

# 03 COMMUNITY LEADERSHIP IN SUSTAINABILITY AND SCIENCE



## Section contents

Recommendations	49
Introduction	49
The value of environmental sustainability action in the ACT	50
Environmental value of volunteers	50
Economic value of environmental volunteering	51
Health and the social value of environmental volunteering	52
Young people make a contribution	53
Older people make a contribution	55
Activism, advocacy and agency	56
Environmental sustainability: variety and activity in cities	59
Natural Resource Management (NRM)	61
Natural Resource Management on public land	63
Natural Resource Management on private land	67
Citizen science – science, the public and the environment	70
What is citizen science and why is it important?	71
Citizen science in and around Canberra	71
Citizen science – the arrival of the digital	75

# RECOMMENDATIONS

**Recommendation 8:** continue to explore the use of ‘deliberative democracy’ for environmental initiatives in accordance with the aspirations of the *ACT Whole of Government Communications and Engagement Plan 2019* and in collaboration with the *Climate Change Strategy 2019–25* Community Liaison Team.

**Recommendation 9:** specifically provide for the recognition of citizen science and community environmental action with a targeted awards program.

# INTRODUCTION<sup>1</sup>

‘The kind of change required by sustainability implicates each community, each household, each individual. Successful solutions to problems at this level of society will need to be rooted in the cultural specificity of the town or region if the people are to be supportive of and involved in such change.’<sup>2</sup>

Promotion of participatory processes in environmental contexts has become the norm internationally, nationally and locally, and this is increasingly reflected in environmental and other reports.<sup>3</sup>

Participatory processes are a powerful driver of the changes that many people believe to be essential if we are to become a sustainable society, ready and willing to deal with climate change, and able to arrest environmental degradation.<sup>4</sup>

While governments enter into binding agreements to address global challenges, there is increasing recognition that the implementation of such commitments requires the engagement, buy-in and action from all stakeholders, including the broader community.<sup>5</sup>

Building and mobilising capacity is a process that takes time and requires communities to ‘learn by doing.’<sup>6</sup> Environmental sustainability activity involves symbolism and practicality, and at its best it explores unique community attributes, of which the ACT has many and much to offer.

- 1 It is the mission of the Office of the Commissioner for Sustainability and the Environment (OCSE) to promote community engagement and act as an independent voice for the environment and sustainability in the ACT, see <https://www.envcomm.act.gov.au/about/our-values>. OCSE connects with schools, academic institutions, volunteers and administrators, and not for profit organisations. The community has been generous and enthusiastic, sharing their knowledge about places of environmental, social, economic and cultural importance, and about localised action in places they love and respect, however unremarkable these places might or might not be to others. OCSE thanks every citizen scientist and environmental volunteering organisation that has contributed a case study to this chapter.
- 2 UNESCO, 1997, *Educating For a Sustainable Future: A Transdisciplinary Vision for Concerted Action*, paragraph 14, found at [http://www.unesco.org/education/tlsf/mods/theme\\_c/mod17.html](http://www.unesco.org/education/tlsf/mods/theme_c/mod17.html)
- 3 European Commission, 2013, *Science for Environment Policy in Depth Report. Environmental Citizen Science*, found at [https://ec.europa.eu/environment/integration/research/newsalert/pdf/IR9\\_en.pdf](https://ec.europa.eu/environment/integration/research/newsalert/pdf/IR9_en.pdf); Environment Protection Authority (EPA) Victoria citizen science projects, found at <https://www.epa.vic.gov.au/our-work/programs/citizen-science-program/citizen-science-projects>.
- 4 Commissioner for Environmental Sustainability Victoria, 2011, *Many Publics Participation Inventiveness and Change*, found at [https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12\\_LR-bookmarks.pdf](https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12_LR-bookmarks.pdf)
- 5 Moreno S.P. and V. Romero, 2018, *Capacity Building and Synergies Across the Biodiversity-related Conventions*, International Union for Conservation of Nature, found at [https://www.iucn.org/sites/dev/files/capacity\\_building\\_and\\_synergies\\_-\\_contribution\\_to\\_the\\_long-term\\_strategic\\_framework\\_for\\_capacity\\_building.pdf](https://www.iucn.org/sites/dev/files/capacity_building_and_synergies_-_contribution_to_the_long-term_strategic_framework_for_capacity_building.pdf)
- 6 Capacity-building priority areas identified by the United Nations Framework Convention on Climate Change (UNFCCC) 2016 Paris Committee on Capacity Building can be found at [https://www.transparency-partnership.net/system/files/document/WRI-building\\_capacity\\_PA-ETF.pdf](https://www.transparency-partnership.net/system/files/document/WRI-building_capacity_PA-ETF.pdf)

The ACT Government is committed to dialogue between insiders and outsiders, acknowledging it has the potential to fundamentally shift the discussion.<sup>7,8</sup> The ACT community is enthusiastic to be involved.<sup>9</sup>

Citizen science and environmental volunteering is valuable in environmental policy design, and in monitoring and management. Further, social capital and resilience are generated through volunteering.<sup>10</sup>

Volunteering exposes the community to a range of new technologies and promotes intellectual engagement with new media.<sup>11,12</sup> Technology is being used to bring people to citizen science projects.<sup>13</sup>



The Australian National Museum's FrogID program involving the community in innovative use of data and audio in 2019 was awarded the Eureka Prize for Citizen Science.<sup>14</sup> Canberra Nature Map, an element of NatureMapr, received a Banksia Award in 2018.<sup>15</sup>

## THE VALUE OF ENVIRONMENTAL SUSTAINABILITY ACTION IN THE ACT

Volunteers come from all walks of life. They contribute vastly divergent skills and qualifications, across different cultures and demographics. The value proposition is environmental, economic and social, and for the volunteers themselves there are marked health benefits.

### Environmental value of volunteers

Benefits of the contributions made by environmental volunteers include:

- unparalleled local knowledge of the surrounding environment and conditions
- local species knowledge
- physical labour – planting, weeding, removing debris
- monitoring and evaluation

7 See: Commissioner for Environmental Sustainability Victoria, 2011, *Many Publics Participation Inventiveness and Change*, found at [https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12\\_LR-bookmarks.pdf](https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12_LR-bookmarks.pdf)

8 Environment, Planning and Sustainable Development Directorate (EPSDD), 2019, ACT Climate Change Strategy 2019–25, ACT Government, Canberra, found at [https://www.environment.act.gov.au/\\_\\_data/assets/pdf\\_file/0003/1414641/ACT-Climate-Change-Strategy-2019-2025.pdf/\\_recache](https://www.environment.act.gov.au/__data/assets/pdf_file/0003/1414641/ACT-Climate-Change-Strategy-2019-2025.pdf/_recache)

9 Feedback can be provided at <https://www.yoursay.act.gov.au/>

10 Rowland, K., 2012, Citizen Science Goes 'Extreme', *Nature*, 17 February, DOI:10.1038/nature.2012.10054

11 Irwin, A., 1995, *Citizen Science: A Study of People, Expertise and Sustainable Development*, Routledge, Oxford; Bonney, R. et al., 2009, 'Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy', *BioScience*, 59(11): 977–84, DOI:10.1525/bio.2009.59.11.9; Roy, H.E., et al., 2012, *Understanding Citizen Science and Environmental Monitoring*. Final Report on behalf of UK Environmental Observation Framework, found at [www.ukeof.org.uk/documents/understanding-citizen-science.pdf](http://www.ukeof.org.uk/documents/understanding-citizen-science.pdf); Wiggins, A. and K. Crowston, 2011, 'From Conservation to Crowdsourcing: A Typology of Citizen Science', Proceedings of the 44th Hawaii International Conference on System Sciences, 1–10, DOI:10.1109/HICSS.2011.207.

12 See, for example, Raddick J.M. et al., 2010, 'Galaxy Zoo: Exploring the Motivations of Citizen Science Volunteers', in *Astronomy Education Review*, 9(1), 010103. DOI: 10.3847/AER2009036; Graham, E.A., S. Henderson and A. Schloss, 2011, 'Using Mobile Phones to Engage Citizen Scientists', in *Research. Eos*, 92(38), 313–15.; also see Haklay, M., 2012, 'Citizen Science and Volunteered Geographic Information – Overview and Typology of Participation', in D.Z. Sui, S. Elwood and M.F. Goodchild (eds), *Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice*, Springer, Berlin, DOI: 10.1007/978-94-007-4587-2\_7.

13 Australian Citizen Science Association Project Finder, found at <https://biocollect.ala.org.au/acsa#isCitizenScience%3Dtrue%26isWorldWide%3Dfalse%26max%3D20%26sort%3DdateCreatedSort>

14 Eureka Prize 2019, found at <https://australianmuseum.net.au/get-involved/eureka-prizes/2019-eureka-prize-winners/>

15 <https://naturemapr.org/>

- administration and management of environmental group activities
- education and raising awareness of local environmental issues
- encouraging practices which support the needs of present and future generations, and
- caring for injured wildlife.

The environmental value of volunteers continues to flourish, and it lies in the inherent connection to and passion for nurturing one's own patch, whether that be through Aboriginal Natural Resource Management (NRM) on Country, measuring rainwater, or picking up rubbish at the local bus stop.

Numbers of environmental volunteers continue to grow with ACT organisations such as Frogwatch illustrative of this.<sup>16</sup> Every year new volunteers join the program. For many people it is a steppingstone into other NRM related activities. After receiving training, volunteers are active during the spring census. Many volunteers return to undertake monitoring year after year. This is especially so if the volunteer has a designated site they feel connected to.

