

CDI Citizen Science Working Group - Proposal for a USGS Citizen Science Workshop

Overview

Engaging the public in scientific endeavors has a long history. Amateur ornithologists monitored birds in 17th century Finland, and in Victorian England, citizen astronomers participated in the great Transits of Venus to accurately measure the distance from the earth to the sun. The Audubon Society's [Christmas Bird Count](#) began in 1900 and has yielded long records of North American bird distribution (USGS volunteers have monitored the "Brooke Circle" in Virginia continuously since 1947). Citizen science is the term now commonly used to describe projects in which non-specialist volunteers collect observations and measurements or perform computations for use in science projects (Turnbull, et al., 2000). In recent years, the Internet, smart phones, and social media have revolutionized the way data can be collected by interested individuals and shared with researchers, resulting in a proliferation of these projects. While questions have been raised about the accuracy of citizen science data, research is beginning to show that, properly constrained and managed, citizen science can produce data that compare favorably to authoritative data acquired by professional researchers (e.g. Haklay, 2010). The engagement of citizen scientists is increasingly viewed as a critical means of extending the reach of the research community "on the landscape", particularly where there are insufficient staff resources to generate the baseline and on-going monitoring and other data required to address complex scientific issues because such activities are expensive, labor intensive, and time consuming (Lee, et al., 2006; Silvertown, 2009).

USGS and Citizen Science

The USGS has a number of well-known citizen science efforts. [The Breeding Bird Survey \(BBS\)](#), a well-known USGS program started in 1966, tracks the status and trends of North American bird populations. Citizens collect important bird observations which are used to track abundance. [Did You Feel It?](#) is a website sponsored by the Earthquake Program that asks citizens to report ground shaking during an earthquake. Volunteers for the [National Phenology Network](#) monitor the life cycles of animals and plants and [help digitize records of bird](#) and animal distribution that date back to the 19th century. Many other USGS citizen science efforts, many championed by individual scientists in distributed centers, are not as well known to one another nor to the USGS at large. A forum for exchanging information could potentially provide immediate benefit to these projects and increase the visibility of these projects within and outside the USGS. Potential citizen science project leaders might need answers to these questions:

- How does one design a project, recruit, train, and retain volunteers?
- What types of data are appropriate candidates for collection by citizen scientists?
- Are there best practices that can be inferred and shared from established projects?

- What policy issues are encountered in citizen science projects, and how can these be addressed without undue burden on project participants and leaders?
- What data collection and management standards should be followed to ensure data can be integrated and shared?

The Citizen Science Working Group of the Community for Data Integration is proposing a USGS-wide meeting of citizen science project leaders inside USGS and in other partner organizations to raise awareness of citizen science and its potential uses and benefits, share best practices for establishing citizen science projects, working with volunteers, collecting and validating data, education, and communication.

Workshop Outcomes and Benefits

An immediate and significant workshop outcome will be the formation of an ongoing community-based infrastructure for sharing ideas, data, and support. Additionally the workshop will provide a venue for:

- Initiating projects that might span multiple mission areas;
- Showcasing USGS tools, including new mobile applications, supporting field observations and data collection;
- Exploring innovative techniques, such as whether mining data from social media can improve interdisciplinary scientific decision making;
- Creating or strengthening partnerships and opening dialogue channels with existing citizen science focused working groups such as DataOne's [Public Participation in Science and Research \(PPSR\)](#), Cornell Lab of Ornithology's [Citizen Science Central](#), and others.

Enhancing and expanding partnerships will provide important opportunities for the USGS research community to:

- Foster cross group pollination, both internally and externally;
- Exchange and communicate ideas, plans, use cases, and focus among groups (e.g., with the TSWG Mobile Applications Development Focus Group for [Citizen Science-oriented projects](#));
- Identify new avenues and approaches for research; and
- Increase efficiency and effectiveness of their projects by leveraging activities and resources and minimizing overlap with partner groups.

In addition to directly supporting the USGS's internal program of research, the results of this workshop could have additional societal benefits including:

- Making USGS science more approachable and understandable to students, teachers, and the general public;
- Expanding science knowledge and scientific literacy among citizen science volunteers (Bonney, et al., 2009); and
- Encouraging positive participation in the President's [America's Great Outdoors](#) and DOI's [Youth in the Great Outdoors](#) Initiatives.

The proposed workshop project, associated costs, and resulting products are described in detail below.

Bonney, R., et al. (2009). Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy. *BioScience*, 59(11), 977-984.

Haklay, M. M. (2010). How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. *Environment and Planning B: Planning and Design*, 37(4), 682-703.

