



Australian Government

Department of Climate Change, Energy,
the Environment and Water

Draft threat abatement plan for competition and land degradation by unmanaged goats

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

Cover image

Unmanaged goats on a rock in Warrumbungle National Park, New South Wales. Image: Julie Burgher flickr (CC BY 2.0)

Contents

1	Introduction.....	1
1.1	Threat abatement plans.....	1
1.2	Definitions and scope.....	1
1.3	Threats	2
1.4	Managing the threat	3
2	Objectives and actions	4
	Objective 1: Prioritise and protect species, ecological communities and places that are affected by competition and land degradation by unmanaged goats	4
	Objective 2: Encourage research into goat impacts on threatened species and ecological communities.....	9
	Objective 3: Maintain up-to-date information on unmanaged goat distribution and abundance and encourage standardised monitoring.....	13
	Objective 4: Investigate new goat control methods and record and monitor goat control programs	15
	Objective 5: Encourage adoption of best practice management of goats.....	19
	Objective 6: Continuous improvement on animal welfare code of practice and standard operating procedures for goat control.....	23
	Objective 7: Increase public understanding of goat impacts, the need for goat control and the objectives of the TAP.....	25
	Objective 8: Form a TAP implementation committee.....	28
3	Investment and implementation of the plan	30
3.1	Investment in the plan.....	30
3.2	Implementing the plan.....	32
3.3	Evaluating the plan	34
	Appendix A: EPBC Act-listed species impacted by unmanaged goats.....	35
	Appendix B: EPBC Act-listed threatened ecological communities impacted by unmanaged goats ..	42
	Appendix C: Heritage listed and Ramsar sites impacted by unmanaged goats	44
	References	46

Tables

Table 1	Actions to achieve Objective 1: Prioritise and protect species, ecological communities (communities) and places that are affected by competition and land degradation by unmanaged goats	7
Table 2	Actions for Objective 2: Encourage research into unmanaged goat impacts on threatened species and ecological communities	11

Table 3 Actions for Objective 3: Maintain up-to-date information about unmanaged goat distribution and abundance and encourage standardised monitoring	14
Table 4 Actions for Objective 4: Investigate new goat control methods and record and monitor goat control programs.....	17
Table 5 Actions for Objective 5, encourage adoption of best-practice goat management and on-farm management of goats	21
Table 6 Actions for Objective 6, continuous improvement on animal welfare code of practice and standard operating procedures for goat control	24
Table 7 Actions for Objective 7, Increase public understanding of goat impacts, the need for goat control and the objectives of the TAP.....	26
Table 8 Actions for Objective 8, form a TAP implementation committee	29
Table 9 Approximate costs for elements of actions with the plan as of November 2022.....	31
Table A1 Species known or thought to be impacted by unmanaged goats based on information in the SPRAT database, conservation advices, recovery plans and scientific literature	35
Table B1 EPBC Act-listed threatened communities impacted by unmanaged goats according to the Species Profile and Threats Database as of June 2022.	42
Table C1 Nationally listed Heritage places known to be impacted by unmanaged goats as of 2018...	44
Table C2 Ramsar wetlands known to be impacted by unmanaged goats as of 2018.....	44
Table C3 Islands within the Great Barrier Reef World Heritage area with known established goat populations.....	44

1 Introduction

1.1 Threat abatement plans

Competition and land degradation by feral goats is listed as a Key Threatening Process (KTP) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A key threatening process is a process that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community. This Threat Abatement Plan (TAP) replaces the 2008 TAP, and it aims to abate the impacts of unmanaged goats on biodiversity and cultural values. This plan should be read in conjunction with the *Background document for the Threat Abatement Plan for competition and land degradation by unmanaged goats* (the Background Document), which provides more information about unmanaged goats, their impacts on the environment and cultural heritage, their economic and social values and management.

This 2023 TAP addresses threats to EPBC Act listed threatened species and ecological communities, but also recognises threats to species and communities that are likely to become threatened if the threat from unmanaged goats continues. Mitigating the threat of invasive species is not simply a matter of providing better technical solutions. It also involves understanding and addressing social and economic factors; for example, through supporting the efforts of private landholders and leaseholders to manage goats on their lands for biodiversity conservation and primary production. Research and actions for controlling unmanaged goats therefore need to consider the interests of primary production while still conserving and enhancing ecosystems and native species.

The threat abatement planning process included assistance from state and territory governments, natural resource management agencies, scientific experts, primary industry representatives, First Nations Peoples, not-for-profit conservation organisations and other stakeholders. To progress actions under this TAP, the Australian Government will rely on working in partnership with a wide range of stakeholders.

The goal of this TAP is to improve protection for species and ecological communities threatened by goats, and to prevent further species and ecological communities from becoming threatened or extinct due to threats posed by goats. To achieve this goal, the plan has 8 objectives, developed through the review of the previous TAP and consultation with experts and stakeholders.

1.2 Definitions and scope

Populations of unmanaged goats, *Capra hircus*, occur predominantly in arid and semi-arid landscapes of Queensland (Qld), New South Wales (NSW), South Australia (SA) and Western Australia (WA) (Parkes et al. 1996), and on farmlands and reserves in temperate zones. Unmanaged goats occur in every state and territory (West 2011) across an estimated 2 million km² of Australia, including some offshore islands. While unmanaged goats have long been established in numerous parts of Australia, their expanding range in some locations is of concern (Murphy and van Leeuwen 2021).

The terms unmanaged goat and feral goat are interchangeable, and both refer to invasive goats. The term unmanaged goat is used in the TAP and Background Document. The goat industry commonly uses the term 'rangeland goat' to refer to feral or unmanaged goats. The term 'wild harvest' refers to

live captured animals that are immediately transported off the property or transported via an approved holding depot.

The term 'managed goats' generally refers to securely fenced goats, legally defined as stock, under an active primary production system, with no access by unmanaged transient goats, and maintained to match market demand and supply. It should be noted that there is a lot of variability in the level of goat herd management. There are 'semi-managed' herds (GICA 2021) within cluster fencing or behind dog fences, that have little interaction with land managers, their grazing pressure is not managed, and harvesting might be done more opportunistically, rather than planned.

Once compulsory electronic tagging of goats is in force as part of the National Livestock Identification System (end of 2024, see section 1.6 in the Background document), a goat being tagged will form part of the definition of a managed goat. A managed goat herd should also be able to be removed if there is a need to de-stock the paddock.

Predation by dingoes, access to artificial watering points and control measures are the main influences on the distribution and abundance of unmanaged goats in Australia. For this reason, outside state-wide dog barrier fences, goat numbers are generally much lower. Some goat herds occur inside cluster fences erected to keep dingoes out of sheep grazing areas in parts of NSW and Qld. Cluster fences are exclusion fences built around a group of properties. It is unclear how many of the goats in these regions are unmanaged versus managed.

Collectively, the Qld and NSW cluster-fenced areas are thought to cover more than 200,000 km², and so the area containing unmanaged goats may now be less than the previously estimated 2 million km². Similarly, in WA, the Murchison Regional vermin cell fence (a large dog fence outside the WA dog barrier fence) covers an area of ~65,000 km² and 53 pastoral leases. However now that the fence is constructed, it is unclear how many of these properties in this region will transition from unmanaged goat herds to managed goats.

1.3 Threats

Goats occur in a wide range of landscapes across Australia. If left unmanaged, populations can grow to large numbers and have detrimental effects on cultural and biodiversity assets and primary production (Lethbridge et al. 2013). Goats are among the 5 worst invasive species in Australia in terms of negative impacts on EPBC Act listed threatened taxa (Kearney et al. 2019). The Australian Government's Species Profile and Threats Database (SPRAT) and scientific literature (See Appendix A) indicate goats have a negative impact on around 128 threatened species.