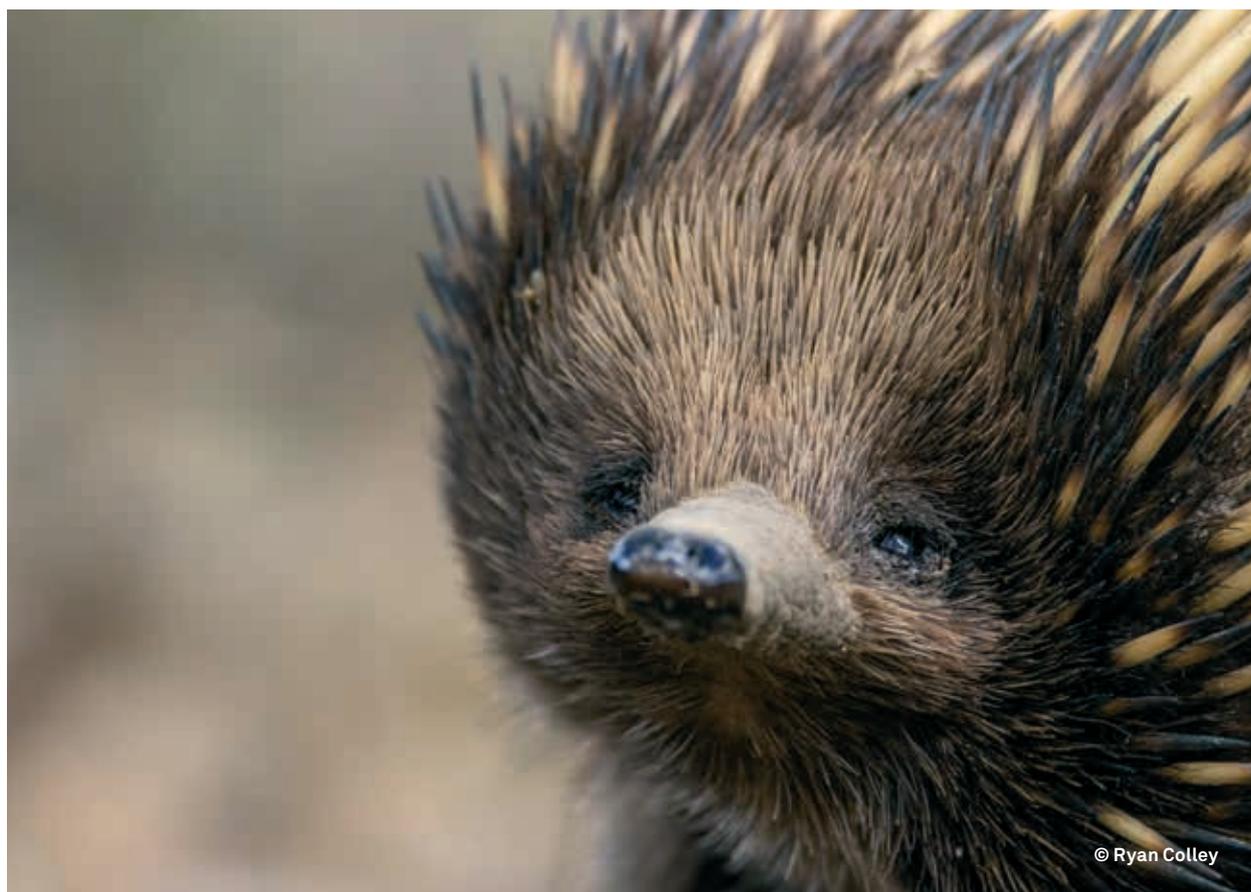
## Economic value of environmental volunteering

To replace the level of environmental volunteering with paid employment would be inconceivable. It would be cost prohibitive and strip the community of its agency in relation to environment, biodiversity, sustainability, and climate change issues.

The economic value of volunteering cannot be understated. A 2013 report cited in the ACT Volunteering Statement Action Plan 2018–2019<sup>17</sup> found that ACT volunteers contributed \$1.5 billion to the ACT economy annually. Environmental volunteers make a significant contribution.

The OCSE Environmental Economic Accounts Proof of Concept 2017<sup>18</sup> estimated the value of volunteer activity to be in excess of 22% of total ACT Government expenditure on the environment. Replacement cost in wages was:

- 2013–2014: expenditure of \$49.2m
- 2014–2015: expenditure of \$49.8m
- 2015–2016: expenditure of \$50.5m.



© Ryan Colley

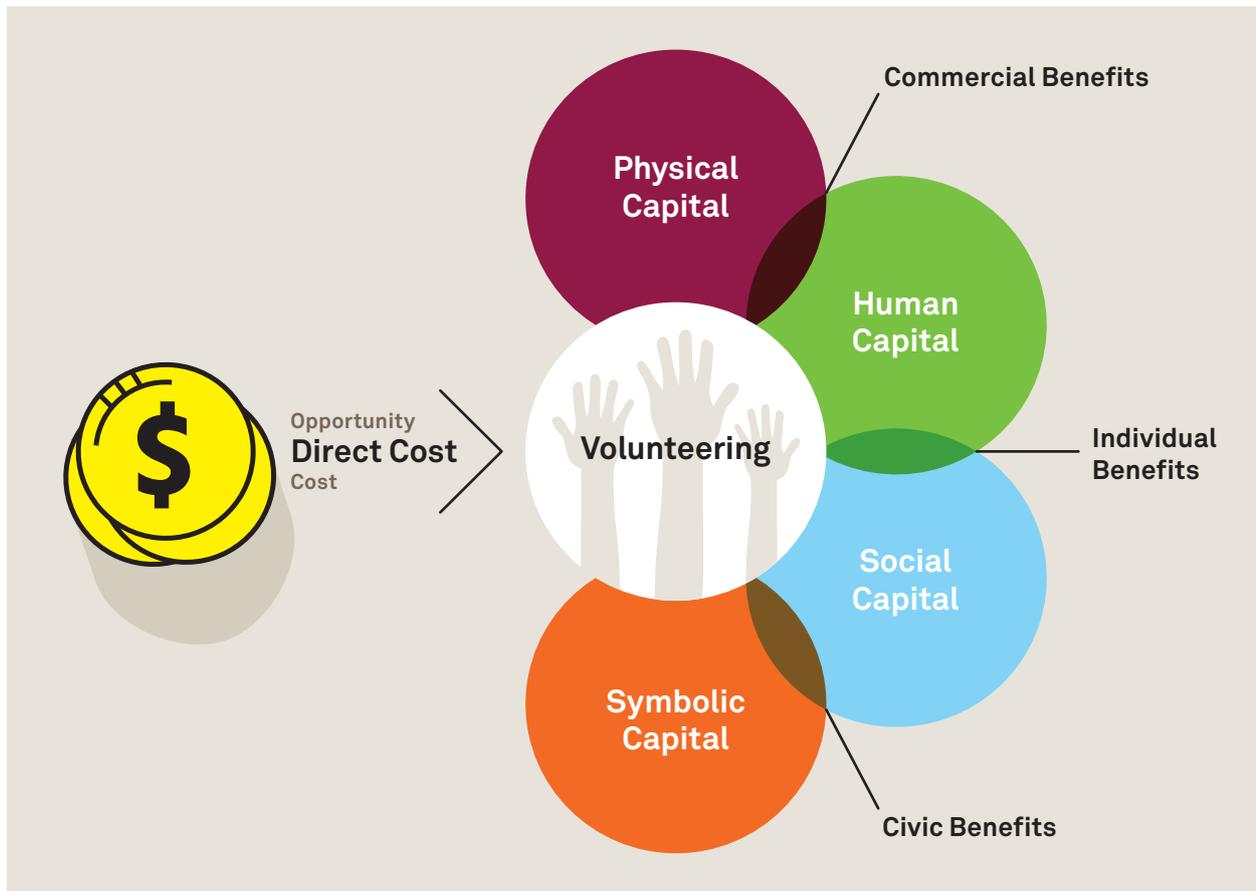
<sup>16</sup> <https://landcare.nsw.gov.au/groups/act-region-frogwatch/>

<sup>17</sup> *The State of Volunteering in the ACT 2013*, cited in Community Services Directorate, 2017, *Consultation Paper, ACT Volunteering Statement Action Plan 2018–2019*: 4, ACT Government, Canberra

<sup>18</sup> OCSE, 2017, *Environmental-Economic Accounts for ACT State of Environment Reporting, Proof of Concept*, ACT Government, Canberra, found at <https://www.envcomm.act.gov.au/publications/environmental-economic-accounts>

## Health and the social value of environmental volunteering

Volunteering contributes to the wellbeing and functioning of individuals, businesses and government.



Volunteering promotes social relationships between generations, genders and people, healthier and more active lifestyles, and it gives purpose, including a feeling of giving something back to nature and the community.<sup>19</sup>

Research reinforces a positive association between environmental volunteering and health and wellbeing outcomes. Persons volunteering for the environment maintain higher levels of physical activity, and report better self-rated health and fewer depressive symptoms.<sup>20 21</sup>

Communities benefit from environmental volunteering, with improved cohesion and access to green spaces. Arguably, organisations that foster community involvement in decision-making

and participation will be in the best position to increase capacity, build resilience, and respond to change.<sup>22</sup> These collaborations do not simply extend possibilities and numerically increase groups, they open lines of communication, enable sharing of deep insights and thoughtful proposals for action.<sup>23</sup>

As the ACT Government develops its Wellbeing Framework, about which the community is being invited to comment, the benefits of environmental volunteering will become increasingly relevant.<sup>24</sup>

19 Sloane G.M. and U. Pröbstl-Haider, 2019, 'Motivation for Environmental Volunteering – A Comparison Between Austria and Great Britain', *Journal of Outdoor Recreation and Tourism*, March, 25: 158–68

20 Pillemer K. et al., 2010, 'Environmental Volunteering and Health Outcomes over a 20-Year Period', *Gerontologist*, 50(5): 594–602.

