

Citizen Science Case Studies

A collection of key learnings
and benefits of citizen science
projects



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Cover photo: Nature Nomads volunteers exploring Bundjalung National Park and helping out with bush regeneration and bird surveys (J McClymont/OEH).

Published by:

Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (OEH and national parks enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
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Contents

WildCount: a collaborative case study using crowdsourcing to analyse images	1
Background	1
Citizen Science monitoring the recovery of Warrumbungle National Park post-2013 fires	2
Background	2
World Park Congress BioBlitz – Partnerships case study	3
Background	3
Evaluating Citizen Science data quality	4
Background	4
Zooniverse: Value of online projects and research into ways to measure the success of Zooniverse projects	5
Background	5
Citizen Science: findings relating to participant behaviour change and motivation	6
Background	6

Globally, citizen science is leveraging the enthusiasm of the public to help answer scientific questions. This has allowed greater amounts of data to be collected and analysed while breaking down barriers between the scientific world and the public. The six case studies below provide insight into the benefits, challenges and impacts citizen science projects can have.



Citizen Scientists searching for birds Photo: Simone Cottrell/OEH

WildCount: a collaborative case study using crowdsourcing to analyse images

Background



Emu looking at a camera trap Photo: Wild Count

WildCount is a 10-year fauna monitoring program that uses motion-sensitive digital cameras in 200 sites across 146 parks and reserves in eastern NSW. Every year more than 270,000 images are taken by the remote cameras of which around 1/3 are blanks.

The crowdsourcing platform DigiVol, (developed by the Australian Museum in collaboration with the Atlas of Living Australia) is used by citizen scientists to sort through the thousands of records and images in Museum and partner collections.

Aims

Pilot the accuracy and interest of the online citizen science DigiVol community to review and identify species in the WildCount images.

Challenges and Benefits

Science Division prepared a report looking at the accuracy of the online citizen science community. Volunteers had a 96% accuracy in assessing presence/absence. The accuracy varied greatly between species. The citizen science team is currently working with the Australian Museum to modify their platform to improve clarity. Advantages of using crowdsourcing are cost, speed quality, flexibility, scalability, publicity and diversity.

Citizen Science monitoring the recovery of Warrumbungle National Park post-2013 fires

Background



Students looking for birds
Photo: Simone Cottrell/OEH

Citizen scientists are helping track plant and animal recovery post an intense 2013 bushfire. Three initiatives are currently underway:

1. Using an app, visitors to the park are asked to upload photos of recovering vegetation from three fixed photo points within the park so the data can be compared over time.
2. Citizen scientists have been surveying burnt and unburnt sites within Warrumbungle National Park to monitor how bird diversity changes as the park recovers.
3. Working with schools (neighbouring Warrumbungle National Park), OEH staff and students record water quality and macroinvertebrate diversity within the park and at a control site at Mount Kaputar National Park.

Aims

Involve the local community and embed citizen science in monitoring to provide valuable information on how the National Park is recovering from fire by collaborating with the Warrumbungle National Park Environmental Education Centre, the National Park Visitor Centre and other Science Division post-fire projects.

Evidence of Impacts

1. Since its inception, visitors have continued to upload images onto the WarrumbungleSnap website. Researchers have used the images to identify change at the photo point sites. This project has been the catalyst for other photo point projects in OEH.
2. Occurring twice per year (Autumn and Spring), 'Back to Bungles' bird surveys continue to attract new and repeat citizen scientists. The collective effort of OEH staff and volunteers has been able to identify changes in bird diversity and importantly, increases in bird diversity in burnt areas. So far, 123 different species have been recorded during the surveys.
3. Soon after the fires, Warrumbungle National Park received heavy rain causing flooding and erosion. This resulted in sedimentation of creeks and a complete change in creek structure. The collaborative effort has recorded improved changes in water quality and an increase in macroinvertebrate diversity – likely due to the creeks returning to their pre-fire state.