Goats are also listed as a threat, or a potential threat, to 24 listed threatened ecological communities (Appendix B), and they threaten the values of nationally listed heritage sites, and Ramsar-listed Wetlands of International Importance (Appendix C).

Goats can prevent the regeneration of plants, increase soil erosion, and directly compete for food resources and refuges with native herbivores such as rock-wallabies (*Petrogale* spp.) (Harrington 1979, Harrington 1986, Greene et al. 1998; Lethbridge et al. 2013). The density at which unmanaged goats pose a threat varies between different ecosystems, the level of degradation of the ecosystem, available water and the composition of palatable plant species (Lethbridge et al. 2013).

1.4 Managing the threat

This plan outlines new and continuing actions needed to abate the threats posed by unmanaged goats, based on a 2013 review of the 2008 TAP and a literature review and stakeholder engagement process undertaken in 2022.

Historically, primary producers viewed unmanaged goats negatively because they competed for feed resources with farmed sheep and cattle, destroyed infrastructure, affected wool class, and had the potential to spread disease. The live weight price of goats fluctuates but has generally increased over the past 5 years, as has the export demand for goats, now making them economically viable as managed livestock (see Background Document). Together with the 2017-2020 drought, this has motivated some primary producers to either muster large numbers of unmanaged goats for sale or, where possible, diversify their operations to include managed or semi-managed goat production systems. The 2017-2020 drought also motivated an increase in the removal and sale of unmanaged goats while they still had economic value. Populations of unmanaged goats generally increase rapidly with the return of favourable rainfall. The perception of unmanaged goats as both a pest and a resource has caused conflict, and increased challenges to their management for biodiversity outcomes in some parts of Australia.

This plan is designed to be flexible to support goat management in different jurisdictions and landscapes, considering differences in land systems and government policy frameworks.

2 Objectives and actions

This TAP establishes a national framework to guide and coordinate Australia's response to the impacts of unmanaged goats on biodiversity. It identifies the research, management and other actions necessary to ensure the long-term survival of native species and ecological communities affected by competition and land degradation caused by unmanaged goats. The plan also aims to promote the maintenance of all other native species and communities impacted by unmanaged goats to prevent the deterioration of their conservation status.

Many of the stakeholders consulted emphasised the importance of evidence-based, scientifically supported decision-making in goat management. Ensuring that the control of unmanaged goats is evidence-based could minimise future conflict between sectors and ensure broad support for management actions. This document identifies knowledge gaps and actions that will enhance knowledge about goat numbers, distribution, impacts, and effective management practices.

The plan identifies 8 objectives and 45 actions to help achieve its goal. Each action is either high, medium or low priority and has a timeframe of short-term (within 3 years), medium-term (within 3 - 5 years), long-term (taking 5 years or longer) or ongoing (a continued need to undertake the action). Descriptions of the expected outputs and outcomes from each action's implementation can serve as performance indicators.

The tables in this section identify some of the parties responsible for implementing all or part of an action. Additional parties are invited to play a role in assisting the implementation, and to form partnerships to allow greater impact and sharing of knowledge. Achievement of the best outcomes for threatened species and communities under threat from unmanaged goats relies upon partnerships between governments, non-government organisations, scientists, community groups, First Nation Peoples, regional groups, landholders and individuals.

Objective 1: Prioritise and protect species, ecological communities and places that are affected by competition and land degradation by unmanaged goats

The review of the previous TAP found that in some regions there was no recognition of the threats posed by goats to vegetation and land condition, or the biodiversity value of certain areas such as habitat corridors that benefit native species but are impacted by goats. Prioritising the location of management actions is required to protect high-value areas, and this should be an ongoing priority.

Appendix A and B identify EPBC Act-listed species and ecological communities which are threatened by goat activity such as browsing, trampling, digging or habitat competition. The protection of these species and ecological communities should be the initial priority for goat management until further information is collated.

The lists of species and ecological communities impacted by unmanaged goats need to be continuously reviewed and updated. A GIS (geographic information system) database which links goat density and management to the specific recovery plans for threatened species and ecological communities and survey data would help with understanding which native species are impacted by

unmanaged goats, the severity of the impact, and the importance of ensuring goat populations are managed.

Appendix C identifies Ramsar wetlands (The Convention on Wetlands of International Importance), and nationally listed heritage sites under threat from unmanaged goats. Monitoring and management of goat populations in these areas is a priority especially as the Australian Government has international and national obligations to ensure these sites' protection.

On public and private reserves with high-value biodiversity assets where eradication is not feasible, culling, trapping and/or mustering operations will be needed to keep unmanaged goats at low density. After an initial control operation, the remaining unmanaged goats (often called 'sticky goats') are generally scattered in small numbers and difficult to trap or muster. Small numbers of goats can still have adverse effects on native plants and animals, particularly in steep terrain, where numbers can increase quickly if left unchecked. On Indigenous Protected Areas and jointly managed reserves, a combination of management techniques has generally been needed to see any benefit to the biodiversity assets targeted for protection. In some areas, fencing to protect assets may be the best option, especially in the short term while goat density is being reduced.

Goats have caused severe degradation to numerous islands after being deliberately introduced as a source of meat and milk for people who worked on the islands, and for shipwrecked mariners (Dalby 2005). Eradication of goats may be feasible from some islands, peninsulas and isolated patches of habitat where there is low risk of re-colonisation. There have been numerous successful goat island eradications, with recent successes on Kangaroo Island and Dirk Hartog Island. However, unmanaged goats are still present and established on more than 35 offshore islands (DCCEEW 2016), with around 24 of these islands within the Great Barrier Reef World Heritage Area (Appendix C). More up to date information on goat presence on islands is needed.

Analysis of goat impacts, biodiversity assets, human population, industries present on each island and stakeholder support would help inform prioritisation for island eradication programs. A prioritisation process on the conservation status of Australian offshore islands has been undertaken (Ensure, 2009) but requires updating. However, the islands within the Great Barrier Reef World Heritage Area should be a priority for control and eradication programs.

There is currently a goat eradication program underway on French Island, Victoria which has had initial success. The island has high biodiversity and cultural value and is a priority location identified in the Threatened Species Action Plan. Support for the completion and monitoring phase of the program is a priority.

Wildfires, and in particular megafires, amplify existing threats to threatened species and ecological communities. Unmanaged goats, and other feral herbivores can exploit the higher quality new foliage in recovering burnt areas and disturb soil with their hard hooves (Geary et al. 2022). This can directly impact plant survival, cover and structural characteristics of the vegetation, and could potentially reduce resources and habitat available to native species. Burnt areas provide an opportunity to efficiently control unmanaged goats, as they are easier to detect in low density vegetation. Rapid post-fire removal of goats may also benefit the recovery of priority species and communities.

The formation of a TAP implementation committee has been proposed to drive implementation of the plan, and to allow a rapid respond to any emerging issues. The committee will have a role to play in most of the proposed actions. Please see Objective 8 for more information on the role of the TAP implementation committee.