Lee, T., et al. (2006). Citizen, science, highways, and wildlife: using a web-based GIS to engage citizens in collecting wildlife information. *Ecology and Society* 11(1).

Silvertown, J. (2009). A new dawn for citizen science. *Trends in Ecology & Evolution*, 24(9): 467-471.

Trumbull, D. J., et al. (2000). Thinking scientifically during participation in a citizen-science project. *Science Education* 84:265-275.

Project Topic	Tasks	Resources Required	Deliverables	Benefits to USGS Scientists	In-Kind Funding Provided	Total Funding Requested
USGS Citizen Science Workshop	<ul style="list-style-type: none"> • Plan and Conduct Workshop <ul style="list-style-type: none"> ○ Plan workshop ○ Conduct workshop • Communicate Workshop Findings <ul style="list-style-type: none"> ○ Prepare workshop materials (deliverables) for publication ○ Publish informal workshop report (to CDI) ○ Publish formal workshop report (OFR) ○ Report out findings at large national science meeting, e.g., the Participatory Science for Conservation Conference (PSCC) • Preserve and Share Knowledge <ul style="list-style-type: none"> ○ Set up and populate USGS Citizen Science website (extranet) 	<ul style="list-style-type: none"> • In-kind Costs <ul style="list-style-type: none"> ○ Program Committee: 10 FTE (1440 hours) ○ On-Site Logistical Support: 5 FTE (3 days) ○ Participant Attendance (35 estimate) ○ Workshop Committee Attendance (4) ○ Poster Session • Direct Costs <ul style="list-style-type: none"> ○ Travel: 2 Plenary Speakers and 3 others in need ○ Workshop Committee Attendance (6) ○ Workshop Refreshments ○ Distributed Materials (name tags, folders, agendas, abstracts, list of participants) ○ OFR Preparation (0.1 FTE/ 12 months) ○ EPN Services ○ Website Preparation (0.05 FTE/ 100 hours) ○ Travel to PSCC or other suitable large 	<ol style="list-style-type: none"> 1. Workshop 2. Reports: <ol style="list-style-type: none"> 1. Open-File Report (formal) 2. CDI Workshop Report (informal) - Snapshot of Citizen Science Project within USGS 3. USGS Citizen Science Website 4. Action Plan for future directions in citizen science research within the USGS/DOI 5. Knowledgebase: Collection and Sharing of Best Practices 6. Proposed Guidance on Crowd-Sourced Citizen Science Relative to USGS Volunteer Handbook 	<ul style="list-style-type: none"> • Mission Area Benefits <ul style="list-style-type: none"> ○ Climate: National Phenology Network provides extensive baseline datasets for comparison when researching the effects of climate change ○ Hazards: Open Street Map assists rescuers during disasters; Did You Feel It? provides more data about earthquakes and their effect on citizens ○ Ecosystems: National Phenology Network and Breeding Bird Survey provide extensive datasets about species that would not be collected otherwise • Increased exposure and recognition for USGS CS projects within the larger scientific community, not just in their local Science Centers. • Greatly expand data collection potential by harnessing citizen scientists. Citizen scientists can provide a broad geographic 'sensor network' beyond our scientists' reach. • USGS researchers made aware of internal and external citizen science projects and their 	\$87,065	\$39,331

national science
meeting

potential value to non-
participating research programs

- **Potential to leverage existing work** and achievements from other initiatives such as DataOne's Public Participation in Science and Research (2 CSWG members overlap) and Cornell's Citizen Science Central.
- **Potential to leverage efforts of and create synergy among the CS researchers and the USGS External Communications and Citizen Engagement** team in the Office of Communications, and other DOI initiatives such as the Youth In the Great Outdoors and the White House's America's Great Outdoors programs.
- **Snapshot of status of citizen science research** within the USGS/DOI Agencies and partners
- **Increased awareness of citizen science activities within USGS/DOI and partner agencies**; workshop report can be distributed to other agencies to inform and educate on our efforts;
- **Make USGS science more approachable and understandable** to students, teachers, and the general public;
- **Expand science knowledge and scientific literacy** among citizen participants.