World Park Congress BioBlitz – Partnerships case study

Background

A BioBlitz is an excellent tool for exciting children and community members about environmental science. This event generates energy and enthusiasm among scientists and lay people alike. It is rare for biologists from many disciplines to have the opportunity to get together, share their passion with each other and the public, and work towards a single common goal. This event is designed to capitalise on that and to encourage citizen science through interaction with the community.

The World Parks Congress BioBlitz, led by OEH, was held in 2014 at the Sydney Olympic Park. It was a free for all-ages event and scientists worked with adult and children citizen scientists to create a one-day 'snapshot' of urban biodiversity in the area. Participation included a mix of options including expert-led and solo surveys using the iNaturalist app to record observations.

Over 500 people participated with over 243 species recorded, including some invertebrate species that had never been logged in that area. Valuable information was added to Sydney Olympic Park Authority records.

Aims

A BioBlitz will:

- promote and inspire sustained environmental programs within the surrounding community
- engage people in meaningful citizen science
- provide a vehicle for informal and formal environmental education
- acknowledge that biodiversity is not limited to the rainforest, but all around us, even in the most unexpected and mundane locations
- formulate a database of localised species
- help protected area managers track change over time.

Benefits of Partnerships

The day is a useful example of how science and the community can work together. Citizen scientists came from all over the world to participate and the event highlighted the benefits of citizen science.

The BioBlitz was also successful in forming many national and international partnerships who contributed both in-kind and financial support. In addition to a crew from National Geographic who created a [video package](#) of the day, the BioBlitz tent was filled with interactive hands-on displays from Taronga Zoo, the Frog and Tadpole Study Group, Society of Insect Studies, Living Data and the Australian Museum.

The promotional advantages were extensive as the event was published on partner websites, newsletters, Facebook, Twitter and Foxtel on the National Geographic Channel. Other sponsors included IUCN (International Union for Conservation of Nature), Canadian Museum of Nature and Ontario BioBlitz, Parks Canada, Royal Botanic Gardens and Atlas of Life in the Coastal Wilderness.

Evaluating Citizen Science data quality

Background

The increase in the number of citizen science programs has prompted more research into the ability of citizen scientists to provide data of sufficient quality. Data quality is paramount and could have far-reaching environmental, social and political implications. It can also be an inhibitor to some scientists in the field who question whether citizen science can produce quality data.

There have been a number of papers on this issue. Even though the different research papers target different species, there are several consistent findings showing that volunteers perform equally or almost as well as professionals in many areas. It is generally recognised that standardising monitoring protocols, designed by professionals and field-tested with citizen scientists working under realistic conditions can improve quality and analysis. A list of consistent findings when assessing citizen science vs professional scientific data collection are outlined in the section below.

Challenges and Benefits

- Once proper protocols are established, they should be standardised and data quality should be regularly monitored to ensure that training and sampling design remain adequate.
- Citizen science data quality is more accurate where species identification training is offered.
- Citizen scientists performed better when identifying higher taxonomic categories that differed dramatically in physical characteristics or pooled by genus or where characteristics were more narrowly defined.
- Predictably, citizen scientist data is less accurate when it comes to classifying more difficult groups or species within a given taxon (e.g. species that have similar physical attributes that are hard to distinguish between).
- Such errors in species identification could be remedied by considering protocols that leave more difficult species to taxonomists.
- Accuracy rates can be improved if protocols require voucher specimens to be collected for verification and if geolocated specimen are photographed (and specific instructions on what physical characteristics to look for are provided). The evolving use of technology such as online data entry forms with automated validation capabilities will help improve data quality.
- Citizen scientists easily acquired GPS skills to geolocate species. The challenge of making these technologies available to large numbers of volunteers may be overcome by creating a network of 'technology libraries' to host GPS units and other monitoring resources for surveys.
- Citizen scientists and professionals performed equally when implementing plot-based assessments recording presence/absence for most species and monitoring networks.
- Citizen scientists with modest training can collect useful observational data for detecting spatial and temporal differences. These results mirror similar studies that

found citizen scientists are most effective when monitoring changes in communities over space and time (including abundance, richness and composition).