Table 1 Actions to achieve Objective 1: Prioritise and protect species, ecological communities (communities) and places that are affected by competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
1.1 Update the list of EPBC Act-listed species and communities impacted by unmanaged goats. Identify species and ecological communities where evidence of impact is required (i.e. data deficient).	High priority	Short term	Gaps in knowledge identified in the process will feed into research conducted in action 1.4. Publicly available database of native species and communities impacted by unmanaged goats.	Stakeholders have a clear understanding about which species and communities goats threaten.	TAP implementation committee, Australian, State and Territory Governments, researchers
1.2 Prioritise species and communities identified in action 1.1 by their need for abatement of threat posed by unmanaged goats.	High priority	Short term	Publicly available database of native species and communities impacted by unmanaged goats prioritised by need for goat threat abatement.	Species and communities most at risk identified so they can receive priority action.	TAP implementation committee, Australian, State and Territory Governments, researchers
1.3 Determine which threat(s) (e.g. browsing, habitat destruction, displacement) are acting on species and communities identified in action 1.1, and what management actions are required to conserve and improve the condition of these species and communities.	High priority	Short term	A review of relevant published literature. Pest species experts and land managers consulted on the design and implementation of control methods best suited to an area and/or endangered species. A publicly available GIS database linking goat management approaches to specific threatened species and communities recovery plans, and the distribution of threatened species and communities impacted by goats.	Spatially explicit information about key management actions and the biodiversity targets that these actions will protect is being used to abate the threat posed by unmanaged goats.	Australian, State and Territory Governments, researchers, non-government organisations, Indigenous ranger groups
1.4 Determine if there is likely to be a change in the impacts from unmanaged goats due to the shift in goat distribution with climate change (see Action 3.3).	Medium priority	Medium term	Publicly available database of native species and communities that are likely to become impacted by unmanaged goats in the future under climate change, and a list of those that are likely to be less impacted under climate change.	Preventative actions can be taken on species/areas identified as likely to become threatened/impacted. Information can be fed into management priorities in action 1.6 and to inform future conservation strategies.	Australian Government, state agencies, researchers

Draft threat abatement plan for competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
1.5 Identify high biodiversity and high cultural value habitat patches that are currently goat-free but are close to known goat populations, to prevent goat invasion into new areas.	Low priority	Medium term	A review of relevant published literature, field work, mapping, consultation with Traditional Owners, the public, pest species experts and land management.	Land managers are able to prioritise areas at high risk of goat invasion.	TAP implementation committee, Australian, State and Territory Governments, Traditional Owners, land managers
1.6 Target goat management to species, communities and places, including islands, identified in actions 1.1, 1.4 and 1.5 using methodologies identified in action 1.3, and density targets determined from action 2.2.	High priority	Long term	Goat management implemented based on prioritisations and information obtained via other actions. Goat eradication carried out on high conservation value islands where feasible. Goat densities in and around priority sites/species reduced and lower densities maintained. Exclusion fencing installed around priority sites/species where goat culling or harvesting is not feasible.	Increased population and/or condition of species/communities where goat threats have been reduced. Increase in land area where goats are effectively managed for biodiversity outcomes. No further establishment of goats in goat-free priority areas. Goats eradicated from high conservation value islands.	State and Territory Government, NRM groups, conservation groups, Indigenous ranger groups, farmers.
1.7 Control unmanaged goats in fire-affected priority sites, commencing within 6 months of a fire.	High priority after a wildfire	Medium term	Goats eradicated or reduced to densities identified in action 2.2	Improved post-fire recovery of threatened species and communities.	State and Territory Governments, NRM groups, pest controllers, Indigenous ranger groups

Objective 2: Encourage research into goat impacts on threatened species and ecological communities

Overgrazing and trampling by goats can negatively impact native vegetation, soil properties and lead to competition with native herbivores for resources. There have been some empirical studies on goat impacts, and ecosystem recovery after goat control (e.g. Bayne et al. 2004, Creese et al. 2009, Greene et al. 1998, Harrington 1979), but a lot of the knowledge of goat impacts have been observational. In addition, there is a need for more evidence on the benefits of goat control for native species, ecological communities and soil structure (Reddiex and Forsyth 2004).

Stakeholders consulted agreed that decisions on unmanaged goat control and goat stocking rates in managed systems need to be based on impact metrics for goats and other herbivores present. Such metrics would strengthen decision-making and remove much uncertainty around managing goats for conservation outcomes. Current scientific data needed for informed decision-making on goat impact/numbers are either incomplete or in progress. The density at which goats pose a threat varies for the species and ecological community being impacted, and it also depends on how the species or community are impacted, for example, if they are directly browsed upon versus being trampled.

Even at low population densities, goats can have detrimental effects on critical resources for rock-wallabies, especially during dry periods. A confounding factor in determining goat impacts is the difficulty of distinguishing goat browsing from the browsing of other herbivores when their range and diet overlaps.

Current landscape condition monitoring methods do not adequately relate the level of impact to the activity or density of goats. A method developed by Lethbridge et al. (2013), building on the work of McDonald and Brandle (2009) uses multiple plant indicator species and categorises these into growth form classes and forms that indicate the severity of herbivore impact (Lethbridge et al. 2013). This method has the potential to provide evidence for plant responses to goat management and requires further development. The Terrestrial Ecosystem Research Network (TERN) are currently developing a set of standardised monitoring protocols to quantify changes in goat impacts for conservation and restoration programs before and after goat management (TERN 2021). This methodology may fill this knowledge gap.

The rise in the commercial value of rangeland goats has led to an increased opportunity to harvest goats. This poses both a benefit and a risk, especially if the harvesting of unmanaged goats is not sufficient to mitigate threats to biodiversity, or if goats are intentionally spread to new areas, to create opportunities for future harvest. One solution for primary producers is to transition unmanaged goats to a managed goat production system, which usually requires additional fencing or an upgrade to fencing. Government agencies in Queensland and NSW, together with Meat and Livestock Australia (MLA) and the Goat Industry Council of Australia (GICA) have been broadly promoting total grazing pressure (TGP) fencing as a method for managing pastures under goats at a broad scale. This considered the total grazing pressure on a pasture from all herbivores.

Appropriate goat stocking rates in fenced areas with biodiversity assets have been poorly researched, but such information is critical to support a transition to goats as managed livestock, rather than an opportunistically harvested resource. Landscape-scale impacts from fencing have been difficult to monitor across large pastoral properties (MLA 2018), and there is a need to monitor

impacts of TGP management on groundcover and other components of biodiversity, both inside and outside these fences. MLA have proposed an industry relevant TGP database of current knowledge, which would also include the condition and diversity of natural assets (MLA 2018). Many stakeholders consulted suggested research is needed to assess goat grazing trials in these systems to determine whether there are long-term co-benefits or negative effects to both biodiversity assets and primary production outcomes. A shift to having 'semi-managed' goats is unlikely to have improved biodiversity outcomes. This is especially the case if goat density is high, the pasture is not rested when required, and the herd is not de-stocked during drought.

Cluster fencing in Queensland, including fencing containing goats, can affect any one species positively or negatively (Smith et al. 2020, Smith et al. in review). Cluster fences have prevented the movement of numerous species of wildlife including the yellow footed rock-wallaby (*Petrogale xanthopus xanthopus*) (Smith et al. in review). Animals may face risks such as behavioural changes, disruption to natural movement between colonies and restrictions to gene flow as a result of exclusion fencing, especially when installed over long distances. Exclusion fencing can also impact animal welfare on both sides of the fence through injury, starvation and distress (Bradley et al 2014). The impact of fencing for unmanaged goat control on biodiversity assets therefore needs to be investigated as part of transition to goats as managed livestock.

