Citizen Science yields reliable biodiversity baselines for assessments

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Outline

1. **Citizen Science – an overview**
2. **Citizen Science contribution to biodiversity data**
3. **Other benefits of Citizen Science**
4. **Has CS contributed to Impact Assessment?**
5. **Can CS contribute more to Impact Assessment and also enhance participation?**

Citizen Science – Overview (1)

Citizen Science (CS) **engages the public in genuine scientific outcomes and yields reliable useful data** (McKinley et al 2016, Fraisl et al 2022).. This may be counting things (birds, tress) or developing entire science projects

Three approaches to public participation: **contributory, collaborative and co-created** (The Open University)

"CS research can fill important data gaps across both time and space, which might not otherwise be possible without the contribution of many participants, including people with local andlay knowledge or Indigenous knowledge" (Fraisl 2022)

Recent rapid expansion - opportunities through new/emerging technologies (mobile smart phones and low cost sensors, crowdsourcing, the internet and cloud storage
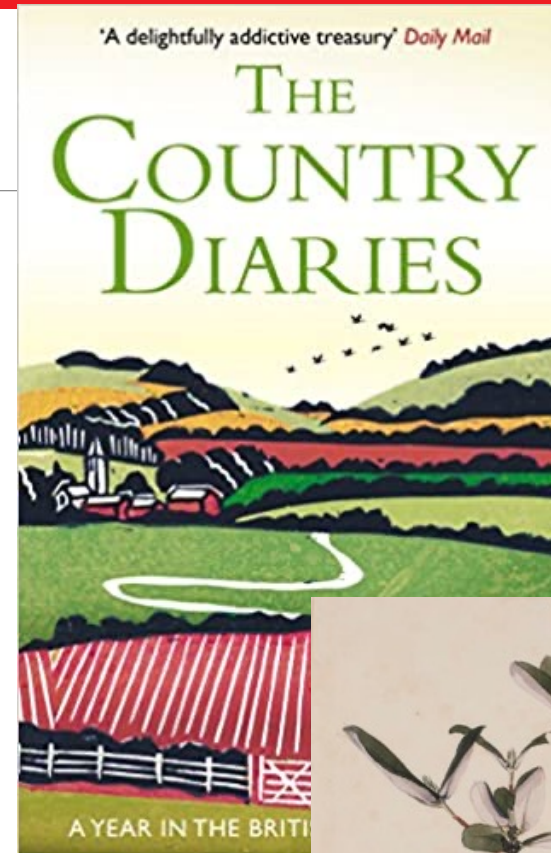
Citizen Science – Overview (2)

'Unqualified' citizens have long contributed to natural history & weather-related observations & survey data (farmers/hunters, plant collectors, country landholder diaries, Natural History Associations) but not organised or data-verified

Now tens of thousands of CS projects and > 1 million volunteers globally (but difficult to keep track) – USA Citizen Science Association lists >2,000 known projects; Australian CSA has links to >1500 projects .... Plus other educational CS projects and community nature conservation programs

Example: **Powerful Owl Project** (>10 yrs, 270 urban territories)

NOTE: Australia's Radio Galaxy Zoo (CSIRO) involved over 12,000 volunteers who analysed radio sky images, and made over 2.29 million classifications – equivalent to 122 years of full-time work if done by a single astronomer. (Nasrullah 2022)
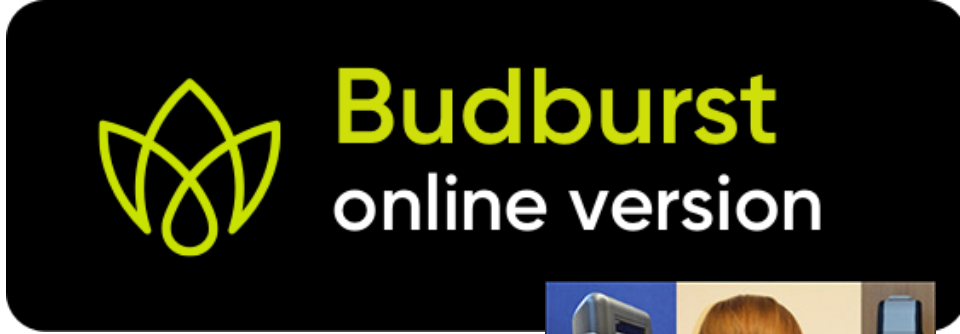

'A delightfully addictive treasury' *Daily Mail*

THE COUNTRY DIARIES

A YEAR IN THE BRITI

Citizen Science – Overview (3)

