

Island partnerships building collective impact

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Abstract. If conservation depends on people, then community partnerships are the lynchpin to conservation success. The contribution of local knowledge, intellectual capital and volunteer labour not only saves project managers invaluable time and money, it fosters ownership and longevity into conservation initiatives well beyond their projected timeframe. Island communities are socially and culturally diverse and driven by a range of motivations. Hence, if we are to deliver conservation programs at scale, we need to better understand and embed these drivers into program design. We present four contemporary case studies on major populated islands in Australia where community collaborations are building the collective impact needed to underpin conservation success. They contain key learnings about community involvement, to help guide managers with future island planning and avoid some pitfalls.

Keywords: biodiversity conservation, Bruny Island, collective impact, community partnerships, island management, Kangaroo Island, Lord Howe Island, Phillip Island.

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Introduction

Island communities

With advancing technologies, Australia, like other countries, is turning its attention to repairing island ecosystems on a more ambitious scale by targeting larger islands and even multi-tenure island groups (Springer 2018; Towns *et al.* 2018). However, delivering large or complex initiatives on populated islands brings with it a range of additional challenges that may not always be a primary consideration for managers responsible for the economics and logistics of program delivery. It involves dealing with people and communities with diverse social and cultural interests, a strong sense of place but not necessarily with nature conservation as their highest priority, so understanding these community motivations is pivotal to program success.

Community contribution on Australian islands

There are a multitude of landholders, volunteer groups and community-based organisations across Australia involved in island conservation (reviewed by Bryant and Copley 2018).

Island-based community groups, including our First Nations peoples, take on the plethora of actions needed to protect and maintain their island environments. As island custodians, they often deliver these services self-funded and while operating within increasingly more complex bureaucratic environments. For example, 'Friends' volunteer groups provide enormous contributions towards protecting island reserves in partnership with government park authorities, and although their governance structures vary, this model now operates in nearly every Australian state and territory. Environmental non-profit organisations such as WWF Australia, Birdlife Australia, Great Barrier Reef Foundation, Australian Wildlife Conservancy, etc. are a few of the broad-reach organisations that seek grants, donations and philanthropic support to help protect island values. They rally public support at priority hot spots, collect and interpret large data sets, compile strategic reviews, and through their membership, often lobby governments for legislative change.

Collectively, island-based communities, volunteers and non-government organisations (NGOs) now fulfil roles across the spectrum as island caretakers, restorers, educators, researchers

and guardians. No longer do these groups perform a single task, their diversification and capacity has expanded to fill the void left by unfunded programs, changing priorities and meagre government budgets. The reality is that embedding community ownership in island conservation is critical if we are to achieve lasting success. In fact it is a national imperative given the significant role islands play in safeguarding Australia's natural capital (Moro *et al.* 2018).

Building collective impact and the 4Cs criteria

In September 2014, the Third International Conference on Small Island Developing States (SIDS), to which Australia was a contributor, focused the world's attention on the sustainable development of SIDS through genuine and durable partnerships (Secretariat of the Convention on Biological Diversity 2014). They identified five key elements to partnership success:

1. influential and dedicated high-level country champions as Co-Chairs of the Partnership.
2. shared passion, values and dedication of its participants.
3. a true partnership based on inclusive participation, flexibility and genuine willingness to engage and foster collaboration.
4. mutually reinforcing activities toward achievement of long-term goals.
5. good governance, planning and dedicated coordination support.

While these criteria are key to many partnership models, Arnstein (1969) explains there is a critical difference between going through the process of tokenistic participation (e.g. information sessions, consultation, placation) to having the real power needed to achieve your outcomes. People are often placed on rubberstamp advisory committees or boards for the purpose of 'educating' them or engineering their support and it is usually the officials who educate, persuade and advise the community, not the reverse. Genuine partnerships are created by a shift in delegated power and decision-making from powerholders to people. Arnstein (1969) explains how a greater share in planning and decision-making responsibilities through structures such as joint policy boards, planning committees and mechanisms for resolving impasses, re-distributes the balance of power and provides community with a mandate to influence change. More recent progressions to this theory involve adopting co-design and social learning as a way of enabling full community participation (Collins and Ison 2009; Blackmore 2010). Although this requires specialist expertise to facilitate and a range of associated enabling conditions, it could be particularly useful for island communities that retain a strong sense of ownership and place.

Many social disciplines also advocate that attracting collaboration from a wide cross-section of stakeholders is equally as important to build the collective impact needed to solve large complex problems (Kania and Kramer 2010). This concept is now gaining traction in environmental protection (Braun *et al.* 2016). Kania and Kramer (2010) identify the five conditions needed for collective impact:

1. a common agenda, with a shared vision for change.
2. shared measurement and reporting on change including understanding success.

3. mutually reinforcing activities delivered through a plan of action.
4. ongoing communication to build trust, create motivation and reinforce mutual objectives.
5. a backbone support organisation with people dedicated to guiding the vision, building public will, advancing policy and mobilising funding.

People who live and work on islands are not merely stakeholders. As the histories of conservation interventions show, island communities will not necessarily embrace changes unless given compelling reasons to do so (Walter and Hamilton 2014). The conventional 'we must protect nature' approach is slow to work and as Ball *et al.* (2018) suggest, the pathway to more effective conservation lies not in the answer to 'why don't more people care?' but understanding 'what would motivate more people to support conservation?'. For example, in the Pacific region, generating tangible benefits for island communities, and providing external support for 5 years or more were imperative for program success (Keppel *et al.* 2012). In addition, a recent study by Glen and Hoshino (2020) found managing invasive species on inhabited islands in New Zealand and Japan required addressing unforeseen challenges such as finding common ground and ensuring management was socially and culturally acceptable. Building tangible benefits with a flow-on effect to the island community's cultural and economic needs is an emerging model worth applying (Keppel *et al.* 2012; Kareiva 2014; Ball *et al.* 2018).

