



Harnessing citizen science

using volunteers effectively for conservation research and monitoring

Citizen science, the involvement of volunteers from the general community in academic research, has become increasingly important in conservation science and management.

Citizen science can inform decisions

The popularity and scope of citizen science appears almost limitless. For citizens, the motivation is to contribute to science and better conservation outcomes. For researchers and managers, it provides an opportunity to gather field data with limited resources.

Citizen science enables a significant in-kind contribution to survey projects by volunteers, an investment that is unlikely to be possible in most scientific projects. The way in which a citizen science program is designed and delivered is key to whether it can inform conservation and management decisions.

Citizen science has a wide range of applications including:

- Gathering baseline data
- Providing monitoring data
- Tracking the spread of invasive species or diseases

Does citizen science work?

How reliable is volunteer-collected information? Some scientists are sceptical about its utility and accuracy. Our research comparing citizen-science data to systematically collected data suggests citizen science can work, even without control over quality. With appropriate calibration, volunteer-collected and existing atlas data can be used to generate robust datasets - eg, population estimates for many species at a regional scale. See Szabo *et al*, 2012 and [Decision Point issue #64](#).

Why use citizen science?

- Significant in-kind contribution is possible
- Cost-effective method of data collection
- Data is reliable, with appropriate protocols
- Can inform management decisions
- Can address large-scale ecological issues, such as migration patterns and the impacts of climate change, across countries and continents
- Contributes to:
 - raising public awareness
 - education
 - recreation
 - social and economic research
 - improved monitoring methods

In practice

Eremaea eBird is an online resource for birdwatchers to record and share their observations. It helps citizen scientists keep track of their bird sightings and bird lists, map their records and share their data with the growing Eremaea-eBird community.

As the bank of records grows there is an increasing opportunity for the information to contribute to science and conservation.

CEED played a pivotal role in establishing Eremaea eBird in 2014 when two online

bird groups (Eremaea in Australia and eBird in the United States) joined together.

Since then, Eremaea-eBird data have been incorporated into the Australian National Heritage Assessment Tool, and research projects incorporating Eremaea-eBird data have been established for learning about the state of Australia's environment and assessing the extinction risk of nomadic birds.

Citizen science does have its challenges. These include survey inconsistencies over time, potential errors in records due to variable observer skills, spatial bias in effort (citizen scientists prefer some places over others), and at the very top, survey design and communication issues.

Critical success factors

To ensure the work of citizen scientists makes a meaningful contribution to scientific research and monitoring, the following must be in place:

- **Objectives:** clear objectives and outcomes established
- **Protocols:** volunteers fully understanding project requirements and collection methodology
- **Infrastructure:** data is stored effectively
- **Coordination:** resources needed for coordination of volunteers
- **Communication:** between researchers and organisations coordinating volunteers is critical
- **Contribution:** volunteers' contribution is valued and recognised with data or results shared

A growing network

With the emergence of new technologies, greater networking and the rise of open-access science, volunteers will increasingly have the capacity to participate in monitoring and managing biodiversity. This is already becoming possible with programs such as [Eremaea-eBird](#), [Fungimap](#), the [Atlas of Living Australia's Citizen Science portal](#) and recent formation of the [Australian Citizen Science Association](#).

For more information on citizen science:

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Resources

- Szabo JK, RA Fuller & HP Possingham (2012). A comparison of estimates of relative abundance from a weakly structured mass-participation bird atlas survey and a robustly designed monitoring scheme. *Ibis* 154: 468-479.
- Tulloch AIT & JK Szabo (2012). A behavioural ecology approach to understand volunteer surveying for citizen science datasets. *Emu* 112: 313-325.
- Tulloch AIT, LN Joseph, JK Szabo, TG Martin & HP Possingham (2013). Realising the full potential of citizen science monitoring programs. *Biological Conservation* 165: 128-138.
- [Australian Citizen Science Association](#)
- [Citizen science and conservation \(Decision Point #89\)](#)
- [Citizen science and the value of protected areas \(Decision Point #83\)](#).

CEED is an Australian Research Council (ARC) partnership between Australian and international universities and research organisations. Our vision is to be the world's leading research centre for solving environmental management problems and for evaluating the outcomes of environmental actions.

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How to make the most of citizen science

1. **Learn**
Elements of successful citizen science protocols should be incorporated into future programs, emphasising: (a) fine-scale data collection, (b) temporal replication that covers the full range of habitats or land use types, and (c) communication of data needs with volunteers.
2. **Maintain quality**
Regional coordinators are in place to maintain data quality.
3. **Communicate**
Communication between researchers and the organisations coordinating volunteer monitoring is enhanced, with monitoring targeted to meet specific needs and objectives.
4. **Fill the gaps**
Application of citizen science programs to under-explored objectives and species is encouraged, and data are made freely and easily accessible.