Wide of apps & equipment now available:

Each with a range of sponsors/partners:
- Universities
- Atlas of Living Australia
- Local Councils
- Museums & Science Departments
- Environment Agencies
- Landcare & Catchment Groups
- Resource companies & private sector

Butterfly Migration Project

Plus camera traps, call ID apps and wearable monitoring equipment

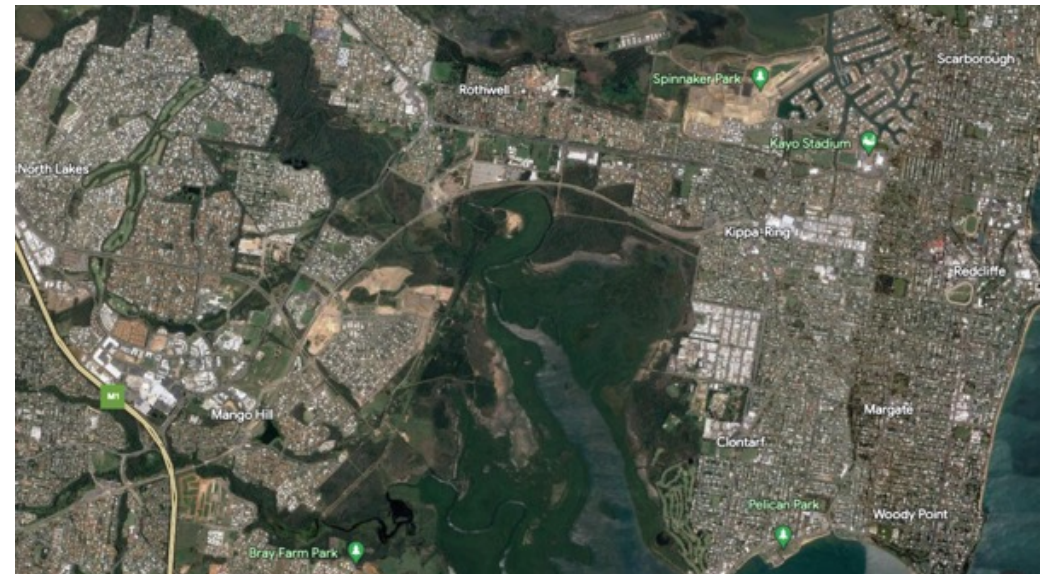# Citizen Science – Overview (4)

CS is getting smarter & more trustworthy

No longer just about data collection, now also how data is analysed and used

Challenging the old expert paradigms *e.g Redcliffe Rail Line IAS*

Effective impact assessment needs to build on multiple sources of evidence, including CS
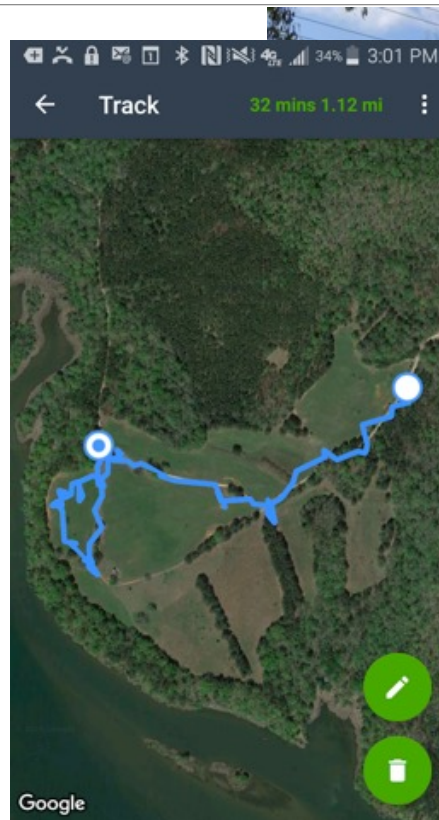
Who else will collect long term base data?

Hays Inlet on northern side of Brisbane
Source: Google Earth

CS contribution to Baseline Data - Birds

Biodiversity research relies on CS data to understand ecological patterns at spatial and temporal scales (Mesaglio et al 2021)

50% of published papers on migratory shorebirds have used CS data (Nasrullah 2022)

CS contribution to Migration Data - Birds

The Great Backyard Bird Blitz in February each year involves > 0.5 m people across 202 countries.