Table 2 Actions for Objective 2: Encourage research into unmanaged goat impacts on threatened species and ecological communities

Action	Priority	Timeframe	Output	Outcome	Responsibility
2.1 Refine existing methodologies for rapid assessment of goat impacts in the field at a regional scale.	High priority	Short term	<p>A guide for rapid assessment of impacts, and long-term monitoring and measurement of impacts using regionally appropriate indicator species.</p> <p>Outputs fed into the database and prioritisation process in action 1.1, increasing rigour of prioritisation process.</p> <p>Clear methodology developed to measure goat impacts on native vegetation to access the benefits of goat control operations.</p>	<p>Guide is widely promoted, with high uptake, for on-ground management and recovery planning.</p> <p>More land managers monitoring goat impacts before and after goat management, allowing identification of effective management practices and support of an adaptive management approach.</p>	Researchers, Australian, State, and Territory Governments, the goat industry
2.2 Determine the density impact relationships for the key bioregions where goats are established (e.g. Mulga Lands, Channel Country, Flinders Lofty Block), and for priority highly threatened vegetation communities.	High priority	Medium term	<p>Target densities for goat control operations known; triggers for instigating goat control in different regions/habitats known.</p> <p>Improved understanding of goat density impact relationships for bioregions/priority vegetation communities where goats are established. Demonstrated application of the methodology developed in 2.1</p> <p>Outputs available in publicly accessible database.</p>	<p>Density impact relationship information applied by land managers leading to more effective goat management to mitigate threats to biodiversity assets.</p> <p>Density impact relationship information applied by graziers/pastoralists leading to improvements in land management practices for farmed goats.</p> <p>Together actions 2.1 and 2.2 will allow the identification of appropriate target goat densities and methods to measure the achievement of goat control operations</p>	Researchers, State and Territory Governments, First Nations people, the goat industry

Draft threat abatement plan for competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
2.3 Undertake research on long-term grazing trials in areas with TGP and cluster fences to determine the benefits and impacts of cluster fences to biodiversity assets and primary production.	Medium priority	Short term	<p>More informed decision-making for the goat producers transitioning to fenced goat management in commercial production systems.</p> <p>Increased understanding of the benefits of commercial goat farming on biodiversity.</p>	<p>Increased understanding of the risks and benefits of TGP fencing to biodiversity assets. Can be used to make informed decisions on where best to install TGP fencing.</p> <p>Improved goat grazing management for conservation and primary production outcomes.</p>	Australian, State and Territory and Governments, goat industry, researchers, TAP implementation committee
2.4 Evaluate goat impacts on species/communities where impacts are suspected, but there is a lack of evidence, and identify additional native species, ecological communities, cultural heritage and places that are likely to become threatened by goats.	Medium priority	Medium term	<p>An enhanced evidence-based list of species and communities at risk</p> <p>Information on what is likely to become threatened/impacted.</p>	<p>Availability of information to better support ongoing and future conservation strategies</p> <p>Preventative actions can be taken on species/areas/cultural heritage identified as likely to become threatened/impacted.</p>	Australian Government, state agencies, researchers, conservation managers, First Nations people

Objective 3: Maintain up-to-date information on unmanaged goat distribution and abundance and encourage standardised monitoring

To help identify current and emerging threats, and set evidence-based priorities for goat management, up-to-date information on goat distribution and abundance is required. Information on the effects of climate change on goat distribution and abundance and the effects of management interventions is also required. These data are also important for assessing the effectiveness of goat management, including the threat abatement strategies in this plan.

A collation of Australia-wide estimates of goat population was last published in 2012 (Pople and Froese 2012). While aerial surveys continue separately in each state, these data have not been collated, and in some areas have not been collected. Methodologies vary between states for collecting goat density and abundance data (see Background Document). Developing aerial survey protocols that produce comparable data would allow the national collation of data. Surveys need to be able to differentiate between managed and unmanaged goats, so that a more accurate picture of where goat control is required can be developed.

The Atlas of Living Australia (ALA) provides online access to information about Australia's biodiversity, including sightings and locations of pest species. This spatial data portal can support organisations through identifying where unmanaged goats have been sighted across the country. However, these sightings are opportunistic and at times biased towards accessible areas. ALA could be updated with broadscale population estimates from the increase in survey effort with more consistent surveying approaches.

Once broadscale data are collected and collated into a spatial database system, such as the Australian Government's Biodiversity Data Repository (in development), data could be overlaid with data on threatened species and ecological communities to assist with the identification of priority areas for goat management. This in turn would assist in identifying areas where goats need managing or where alternative types of management could be applied.

Table 3 Actions for Objective 3: Maintain up-to-date information about unmanaged goat distribution and abundance and encourage standardised monitoring

Action	Priority	Timeframe	Output	Outcome	Responsibility
3.1 Facilitate the sharing and collation of data on unmanaged goat distribution and abundance data from across Australia.	High priority	Initial collation within 1 year, and ongoing for the life of the plan	Long-term datasets of goat distribution and abundance.	Capacity to monitor program successes and identify new incursions, which compromise Objective 1 priorities.	Australian, State and Territory Governments, NRM groups, researchers
3.2 Create and maintain a national database of goat distributions that is available to stakeholders.	Medium priority	Ongoing for the life of the plan	Central dataset of goat distribution and abundance accessible to all state and territory governments and the general public.	Nationally consistent long-term monitoring, reliable GPS sightings for control methods to be implemented best suited to the landscape.	Australian, State and Territory Governments
3.3 Undertake modelling to determine if the potential goat distribution is likely to change under predicted future climate.	Medium priority	Short term	A map showing the potential distribution (suitable habitat) of goats under current and predicted future climate. This spatial information will indicate if, and where, population establishment and expansion is most likely now and in the future.	Ability to target management to prevent a range shift or expansion if a change in goat distribution is predicted.	Australian Government
3.4 Create an updated map of unmanaged goat density and distribution across Australia, and maps of biodiversity assets (threatened species habitats, threatened ecological communities, cultural heritage) in relation to goat distribution.	High priority	Short term, with updates every 2 years	Publicly available map of goat distribution, and maps of biodiversity assets overlaid with unmanaged goat populations.	Improved access to information allowing public and industry to understand where key biodiversity assets are relative to unmanaged goats, and changes in the goat distribution and density since 2012.	TAP implementation committee, Australian Government
3.5 Develop a nationally consistent survey method for measuring goat distribution and abundance that separates managed and unmanaged goats. Encourage consistent survey design across jurisdictions.	High priority	Short term	An agreed standardised aerial survey methodology for estimating the distribution and abundance of goats.	Nationally consistent long-term goat monitoring that allows detection of changes in density and distribution. Improved ability to determine the effect of goat control programs.	Australian, State and Territory Governments, NRM groups, researchers

Objective 4: Investigate new goat control methods and record and monitor goat control programs

Monitoring the outcomes and effectiveness of goat control and management activities will be key in determining whether the objectives of the TAP are being met, and whether the status of biodiversity assets is improving because of these actions. Lessons from long-term programs and partnerships, including their methods, cost-benefits, management triggers, assumptions and collaboration approach need to be recorded and shared.

Data need to be captured and shared on an ongoing basis including the number of goats removed, target areas, collaboration approaches, costs, methods employed and how, if at all, impact metrics have been used. The data collection considerations in this objective will enable this information to be shared to further promote best-practice goat threat abatement.

Landholders and management staff could access the suggested strategies, policies, and priorities most relevant to their landscape online. Management zones could be established to allow for application of the relevant actions, priorities and control methods based on the area's land use, topography and climate. However, the management of goats is dependent on many other variables, other than climate and landscape, and would need to consider other influences such as biodiversity or cultural significance and values.