When bringing people together from diverse backgrounds to help lead large-scale change, this broader involvement means the interplay between conservation goals, and the needs and aspirations of island communities becomes fundamental. The 4Cs philosophy, as described by Ball *et al.* (2018) and as operating on Norfolk Island, attempts to integrate commerce, culture and community into conservation management, so that everyone in the community can play a role and see a direct benefit. For example, the local economy benefits from conservation volunteers paying to stay and work on Norfolk Island; cars are hired and groceries are bought, or when new ventures such as 'Bird Week' are established that increase the flow of visitors to the island. The 4Cs principles are:

1. conservation is essential to safeguard biodiversity and the integrity of the ecosystem services which support all life.
2. conservation delivery needs to support and nurture human communities, rather than create divisiveness.
3. in achieving conservation, cultures need to be respected and seen as a source of new knowledge, ideas and innovation.
4. conservation needs to recognise commercial prerogatives and become a source of economic prosperity rather than a burden.

Ball *et al.* (2018) contend that conservation programs are holistic and cannot be undertaken in isolation of other socioeconomic factors and that each program needs to deliver clear outcomes within the other 3Cs; community, culture and commerce. This suggests that to achieve conservation on populated islands, all aspects of conservation program delivery must be fundamental to island life and community needs.

Case studies on populated islands

Here, we present four contemporary case studies on populated Australian islands to show the breadth of community involvement in conservation, their complexities and unexpected initiatives that arise. They reflect the 4Cs philosophy and show what can be achieved when partnerships transition from collaboration to collective impact. The first case study describes the emergency response delivered in the face of a catastrophic event and what can be achieved when diverse stakeholders unite and commit to a common urgency.

Case Study 1: Kangaroo Island wildlife and habitat recovery after the 2019–2020 bushfires

Kangaroo Island (KI), South Australia, with an area of 440 500 ha, is Australia's third largest island. Isolated for about 7000 years, it holds many unique species including 15 endemic bird subspecies, one mammal and several other fauna species likely to be genetically distinct. In December and January 2019–2020, unprecedented catastrophic bushfires raged across the western half of KI for more than 4 weeks, burning 201 830 ha or 46%, of the island's total area. About 60% of this burnt area is set aside for nature conservation (public and private), 22% grazing land, 11% plantation forests and 3% cropping land. Due to the intensity of the fires, many properties were severely damaged including losses of houses, businesses and associated infrastructure. Tragically, two people were killed and more than 50 000 livestock and untold native animals perished.

The Kangaroo Island Business and Brand Alliance's vision for 'Authentic Kangaroo Island' is to build a strong economy for KI businesses believing that all operators can work together to promote the island and grow regional prosperity. 'Nature is fundamental to our concepts of humanity and wellbeing', and is why KI's communities rise up to protect and preserve it (<https://authentickangarooisland.com.au/>).

This very strong connection of the island's unspoiled nature with *Brand Kangaroo Island's* healthy, clean and green business image, including its nature-based tourism industry, underpins just how seriously the catastrophic fire not only impacted nature but also affected the local community and many of its businesses.

Seven of the nine conservation reserves impacted by the fires had between 94% and 100% of their areas burnt, including 98% of the vast Flinders Chase National Park, with little remaining in these areas other than burnt stumps and blackened soils. An overview of the fire's scale and devastating impacts can be found at: <https://www.arcgis.com/apps/Cascade/index.html?appid=ef29c850d8e34e98a8307dbdfe0aaaab>. As many of KI's unique species populations occurred on the western half of the island, three mammal, six bird, one frog and at least 10 invertebrate taxa were predicted to have had over 70% of their known habitats severely impacted by the fires.

Short-term responses for conservation (0–3 months post-fire)

During the fires and immediately afterwards, many locals (e.g. farmers, members of Kangaroo Island Wildlife Network) and others with appropriate licenses and training (e.g. Australian Defence Force personnel and vets from SA Veterinary Emergency Management) undertook animal welfare tasks including

searching for and treating injured livestock and wildlife and where necessary performing euthanasia.

Then, while most of the local KI conservation team (non-Government and Government) took well-earned breaks from firefighting and/or started the long tasks of remediation, off-island resources were mobilised to help undertake priority risk assessments to:

- map relative fire intensity across the fire footprint and assess its potential impact,
- identify threatened and other conservation significant species known to occur within the fire footprint and calculate the relative proportions of their known ranges likely to be affected, and
- identify unburnt patches of habitat that could act as refugia and determine their accessibility.

Early challenges

During January and early February 2020, the impacts of the KI fires on the local community and the island's wildlife received a huge amount of local, national and international media attention. This, in turn, galvanised the wider community into action to either make generous financial donations towards recovery efforts or offer their volunteer assistance with any activities needed. In the first few months after the fire, this latter type of help had to be prioritised and coordinated due to bottlenecks in air and ferry transport to and from the island and shortages in available vehicles and accommodation. In the burnt western sector, some roads and access tracks within parks were closed for many weeks due to safety concerns. Subsequently, several parks and sections of others have remained closed for more than a year post-fire, while resources were directed to prioritised zones.

From a nature conservation recovery perspective, KI was part of a much larger state-wide and national focus due to the many unprecedented fires occurring on mainland South Australia, Western Australia and in vast areas of the eastern states. There were already strong national partnerships in place between local groups and agency staff and the Commonwealth environment department, the Office of the Threatened Species Commissioner and the National Environmental Science Program (NESP) Threatened Species Recovery Hub through a project on the KI dunnart (*Sminthopsis fuliginosus aitkeni*) (Case Study 10 (p. 31) in <https://www.environment.sa.gov.au/topics/plants-and-animals/taskforce>).