21 Australian Psychological Society, Resources for Advocacy on Climate Change, found at <https://www.psychology.org.au/About-Us/What-we-do/advocacy/Advocacy-social-issues/Environment-climate-change-psychology/Resources-for-Psychologists-and-others-advocating>

22 O'Brien, L. et al., 2008, *Environmental Volunteering: Motivations, Barriers and Benefits*, Report to the Scottish Forestry Trust and Forestry Commission, Deakin University, Victoria, found at [https://www.deakin.edu.au/\\_\\_data/assets/pdf\\_file/0005/310748/Forestry-UK-report.pdf](https://www.deakin.edu.au/__data/assets/pdf_file/0005/310748/Forestry-UK-report.pdf)

23 Commissioner for Environmental Sustainability Victoria, 2011, *Many Publics Participation Inventiveness and Change*, found at [https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12\\_LR-bookmarks.pdf](https://www.ces.vic.gov.au/sites/default/files/publication-documents/CPreport12_LR-bookmarks.pdf)

24 <https://www.yoursay.act.gov.au/wellbeing>

# YOUNG PEOPLE MAKE A CONTRIBUTION

As the Young Canberran of the year Dhani Gilbert remarked:

‘There are so many people working to create positive change. Even just seeing the other nominees for the Young Canberra Citizen of the Year Awards was a real confirmation for me of that.’<sup>25</sup>

## CASE STUDY: COMMUNITIES@WORK ISABELLA CHILD CARE AND EDUCATION CENTRE

Isabella Plains Child Care and Education Centre is one of a number of centres south of Lake Burley Griffin that is required through Communities@Work to implement a Sustainability Action Plan to support environmentally sustainable practices for children, families and educators.

Key areas for environmental action include waste, paper consumption, purchasing of food, water and energy conservation, reusing resources, rubbish and chemicals, and exploring outdoor and indoor learning environments.

### Lids for Kids project

During July 2019, children, families and educators at Communities@Work Isabella Plains Child Care and Education Centre collected milk, juice and soft drink bottles for Lids 4 Kids. The lids will be converted into prosthetic hands for children.

With a little extra help from community partners, the initial goal of 1,000 lids was exceeded. The final count was 4,499 lids and 362 bread tags. This simple sustainability initiative diverted waste from landfill and resulted in something much more meaningful.



Lids for Kids milk bottle lid collection.  
Source: Communities@Work.

<sup>25</sup> Quote extracted from Her Canberra 2019, found at <https://hercanberra.com.au/peoples/dhani-gilbert/>

## CASE STUDY: ACTSMART SUSTAINABLE SCHOOLS — ACTION AND LEADERSHIP AMONG YOUNG PEOPLE



Actsmart waste audit at St Bede's Primary School.  
Source: OCSE.

Arawang Primary is one of many schools that have worked on building sustainable practices over several years as part of the Actsmart Schools program. The importance of maintaining a school 'culture of sustainability' is paramount and has been embedded into planning and the curriculum.

Commencing with waste management, the school has a staff team who look after sustainability initiatives, implementation and management. Arawang students in classes K–6 nominate two young 'waste warriors' per class. It is their role to act as leaders in sustainable waste practices. The aim is for students to take ownership of these practices.

Every Tuesday, Arawang hosts 'Waste Free Tuesday' where students are encouraged to bring 'nude food'. Waste warriors collect waste data on participants from each class and reward the winning class with a sustainability certificate.

Compost from across the school is used to support the growth of fruit, vegetables and herbs. When composting, students begin to understand sustainability by monitoring and maintaining the kitchen garden and being part of the garden-to-plate movement.

Arawang also has 'energy savers' who walk the halls during the breaks and monitor which classes have left lights, fans or monitors on. This data is collected and shared with classes to motivate reduction in electricity usage. Recognition and rewards are offered fortnightly to increase engagement.

# OLDER PEOPLE MAKE A CONTRIBUTION

## CASE STUDY: AGEING AUSTRALIANS AND ADAPTATION

Social cohesion, health, environmental and economic benefits flow on from engaging older people in physical and sustainable activities. Seniors invariably remark, 'we always turned off lights', 'we always sorted our waste'.

The Council on the Ageing (COTA) for the ACT<sup>26</sup> advise that factors limiting participation in physical exercise and outdoor activities for older people include:

- sustainability and physical activity can be less of a priority than food or access to medical treatment
- proximity of access to public transport can be a constraint
- there is a tendency to suffer in silence
- social isolation is real and compounding, and
- there can be a heavy reliance on incidental physical activity.<sup>27</sup>

Climate change will further exacerbate these limiting factors. Unpredictable conditions, such as extreme heat and cold temperatures, will restrict incidental activity such as walking to the bus stop or gardening. Social isolation and mental health problems may be compounded. This has the potential to impact government health budgets.<sup>28</sup>

COTA ACT is providing services for seniors, but seniors are giving back, getting involved, and leading. Sustainable action taken by seniors include:

- solar installations on COTAs building as an example of leadership
- sharing resources – COTA has established a second-hand book lending library, tools are shared, clothing is recycled
- ad hoc carpooling
- household energy audits
- community gardening, and
- flexible bus use.

This range of actions represents a localised and informal 'adaptation strategy' and it promotes resilience without the need to draft a 'plan' or raise a 'strategy'.

<sup>26</sup> <https://www.cotaact.org.au/>

<sup>27</sup> Personal communication at meeting between OCSE and COTA ACT, 13/5/2019.

<sup>28</sup> Office of the Commissioner for Sustainability and the Environment (OCSE), 2017, *Implementation Status Report on ACT Government's Climate Change Policy*, ACT Government, Canberra.

# ACTIVISM, ADVOCACY AND AGENCY

Community 'activism' differs from community sustainability efforts, and both differ from citizen science. Each has value. Some initiatives will be useful symbolically, as advocacy, and others will produce practical outcomes such as monitoring and evaluation.

The Canberra Environment Centre Eco-Shout<sup>29</sup> and Meetup<sup>30</sup> platforms work specifically to connect likeminded individuals. Solutions-based groups include Climate Solutions ACT and SE Region,<sup>31</sup> Canberra Eco Club,<sup>32</sup> and Canberra Vegan Meetup.<sup>33</sup>

Organisations like Girls Ride Bikes, ACTforBees, Canberra Ornithologists Group, and Women in Environmental Leadership, focus on particular concerns. The Canberra City Farm offers intensely practical opportunities to engage with environmental issues, food security, and waste.

ACTforBees lobbied the ACT Government for pollination to be considered in urban forest planning instruments. In response, the ACT Government's recent Municipal Infrastructure Standard (number 25) describes the pollination benefits of plantings in its list of 'Plant Species for Urban Landscapes' for developers and others.

*'This is a valuable resource for us all to plant for year round flowering to feed bees, butterflies, birds, small mammals and threatened migratory species. ACTforBees urges developers and Government planners to use this information to create a year round banquet of flowers for our local biodiversity.'*<sup>34</sup>

Universities, specifically the ANU, UNSW, and the University of Canberra, bring people together to discuss the big issues. The Active Travel Office of the ACT Government links with girls and women riding bikes.<sup>35</sup> Communities@Work aligns government with social and sustainability programs like OzHarvest.

These photos are a sample from the Office's work with community sustainability leaders and activists.



29 More information can be found at <http://www.ecoshout.org.au/active-groups/canberra-environment-centre>

30 More information can be found at <https://www.meetup.com/en-AU/topics/environmental-activism/au/canberra/>

31 More information can be found at <https://www.meetup.com/en-AU/Climate-Solutions-ACT-Region/>

32 More information can be found at <https://www.meetup.com/en-AU/CanberraEcoClub/>

33 More information can be found at <https://www.meetup.com/en-AU/Canberra-Veg-Events/>

34 Personal communication between OCSE and ACTforBees, 13/9/2019.

35 More information can be found at <https://www.girlsonbikesact.com.au/>



## CASE STUDY: CANBERRA AND THE SCHOOL STRIKE FOR CLIMATE ACTION — ADVOCACY AND SYMBOLISM



May 2019 Student Climate Strike, Canberra.  
Source, left: <https://the-riotact.com/the-next-global-climate-strike-is-happening-and-this-time-we-need-everyones-support/322750>; middle, right: OCSE.

‘These [school] strikes are a real game-changer because we’re seeing kids who are afraid for their future speaking out and their parents are joining in, their communities are joining in. And the signs! I love the signs.’<sup>36</sup>

The Student Strikes for Climate Action, organised using social and other media, mark a new phase in climate activism and advocacy. Strikes across the country have given encouragement to the Extinction Rebellion movement. Canberra’s community turned out in numbers for both events: 15,000 people attended the climate strike in September 2019 and 500 rallied for Extinction Rebellion in October 2019.

While initiated by students, people of all ages voiced three clear demands:

1. An end to new fossil fuel projects threatening the Great Barrier Reef.
2. A target of 100% renewable energy by 2030.
3. Funding for a just transition to new jobs for fossil fuel workers.

This school strike movement has come at a highly important time for environmentalists in Australia as it is linked to many regional concerns, including the long-term outlook for the health of the Great Barrier Reef.<sup>37</sup>

## CASE STUDY: CANBERRA INDIAN MYNA ACTION GROUP — PRACTICAL ACTION AND A SCIENTIFIC SUBMISSION

At the other end of the spectrum from the school strikes, on a very practical level, the Canberra Indian Myna Action Group (CIMAG)<sup>38</sup> includes retired scientists and community members working to link environmental concerns and citizen science, to raise awareness and reduce the impact of this exotic avian invader on native birds and animals.

CIMAG has developed a strategy that includes community education and collaboration with other like-minded groups, physical bird trapping and disposal methods, monitoring, and evaluation. Numbers of Indian Mynas in reported areas continue

to increase, despite CIMAG trapping efforts, but without this community-led action, populations may have exceeded manageable numbers as is the case throughout much of south-eastern Australia.

Since inception in 2006 to September 2019, there have been 2,470 people undertaking trapping, removing 71,200 Mynas from the Canberra environment.

As a result of its research, monitoring and eradication work CIMAG produced a robust submission to the ACT Government calling for the Myna population to be declared a ‘key threatening process’.