Many biodiversity assets are affected by more than one threatening process and goats may be one of multiple threats to a species or ecological community that need to be considered when planning and prioritising threat abatement actions. The potential for synchronous control of other herbivores, such as deer, which have an overlap in distribution and impact should be explored to see if there are conservation and cost benefits.

Existing goat control methods can be challenging and expensive to implement in some landscapes. Baits are currently used to control a range of vertebrates in Australia (e.g. rabbits, pigs, and foxes), and can be a cost-effective method to increase the efficiency and effectiveness of control programs. Baiting can reduce animal populations, or maintain low densities after deployment of another control method. Currently no bait is registered for unmanaged goats in Australia. The [draft National Feral Deer Action Plan](#) also has an action to develop and trial lethal baits and delivery mechanisms for the control of feral deer, and there will be synergies between bait development for deer and goats.

This plan promotes the trial of new baits for control of unmanaged goats. Sodium fluoroacetate (1080), para-aminopropiophenone (PAPP), sodium nitrite, cyanide and zinc phosphide are all possible toxins for use in goat specific baits. Goat-specific feeders have been developed to administer baits (Hunt et al. 2014), and these aim to exclude native animals from accessing the bait to mitigate off-target risks. There is potential for further development of goat specific feeders, such as using artificial intelligence technologies for animal species recognition.

Further investigation is required to determine effective lethal dose rates, bait delivery medium, goat bait acceptance, humaneness, and risks to non-target species and farmed goats. If a bait is developed that meets these stringent requirements, the plan supports registration of the bait through the Australian Pesticides and Veterinary Medicines Authority (APVMA). The bait would be trialled and

used under strict directions to protect humans, domestic animals, wildlife, and the welfare of target species. Baits would be used according to relevant legislation in each state and territory and at the discretion of authorities, in consultation with landholders, goat farmers and the commercial rangeland goat harvesting industry.

There are potential avenues for technology to be used to make goat management more effective and efficient. Technology has been successfully deployed in the management of other invasive vertebrates in Australia, including cats and pigs. Avenues to be explored include the use of drones for aerial surveys, using thermal cameras to improve detection with aerial culling, and artificial intelligence technologies that only allow goats access to baits or traps. Recent research and development have shown that it is possible to use automated species detection and identification technology to operate an autonomous gate trap (CISS, 2021). This system has the potential to be integrated into water point fence traps for unmanaged goats, minimising the trapping of other species. Further investment and commercialisation is required for this device (CISS pers. comm. November 2022), including more in field testing. There is also the potential for new and emerging control techniques being developed for deer to be modified for goats, due to their anatomical and physiological similarities, and for control methods to be developed that cover a range of ungulate species (Hunt et al. 2014, CISS pers. comm. November 2022).

Dingoes (*Canis lupus dingo*) are apex predators that will prey on goats (Allen et al. 2021), with goat commonly recorded in the diet of dingoes (Forsyth et al. 2019). There is some observational evidence suggesting dingoes may reduce unmanaged goat populations on mainland Australia (Campbell et al. 2022), but there is uncertainty about the extent. A review suggested that interactions between dingoes and unmanaged goats could depend on a range of factors, including sex–age classes vulnerable to dingo predation, dingo pack sizes, the availability of escape terrain for goats and the availability of alternative foods for dingoes (Forsyth et al. 2019). The review also noted that environmental conditions (e.g. rainfall), and how these change the goat population growth rate could also be important.

Barrier fences and baiting are commonly used to control dingoes in, and around, grazing properties (Allen and Sparkes 2001). There could be benefits to retaining dingoes to control goats in very specific situations, such as when cattle grazing dominates the region, and there are no sheep or managed goat enterprises in the landscape. A carefully managed experiment is proposed to examine dingoes preying upon unmanaged goats, in rangeland landscapes grazed by cattle. The experiment would not involve the reintroduction of dingoes. Instead, it would examine private grazing properties that are already voluntarily managing dingoes in various ways; for example, there are cattle stations that have voluntarily reduced dingo control, to see if the dingoes will control feral animals, such as goats (Campbell et al. 2022, Pollock 2021). Dingoes could pose a risk to some native fauna (Allen et al. 2021), and prior to the positive management of dingoes, the risks to all local native vertebrate fauna should be assessed (Allen and Fleming 2012). The impacts on threatened species and ecological communities would need to be stringently monitored as part of the experiment.

Table 4 Actions for Objective 4: Investigate new goat control methods and record and monitor goat control programs

Action	Priority	Timeframe	Output	Outcome	Responsibility
4.1 Collect, collate and map data on goat management activities (e.g. number of goats present, goats removed, goat density, target areas, collaboration and engagement approaches, costs, in-kind contributions, methods and impact monitoring metrics).	High priority	Short term, with updates over the life of the plan	Map and create an accessible repository of outcomes of data collected for goats removed on and off reserves and how they were removed, for public and industry use. Organisations receiving funding for goat management to provide details of their outputs.	Improved access to information about successful goat impact mitigation, allowing public and industry users to gain understanding on the number of goats removed and what method was used for use in their own practices.	TAP implementation committee, Australian Government led, in collaboration with States and Territories.
4.2 Document the cost-effectiveness of different goat control methods including transition to managed goat production systems.	Medium priority	Short term	Publicly accessible information package for landholders and industry that provides the costs of control methods and the effectiveness of control methods.	Improved public and industry understanding of control methods and their effectiveness or costs for better decision-making.	TAP implementation committee, Australian Government, researchers.
4.3 Develop online resources for stakeholders (landholders, growers, agencies and government) outlining the management actions and prioritisation for each biodiversity asset, landscape and climate where the KTP is present.	High priority	Short term, with updates over the life of the plan	Simple resources outlining which action/priority/method is most appropriate dependent on the landscape (e.g., rangeland, coastal or conservation area), which also identifies areas of high concern/management priority and appropriately suggested management methods.	Guidance for relevant actions and priorities based on biodiversity asset/landscape/climate and perception of goats in a jurisdiction to ensure appropriate practices are occurring. This will ensure the plan does not follow a 'one size fits all' approach.	TAP implementation committee, Australian Government, ongoing consultation with stakeholders.
4.4 Determine best-practice goat management for each bioregion they are established in.	High priority	Medium term	Land managers can make more informed decisions on the method of goat control to use in a specific location.	Application of more effective goat control.	TAP implementation committee.
4.5 Trial baits and feeders for goat control under permit and ethics approval. Register appropriate bait(s) with APVMA if one or more baits successful in trials.	Medium priority	Long term	Determine the value of baits in ungulate-specific feeders as a viable control method for goats.	Bait registered for use if trial successful. Feeder design ready for commercialisation.	Australian, State and Territory Governments, researchers

Draft threat abatement plan for competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
4.6 Conduct research and field trials into the use of technology for improved goat control.	Medium priority	Long term	Prototypes developed of novel control tools incorporating technology. Field trials conducted to test new equipment and/or procedures.	New equipment and methodology ready for commercialisation.	Researchers, State and Territory agencies
4.7 Investigate if integrated deer and goat management across a region is effective and feasible.	Low priority	Short term	Increased understanding of the crossover in distribution of goats and various deer species, and similarities in control methods.	If feasible, a more cost-effective landscape scale herbivore control.	Australian, State and Territory Governments, NRM groups, researchers
4.8 Conduct carefully managed research to determine the extent to which dingoes limit goat abundance	Medium priority	Medium term	Increased understanding if goat abundance and/or distribution is influenced by the presence or abundance of dingoes, and under what conditions.	The outputs of this action will inform whether action 4.9 should be undertaken and could inform other dingo management strategies.	Australian, State and Territory Governments, NRM groups, researchers.
4.9 Conduct carefully managed research to determine if naturally occurring dingoes can be used to control goats within cattle properties in the rangelands under different dingo management strategies.	Low priority	Long term	Establish whether dingo management on cattle properties affects feral goat abundance, the consequences on threatened species and ecosystem properties.	Evidence on whether or not dingoes can be used to manage goats, and what the costs, benefits and impacts are to native species and cattle grazing enterprises.	Australian, State and Territory Governments, NRM groups, researchers, cattle graziers.