The long-running and successful South Australia glossy-black cockatoo recovery project also had a high profile nationally because of the steady rate of the species recovery on KI prior to the fires (case study in Bryant and Copley 2018). The dunnart and cockatoo became the focal threatened species of concern in the media and for foundational discussions around priority-setting, and WWF-Australia immediately provided the emergency funding needed to undertake their assessments.

In late February 2020, over 80 animal and plant experts, community members, researchers and park managers met on KI to identify priority recovery actions, key knowledge gaps and resourcing requirements to strategically support recovery of individual threatened species and habitats. Organisation of this workshop had begun before the fires were even extinguished and involved key people from Kangaroo Island Natural Resources

Management (KI NRM) and South Australian State Government, the Australian Government, the NESP Threatened Species Recovery Hub and local private conservation landholders.

The discussions and outputs from this workshop then formed the basis for prioritising actions and investments in the medium- to longer- term recovery efforts. The main priority actions identified were:

1. rapid surveys and monitoring of unburnt patches within and around the fire footprint to determine: (a) short-term survival, (b) medium- to long-term persistence, and (c) re-establishment in burnt sites of the priority species identified.
2. targeted management of feral cats to reduce predation pressure on small and isolated remaining native fauna populations, and
3. targeted management of herbivores, especially re-establishment of fencing to exclude stock from regenerating habitats and feral pig removal, with the aim of eventual eradication.

Community involvement in Kangaroo Island wildlife and habitat recovery

After the fires, local Department for Environment and Water (DEW)/National Parks and Wildlife Service (NPWS) South Australian staff were redeployed to the clean-up and reinstatement of visitor infrastructure within affected parks to support recovery of the island's strong nature-based tourism economy, so additional personnel were needed to undertake wildlife recovery actions.

Bird surveys and monitoring

After the fires, grave fears were held for several KI bird populations. Birdlife Australia and NPWS South Australia organised a small team of expert ornithologists to undertake a rapid assessment of as many of the unburnt remnant habitat patches as possible to determine species distributions and survival. These sites are being re-surveyed every 6–8 weeks to monitor presence and persistence and any immigration of additional species. Local ornithologists have also been mobilised to undertake bird surveys of unburnt habitats on the rest of the island.

Native fauna and feral animal surveys and monitoring

Prior to the fires, an improved camera-trap method for detecting KI dunnarts had been developed by Dr R. Hohnen through a NESP Threatened Species Recovery Hub project (<https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/csp2.4>), prior to which few dunnarts had ever been captured. Fortunately, prior to the fires, the Hohnen technique had already been adopted by Land for Wildlife Kangaroo Island on several private Heritage Agreement properties and was proving a real 'game-changer' for detecting dunnarts and many other native wildlife species as well as feral cats and pigs (<https://www.facebook.com/KILandforWildlife/>).

Emergency funding from WWF Australia through KI NRM (now Landscapes Kangaroo Island) and provision of vehicles and staff from DEW on the mainland, enabled drift fences and camera traps to be deployed relatively quickly in most unburnt habitat patches on park. With additional funding from the Australian



Fig. 1. Kangaroo Island Land for Wildlife North West Conservation Alliance project surveys. From left: Liberty Olds (Zoos SA), Ashlee Benc (Kangaroo Island Land for Wildlife) and Heidi Groffen (Kangaroo Island Land for Wildlife) (photo: Kangaroo Island Land for Wildlife).

Government, local personnel were employed to maintain the camera-traps, frequently check the camera images for evidence of dunnarts and feral cats and to maintain cage traps in the vicinity of the camera-traps to dispatch as many feral cats as possible.

KI dunnarts were detected immediately after the bushfires by KI Land for Wildlife in a small (~1 ha) unburnt area of a Heritage Agreement on private property (Fig. 1). This encouraged the deployment of more camera-traps on parks and private land (60+ sites). After 12 months of survey and monitoring, dunnarts had been recorded at a remarkable 48 sites on park and private properties, including several severely burnt areas now in early stages of regeneration.

Feral cat management

The combination of camera-traps and cage trapping proved successful at targeting and catching cats for the first 9–10 months post-fire (Case Study 7, <https://www.environment.sa.gov.au/topics/plants-and-animals/taskforce>). As cage-trapping is very time-consuming, NPWSA rangers from the mainland worked on a roster for several weeks to assist with the task, allowing some respite for the main teams. KI Land for Wildlife have also maintained extensive cat trapping and culling in surrounding areas, assisted by the Australian Wildlife Conservancy (<https://www.australianwildlife.org/news/>).

In the first year after the fire, approximately 250 feral cats were captured and culled from parks and private lands combined. This was a key post-fire management action identified for the protection of dunnarts, pygmy possums, bandicoots and many other native ground-based species. Although data analyses to determine the effectiveness of this strategy had not been undertaken at the time of writing, early observations suggest that this has been a critical action and likely to have curtailed local feral cat recruitment rates considerably.

Fauna recovery trends

To track species recovery post-fire, with targeted cat control in place, the large number of camera-trap images are being

analysed by volunteers through DigiVOL, an online crowdsourcing platform developed as part of the Atlas of Living Australia by the Australian Museum, CSIRO and the Australian Government (<https://digivol.ala.org.au/Bushfire-Recovery-Projects>; <https://www.csiro.au/en/News/News-releases/2020/Kangaroo-Island-dunnart-recovery-supported-by-citizen-scientists-across-the-country>).

During the first 5 months post-fire, over 56 000 images from 60 trap-lines were assessed by more than 900 volunteers. Each image was assessed by up to eight volunteers with experts from DEW used to identify any unknown images and validate the rarer species (Case Study 6, <https://www.environment.sa.gov.au/topics/plants-and-animals/taskforce>). Images of birds were verified by volunteer bird experts, and species persistence and/or recovery also tracked during post-fire regeneration.