In Australia, the **Aussie Backyard Bird Count** (October) recorded 3.9m birds of 620 spp (124,000 checklists)

 CS has confirmed mass migrations - In Australia, birds move north-south (summer-winter) and drought-related movements from inland to coast in drought.
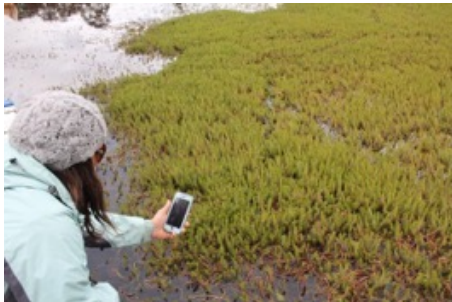
Essential baseline data for EISs !!
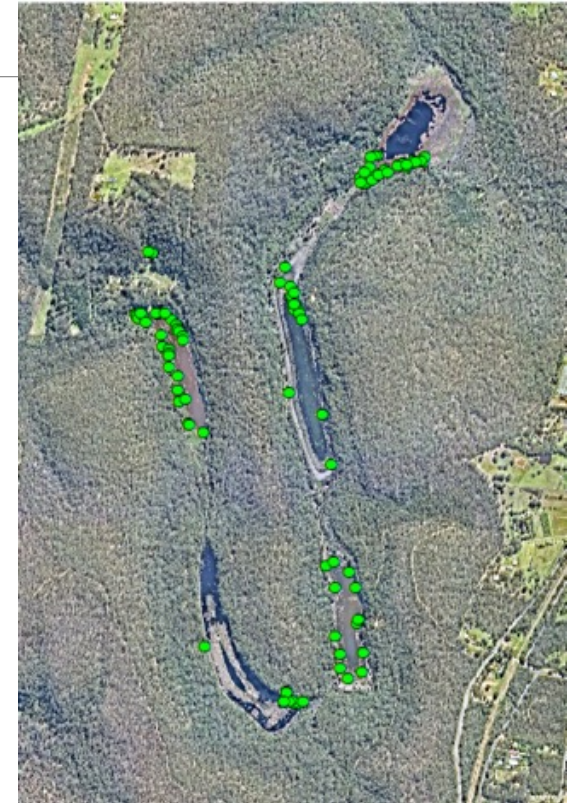
Source: Wen et al 2016
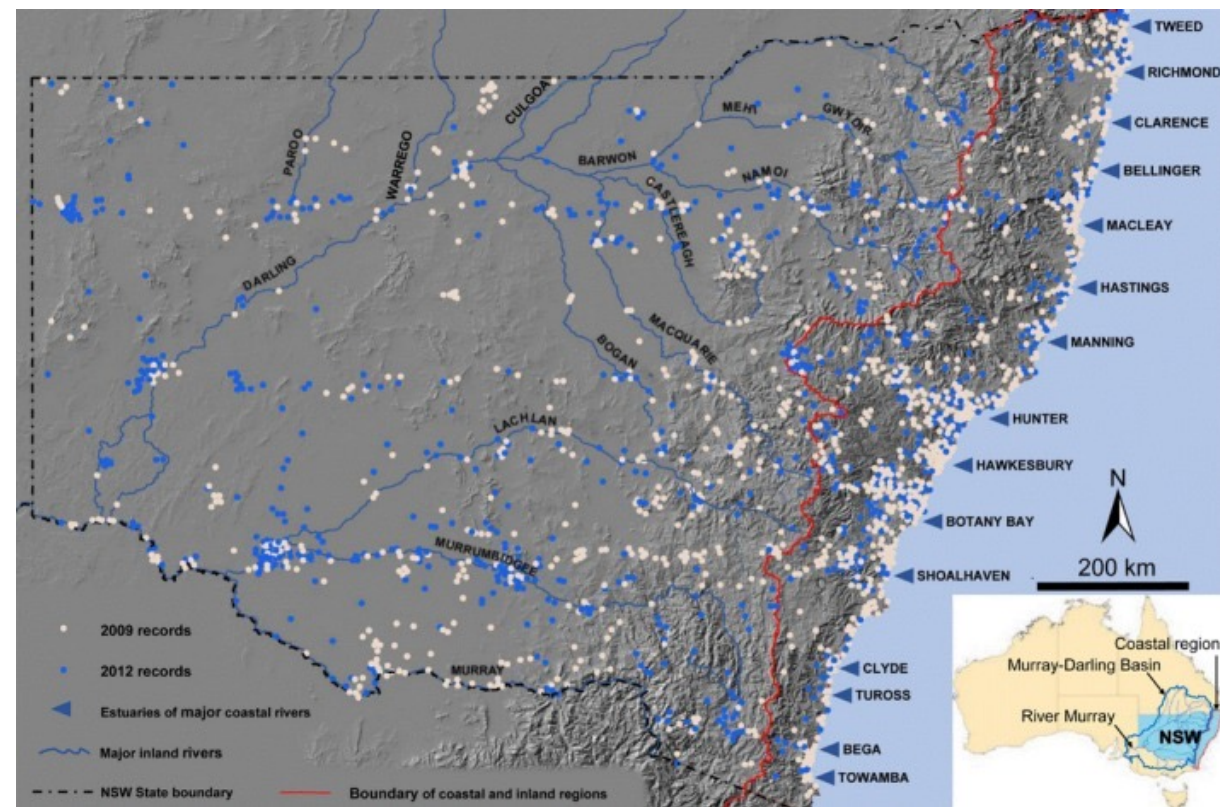
CS contribution to Biodiversity Baseline Data