Assumptions (for Costing Purposes)

Size, Venue, Dates, Duration

- **Size:** 50-60 on-site participants including select non-USGS partners, collaborators, or others; remote access via WebEx
- **Place:** Denver Federal Center
- **Date:** Late Spring 2012 (April-May)
- **Duration:** 3 days (2.5 days workshop plus travel)

Artifacts

- **Brief Summary Workshop Report:** 3 page summary of meeting post-workshop.
- **Workshop Report:**
 - 50-60 pages;
 - USGS-series publication, e.g., an Open-File Report (OFR) or Scientific Investigations Report (SIR) or, if unfunded,
 - an informal summary report for limited distribution to workshop sponsors and participants
- **Website:** USGS-hosted Public/**Extranet**/Intranet to
 - maintain and share key information & documents;
 - link to CDI Citizen Science Working Group and related communities in DOI and elsewhere
- **Workshop documents:** Presentations, posters, white paper(s), etc.,
 - posted to CDI-CSWG wiki and/or proposed website, and incorporated in workshop report (as appropriate)
- **Presentation** (Report of Findings) to [Participatory Science for Conservation Conference](#) (PSCC), Aug. 4-5, Portland OR (in conjunction with the Ecological Society of America's [2012 Annual Meeting](#))
- **Presentation** on work at CDI Annual Workshop in 2012, presenting preliminary results from our Brief Summary Workshop Report.
- **Action Plans** laying out short-term goals of citizen science within USGS, DOI, and partner agencies.

General Thoughts and Suggestions

- The focus should be on shedding light on existing projects within USGS and partners (including DOI), and educating others on how citizen science could help their studies/research
- Provide WebEx access for folks who cannot attend the workshop in person
 - Include information in workshop summary/reports from projects/programs who are not represented in person at the workshop
 - Include abstract/summary of project along with contact information for each project/program - head start on this using Barbara Poore's inventory/survey
 - Goal to produce a document representing the current status of citizen science and research within the USGS/partner agencies
- What can we glean/learn from existing projects in all the areas of interest?
- Invite speakers from well established projects outside the USGS/partners realm (since many other groups are leaps ahead)
- Those attending would learn how to set up new projects, technical aspects of citizen science projects (data management, standards adoption, technology choices, novel approaches), case studies of existing projects, dealing with challenges and breaking down barriers within the USGS and in the science world.

- Create partnerships and relationships with other citizen science working groups and focus groups such as DataOne's Public Participation in Science and Research (PPSR), Cornell's Citizen Science Central, and others. Foster cross group pollination and share information:
 - Exchange and communicate ideas, plans, focus among groups
 - Leverage activities of DataOne's PPSR and Cornell group
 - Have two working group members (Jake Weltzin (NPN/USGS) and Kelly Lotts (Montana State University)) on the CDI CSWG who will act as liaisons with DataOne
- Establish new CSWG focus groups and identify areas for future development and attention through the working group
 - Policy barriers
 - Best practices
 - Discovery/"Show and tell"
 - Training group

Other Workshop Ideas

- The [Citizen Science Working Group](#) (CSWG) maintains a separate [wiki page](#) for submitting and discussing additional ideas about the proposed workshop.

Ideas for Sessions, Presentations, and Breakouts (See [Citizen Science Workshop Draft Agenda](#) in development)

Suggested Session/Breakout Topic/Idea	Suggested Venue	Possible Presenter/Breakout Lead/Participant	Describes	Possible Outputs
Case studies of existing projects Spotlight on established projects	Plenary presentations; posters	<ul style="list-style-type: none"> NPN eBird iNaturalist USGS Did You Feel It? USGS BBS NPS 	<ul style="list-style-type: none"> Their project purpose, goals, reason for existence Drivers behind starting the project What are the data outputs? Are there management decisions being made with the data? Who are using the data? How does it strengthen or integrate with USGS Science Solicit expanded metadata/data survey? 	<ul style="list-style-type: none"> Typology of citizen science projects in USGS--active and passive (gathering data from social media) Understanding citizen motivation Detailed metadata records about the data collected (expand survey/inventory performed in Fall 2011) How can CS data be assessed How are CS data used, and by whom Where the data are used, what standards it they utilizes, how it can be accessed, data sharing policy
Challenges, barriers, tough spots (What are the barriers you encountered establishing your citizen science project)	Breakout	<ul style="list-style-type: none"> National Map OSM 	<ul style="list-style-type: none"> Challenges encountered in establishing or running citizen science projects How did you deal with USGS policies and issues such as PII, etc. USGS Volunteer Handbook doesn't clearly address web-scale Citizen Science. What other barriers had to be overcome? 	<ul style="list-style-type: none"> Knowledge-base of challenges and solutions from various projects/perspectives How to motivate volunteers in active versus passive projects Use of <i>gamification</i> as approach to spur interest/participation by other user communities
How to	Breakout	<ul style="list-style-type: none"> Citizen 	<ul style="list-style-type: none"> How did you establish your project - what 	<ul style="list-style-type: none"> Roadmap of needs and