While the native vegetation is showing remarkable signs of regeneration and many plant and animal species seem to have survived in at least small unburnt habitat remnants, their populations and the wider habitats and ecological processes that used to support them on western KI are still far from recovered.

Protection of regenerating habitats is well underway. A particular early focus has been re-establishment of fencing to exclude stock from burnt remnant bush areas on farms. Some of this protective fencing was a spin-off from the very successful volunteer workforce organised through BlazeAid (<https://blazeaid.com.au/>) who removed over 1200 km of damaged fences and re-erected 784 km of new fencing with 788 volunteers from around Australia.

Also, with the removal of cover by the bushfires an opportunity has been created to target the eradication of feral pigs from the island. To this end, camera-traps and thermal imaging are enabling pig controllers to locate pigs in dense cover and bait or aerially cull entire groups of pigs effectively.

Much has been learnt in the first 12 months after the bushfires. Many of the early challenges typical of large bushfire events have been amplified because of KIs relative isolation from mainland transport and supply networks. However, over time, more targeted activities have been undertaken at more sites by an increasing number of dedicated volunteers from KI and elsewhere. After the winter and spring rains, these activities have been broadened to include weed control, including addressing the mass germination of Tasmanian blue gum seedlings downwind and downstream from burnt timber plantations.

From these varied experiences a *South Australian Wildlife and Habitat Recovery Framework* has been prepared by a Ministerial Task Force to ensure that the next time catastrophic bushfires occur, and they will, Government and community will be much better prepared (<https://www.environment.sa.gov.au/topics/plants-and-animals/taskforce>). Core to the success of all such responses is the cooperative and well-coordinated involvement of many groups and individuals operating across all land tenures to support the recovery of human and ecological communities.

Large-scale, catastrophic events such as bushfires cause a plethora of destructive and disruptive impacts on local human and ecological communities. Natural regeneration after fires is slow but can be impacted by a range of short- to medium-term threats. Recovery activities therefore require strategic, staged, coordinated and cooperative actions to be undertaken by the most appropriate people in the most effective way possible.

Case Study 2: ‘Protecting Paradise’ – implementing a holistic island wide, multi species conservation program on Lord Howe Island

The Lord Howe Island (LHI) community has a strong allegiance and commitment to the management and protection of the island’s heritage, lifestyle and environment. The conservation programs rolled out on LHI over the past few decades have resulted in positive environmental change and a legacy of community led environmental custodianship. However, salient lessons have been learned on the importance of community support and that unless community concerns are addressed and solutions found early in the planning process, they can manifest into protracted delays, budget overruns, and compromises that can place the entire program at serious risk of failure.

Inscription onto the World Heritage List in 1982 and the National Heritage List in 2007 is testament to the natural values of LHI and need for their protection. About 75% of the terrestrial part of LHI is managed as a Permanent Park Preserve (i.e. a gazetted National Park but governed via the *LHI Act*) and governed by the New South Wales statutory authority. Islands as administrative units can create community tensions with respect to generational community custodianship of the island, consequently, the delivery of effective conservation requires strong partnerships and a community mandate. The Government and LHI community have achieved much in the area of threatened species recovery and invasive species management but important lessons are still being learned as the following case study explains.

The LHI Group is an outstanding example of an oceanic island of volcanic origin located in the Tasman Sea, approximately 570 km east of Port Macquarie, NSW, Australia. Containing a unique biota of plants and animals with a high level of endemism, LHI exhibits exceptional natural beauty, provides important breeding grounds for seabirds, habitat for many other rare and endangered species and supports the world’s most southerly true coral reef (Australian Government 2020, <http://whc.unesco.org/en/list/186>).

LHI, with its community of 350 people supported by the Lord Howe Island Board (LHIB) has a long history of implementing conservation programs that protect and enhance the islands’ World Heritage values. The Protecting Paradise program was founded in the 1980s in recognition of LHI’s conservation legacy and for over a century, the LHI community has founded conservation initiatives aimed at preserving their natural environment. The Protecting Paradise programs are testament to what can be achieved through providing government support and guidance to foster community custodianship of environmental programs – turning back the tide on environmental degradation and invasive species impacts – island scale.

Introduced and invasive species have affected the LHI environment since settlement in 1834. Recognising that the island’s rich biodiversity was at risk, the LHIB in conjunction with the NSW Department of Planning, Industry and Environment in consultation with the community prepared a holistic multi species conservation management plan (the Lord Howe Island Biodiversity Management Plan 2007 (LHI BMP)) to guide island-wide restoration initiatives.

The Protecting Paradise program, underpinned by the LHI BMP, aims to eradicate priority pest species and reduce threats

to endemic, threatened and significant species and their habitats. Improved biosecurity measures have been adopted coincident with eradication programs to prevent further re-introduction and spread of pest and diseases and to protecting over \$30 million investment in conservation programs and the environment from future threats.

To date, Protecting Paradise achievements include the successful eradication of over 10 weed species, cats, pigs and goats, myrtle rust and the significant reduction in the density and abundance of priority weeds island scale. A further 20+ weed species are close to being declared eradicated in coming years with an 80% reduction in weed density and a 90% reduction in the presence of mature weeds island wide.

Program 1: rodent eradication

A Rodent Eradication Project (REP) to remove rats and mice from LHI was originally proposed in 2001, with a Rodent Eradication Plan publicly released in 2009 and funding secured in 2012. The project aimed to uphold the island's World Heritage values through removal of a Key Threatening Process (predation by Rodents on Offshore Islands) and, if successful, to turn the tide on rodent assisted extinctions, which already number close to 20 in the century since rodents arrived on the island.