36 Groch, S., 20/9/2019, ‘Everything You Need to Know about Today’s Climate Strike – and Why it Matters’, *The Canberra Times*, found at <https://www.canberratimes.com.au/story/6395031/everything-you-need-to-know-about-todays-climate-strike/> accessed 31 October 2019.

37 Great Barrier Reef Marine Park Authority, 2019, *Great Barrier Reef Outlook Report 2019*. found at <http://elibrary.gbrmpa.gov.au/jspui/bitstream/11017/3474/10/Outlook-Report-2019-FINAL.pdf>

38 <http://www.indianmynaaction.org.au/>

# ENVIRONMENTAL SUSTAINABILITY: VARIETY AND ACTIVITY IN CITIES

Environmental volunteering and community sustainability actions do not only find a place in the wild, national parks, or on rural agricultural properties.

Environmental volunteering is increasingly important in cities.

Volunteer groups in Canberra include City Walk (public servant) volunteers,<sup>39</sup> urban Landcare groups, 'Friends of' groups, urban open space volunteer groups,<sup>40</sup> urban agriculture groups, tree maintenance groups, graffiti removal and community art groups. Their activities are as diverse as the groups themselves and include weeding,

planting, urban artwork, litter collection, urban beautification, tree maintenance, erosion control and design, development, and maintenance of community gardens.

This snapshot of community sustainability efforts is just that – a snapshot. There are many government, not-for-profit and community led organisations such as Landcare,<sup>41</sup> ParkCare,<sup>42</sup> and conservation volunteer groups<sup>43</sup> that work hard to assist and guide the management of the ACT's natural resources, and which promote early adoption of responses to emerging environmental issues. The work of some of these groups is discussed below.

## CASE STUDY: BEES AT PARLIAMENT HOUSE



Beehives and products at Australian Parliament House.  
Source: Cormac Farrell.

The Australian Parliament House beehives were established in 2017. There are two species of bees kept, the European Honeybee (*Apis mellifera*) and the Australian Native Stingless Bee (*Tetranogula carbonaria*). The honeybee apiary is in the outer garden of Parliament surrounded by almost 30 hectares of honey-producing flora, while the stingless nature of the native bees means that they can be housed within the courtyards of Parliament itself.

In addition to providing enjoyment and locally sourced honey for events, the initiative is intended to raise awareness of threats to global bee populations, and their importance to our food supply. The apiary is being managed as a joint venture between the Department of Parliamentary Services, Aurecon and the ANU Apiculture Society. The beehives are also used for scientific research and are currently being used to test Internet of Things technology (IoT) as part of a global network of remotely monitored hives.

39 Coady, S., 13/10/2018, 'Civic's Public Servants Volunteer to Improve Garden Beds', *The Canberra Times*, found at <https://www.canberratimes.com.au/story/6001838/civics-public-servants-volunteer-to-improve-garden-beds/>; <https://www.environment.act.gov.au/home/Bush-Capital/2019/could-you-adopt-a-park> accessed 31 October 2019.

40 ACT Government media release, 23/5/2019, Supporting Your Urban Open Spaces, found at [https://www.cmteed.act.gov.au/open\\_government/inform/act\\_government\\_media\\_releases/act-transport-canberra-and-city-services-media-releases/2019/supporting-your-urban-open-spaces](https://www.cmteed.act.gov.au/open_government/inform/act_government_media_releases/act-transport-canberra-and-city-services-media-releases/2019/supporting-your-urban-open-spaces)

41 More information can be found at <https://actlandcare.org.au/volunteer/>

42 More information can be found at [https://www.accesscanberra.act.gov.au/app/answers/detail/\\_a\\_id/1458/~/~act-parkcare](https://www.accesscanberra.act.gov.au/app/answers/detail/_a_id/1458/~/~act-parkcare)

43 More information can be found at <https://www.volunteer.com.au/environment-conservation-volunteering/in-canberra-city>

## CASE STUDY: APARTMENTS, CANBERRA ENVIRONMENT CENTRE AND THE 'HUNGRY COMPOSTER'

Apartment dwellings present a challenge for the waste sector, particularly if their green waste goes to landfill. The Canberra Environment Centre's Hungry Composter demonstrates the potential for a decentralised organic waste management approach to overcome this problem.

In 2017, the Canberra Environment Centre received funding under the ACT Government's Community Zero Emissions Grants to purchase and install a solar-powered On-Site-Composting-Apparatus in their Acton community garden. The centre had previously been processing small amounts of food scraps from the surrounding childcare centres and university kitchens but wanted to expand their capacity in order to raise awareness about the increasing need to divert organic waste from landfill.

The machine – 'The Hungry Composter' – can process 100 litres of food scraps per day, which is much higher than traditional composting methods. The centre has encouraged local apartment dwellers to sign up to the project. Within a fortnight they reached capacity with 140 individual compost contributors. Local residents brought their food scraps to the centre in buckets and deposited them in specially marked bins. The machine was fed the scraps by a roster of volunteers supplemented by Salvation Army work experience contributors. Apartment dwellers were also taught how to better manage their food waste at home.

The Hungry Composter shows that the community is supportive of initiatives to reduce waste. It also demonstrates the value of utilising technology to increase composting capacity and provide a low emission method of organic waste disposal.



The Hungry Composter. Source: Canberra Environment Centre.

# NATURAL RESOURCE MANAGEMENT (NRM)



Parks and Conservation Service Rangers assist Parkcare volunteers. Source: ACT Parks and Conservation Service.

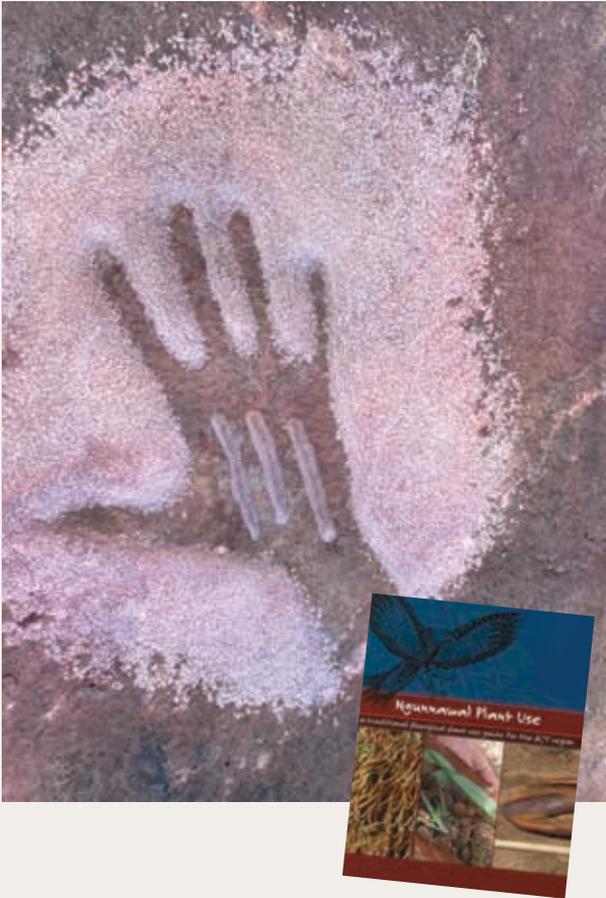
ACT Natural Resource Management (NRM) is one of 56 regional NRM organisations across Australia and is hosted by EPSDD. It was allocated \$3.8 million through the ACT NRM regional delivery of the National Landcare Program. Around 64% of this funding is devolved directly to the community through community-based delivery partners.

ACT NRM works with volunteers, the broader ACT and regional community, and other stakeholders to identify investment priorities, broker partnerships, share knowledge, and deliver programs. The funding received is centred around four strategic investment projects focusing on Matters of National Environmental Significance, Sustainable Agriculture and Aboriginal NRM.

These projects include:

- supporting Aboriginal NRM in the ACT
- Communities Supporting Conservation: managing and restoring Native Temperate Grasslands, Box Gum Woodlands and river corridors in the ACT
- supporting sustainable agriculture in the ACT, and
- administration and Monitoring, Evaluation, Reporting and Improvement (MERI).

## CASE STUDY: ABORIGINAL NATURAL RESOURCE MANAGEMENT



Ngunnawal heritage site. Source: OCSE.

Recognising the unique value of Indigenous ecological and cultural knowledge, the ACT Government has committed to exploring ways to support and share this remarkable Australian contribution to environmental sustainability.<sup>44</sup> Aboriginal people in Ngunnawal Country have embraced the possibilities.

### Ngunnawal Plant Use field guide

The Ngunnawal Plant Use field guide<sup>45</sup> has been a popular learning resource for the community and a means to disseminate knowledge about Aboriginal NRM<sup>46</sup> to both Aboriginal and non-Aboriginal people. The guide has assisted in developing understanding and respect for Aboriginal ecological knowledge in schools and education programs, local business and in the broader community.

The guide was produced through a partnership between local Ngunnawal Elders and their families and the ACT Government, to capture and record traditional plant knowledge in contemporary contexts, to preserve that knowledge for future generations, and to promote greater appreciation of the cultural heritage values of native vegetation in the region.

### Indigenous engagement in Box Gum Woodland restoration

The Ngunnawal Bush Healing Farm<sup>47</sup> advances the dual goals of reconciliation and Indigenous capacity-building in the ACT through a volunteering program which recognises the co-benefits of cultural immersion, nature, and wrap-around care.

The Farm has been engaged as part of the Box Gum Woodland restoration project to facilitate traditional cultural practices on Country that promote health and wellbeing amongst disadvantaged Aboriginal and Torres Strait Islander people.

So far the Indigenous community has been involved in replanting and monitoring 12 hectares of the site, with further opportunities arising in traditional fire management, soil preparation, weed control, pest management and redistributing coarse woody debris.