Objective 5: Encourage adoption of best practice management of goats

A variety of existing goat management practices and activities are outlined in the Background Document. Many of these activities have involved cross-tenure collaborations and incentive schemes to assist private landholders to keep unmanaged goat populations down to levels where they have little or no impact on biodiversity and cultural assets. For example, in South Australia, landholders next to reserves in wildlife corridors have assisted by preventing incursions into reserves. In Victoria, where goat impacts on native ecosystems are mostly within reserves, government agencies have undertaken aerial culling and provided the infrastructure to trap goats to landholders close to parks.

Managing the impacts of pest animals and weeds is a shared responsibility. Farmers, industry, communities and governments all play a role. Stakeholder feedback indicated that under most partnerships between landholders and government agencies, there is often a need for incentives and encouragement to either control goats or transition to a managed goat system. Lack of consistent funding for actions such as fencing to manage grazing pressure on biodiversity assets, targeted goat removals or time-opportunistic removals (e.g. post-fire or drought) can inhibit action by landholders and First Nations communities. Feedback also suggested that there is a need for landholders to receive similar incentives to identify and manage biodiversity assets on private property.

The removal of unmanaged goats through climate-change mitigation programs like Australia's carbon crediting scheme and other biodiversity and stewardship schemes are possible carbon farming opportunities for landowners. The Australian Government is establishing a [nature repair market](#), which will make it easier for businesses and philanthropic organisations to invest in nature repair and create opportunities for landholders to better protect and manage their land. The Nature Repair Market Bill (the Bill) establishes a transparent framework to issue Australian landholders with tradeable biodiversity certificates for projects that protect, manage and restore nature. This could include projects that protect and restore habitat by excluding or actively managing non-native herbivores, including goats. The market is designed to operate in parallel with carbon markets, so landholders can get certificates from carbon projects that create biodiversity.

Australia's carbon crediting scheme is an incentive program for Australian businesses to reduce their greenhouse gas emissions and store carbon in vegetation and soils. The Human-Induced Regeneration carbon farming methodology provides opportunities to incentivise removal of unmanaged goats and allow native vegetation to regenerate. By changing land management practices, landholders facilitate regeneration of 'native forest', and are issued Australian Carbon Credit Units (ACCUs). This method is expiring in October 2023, but a proposed Integrated Farm and Land Management method may provide further opportunities. The proposed Integrated Farm and Land Management method will enable vegetation sequestration activities to generate Australian Carbon Credit Units through improved land management practices, which might include goat management. Further development of this method will be subject to the implementation of the recommendations from the Independent Review of ACCUs.

The government is currently developing the Carbon Farming Outreach Program to help farmers and land managers, including First Nations peoples to participate in carbon markets and integrate low emissions technologies and practices into their operations.

Goats are a threat to 7 of the priority species within the [Threatened Species Action Plan 2022-2032](#), and are present at or near several of the priority places within the plan. Target 22 of the Threatened Species Action Plan is focused on increasing the number of community groups that lead or participate in recovery activities for priority species and places, including through citizen science. One of the actions for this target is to support businesses and individuals to champion threatened species and undertake activities for local threatened plants and animals.

Cluster fencing and or TGP fencing present a further approach for transitioning from opportunistic harvesting of unmanaged goats to managed production systems. Government agencies in Qld and NSW, together with MLA and GICA, have been promoting this as a way of better managing pasture at a broad scale and bringing unmanaged goat herds under control. The desirability and feasibility of fencing for bringing rangeland goats under management is also highly dependent on landscape context and geography. For example, growers in steeper terrain south of the dog barrier fence in SA, where fencing is expensive to erect and maintain, are less inclined to move to TGP fencing as a management method and are more inclined towards mustering and taking goats to registered goat depots. A registered goat depot is a location which aggregates goats prior to commercial sale or transport to an abattoir.

Adopted or planned schemes will need to recognise the differences in areas (climatically/topographically) such as coastal environments compared to that of rock-outcrops or rangelands, and strategies should be implemented which are tailored to the affected environment. In general, this TAP encourages approaches that reduce the negative impacts of unmanaged goats while also allowing goat industries to flourish, providing the practice is consistent with any future proposed conservation strategies. This objective uses data collated in Objectives 3 and 4 to encourage best-practice goat management methods and incentives, while acknowledging their suitability and performance in different contexts.

Table 5 Actions for Objective 5, encourage adoption of best-practice goat management and on-farm management of goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
5.1 Encourage states and territories to develop incentive schemes (e.g., fencing, carbon emissions reduction schemes) that are consistent with conservation strategies, and which effectively reduce goat impacts on biodiversity, based on climatic zones and/or topography.	Low priority	Medium term	Incentive schemes available to land managers to help reduced the impact of unmanaged goats on biodiversity.	Long-term sustained goat impact management.	Australian, State and Territory Governments
5.2 Encourage land managers to improve the condition of biodiversity on their property through controlling unmanaged goats as part of a 'biodiversity certificate' scheme or other incentives program.	Low priority	Long term	Increased number of private land holders managing goats for biodiversity benefits.	Improved biodiversity condition on private land.	Australian, State and Territory Governments
5.3 Encourage programs that encourage pastoralists to have managed goat herds, control unmanaged goats and promote sustainable pasture management. Encourage the sharing of learnings from these programs between regions and agencies.	Medium priority	Medium term	More pastoralists with goats in managed systems and less opportunistic harvesting of goats. Improved management of total grazing pasture. No releasing of mustered nannies and kids to increase numbers of unmanaged goat herds for future opportunistic harvesting.	More effective goat management possible, and pastoralists less reliant on as unmanaged goats..	State and territory government agencies, producer groups, goat industry groups, NRM groups
5.4 Conduct research on the opportunity cost of not managing goats in productive landscapes (e.g. reduced carrying capacity for sheep).	Low priority	Medium term	Understand the dollar cost of unmanaged goats on primary production systems.	Pastoralists and other farmers encouraged to control goats to improve productivity. Greater landscape control of goats which prevents goats reinvading protected areas.	Researchers, State and Territory government agencies, producer groups, goat industry groups.

Draft threat abatement plan for competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
5.5 Support Indigenous ranger groups to control goats, and for Healthy Country plans to include goat control for biodiversity and cultural outcomes where applicable.	Medium priority	Medium term	Indigenous ranger groups more aware of goat impacts and best-practice goat management.	Improved biodiversity condition and/or improved preservation of cultural heritage.	Indigenous ranger groups, Traditional Owners, managers of Indigenous Protected Areas.
5.6 Conduct research and consultation to determine if there are any perverse outcomes from transitioning to managed (farmed) goats, with a focus on biodiversity conservation and ecosystem condition.	High priority	Medium term	An improved understanding if transitioning to managed goats will assist with goat control, biodiversity conservation and improving ecosystem condition, with potential issues highlighted.	Avoidance of increased unmanaged goat population as a by-product of transitioning to managed goats	Australian government, researchers, State and Territory government agencies, NRM groups

Objective 6: Continuous improvement on animal welfare code of practice and standard operating procedures for goat control.