As with many projects globally, initial support for the rodent eradication came from a scientific benefits perspective, with the issue identified and supported by the LHI Board prior to community consultation. This immediately put the project in the difficult position of appearing to be imposed on the community rather than coming from within the community. Though the desire to remove rodents was largely supported, there was growing discontent, and this eventually led to a referendum in May 2015 that resulted in a controversial result of 52% for and 48% against the continuation of the project. It seemed that by not addressing the full list of community concerns, program delivery could be put in jeopardy at several critical junctures. The breadth of these concerns has been detailed by Harper *et al.* (2020) and mainly related to, for example, systemic mistrust of the governing body, aversion to and delivery of toxic baits, non-target impacts, influx of new personnel and potential disruption to livelihood.

With a very narrow majority, the REP moved forward to its next stage, obtaining permits and approvals. Some of the final project approvals were gained within 6 months of the implementation phase of the project; causing serious difficulties when it came to planning and critical pre-project community consultations involving gaining property access.

An immediate response was needed to address community concerns, as community support was not only crucial for eradication success, but also for ongoing biosecurity compliance. These concerns led to a major change in methodology in 2018 when a large portion of the settlement area was reconfigured from hand-broadcast to predominantly bait stations, resulting in a significant project cost increase in line with labour requirements to service 22 000 bait stations.

Once implementation of the project began, although not all residents were supportive of the final methodology, there were only minor issues with the delivery of day-to-day operations. During the operational phase, the REP employed over 20% of the local population (63 people) aged 18–64 years, making up 45% of the project workforce with the majority of households on the

island being represented by at least one team member. The advantages gained by employing a predominantly local workforce were obvious in terms of property access, permeation of transparent project information throughout the community, community engagement and early identification of community concerns.

The baiting phase of the project ran in the period May–November 2019, completing 19 rounds of baiting and two aerial bait drops over the Permanent Park Preserve. Final settlement baiting operations ran for approximately 12 weeks longer than anticipated with the last rats found on the 9 October 2019. In line with this extended timeframe, monitoring was also extended by 6 weeks, with associated financial implications.

During this phase, the use of a communications team that had a deep understanding of community complexities to organise property access was a key operational component. Pack-down of the project began on 1 November 2019 and was completed on 20 December 2019 with all bait stations collected, cleaned and packed for shipping to their next project on Waiheke Island, New Zealand.

After 16 months of monitoring and within months of the scheduled REP success check, two adult rats were spotted and reported by a local resident in April 2021.

This detection triggered an immediate rapid response to deal with the identified rat population as it placed the entire eradication program and project investment at risk. This incident not only reinforces that strong quarantine measures are vital to maintain island biosecurity, but that the community play an essential role in ongoing surveillance and compliance.

The Lord Howe Island REP was an ambitious undertaking and represents the most complex eradication program of its type attempted thus far. Many lessons have and are still been learned, such as the importance of maintaining known personnel, repeated one-on-one communications, and that community involvement is integral from pre-planning to throughout the delivery phase to help guide the decision-making process (Walsh *et al.* 2019). By not addressing community concerns, problems manifested into significant project compromises, legal challenges, cost escalation and lengthy delays that could have otherwise been avoided. These disruptions can also exact a significant emotional toll, not only on the local community but on committed staff and personnel who often contribute well above what is expected of them.

Program 2: weed eradication

The LHI Weed Eradication Program (WEP) aims to eradicate priority weeds on an island scale. The WEP is an ambitious program, given the diversity, density and distribution of weed populations that were present when the program commenced.

The WEP has been the longest running environmental campaign on LHI. Employment of local people has been a priority recognising local knowledge and terrain fitness. Training is provided on island and external contractors engaged to build team size and aid mutual skills sharing. Local capacity is an important element of succession planning as well as encouraging custodianship.

Formally commencing in 2004, the WEP initially targeted 25 priority weeds. In 2016, an additional 45 weeds were listed for eradication, including those expected to spread due to the implementation of a rodent eradication program. In November

2019, the WEP reached the 15-year midpoint of a projected 30-year program achieving 80% reduction of weeds in all life stages and 90% reduction of matures island wide.

The lead-in on weeds prior to the eradication of rodents has been instrumental in reducing weed densities ahead of potential 'cascade effects' from the ecological change post rodent eradication. Field teams are witnessing extensive seedling recruitment of natives and residual mature weeds. The program is at a time-critical stage to remove residual mature weed plants that now have increased reproduction and dispersal capacity.

Repeat weed search and control is conducted on foot and using helicopters to access remote and cliff line weeds. Trials are in progress using high resolution imagery and drones (Dendra Systems) to detect residual weeds in all terrain. This will enable a 'rapid response' saving time and money compared with traditional search methods. Increased resourcing and technical solutions will be essential to keep ahead of weed response post REP.

Annual weed inspections are conducted on leasehold residential and agricultural land to identify known and emerging weed risks. A key learning is that it has been easier to provide assistance to remove weeds than initiate compliance as it helps the big picture in delivering eradication. In 2016, the LHIB gifted leaseholders a prized fruit tree in recognition of their assistance in removing target weeds.

Local and external volunteers are a key stakeholder group for the WEP. Since 2005, over 150 volunteers supported by the LHIB have been engaged on the weed program. Increasingly, LHI residents are volunteering to gain experience and to improve employment opportunities in restoring their beloved island. Another long-term partner, Friends of Lord Howe Island, provide invaluable volunteer assistance with their Weeding Ecotours, and have collectively contributed more than 24 000 h of weeding and help to build valuable networks to raise awareness of the Project.