44 EPSDD 2019, *ACT Climate Change Strategy 2019–2025*, ACT Government, Canberra, found at <https://www.environment.act.gov.au/cc/act-climate-change-strategy>

45 [https://www.accesscanberra.act.gov.au/app/answers/detail/a\\_id/2075/~/ngunnawal-plant-use-field-guide](https://www.accesscanberra.act.gov.au/app/answers/detail/a_id/2075/~/ngunnawal-plant-use-field-guide)

46 EPSDD, Aboriginal NRM, found at <https://www.environment.act.gov.au/act-nrm/aboriginal-nrm>

47 More information can be found at <https://www.health.act.gov.au/services-and-programs/aboriginal-and-torres-strait-islander-health/ngunnawal-bush-healing-farm>

## Natural Resource Management on public land

Natural Resource Management (NRM) in the ACT's nature reserves, national parks, urban parks and public open spaces is shared between the ACT Government and a range of citizen scientist groups, volunteer groups and not-for-profit organisations.

The two main programs are ParkCare and Urban Parks and Places Volunteering (UPP). EPSDD has the primary responsibility for ParkCare and Transport Canberra and City Services (TCCS) for UPP. These programs are only possible due to the contributions of hundreds of regular volunteers and the involvement of more than 45 Landcare and ParkCare groups. The programs undertake a range of critical NRM activities including weed control.

### Parkcare

2019 marks the thirtieth anniversary of Parkcare in the ACT. Volunteer involvement in Parkcare is growing with the contribution of volunteers doubling over the past five years with each year seeing increased numbers of volunteers reporting more hours.<sup>48</sup>

In 2018–2019, Parkcare had 807 registered volunteers contributing 32,048 total volunteer hours.

There are four main streams of ParkCare:

- **ParkCare Patch:** volunteering which takes place within any of the established ParkCare groups in the ACT who look after their 'patch'. This component contributes most of the volunteer hours for Parkcare (66% in 2018–2019) and includes activities such as weed removal and site rehabilitation.
- **VisitorAssist:** a team of specialist visitor services volunteers who are experts at environmental interpretation.
- **RangerAssist:** volunteers work alongside PCS staff to contribute to projects and initiatives throughout the ACT.
- **WildlifeAssist:** volunteers work with the Tidbinbilla Wildlife team to care for, protect, and conserve native animals at Tidbinbilla Nature Reserve, including threatened species recovery programs.

### CASE STUDY:

## PARKCARE — GRIFFITH WOODLAND VOLUNTEER GROUP — THE NEWBIES

Formed in March 2018, the Griffith Woodland Volunteer Group has been able to achieve some remarkable results within their first year. Their site, located off La Perouse Street in Griffith, contains significant remnant woodland trees, shrubs and grasses, all characteristic features of endangered Box Gum woodland. Some of the group's achievements include:

- community working bees to remove woody weeds
- cataloguing flora and fauna on Canberra Nature Map<sup>49</sup>
- completion of a master planting plan for the site by a local landscape designer

- community members planting 335 native wildflowers and grasses on the site
- over 110 hours of volunteer labour to the site
- successfully submitting for a small grant from the Friends of Grasslands to conduct spraying of invasive grasses, and
- success in fundraising efforts, with funds being used to purchase more plants.

This work is a great example of community stewardship and the positive results it can achieve in a short period of time.

<sup>48</sup> ACT Parks and Conservation Service, 2019, *ParkCare Annual Report 2018*, ACT Government, Canberra

<sup>49</sup> More information can be found at <http://canberra.naturemapr.org/Community/Location/2028>

## CASE STUDY: PARKCARE — FRIENDS OF ARANDA BUSHLAND WEED CONTROL AND THE SNOW GUMS HERITAGE AREA — AN OLDIE AND A GOODIE



Weed control of Aranda Bushland in 2000. Source: *The Canberra Times*. Snow Gums Heritage Area in 2019. Source: OCSE.

### Formation of the Friends of Aranda Bushland

In the early 1990s the Friends of Aranda Bushland<sup>50</sup> ParkCare group formed to conserve and rehabilitate the eucalypt forest and woodland that had become a mass of weeds. The group comprises many ACT scientists and community members.

The Aranda Bushland is a 100 hectare reserve and forms part of Canberra Nature Park. Within this area there is a patch of Snow Gums that have survived from the last ice age, the only remaining Snow Gums along the Molonglo River corridor. Due to both their historical and ecological significance, these Snow Gums were declared a Heritage Area in 1998.<sup>51</sup> Seed provenanced by the 'Friends' from this remnant stand has been used for further Snow Gum propagation.

Friends of Aranda Bushland have spent thousands of hours using various techniques to weed the area and it is now largely free of St John's Wart and Patterson's Curse. The group also undertook extensive weed monitoring over a 12 year period to determine trends in weed distribution and abundance. This grassland monitoring provides an important contribution to weed knowledge, particularly in the light of climate change impacts.

Friends of Aranda Bushland continues to manage weed control and maintains a keen interest in vegetation monitoring, awaiting a feasible long-term method that provides new information.

<sup>50</sup> More information can be found at <http://www.friendsofarendabushland.org.au/>

<sup>51</sup> EPSDD, ACT Heritage Register, found at [https://www.environment.act.gov.au/heritage/heritage\\_register/register-by-place](https://www.environment.act.gov.au/heritage/heritage_register/register-by-place)

## CASE STUDY: PARKCARE — ADFA RANGERS ASSIST ON MT PLEASANT



ADFA cadets on Mt Pleasant. Source: EPSDD.

The Australian Defence Force Academy (ADFA) has participated in multiple corporate volunteer activities with ParkCare after developing a strong relationship with the Mount Pleasant ParkCare Group.

Over two separate events, more than 130 international cadets from countries including Papua New Guinea, France, Indonesia and Fiji worked with ParkCare

volunteers and PCS staff to remove invasive plants in the reserve system.

Participants were able to learn about invasive native species and further develop their teamwork skills. The organisational structure of Defence participants has been highly productive.

### Urban Parks and Places Volunteering

The Urban Parks and Places Volunteering (UPP)<sup>52</sup> program allows the community to contribute to the conservation, presentation, and maintenance of Canberra's many public urban open-space areas, including parks, playgrounds, grasslands, shopping centres, wetlands and lake surrounds.

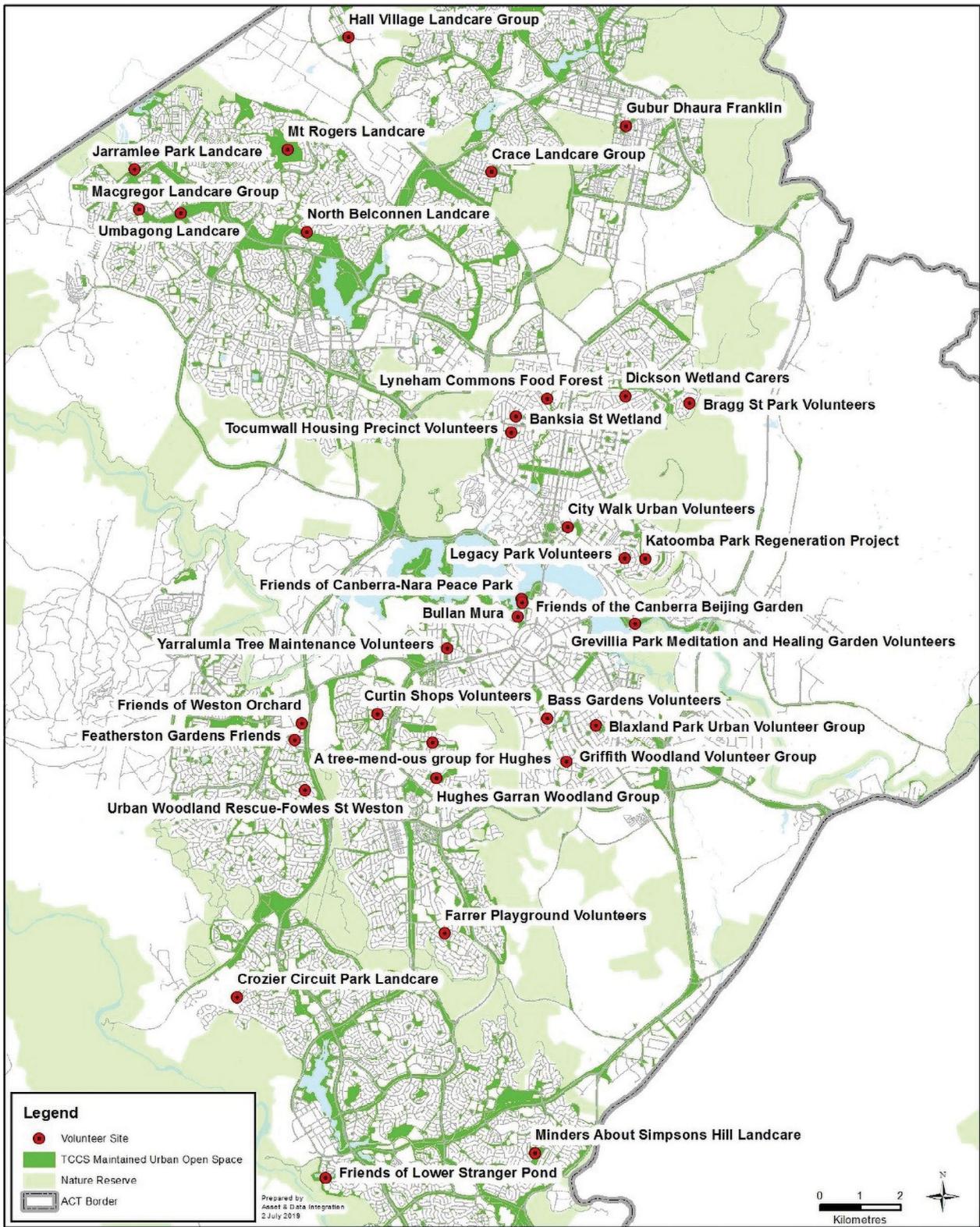
In 2019, 34 groups were registered with the UPP program contributing 2,057 volunteering hours. The number of volunteer hours in 2018–2019 equates to nearly \$70,000 in value.<sup>53</sup> As with Parkcare, volunteer involvement in UPP is also growing

with the contribution of volunteers increasing by over 800 volunteering hours between 2017–2018 and 2018–2019.