Consistent with the Australian Animal Welfare Strategy (2010-2014) model, codes of practice (COPs) and standard operating procedures (SOPs) have been developed for managing the animal welfare aspects of pest animal control and pest animal research. PestSmart, an initiative of the Centre for Invasive Species Solutions, has developed a matrix for comparing the relative humaneness of different goat control methods, which serves as a useful guide. However, COPs and SOPs do not override legislation for each state or territory jurisdiction, and compliance with animal welfare COPs and SOPs is not mandatory (RSPCA Australia, Submission 49 to the Senate Standing Committees on Environment and Communications Inquiry into the impact of feral deer, pigs, and goats in Australia, 2018).

This plan promotes a continuous improvement model for animal welfare codes and procedures in goat control, including better alignment of practices between different states and binding agreements to ensure adherence to humane practice. SOPs for goat control programs in some states are more detailed and stringent than the PestSmart SOPs. For example, SOPs for the use of Judas animals (see Background Document) varies dramatically from state to state (Lethbridge *pers. comm.* June 2022). The *Use of Judas Goats SOP (GOA005)* (PestSmart 2020) appears to be inconsistent with some state SOPs in relation to Judas animal being exposed to the culling of other animals in its herd, how the animal is isolated from the herd, and the number of times the same Judas animal should be used to locate a herd.

The SOPs most agencies have in place are for standard control work of invasive goats, which typically reduces the goat population for a period of time. When eradication of goats is the objective, approaches often need to be more innovative and use an array of control techniques. The development of a set of national SOPs for goat eradication would assist eradication programs to achieve their goal and improve animal welfare outcomes.

Table 6 Actions for Objective 6, continuous improvement on animal welfare code of practice and standard operating procedures for goat control

Action	Priority	Timeframe	Output	Outcome	Responsibility
6.1 Update national SOPs and COPs for each management practice, including the use of Judas animals.	Medium priority	Short term	Up to date management practice guidelines for each control method available online to a standardised national level based on the most recent research.	Improved welfare of controlled goats.	Australian, State and Territory Governments, animal welfare organisations
6.2 Encourage compliance with control practices through independent animal welfare organisations.	Low priority	Long term – on going	Compliance checks on a regular basis where an independent agency attends control events.	Assurance that good management practices are occurring.	Australian, State and Territory Governments, animal welfare organisations
6.3 Encourage binding agreements for SOPs according to the national standards to ensure consistency across all states.	Medium priority	Short term – then on going through the life of the plan	State requirements published and accessible online for control methods that align with the national standards.	Consistent SOPs across all states and territories to eliminate inconsistencies in practices. Updated state legislation and binding agreements with national standards.	TAP Implementation Committee, Australian, State and Territory Governments
6.4 Develop guidelines and SOPs for the eradication of goats.	Medium priority	Short term	Clear guidelines outlining the best control techniques to use at different stages of a goat eradication program, and when different challenges are encountered.	Increased success of eradication programs	Australian, State and Territory Governments
6.5 Support education, training and collaboration between the goat industry, grazing industry, pest animal controllers, and all levels of government to encourage good management practices.	Medium priority	Long term	Training programs carried out and education material produced and disseminated, based on the most recent SOPs and COPs and best practice goat management.	Good management standardised across all industries involved with managed and unmanaged goats from ongoing training and education, ensuring operations are carried out humanely.	TAP Implementation Committee, Australian, State and Territory Governments agricultural industry, pest animal controllers.

Objective 7: Increase public understanding of goat impacts, the need for goat control and the objectives of the TAP

The impacts of goats can be less obvious than those of introduced herbivores such as rabbits and horses, and current community awareness of the threats posed by goats to native fauna and habitats is low. Goats are often viewed differently to other feral animals in Australia, with stakeholders more likely to accept lethal methods to control feral pigs, which are viewed as a 'pest,' but less likely to consider controlling unmanaged goats (Sinclair et al. 2019). Raising awareness of the biodiversity benefits for controlling goat populations using case studies and images of goat impacts will increase public understanding of the need for goat control. This should include before/after stories from successful control and eradication programs.

Farmed goats are also sometimes viewed differently to other livestock, such as being inferior to sheep. Reducing the stigma around goats and the goat industry could assist with the overall management of goats from both a conservation and primary production perspective (El Hassan 2019).

This plan aims to develop and implement an awareness program, with information tailored to different audiences with varying views on goats (e.g. conservation and agricultural). This will help to improve implementation of the TAP. As with all vertebrate control programs, acceptance and support for goat control relies upon community awareness of the negative impacts of goats on native flora, fauna, and landscapes. The success of major goat control programs is often attributed to the relationships between the different organisations involved, and good community engagement and support before and throughout the program. Any collaborative approach needs to be strongly evidence-based so there is a foundation from which to seek common values between all stakeholders.

The [FeralGoat Scan](#) website and app allow the public to record sightings of unmanaged goats, (including scats and tracks), upload images from monitoring cameras, report damage to native vegetation and infrastructure from goats and record control activities. This is potentially a great resource for documenting goat activity, planning control programs and working with neighbours to reduce impacts caused by unmanaged goats. The website and app are currently underused, with only a total of 664 records as of April 2023 since the website and app were first launched. Wider publicity of its benefits would increase use of this platform and improve knowledge of unmanaged goat distribution. Where appropriate, depersonalised information from FeralScan is fed into the Atlas of Living Australia.

The legal status of goats and level of control required, varies greatly between jurisdictions throughout Australia. This means that efforts to raise public awareness about goat control need to be locally tailored. Having unmanaged goats consistently declared as a pest in all states and territories would assist in large-scale control efforts, achieving conservation outcomes and increase community engagement and awareness. The pest status of goats in each state and territory is summarised in the Background Document. Harmonisation of relevant legislation and regulations could also assist with preventing goats from being introduced to areas where they are currently not present, but are currently not a declared pest.

Table 7 Actions for Objective 7, Increase public understanding of goat impacts, the need for goat control and the objectives of the TAP.

Action	Priority	Timeframe	Output	Outcome	Responsibility
7.1 Improve public education on the impacts of unmanaged goats on native ecosystems and species.	Medium priority	Ongoing for the life of the TAP	Online education campaign, including social media, prepared and launched. Extension material produced and distributed on unmanaged goat impacts, benefits of control for conservation and primary production.	Increased public awareness of the impact of unmanaged goats. Increased support for goat management for conservation outcomes. Increased number of land managers controlling goats for biodiversity benefits.	Australian, State and Territory Governments
7.2 Increase support to land managers controlling goats for improved biodiversity outcomes.	High priority	Ongoing for the life of the TAP	Increased awareness and accessibility of information on who/what organisation can help implement control methods. Increased landholder participation in best-practice goat management/control.	Increase in unmanaged goat control. Increased ability to implement best-practice goat control. Increased recognition of landholders participating in management/control programs and reporting on outcomes.	Australian, State and Territory Governments, NRM groups and local councils
7.3 Increase the promotion of FeralScan for the reporting of unmanaged goats and their control and impacts.	Low Priority	Ongoing for the life of the TAP	An increase in the general public, conservation and agriculture industry reporting unmanaged goat sightings. An increase in the amount of 'citizen science' data accessible to the public on goat distribution and sightings.	An increase in the use of Feral Scan goat data to inform management strategies and priorities.	Australian, State and Territory Governments for promotion. Centre for Invasive Species Solutions. General public for implementation.
7.4 Encourage harmonisation of legislation across Australia for consistency in status of goats as a declared pest which needs to be controlled.	High priority	Short term	Collaboration between states and territories to update the status of unmanaged goats across all jurisdictions.	Commonwealth, state and territory legislation consistently identifies unmanaged goats as a declared pest. Goats managed more consistently, and management improved, across the country.	Australian, State and Territory Governments