WEP achievements:

- 200 620 h of weeding effort and 40 000 h of volunteer action.
- 6515 ha searched (equivalent to weeding the island 4.5 times).
- 90% less weeds removed per hour (from 34.6 weeds/h to three weeds/h).
- \$13 million investment by the State and Federal Government and LHIB.
- Over 2.55 million weeds removed (seedling to matures) since 2004.
- 10 weeds eradicated, 15 remaining undetected for 2 years, 25 weeds in low density.

The collective achievements of LHI conservation programs have improved the immediate protection and ultimately resilience of the islands' World Heritage values into the future. Key lessons reinforce that building community trust from the project outset is critical, active involvement in project delivery increases project robustness and constant communication is imperative, without which community disharmony can lead to project delays and places project investment in jeopardy.

Case Study 3: tracking 'liveability' on Bruny Island, Tasmania

Island communities, particularly those with a high proportion of generational landholders, have a strong sense of ownership and

place. As the status quo changes over time, many island communities can become disenfranchised and overwhelmed when unplanned growth and rapid development fails to meet local needs and aspirations (Moyle *et al.* 2010). They want to share benefits that growth can bring, such as a healthy local economy and better access to primary services, but not at the expense of their lifestyle or environment. The following case study demonstrates how, in the face of rapid growth, one island community is applying a novel framework to track environmental change as a measure of island sustainability.

Conservation initiatives

Bruny Island, Tasmania (362 km²), approximately 1 h south of Hobart and accessible by vehicular ferry, has a resident population of about 700 people, which swells considerably with shack owners and visitors on weekends and during the summer. Many landholders have permanently protected their land through perpetual conservation covenants and a range of community-driven initiatives such as threatened species protection, controlling cats and invasive species, marine debris clean-ups and revegetation efforts are voluntarily delivered. Bruny Island's 'island conservation' brand supports a diverse artisan community, eco-businesses and the biennial Bruny Island Bird Festival, all of which attract thousands of visitors to celebrate conservation efforts and support island life.

However, over the past two decades, Tasmania's rapid growth in tourist numbers has led to Bruny Island experiencing an unprecedented rise in popularity with visitor numbers increasing from under 50 000 in 2005 to over 120 000 in 2019 (Jackson 2006; Tasmanian Visitor Data, <http://www.tvsanalyser.com.au/> accessed 15 March 2021). This growth in popularity has created disharmony in the local community who demanded action from State and Local governments to redress what they considered as degradation of their lifestyle and environment. Despite several studies conducted previously, all identifying the need for a sustainable island policy, the State Government in 2017 required yet another survey to be undertaken at the same time it committed to increase ferry services, improve island infrastructure and grow visitation numbers. The contract was awarded to a local consultant, who over a period of 5 months, contacted all Bruny Islander ratepayers to gauge their views about living and working on Bruny Island, and their aspirations for the island's future for years to come. The community survey, 'Bruny Life' (Fagan 2018), explored 10 domains of liveability across the spectrum of work-life attributes, only one of which was related to the environment (Fig. 2).

Engagement for the study involved eight local people spread across the island holding small group meetings at workplaces, local venues, house-to-house interviews, and polling using social media and word-of-mouth. The survey was comprehensive, inclusive and the results obtained were statistically significant. The highest scoring statement by ratepayers was 'Protection of Brunys natural environment' as their top priority', and this finding was consistent across all islander demographics.

A key recommendation from the study was to monitor, measure and evaluate the social, economic and environmental impacts of visitors on the people and natural environment of Bruny Island. The community identified this recommendation as essential, and after further consultation, the Bruny



Fig. 2. Ten domains of liveability developed for the Bruny Island community, as described by Fagan (2018).

Island Environment Network took on the role to objectively measure environmental change by constructing a 'sustainability account'.

In 2018, after a series of workshops, the first working group was convened comprising approximately 20 representatives from local business, government, University of Tasmania academia, environmental NGOs and community sectors all with an interest in the island. The methodologies adopted to frame the accounts include the System of Environmental-Economic Accounting framework (United Nations 2014), Conservation Standards (Conservation Measures Partnership 2020), the Partnering Initiative (Stibbe and Prescott 2020), and the Accounting for Nature principles developed by the Wentworth Group of Concerned Scientists (2016). Over a 2-year period, the key candidate accounts, their indicators and data sources were identified, agreed and construction commenced.

Wherever possible, the framework has built on existing Bruny Island data sets, including the Tasmanian Land Conservancy's WildTracker data (<https://tasland.org.au/projects/wildtracker/>), Institute of Marine and Antarctic Studies' Reef Life Survey (<https://reeflifesurvey.imas.utas.edu.au/static/landing.html>), Kingborough Council's aquifer monitoring (Cromer *et al.* 2020) of potable water extraction and many others. Paired with the environmental account are social criteria such as vehicle and ferry usage (Fagan 2020) and Tourism Tasmania's visitor movements (<https://tourismtasmania.com.au/research/visitors>) and other island-related datasets to form a set of Environmental Accounts that serves as a tool for measuring trends and changes

on the island in the next 5–10 years. The first set of trial accounts should be completed in 2021–2022.

The lessons learned during this process were that good leadership and organisational skills within a community are key to having a sustained impact. They extend to the specific expertise needed to attract funding, understand data and ecological knowledge, strategic thinking and process understanding from a wide cross-sector of others. Community consultation must be comprehensive and meaningful, and that complex processes using innovative models and concepts are readily trialed if they can underpin future decision making.