The program will expand in the future with four new volunteer groups commencing activities in Holder, Aranda, Campbell and along the Molonglo River, and some new initiatives to be launched in 2019–2020 to support the UPP program. This will include the introduction of the Better Impact online volunteer platform to register and maintain volunteer records.

<sup>52</sup> More information can be found at [https://www.tccs.act.gov.au/city-living/public\\_areas/volunteering](https://www.tccs.act.gov.au/city-living/public_areas/volunteering)

<sup>53</sup> Based on the Volunteering Australia standard of \$33.71 per hour for volunteer labour.



**Figure 1: Urban Parks and Places Volunteer Groups**

Source: Transport Canberra & City Services, City Presentation. [www.tccs.act.gov.au](http://www.tccs.act.gov.au)

## Natural Resource Management on private land



Native propagation and replanting. Source: EPSDD.

In addition to public areas, ACT NRM works closely with rural land holders and organisations such as Greening Australia and ACT Catchment Groups (Ginninderra, Molonglo and Southern ACT) to manage biodiversity and build the resilience of landscapes to support the Landcare community on privately owned land.

This work has depended on the substantial contribution of volunteers. Over the 2015 to June 2018 period, the average annual volunteer participation was:

- 2,437 total registered volunteers
- 7,599 total volunteering hours, and
- 210 volunteer activities

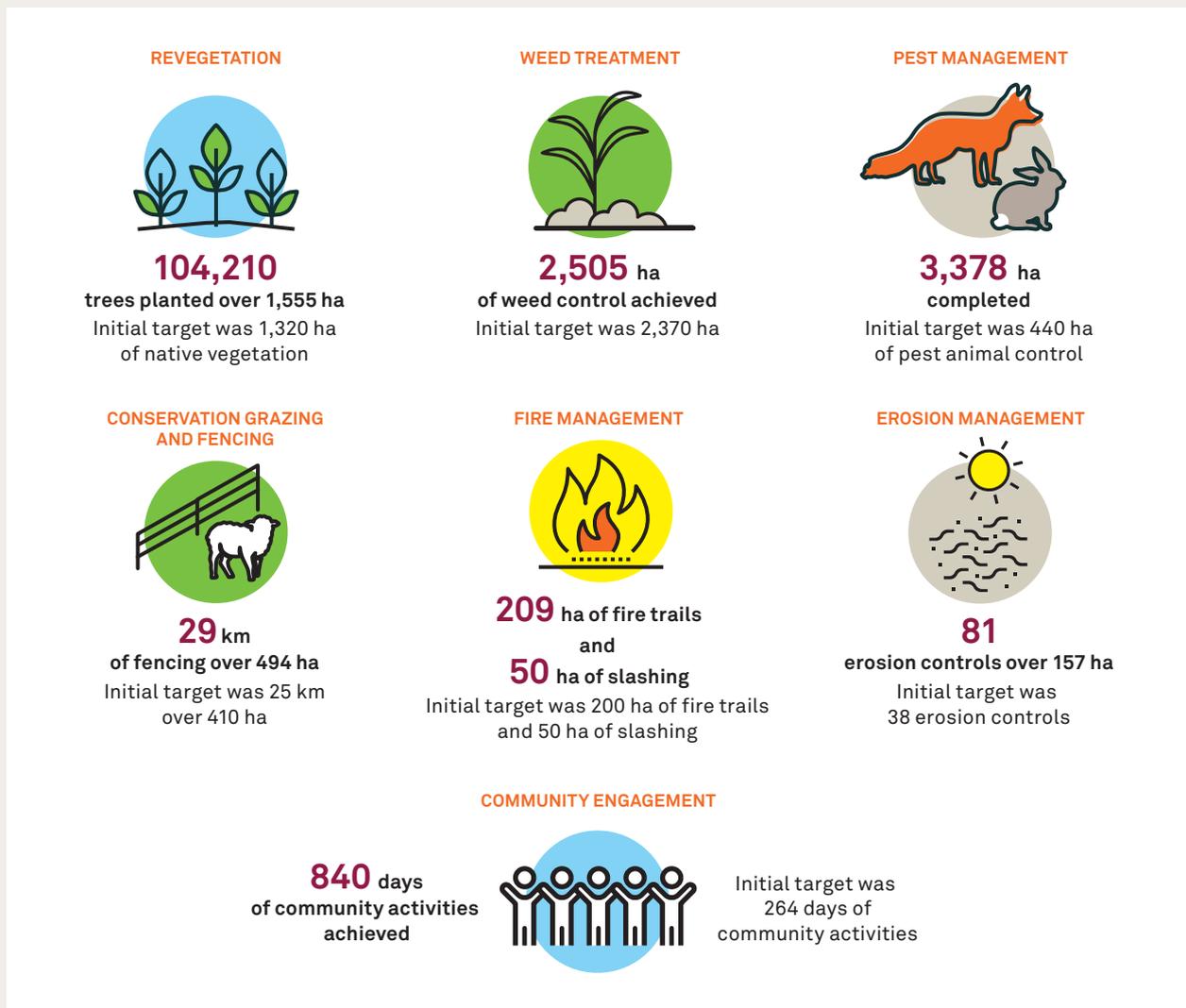
## CASE STUDY: COMMUNITIES SUPPORTING CONSERVATION

The Communities Supporting Conservation project focuses on improving the condition, extent and connectivity of Matters of National Environmental Significance (MNES) in Box Gum woodlands, Native Temperate Grasslands, and River Corridors in the ACT and surrounding border regions. The project operated from 2014–2018.

The ACT Government collaborated with four main community partners to deliver the targets of the project, Molonglo, Ginninderra and Southern ACT Catchment Groups, and Greening Australia Capital Region. This collaboration enables increased community engagement leading to improved skills, knowledge and awareness.

On ground site selection was based on ACT Government priorities, feedback from ACT rural landholders and Indigenous stakeholders, and advice from the ACT NRM Council.

The main activities undertaken by volunteers included revegetation, weed and pest control, conservation grazing and fencing, fire management and erosion control. In addition, community engagement activities were undertaken for purposes such as improving education and increasing participation. Key on ground biodiversity management achievements are shown below.



**Figure 2:** Communities Supporting Conservation program, key on-ground biodiversity achievements undertaken between 2015 and June 2018.

Data sourced from: Greening Australia

## CASE STUDY: SUSTAINABLE AGRICULTURE — LANDCARE AND RURAL LANDHOLDERS



Paddock of African Lovegrass. Source: Catherine Kiernan.

ACT rural landholders have been engaged as individuals and in groups with the active support and guidance of the ACT Landcare Facilitators, and in partnership with various ACT and NSW Government agencies. Rural landholders have been undertaking sustainability activities for many years. Their observations, feedback, and engagement in skills and technical programs have been critical to improve environmental outcomes in the management of private land.

Activities have included:

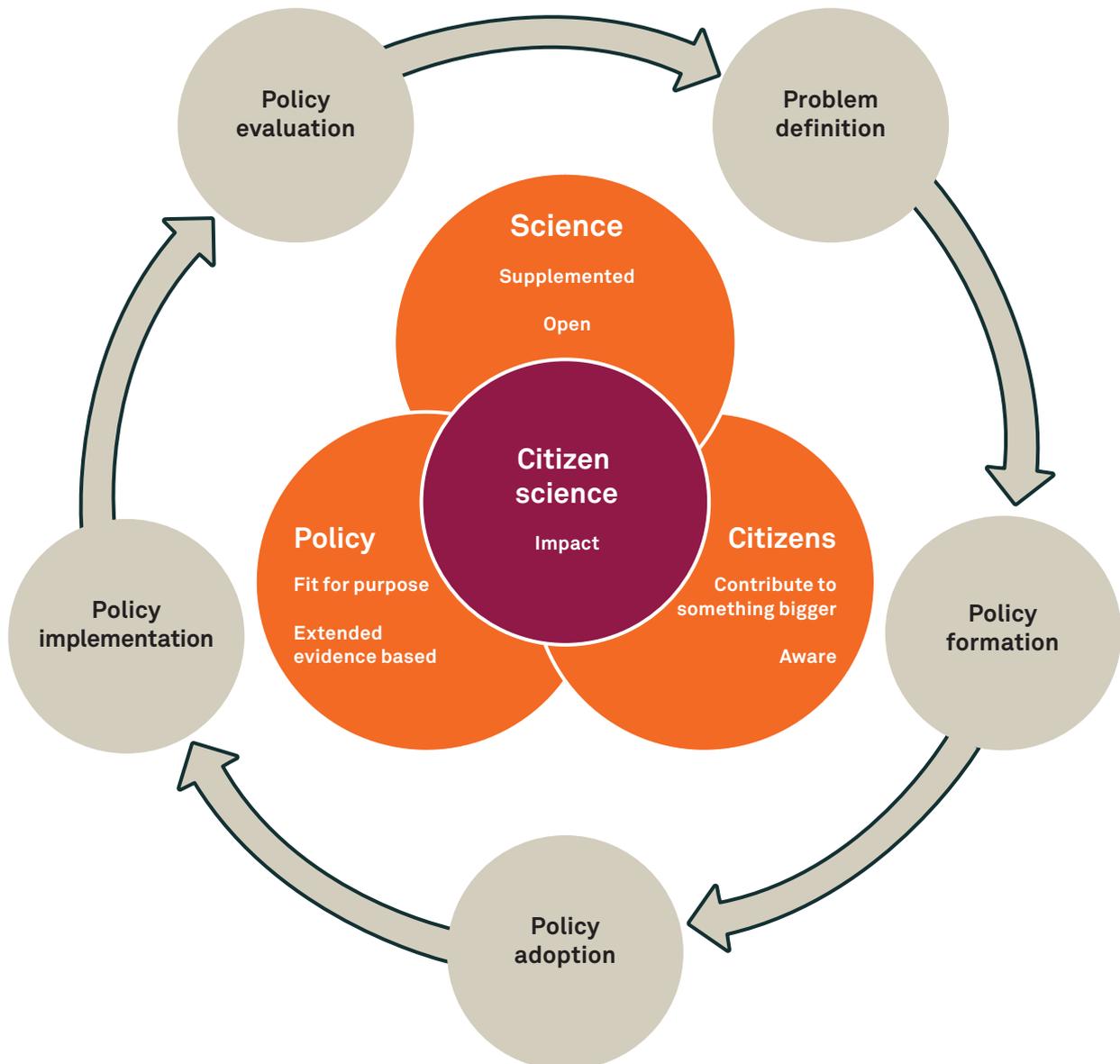
- Soil health improvements, including a National Landcare Program Regional Land Partnership to deliver a \$330,000 soils program from 2018–2023.
- Pest animal eradication with a strong focus on rabbit control; other animals pests controlled include pigs and deer.
- Support for drought resilience initiatives, including a National On-Farm Emergency Water Infrastructure Rebate Scheme distributed to 8 ACT rural landholders to improve water management techniques.
- Blackberry control in the Ginninderra Catchment to improve connectivity and riparian land recovery in the Lower Molonglo.