Waterbug mapping

Source: National Geographic

The Horsehoe Count

Join The Horsehoe Count, a survey that gets volunteers to count horseshoe crabs during spawning season at beaches in Delaware and New Jersey.

Observe Appalachian Flowers

Monitor the timing of plant flowering in the Appalachian Mountains as you hike trails. The Appalachian Mountain Club will use the data as part of a study to understand how changes in climate are affecting mountain flora.

Rare & Threatened Species-targeted surveys

Source: Australian Citizen Science Association

Other benefits of Citizen Science

In addition to better more widespread data and trends; and more accessible & transparent data, benefits include:

- **Science education and awareness in the community**

- **Community nature conservation – reserves, weeds, revegetation, nest boxes, fauna crossings etc**

- **Inclusiveness – more women, more young people, more disadvantaged/marginalised groups, more First Nations**

- **Better informed community inputs and submissions;**

- **Empowers local communities**

Has CS contributed to impact assessment?

Yes, with respect to base data especially birds

Toondah Harbour coastline development proposal in a Ramsar-listed wetland (part of Queensland's Moreton Bay). EIS used QWSG migratory shorebird bird data to analyse temporal variation in bird use of roosting & feeding sites.

- CS data collected over many years (26) prior to and unrelated to project

- Concerns over interpretation of CS data ?

Also CS has an increasing role in **compliance monitoring** eg. In residential areas surrounding approved landfills; (graph shows 'IRATE' measurements of air pollution during landfill fire)
but generally adversarial

Can CS contribute more to assessment & enhance participation?

YES … in baseline data (biodiversity, water and air quality) collected & analysed over wide areas and many years prior to project proposal; as a basis for assessing impacts in the context of temporal and spatial variability; part of initial constraints and opportunities analysis, prior to planning and design. This allows the community to survey and identify parts of a site with greatest value./significance

❑ BUT data collectors may not be happy with consultants/agencies using (misusing?) 'their' data this way

YES … in post approval/post construction (operational) monitoring of predicted impacts

❑ BUT …. The groups most willing to commit time to monitoring are often adversarial, not impartial

YES …. In Strategic Impact Assessments, with a broader scope than a single development project

❑ BUT…. CS data inputs require expert management of data, volunteer effort and inclusivity

MAYBE ? ….data & survey collection integrated in project-specific impact assessment

❑ BUT … conflict of interest issues if interest groups contribute data and also make submissions (whether or not CS researchers are paid or voluntary); requires full disclosure and careful management

References:

Fraisl D. (2022) Citizen science in environmental and ecological sciences *Nature Reviews (2022) 2:64*

Mesaglio T & Callaghan C.T. (2021) An overview of the history, current contributions and future outlook of iNaturalist in Australia. CSIRO *Wildlife Research*, 2021, **48**, 289–303

McKinley D.C. et al (2022) Citizen science can improve conservation science, natural resource management, and environmental protection. *Biological Conservation 208 (2017) 15–28*

Nasrullah.,Q (2022) The current state of citizen science. *Cosmos July 2022 1-9*

Vohland, K et al (Eds – 2021) The Science of Citizen Science. Springer . ISBN 978=3=030-58277-7

Wen, L. et al (2016) Changes in distribution of waterbirds following prolonged drought reflect habitat availability in coastal and inland regions. *Ecology and Evolution 2016; 6(18): 6672– 6689*

Let's continue the conversation!

Post questions and comments in the IAIA23 app.

Cartoon: *Frits Ahlefeldt*

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