Case Study 4: island-wide conservation on Phillip Island, Victoria

Phillip Island (PI), in Victoria, is home to the world's largest populations of little penguins (*Eudyptula minor*), Australian fur seals (*Arctocephalus pusillus*) and short-tailed shearwaters (*Ardenna tenuirostris*) and has significant populations of other threatened species and communities (Sutherland and Dann 2014; McIntosh *et al.* 2018). The 10 000-ha island comprises approximately 20% nature reserve, 20% urban and 60% agricultural/rural residential land. The crown lands, which comprise 1805 ha, are managed by a Board appointed by the Victorian State Minister for Environment and Energy and known as the Phillip Island Nature Parks (hereafter 'the Nature Parks'), which is a unique conservation organisation that operates and derives most of its income from ecotourism experiences on PI, especially the 'Penguin Parade' of the little penguins.

Visitors have been coming to see the nightly arrival of penguins on Summerland Beach since the late 1920s. The attraction has grown significantly over the past 90 years and in 2019, it was viewed by over 700 000 visitors, more than half of whom were international travellers and estimated to be worth \$402 million to the Victorian economy per annum (Phillip Island Nature Parks 2020).

PI has a permanent population of 10 387 residents (Australian Bureau of Statistics 2018) and receives around 2.2 million visitors per year (Bass Coast Shire Council 2016). As the Nature Parks is the largest employer on PI, and offers a range of natural and recreational attractions, there is a high level of public interest in its operation.

Research on penguins on PI began in 1968 with the formation of a citizen scientist group, the Penguin Study Group (PSG) by the late Pauline Reilly. The thirst for answers to the multitude of questions about penguins raised by visitors prompted the then manager of the Penguin Parade to approach Pauline Reilly for assistance. The PSG made regular visits for 50 years between 1968 and 2019, and it was the concerns they and others raised, including the Phillip Island Conservation Society and the Penguin Parade's scientific advisory committee, that led to a full-time scientist being appointed in 1980 whose primary role was to determine the status, population size and principal threats to the penguins.

The decreasing range and population size of little penguins on PI was the main community-driven concern, and a reflection of the strong community ownership of penguins on the island and across Victoria, especially as by the 1980s, nine of PI's 10 penguin colonies were already extinct (Dann 1992).

Population studies had shown that land-based threats such as predation by foxes, habitat destruction from housing development, roadkill, fire and domestic pets were having a significant impact on PIs last remaining penguin colony and that unless they were addressed, predictions were that the Penguin Parade would cease to be a natural attraction by 1997.

The identified threats to the penguin population were mostly anthropogenic and terrestrial (although marine threats were suspected but not clearly identified at that time (Norman *et al.* 1992)). A plan was implemented to eradicate or mitigate these threats and engage local and state-wide communities through an extensive engagement and media campaign. The main elements of this threat abatement plan were:

- eradication of foxes from PI (Dann 1992; Kirkwood *et al.* 2014). This eradication was declared successful in 2017 and had been dependent on significant support of farming communities across the island over the life of the eradication program.
- purchase and removal of a seaside village 'Summerland Estate' in the middle of the penguin breeding area, which involved extensive public consultation and engagement. Victorian State Government began buying back homes in the 'Summerland Estate' on the Summerland Peninsula in 1985 (Dann 1992; Sutherland and Dann 2012; Sutherland *et al.* 2014).
- control of dogs within Nature Parks. Considerable community engagement over penguin depredation occurred and impacts on threatened hooded plover breeding success via the Hooded Plover Watch Group (volunteers).

- traffic management plan to reduce and ultimately eliminate road kills of penguins (Dann 1992). This was the first time in Victoria that government roads were temporarily closed for any reason other than road maintenance and emergency response.
- campaign to reduce oiling of penguins at sea, part of which involved the training of volunteers in penguin rehabilitation and the construction of a centre to house volunteers during training and in the advent of an oil spill.

These actions proved highly successful and resulted in a three-fold increase in the breeding adult population between 1984 and 2019 to what is now the largest breeding population of little penguins in the world (Sutherland and Dann 2014; Bird-Life International 2020).

The eradication of foxes from PI took over 30 years and the slow progress in the early years was because the methods used were not island-wide nor effective (Kirkwood *et al.* 2014). Extensive debate occurred over whether to go for a 'Fortress Summerland' approach (fence off the Summerland Peninsula and eradicate foxes inside the fence) or an island-wide eradication. Fortunately, the potential benefits of an island-wide eradication won the day, resulting in the 'Phillip Island Ark' with its benefits to biodiversity, ecosystem function, the Island economy and ecotourism.

The removal of foxes from PI, in conjunction with a feral cat control program, provided several significant immediate opportunities for biodiversity conservation:

1. opportunity for species threatened/controlled by fox predation on PI to expand their breeding success and survival, distribution on the Island and population size. These species include little penguins, short-tailed shearwaters, beach-nesting birds and Cape Barren geese (*Cereopsis novaehollandiae*).
2. reintroduction of species previously exterminated by foxes (and possibly feral cats). A community engagement workshop was held to establish priority list of reintroductions. A structured decision-making process (Phillip Island Nature Parks 2019) was conducted with key stakeholders including the residents, farmers, traditional custodians and various institutions to decide which threatened fauna were supported and to prioritise their reintroduction. This process represents the intended approach for future island-wide conservation programs as it provides a transparent and inclusive means for the community to contribute to decision making from the outset.
3. provision of a fox-free haven for threatened species found elsewhere in Victoria but not known previously on PI, such as the eastern-barred bandicoots (*Permeles gunnii*). A community engagement and communication plan was prepared for releases on nearby Churchill Island and PI. To help engage with the communities and address their potential concerns about the introduction, a 2-year trial release was conducted on Churchill Island (connected to PI by a bridge), enabling residents to visit this demonstration site and see first-hand what they might expect from an introduction to their island. The demonstration site has been invaluable for garnering community support and consequently, bandicoots were successfully released to PI in October 2017 (Hill *et al.* 2018). The community has been instrumental for monitoring these populations with 128 volunteers contributing more than 2868 h. Proactive community engagement has enabled the vision to create safe havens where threatened species can be

reintroduced or even introduced to aid their recovery (Phillip Island Nature Parks 2019).