In addition, between 2014 and 2018, the rural grants program provided \$447,000 to promote environmental sustainability by fencing areas of high conservation value, promoting cross-farm collaborations, protection of mature paddock trees, and the provision of advice. Twenty-eight farmers received direct grants and 11 have had the benefit of advice. More than 3,500 hectares of practice change across ACT rural lands has been achieved, including:

- 1,594 hectares of grazing management through fencing projects on 14 properties
- 525 hectares of pasture and groundcover protection by feed lot development
- 1078 hectares of collaborative weed control across seven farms
- 136 hectares of cropping and pasture establishment to address African Lovegrass on three farms
- 95 hectares of innovative porous electric fencing on one farm
- 21 hectares of rabbit control across two farms, and
- 12.4 hectares of riparian protection on two farms.

# CITIZEN SCIENCE — SCIENCE, THE PUBLIC AND THE ENVIRONMENT

The ACT has a long tradition of citizen science which is now being boosted by digital technologies, encouraging new and diverse cohorts of the public to contribute to knowledge, sustainability activities and advocacy.



**Figure 3:** The three main pillars of citizen science in the policy cycle: scientific excellence, citizen engagement, and policy relevance.

Source: Bio Innovation Service for the European Commission, 2018.<sup>54</sup>

<sup>54</sup> Bio Innovation Service, 2018, *Citizen Science for Environmental Policy. Development of an EU-wide Inventory and Analysis of Selected Practices*, Final report for the European Commission, in collaboration with Fundacion Ibercivis and The Natural History Museum, found at <https://www.rri-tools.eu/-/citizen-science-for-environmental-policy-development-of-an-eu-wide-inventory-and-analysis-of-selected-practices> accessed 21 October 2019.

## What is citizen science and why is it important?

Citizen science is scientific work undertaken by members of the general public, often in collaboration with, or under the direction of, professional scientists and scientific institutions.<sup>55</sup> Citizen science projects can involve non-professionals taking part in crowdsourcing, data collection and analysis to increase scientific knowledge. This is often achieved by breaking down complicated research and monitoring tasks into understandable components that non-specialists can perform.<sup>56 57</sup>

Professor David Lindenmayer, an internationally respected scholar, celebrates the role of citizen science and its capacity to produce valuable data and information that can be used for environmental reports and policy.

‘There are examples where long-term studies have produced valuable information, even when they have not been guided by carefully crafted scientific questions, where no formal conceptual model was used to identify those questions, and there was a noticeable absence of a statistical-based experimental design.’<sup>58</sup>

## Citizen science in and around Canberra



Left: *Auricularia auricularia*. Right: *Armillaria hinnulea*. Photos taken by citizen scientists of the ACSA ACT and Region chapter. Source: TM and JC Van der Heul, Box Cutting Rainforest NSW.<sup>59</sup>

The ACT and Region chapter of the Australian Citizen Science Association (ACSA)<sup>60</sup> was launched in early 2019 reflecting the demand for ACT representation. The chapter helps to build awareness of citizen science in the community, identifies priority projects and provides a communication channel from the local to national level, and beyond.

With its high concentration of scientists, national and international science agencies and an eager community, Canberra is neatly placed to make a significant contribution to science through the exchange of ideas.

The ACT is dependent on community programs and organisations for a range of monitoring data including:

- Waterwatch supplies the data required for the ACT’s Catchment Health Indicator Program (see Water section).
- Frogwatch provides data on frog distributions and abundance.
- Canberra Ornithologists Group provides much of the available data on bird distribution and abundance, and
- Landcare has provided links and opportunities for citizen scientists over a long period of time.<sup>61</sup>

The benefits of citizen science are many: it vastly increases the amount of monitoring both in terms of frequency and coverage, and the work is often undertaken by community members who have ready access to, and an intimate knowledge of, the sites they are reporting on. Without citizen science, many aspects of environment knowledge would be severely limited.

55 Definition taken from Citizen Science Center website, found at <http://www.citizensciencecenter.com/citizen-science-definition/> accessed 21 October 2019.

56 S.Legge et al., 2018, *Monitoring Threatened Species and Ecological Communities*, CSIRO Publishing, Canberra.

57 <https://theconversation.com/explainer-what-is-citizen-science-16487>

58 Lindenmayer, D. and G.E. Likens, 2018, *Effective Ecological Monitoring*, CSIRO publishing, Canberra: p175.

59 TM and JC Van der Heul have been studying fungi for 25 years and have found more than 500 species of fungi and approximately 50 species of myxomycetes (slime mould). *Tubifera vanderheuliae* was named in their honour earlier in 2019.

60 More information can be found at <https://citizenscience.org.au/acsa-act-region/>

61 More information on becoming a citizen scientist can be found at <https://actlandcare.org.au/volunteer/become-a-citizen-scientist/>

## CASE STUDY: WATERWATCH — DATA FOR ACT RIVER ASSESSMENT AND POLICY



Waterwatch volunteer water monitoring activities.  
Source: Waterwatch.

The Waterwatch program is undertaken by over 200 volunteers who monitor water quality every month at 243 sites around the ACT region. The monitoring undertaken covers a total area of more than 11,400 square kilometres. In 2018, Waterwatch provided data from 2,081 water quality surveys, 192 water bug surveys, and 220 river vegetation assessments.

The success of the program over the past five years is evident in the increased uptake of Waterwatch data. The program has gone from being an underutilised data set to one that sits within an integrated monitoring framework for the ACT region (see Water section). For example, the data collected by Waterwatch volunteers is used for Catchment Health Indicator Program (CHIP) reporting in the ACT. Data also feeds into the Atlas of Living Australia and the work done by this group of citizen scientists is increasingly informing government policy, including:

- The ACT Water Strategy 2014–2044 has an outcome to ‘Improve water monitoring and analysis across the ACT and region’, where it highlights ‘Better integration of Waterwatch activities into a broader monitoring program’ as one of the actions.
- The Canberra Capital Metro project used Waterwatch data to help establish a historic baseline along the project’s alignment.
- The ACT Government’s Biodiversity, Research and Monitoring Program, Aquatic and Riparian Ecosystems Monitoring Plan, Conservation Effectiveness Monitoring Program and ACT Integrated Water Monitoring Plan all rely on Waterwatch data.
- A catchment model (Source) is intending to use Waterwatch electrical conductivity data to calibrate salt export rates from the ACT.

- Icon Water is using Waterwatch data as part of their three-year sanitary survey to determine the nature and extent of likely contaminants entering the catchments.
- The Snowy Monaro Council obtained a \$100,000 NSW Environmental Trust Grant in 2016 for restoration works on the Cooma Creek. The grant contained a combination of platypus data obtained during Waterwatch’s Platypus Month and the results on Cooma Creek from the CHIP report.



Platypus at Tidbinbilla Nature Reserve.  
Source: <https://canberra.naturemapr.org/Community/Sightings/Details/3361933>.

In addition to river monitoring, Waterwatch conducted a Platypus census in August 2018. The census consisted of 24 surveys conducted by over 100 volunteers across the ACT region. This is twice the number of surveys done in previous years, greatly improving survey effort and increasing confidence in the data.

Despite the increased survey effort, platypus numbers were consistently down over all sites. A total of 11 individual platypus were sighted over the six reaches surveyed down from 16 individuals in 2017. Rakali (Water Rat) numbers totalled 6 individuals in 2018, down from 11 in 2017. These results are likely due to the drought conditions in 2018. Dry autumn and winter conditions have been linked to fewer platypus sightings in the following breeding season.<sup>62</sup> Dry conditions affecting river flows could also explain the record number of platypus sightings in Lake Burley Griffin over August.

Both in the ACT and nationally, our understanding of platypus numbers and population dynamics is very limited. Every piece of research and data gathered by citizen scientists adds to the picture and better enables us to protect this iconic species.

<sup>62</sup> Australian Platypus Conservancy, found at <https://platypus.asn.au/>

## CASE STUDY: FROGWATCH — MONITORING, TRAINING AND TECHNOLOGY



Frog monitoring technology. Source: ABC News.



© Ryan Colley



Top: Peron's Tree Frog. Source: Ryan Colley.

Bottom: Frog spawn. Source:

<https://ginninderrallandcare.org.au>

Data on the ACT's frog species are collected by around 200 Frogwatch members annually, with many local Landcare and Parkcare groups also undertaking Frogwatch activities.

