 Data & Participant Summary. USA-NPN Technical Series 2012-001. www.usanpn.org.
- Leopold, A., and S. E. Jones. 1947. A phenological record for Sauk and Dane Counties, Wisconsin, 1935–1945. *Ecological Monographs* 17:83–123.

- Menzel, A., T.H. Sparks, N. Estrella, et al. 2006. European phenological response to climate change matches the warming pattern. *Global Change Biology* 12:1969-1976.
- Ohrel, R.L., Jr. and K.M. Register. 2006. Voluntary Estuary Monitoring: A Methods Manual. 2nd edition. The Ocean Conservancy and the US Environmental Protection Agency. Accessed 5/18/2012 at <http://water.epa.gov/owow/estuaries/monitor>
- Perry, S. 2007. Baby Boomers Seek a Purposeful Direction in Later Life, Study Finds. The Chronicle of Philanthropy. Accessed 3/1/2012 at <http://philanthropy.com/article/Baby-Boomers-Seek-a-Purposeful/55117/>
- Pryby, M. and P. Super. 2007. Programming Citizen Science. Monograph of the Association of Nature Center Administrators.
- Silvertown, J. 2009. A new dawn for citizen science. *Trends in Ecology and Evolution* 24:467-471.
- Strong, R. and Harder, A. 2011. The Effects of Florida Master Gardener Characteristics and Motivations on Program Participation. *Journal of Extension* 49 (5).
- Sullivan, B. L., Wood, C. L., Iliff, M. J., Bonney, R.E., Fink, D. and Kelling, S. 2009. eBird: A citizen-based bird observation network in the biological sciences. *Biological Conservation* 142: 2282–2292.
- USA-NPN National Coordinating Office. 2011. USA National Phenology Network Stakeholders Workshop Report. USA-NPN Programmatic Series 2011-001. www.usanpn.org.
- Wiggins, A. 2011. eBirding: Technology Adoption and the Transformation of Leisure into Science. Conference Proceedings. *iConference* Feb 8-11, 2011.