One consequence of the fox eradication on PI was that the Cape Barren goose population increased substantially, to the extent they were impacting on agricultural productivity. A stakeholder working group has been formed and is in the process of developing an (abundant) wildlife management plan for PI, which will focus on reducing the impacts of these species while still maintaining the character of the island.

The PI community has always played a role in instigating and implementing a range of significant conservation initiatives and their involvement is fundamental to program success. The key learnings are:

1. success can be attributed to a dedicated team conducting research and long-term management programs with clear goals of eradicating or mitigating anthropogenic threats.
2. significant community engagement and communication are a crucial part of conservation successes, also recognising that some significant conservation actions are initiated by community conservation groups.
3. all conservation successes on PI featured an integration of long-term research commitment, research-led management actions, community engagement and participation and post-graduate student involvement.

Discussion

The island case studies presented here, while all different, reinforce the pivotal role island communities play in conservation delivery and that durable partnerships provide invaluable opportunities to learn, be involved, and where possible derive a benefit. These are critical factors to success. However, several salient messages emerge, which serve as key learnings for island managers.

1. *Community involvement from the outset*

Although island communities will differ in their desire and capacity to be involved, unless genuine partnerships are formed at the very outset, dissatisfaction can lead to programs stalling, costs escalating, and timelines becoming protracted as it did with the rodent program on Lord Howe Island. Non-participation and tokenism alienate the community, resulting in a lack of follow-through, and no assurance of changing the status quo (Arnstein 1969). On Lord Howe Island, the diversity and complexity of cultural, social and environmental viewpoints on the REP needed to be addressed at the start, not midway during program delivery. Programs on this scale are ambitious, expensive and technically complex, the community need to genuinely share in the planning and decision-making process, and it is their level of support that can spell the difference between success and failure. The importance of anticipating potential for conflict rather than reacting to it by forming resilient partnerships, like those formed on the LHI WEP and Phillip Island, provide the community with a share in decision making and degree of influence over future island management.

2. *Working together guided by science*

The imperative of science to underpin conservation work cannot be underestimated, not only to ensure procedures are scientifically robust but conservation success can be

measured and communicated. Integrating a long-term research commitment with research-led management actions, community engagement and post-graduate student participation typify the conservation successes on Phillip Island. Even on Bruny Island after strong community consultation, it was beholden on a community group to adopt the actions recommended in the government report and develop a scientifically credible procedure to validate its findings. During the emergency bushfire event on Kangaroo Island, a clear understanding of conservation priorities focused conservation effort so time was not wasted. The generous and diverse scientific expertise that underpinned community action ensured the procedures adopted were scientifically rigorous and provided the foundation for community groups to continue tracking species and vegetation recovery for years to come.

3. *Strong organisational support*

A backbone support organisation is essential to drive the complex conservation initiatives needed for holistic island conservation. The organisation must have good governance and the transparency needed to maintain community confidence, trust and motivation, and be able to go the distance when programs stall or budgets blow out. Organisations such as government have greater potential to harness the realistic budgets needed to support island-wide restoration work, as on Lord Howe Island, or show a direct line of sight from government enterprises underpinning conservation initiatives, as on Phillip Island. But funding is not always the initial motivator for community involvement as groups in every island case study have a long history of volunteer involvement or securing their own funding when needed. On Kangaroo Island for example, even though essential disaster relief funding quickly flowed, much of the early on-ground work was performed by volunteers (on and off island) at a crucial time when information was needed for future decision making. Doing what needs to be done is what islander people do best, especially in times of challenge, but a strong support organisation can help steer and underpin this longevity.

4. *Embracing change and technology*

Trialling novel procedures like Environmental Accounts on Bruny Island may take time to gain traction but the commitment of stakeholders involved increases the stakeholders involved increases the robustness and likelihood that a useful tool will eventuate. If island sustainability can be measured and tracked in an agreed credible way, then the community can better understand where it is headed and its future challenges. While conservation success is typically measured by species and hectares, a measure of island community health that integrates financial, social and cultural needs and aspirations should also be used as reporting criteria to align with the 4Cs philosophy.

The mobilisation of effort post-fire on Kangaroo Island was enhanced by the uptake in new techniques and equipment being quickly adopted by community members when trained and guided by specialists. Island communities are globally connected and often resourceful in applying or adapting novel technologies if it saves time, money or safeguards their environment.

5. *Supporting island economies*

These case studies show that supporting local people not only provides them a direct economic benefit, it also strengthens

community support for conservation efforts more broadly. Employing locals on specialist or remedial programs, purchasing services or equipment from local suppliers, assisting property holders, for example through Land for Wildlife, engages a wider cross-section of the community than may otherwise have been involved. Employment was seen as a positive tool on Lord Howe Island, as was presenting the economic cost-benefit analysis of the eradication program so the community could clearly see any potential impact on their livelihoods (Walsh *et al.* 2019). A principle of the 4Cs philosophy is that a greater number of stakeholders will participate if they can see a direct economic benefit flowing from conservation, and this motivation is essential if we are to attain the collective impact needed for conservation success.

These case studies demonstrate the longevity of many island communities, their resilience, capacity to adapt and willingness to be involved depending on various motivators. They also show how community disharmony and discontent can fracture even the best technically or operationally planned programs and threaten their chance of success. If we are to address island conservation at scale and with the urgency it needs, we must broaden our perspective and adopt a new paradigm of engagement to do so. Diverse stakeholders help build collective impact and even though integrating community, culture and commercial aspirations into island conservation programs may require new skill sets beyond our present conservation thinking, these elements are clearly already emerging.

Conflicts of interest

The authors declare no conflicts of interest.

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