Training is an important component of Frogwatch. All Frogwatch volunteers are trained on how, when and where to monitor frogs ensuring accurate citizen science data are collected. This includes the use of digital technology to:

- audio-record frog calls
- measure air and water temperature
- assess weather conditions, pond conditions and the surrounding landscape, and
- enter data into an online portal.

All data and frog calls are scientifically verified before being included in the Frog census data.

Frogwatch is planning to reduce the number of monitoring sites in the region from 500 to 200 to ensure that every site is monitored annually, making the data more robust and meaningful. These sites will represent different landscapes and habitat types and align with other monitoring programs such as Waterwatch.

Many scientific publications incorporate Frogwatch data, including in the fields of frog population dynamics, habitat and management recommendations, and climate change impacts.<sup>63 64</sup>

To improve data collection and accuracy, FrogPhone<sup>65</sup> has been developed in collaboration with the University of Canberra. FrogPhone is the world's first remote frog survey device based on mobile phone technology. The device will revolutionise the community's capacity to undertake accurate frog surveys. The combination of citizen science and digital technology are demonstrating strong potential for biodiversity monitoring across a range of species.

63 Westgate, M.J. et al., 2015, 'Citizen Science Program Shows Urban Areas Have lower Occurrence of Frog Species, but Not Accelerated Declines', *PLoS ONE*, found at <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0140973>; Hoefer, A.M. and D. Starrs 2016, *One Pond Fits All? Frogs as an Indicator of Urban Wetland Health*. Final report to Upper Murrumbidgee Waterwatch, Ginninderra Catchment Group, Canberra, found at [http://www.act.waterwatch.org.au/Files/frogs/Hoefer\\_Starrs\\_Wetland\\_Indicator\\_Final\\_Report.pdf](http://www.act.waterwatch.org.au/Files/frogs/Hoefer_Starrs_Wetland_Indicator_Final_Report.pdf)

64 <https://mobile.abc.net.au/news/2019-10-05/rise-of-citizen-scientists-thanks-to-advances-in-technology/>

65 <https://www.engineersaustralia.org.au/News/iot-frogphone-monitors-endangered-species>

## CASE STUDY: CANBERRA ORNITHOLOGISTS GROUP — DATA FOR BIRD CONSERVATION

Canberra and the surrounding region has the richest bird life of any Australian capital city – over 200 species have been recorded here. From our largest bird, the Emu, to the smallest, the Weebill, the birds of Canberra present an ever-changing kaleidoscope of sizes, shapes, colours and sounds.

The Canberra Ornithologists Group (COG) collects bird observations made by community members. This data is published in COG's annual report and used for the Birdlife Australia Atlas. The data collected is extensive, for example in 2017–2018, 251 bird species were recorded and 176,679 observations recorded.<sup>66</sup>

Surveys are undertaken for garden birds, woodland birds and waterbirds. COG also conducts an annual 'Bird Blitz' in the last week of October. These initiatives enable COG to record the species of birds present in the ACT across a wide variety of habitats.

The data provides valuable insights into changes in the distribution, abundance and breeding status of birds in the ACT. Such information, particularly when recorded over a long period of time, is key for the detection of environmental changes that impact on bird species, both within and outside of the ACT.

The data provided by COG is fundamental for the conservation of birds in the ACT, particularly threatened species, informing the need for potential management interventions and providing feedback on the effectiveness of current strategies. Examples of COG data and research can be found in section **5.5 Biodiversity**.



Horsfield's Bushlark on a wire. Source: Ryan Colley.

<sup>66</sup> Canberra Ornithologists Group, 2019, *Canberra Bird Notes*, 44(1), Canberra Ornithologists Group, Canberra.

# CITIZEN SCIENCE — THE ARRIVAL OF THE DIGITAL

‘We are at the beginning of a citizen science renaissance online. After hundreds of years, beyond the purview of bug-collectors and bird-watchers (all very important work, I hasten to add), we are finally able to tap into the cognitive surplus – the population’s free time – and attempt truly distributed research.’<sup>67</sup>

Armed with phones that have built-in cameras and GPS receivers, volunteers can now provide geo-location information about species or environmental conditions in real time providing the community with the opportunity to submit data from anywhere, at any time. In addition, the development of applications will increase the accuracy of species identifications (see Frogwatch case study). Online citizen science participation is already revolutionising community capacity to report on the distribution and abundance of flora and fauna species. It also promotes collaboration and assists volunteers by making data collection easier, faster, and more engaging across a wider demographic.<sup>68</sup>



© Ryan Colley

67 <https://theconversation.com/explainer-what-is-citizen-science-16487>. An example of digital technology being used and useful is Zooniverse. This program has a global community of more than 850,000 people who have taken part in more than 20 citizen science projects internationally. In the last year alone, people collectively volunteered almost half a million hours, which amounts to one person spending 52 years analysing data. Most users on Zooniverse do little and some users do staggering amounts, discussion at <https://theconversation.com/explainer-what-is-citizen-science-16487>

68 Discussed in <https://theconversation.com/explainer-what-is-citizen-science-16487>; found at <https://www.zooniverse.org/>

## CASE STUDY: CANBERRA NATURE MAP — REVOLUTIONISING MONITORING

Canberra Nature (NatureMapr)<sup>69</sup> is an authoritative source on wildlife distribution and abundance in the ACT region. It is made up of over 2,000 existing private databases of citizen scientist and local naturalist groups and it is updated with reported sightings every day. It has been recognised for environmental excellence at the Banksia Awards 2018.

Over 1,166,000 animal, plant and fungi records of 5,044 species have been loaded into the Canberra Nature Map portal. This information is used daily by land managers, park-carers, consultants and

government decision-makers, enabling more informed actions.

All users can add to the communal knowledge base by uploading a wildlife photograph or sound recording and suggesting an identification. Over 80 expert volunteer moderators audit the posts for accuracy. NatureMapr is 'intuitive', caters for all levels of expertise and educates as well as engages.

Citizen science entries on Canberra Nature Map are having a revolutionary impact on conservation understanding and management actions.

### Spider Orchid – critically endangered in the ACT

The Canberra Spider Orchid (*Arachnorchis actensis*) occurs only in the ACT. Prior to Canberra Nature Map it had two known locations with a total population of 250 plants. 155 individual sightings later, it is now known at five locations with a total population of around 800 plants. This has implications for plant genetics as well as climate change resilience.



### New weed incursions

Since 2015, there have been 3816 weed sightings of 570 weed species. On over 200 occasions either government workers, park-carers or the reporting individual have taken action to control new incursions of 85 high risk weed species. Sightings include 89 accounts where a species was recorded in a specific reserve for the first time, a great outcome for stopping weed infestations. Pictured: Madagascar fireweed.



### Small Ant Blue Butterfly

In February 2018, a Small Ant Blue Butterfly (*Acrodipsas myrmecophila*) was identified on Canberra Nature Map. This was only the second ACT record of this rare butterfly. The species has a complex and dependent relationship with an attendant, the Coconut Ant (*Papyrius nitidus*). A group of volunteers were trained in the identification of Small Ant Blue caterpillars, pupa and adult butterflies. Searches were made in areas with high concentrations of Coconut Ant nests, resulting in 344 sightings. Specialised training in conjunction with digital technology has increased sightings. The Small Ant Blue is now known in five of the ACT's reserves.



### Gang-gang Cockatoo – vulnerable in NSW<sup>70</sup>

Despite several thousand recorded sightings of Gang-gang Cockatoos (or Gang Gang for short, *Callocephalon fimbriatum*), only two active nest trees within Canberra were known in 2018. Canberra Nature Map citizen scientists were asked to observe and record Gang Gang behaviour around suitable tree hollows and make repeated observations. Six nesting trees are now known, while about 40 highly likely nest trees have been identified for targeted observation this coming breeding season.



69 Found at <https://canberra.naturemapr.org/>

70 Birdlife Australia website, found at <https://birdlife.org.au/bird-profile/gang-gang-cockatoo> accessed 15 October 2019.

## CASE STUDY: WHAT'S YOUR REALITY? VIRTUAL REALITY AT CALWELL HIGH



Calwell High students working with PCS for 'What's Your Reality?'. Source: EPSDD.

'What's Your Reality'<sup>71</sup> is a project where students from Calwell High School volunteered their time to produce nature based virtual reality (VR) content for the National Disability Insurance Service (NDIS).

The program won the Innovation in Service Delivery Award at the Youth Coalition of the ACT YOGIE Youth Work Awards in 2019.

Students worked with the YWCA Clubhouse and ACT Parks and Conservation Service to plan, film and produce nature-based VR experiences in a pilot program providing footage for the ParksVR platform.

Using innovative technology, the team created a product which translates experiences and locations to people with ability or other limitations that are unable to have a direct connection with nature. These experiences were showcased by Muscular Dystrophy NSW in December 2018. Forty young people with muscular dystrophy were able to experience fire training, bushwalking, swimming, bike riding and learning about the threatened species of Tidbinbilla Nature Reserve for the first time.

Once 'inside' the VR, each participant fell silent as they were lost in the adventure. Everyone was delighted by the control they had over the images, enjoying the freedom of being able to spin in their electric wheelchairs and independently choose what they wanted to see.

One participant commented that he was so convinced by the VR video of a boat rolling over, that he held his breath when the camera was under water!

The volunteer students also felt an impact from this work. Many of the students captured and shared their first encounters with our parks and reserves. Students went from being unaware of what was available, to understanding how to enjoy nature, to being ambassadors for our parks

The 'What's Your Reality' suite of VR experiences has now been provided to New Horizons which will continue to share the experiences with the disability sector through the established 'Parallel Parks' program.<sup>72</sup> This will dramatically increase the reach and diversity of people who will be able to experience our parks and reserves in the ACT.

<sup>71</sup> More information can be found at <https://ywca-computerclubhouse.org.au/whats-your-reality-a-journey-through-virtual-worlds/>

<sup>72</sup> The Parallel Parks program is found here <http://m.newhorizons.org.au/parallel-parks/>