establish a citizen science project		Science Central	<ul style="list-style-type: none"> • was the driver/need? • Policy issues • How to engage the public • Sustainability (keeping volunteers consistently engaged) • Rewards/inducements • Training citizen scientists 	<ul style="list-style-type: none"> • decisions, how to start a citizen science project within the USGS • Collection ethics • Quality resources and help documents used as guides
Collecting, managing, and using citizen science data	Breakout	<ul style="list-style-type: none"> • eBird • USGS BBS • DataONE • NPN 	<ul style="list-style-type: none"> • Collection protocols • QA/QC of data • Analyzing data • Outputs/effect/evaluation needs 	<ul style="list-style-type: none"> • Mandated limits on collection of PII, other information • Security best practices • Data acquisition and management best practices • Data quality, reliability, suitability guidance
Standards adoption in citizen science projects	Breakout	<ul style="list-style-type: none"> • DataONE 	<ul style="list-style-type: none"> • What standards are used? • What protocols are available? • Biological data standards used? • What has the adoption of standards allowed in your project? • Has it expanded data sharing capabilities? • Other benefits the adoption of standards can bring? • Novel uses of the data by other scientists or in other programs/projects? 	<ul style="list-style-type: none"> • Knowledgebase from existing projects: <ul style="list-style-type: none"> ○ Standards used ○ Protocols used ○ Biological data standards used ○ Exchange schemas used ○ Examples of data exchange or integration
Technology in support of citizen science	Breakout; posters	<ul style="list-style-type: none"> • TSWG-MAD 	<ul style="list-style-type: none"> • Technology stack (data acquisition, management, security, etc.) • Technologies, novel approaches for data collection, crowd-sourcing, distributed computing, e.g.: <ul style="list-style-type: none"> ○ Mobile apps, including those currently developed or proposed by 	<ul style="list-style-type: none"> • Knowledge-base from existing projects • Developments or examples from existing projects • Pros/cons to consider with each • QA/QC benefits of mobile data collection (per Sally Holl

		USGS) ○ Desktop grids Mobile grids ○ Augmented reality	TWSC - How mobile data collection factor into contributions to citizen science - largely the mechanism for contributing to CS projects)
Needs and future directions in USGS/Citizen Science partnerships	Panel; breakout	<ul style="list-style-type: none"> • Discussions and kickoffs for new focus groups <ul style="list-style-type: none"> ○ Policy Barriers group <ul style="list-style-type: none"> ▪ Address continuing or upcoming challenges ▪ Include folks who have some kind of power to push issue resolution (or establish contacts with those who do have that power) ○ Discovery group <ul style="list-style-type: none"> ▪ Continue the discovery and sharing of new/existing projects, establishing document store/knowledge-base of their activities ▪ Scheduling meetings for future CSWG meetings, inviting or outreach to other USGS scientists ○ Training group <ul style="list-style-type: none"> ▪ Have presenters demonstrate various how tos 	<ul style="list-style-type: none"> • Expansion of internal/external participation in CSWG and related activities • New issue-specific focus groups within CSWG • Brainstorm ideas for new focus groups needed • Solicit membership

Staffing (Planning, Execution, and Follow-up)

Feasibility to complete by July 2012

The CSWG's desire is to hold the workshop in spring of 2012 (April-May 2012). Ideally, we would have six months to plan and prepare for the workshop, however, we can likely accept a minimum of four months preparation time for the development and planning of logistics and sessions, and to be considerate of our invited/solicited speakers and participants who will need to arrange and check on funding for travel.

The development of a short summary report (approximately 3 pages) can be expected before July 2012, but the larger workshop report (OFR or SIR) and website providing access to more detailed information may be delivered past that date due to their reliance on materials and information gleaned at the actual workshop. The Workshop Report Development team can do some pre-workshop development using contributed abstracts and inventory information, however much of the information gleaned from discussions and interactions at the workshop will need to be written and included post-workshop completion.

Proposed Workshop Planning Team

- Jake Weltzin - NPN/USGS/member of D1 PPSR WG
- Barbara Poore - USGS/CEGIS
- Megan Hines - UW/USGS
- Dave Govoni - USGS/OEI
- Sue Hazlett - USGS/ERGC
- Kelly Lotts - Montana State University/Representative back to D1
- Eric Wolf - USGS/CEGIS
- Elizabeth Sellers - USGS/CSAS
- Steve Tessler - USGS/WRD
- Sarah Courchesne - Tufts School of Veterinary Medicine/SEANET
- Abby Benson - USGS/CSAS

Proposed Workshop Report Development Team

- Elizabeth Sellers - USGS/CSAS
- Dave Govoni - USGS/OEI
- Abby Benson - USGS/CSAS

Proposed Website Development Team

- Megan Hines - UW/USGS
- Dave Govoni - USGS/OEI (Information Architecture design)