Zooniverse: Value of online projects and research into ways to measure the success of Zooniverse projects

Background

Zooniverse is a cluster of projects that use online volunteer contributions to analyse and interpret large datasets. No specialist knowledge is needed to participate. The original Zooniverse project focussed on astronomy but has since extended to an increasingly diverse range of projects. It has more than 1.1 million registered volunteers around the world.

Aims

1. To solve scientific problems by serving as a 'reduction tool' for data and labour-intensive science. By using citizen scientists, user input is transformed into data product that can be used for research.
2. To engage with the public to educate and change attitudes towards science.

Challenges and Benefits

A case study of Zooniverse projects was conducted to define and measure success in online citizen science against a comprehensive set of criteria. This case study illustrated how a success matrix can measure both contribution to science and public engagement.

One of its key findings was that projects that engaged well with volunteers resulted in more classifications *and* better/more scientific impact. In other words, to achieve success, citizen science projects need to have scientific impact and good public engagement. One goal cannot be achieved without the other. A side benefit to all the Zooniverse projects was that they provided cost savings on average equivalent to 34 full-time working years due to the involvement of volunteer citizen scientists.

Citizen Science: findings relating to participant behaviour change and motivation

Background



Community meeting in Quollidor focus area, Broger's Creek Photo: Simon Tedder/OEH

Citizen science has a significant role to play achieving a wide range of outcomes for people and the environment. It engages people with their environment and increases their understanding of its value. Research shows that through participating in projects that monitor the local environment, people increase their knowledge and awareness of the biodiversity of their local green spaces. However, more recent research conducted by the Scottish Environment Protection Agency and a Conservation Volunteer group shows a longer-term correlation in positive pro-environmental behaviour because of participation in citizen science.

Motivation

Understanding participant motivation is important. Participants like to know that their actions matter or they can see visible changes because of their action. Sustained commitment is also more likely where citizen science projects have been devised by participants themselves. Lastly, there is evidence citizen science leads to connectedness to nature which is a precursor for positive behavioural change in attitude towards the environment.



People watching birds with binoculars at Warrumbungle National Park, Burbie Canyon track: Simone Cottrell/OEH

Rewards. Motivation is also affected by the tangible and intangible rewards citizen science projects provide. Rewards can be an intrinsic motivation, driven by individual interests and values and desire to help where no explicit reward is offered. Rewards can also involve intangible competitive participation, particularly when online projects use points and game advancement. Similarly, displaying top contributor rankings on a project and providing access to personal performance metrics are powerful incentives. Lastly, there are more traditional tangible rewards such as public acknowledgement, certificates, T-shirts, role advancement, and volunteer appreciation events.

Social opportunities. This is another key motivator for citizen scientists. In more local projects, this could include face-to-face training and group participation or in some instances classroom participation and forums in a more formal educational setting with researchers taking part in structured group tours. Where participants are distributed over geographical distances, social opportunities are still

afforded by social media, blogs, conference calls and email list servers.

Group dynamics

Feedback from social peers can act as a strong motivation for participants. Raising awareness of the group's work and this new behaviour as a 'social norm' can also speed up the spread of pro-environment behaviours.

The most effective citizen science projects give groups time for conscious reflection and sharing of experience and learning. Lastly, apps have an integral role in highlighting a situation or problem among the wider community and spark greater interest and involvement of participants beyond their initial engagement.



Participants sorting collected macroinvertebrates Photo: Patrick Tegart/OEH

Understand and experience

Research suggests that there is a meaningful link between citizen science participation and increased environmental knowledge, attitudes and pro-environmental behaviour. Knowledge and increased awareness were also key motivators for citizen science participants. Other interesting findings include: (a) active participation in childhood results in related positive behaviours in later life, and (b) working with an 'expert' increases motivation among citizen scientists. Again, citizen scientists' motivation and engagement are improved when they are given the opportunity to share their learning within the group.