Draft threat abatement plan for competition and land degradation by unmanaged goats

Action	Priority	Timeframe	Output	Outcome	Responsibility
7.5 Improve awareness and uptake of this TAP, and its objectives, by ensuring appropriate linkages with Recovery Plans and Conservation Advices for threatened species and ecological communities at risk from unmanaged goats.	Medium priority	Short term – and then ongoing for the life of the plan	Increased awareness of goat impacts. Consistent information presented to stakeholders.	Improved recovery/management of threatened species and communities impacted by goats.	Australian Government, TAP implementation committee

Objective 8: Form a TAP implementation committee

Establishing a TAP implementation committee would drive implementation of the plan and adaptive management in response to emerging issues. Natural and commercial changes in the goat industry since 2008 have been dynamic and at times volatile. For example, since the 2008 TAP, the goat meat industry has gained unexpected traction, and there have been droughts and extensive wildfires impacting species, ecological communities and primary producers. The committee would have members from state, territory and the commonwealth governments, and conservation and agricultural sectors, and would be overseen by a coordinator. Appointing someone to oversee the committee and take lead on a range of actions could lead to improved uptake of the TAP, and increased mitigation of the impacts of unmanaged goats.

The TAP coordinator and implementation committee would help meet emerging issues, and could give effective oversight to a range of the actions. This would include:

- Oversee the prioritisation of species, ecological communities and sites for goat management (Objective 1)
- Encouraging research on goat impacts on native species, ecological communities, and managed production systems (Objective 2)
- Ensuring that data on goat distribution and abundance are maintained and collected in a coordinated manner (Objective 3)
- Ensuring that goat control programs are monitored, and lessons are learnt from outcomes (Objective 4)
- Encouraging adoption of best-practice goat management and on-farm management of goats (Objective 5)
- Supporting collaboration between the industry and all levels of government (Objective 6)
- Unifying approaches to animal welfare in goat control (Objective 6), and
- Increasing public understanding about goat impacts and the need for control (Objective 7).

A TAP implementation committee would enable adaptive management as new data and information becomes available, while keeping to the overarching objectives and priorities in the plan. The committee could play a role in facilitating data-sharing arrangements, public and landholder education/dialogue, and promoting best-practice management and monitoring methods with regional agencies and landholders as better evidence emerges. The committee could enable the TAP to have more traction with regional agencies and groups who would carry out components of the on-ground work, especially if these groups have representatives on the committee.

Table 8 Actions for Objective 8, form a TAP implementation committee

Action	Priority	Timeframe	Output	Outcome	Responsibility
8.1 Establish an unmanaged goat TAP implementation committee to coordinate actions and prioritise tasks.	High priority	Meetings as required during start up phase, and then at least one meeting per year over the life of the plan	Effective meetings and engagement involving representatives of relevant agencies, organisations and the scientific community.	Better implementation of the plan	Australian Government-led in collaboration with States and Territories and relevant sectors.
8.2 Encourage and facilitate the reporting of goat management and control actions.	High priority	Occur on a 12-monthly schedule over the life of the plan	A continuously updated list of actions managed	Better coordinated actions, advice and assistance with data and welfare standards.	TAP implementation committee, Australian Government
8.3 Encourage sharing of experiences and lessons learned between regions to improve goat control practices across jurisdictions.	Medium priority	Ongoing for the life of the plan	Forums in, and between, industries for data sharing over regions. Improved understanding of the successes, and failures of goat impact mitigation.	Increased collaboration and positive outcomes, with the use of practices best suited to a region.	TAP implementation committee, Australian, State and Territory Governments, NRM groups
8.4 Source and provide accurate and timely information on unmanaged goats to the Australian Government.	Medium priority	To occur on a need to basis, ongoing	Current, accurate advice	Better able to determine if the TAP objectives are being achieved.	TAP implementation committee, State and Territory Governments, NRM Groups, land managers

3 Investment and implementation of the plan

This plan reflects the fact that the threat abatement process will be ongoing, as there is no likelihood of eradicating unmanaged goats nationally in the foreseeable future. The actions identified in the plan may be reviewed at any time, but must be reviewed at intervals no longer than five years as specified by the EPBC Act. Any emerging issues that need to be dealt with urgently will be addressed by the TAP implementation committee.

3.1 Investment in the plan

This TAP is not directly linked to any Australian Government funding programs. However, the plan helps direct the focus of government funding programs to activities that will help to meet the identified objectives and actions. While the Australian Government is unable to provide sole funding to cover all actions in this plan, it has an obligation to implement the plan to the extent to which it applies in Commonwealth areas. There is also potential for some of the actions to be co-funded.

3.1.1 Costing

The total cost of implementing this plan cannot be fully quantified at the time of writing. The Commonwealth Procurement Rules guide the funding of Australian Government projects. A process to test the market (e.g. to obtain quotes or tenders for those projects) will determine the cost of individual projects.

Managing established pest animals like goats is a shared responsibility between landholders, community, industry and government. On-ground management is primarily the responsibility of state and territory governments and land managers. Investment in many of the TAP actions will be determined by the priority and level of resources that stakeholders commit to management of the problem. Partnerships among and between governments, non-government organisations, industry, community groups, First Nation Peoples and individuals will be key to successfully delivering significant reduction in the threats posed by goats.

The estimated costs for implementing some of the actions are outlined in Table 9. Costs of field projects and goat control are location dependent, and the cost of research projects varies with the topic, notably if the project is desktop based (less expensive), or field based (more expensive). The estimates presented can be used when considering which actions an organisation, land manager, or government may be able to implement. It is recommended that a budget is developed by any organisation looking to implement an action once specific variables are known (e.g. project type, location, desired outcome).

Control costings can be difficult to estimate and will vary greatly depending on the management objective, area targeted, goat population density, control technique, and characteristics of the location. The ongoing costs of goat control will generally be high. The time taken per kill, and therefore the cost per kill, is typically very low at high goat densities, but increases exponentially when densities approach approximately half the initial density (Maas 1998). Modelling indicates shooting becomes more difficult and expensive when goat densities are below 11 per square

kilometre. Cost to cull goats can vary between \$5 per goat at the start of the operation when goat density is high in sparse vegetation, and can increase to thousands of dollars per goat at the end of an eradication program when goat density is very low within dense vegetation.

Some of the actions in Table 9 could be carried out as part of a broader vertebrate pest management program. This means there is the potential for costs associated with some actions, such as exclusion fencing, to be shared across multiple threat abatement and action plans.

Table 9 Approximate costs for elements of actions with the plan as of November 2022

Activity	Approximate cost of components of the activity	Minimum estimated cost over 5 years
TAP implementation role (manager level)	Oversee TAP implementation, TAP Implementation Committee, communications, monitoring and reporting of control programs \$124,000 p.a. plus on costs. Travel and workshops would be additional	\$800,000
Biodiversity asset prioritisation	This will require one or more people with expertise in ecology, data collation, spatial analysis and mapping, equivalent of 1 FTE senior project officer p.a. \$112,000 plus on costs. Updates would be required every 3 years, 1 FTE over 6 months \$56,000. Additional information is required which will need to be obtained through research projects and field work.	\$300,000
Goat distribution and density data collation and mapping, mapping of control programs	Environmental data scientist/GIS officer \$90,000 p.a. plus on costs. Updates required every 2 years, 1 FTE over 6 months \$45,000 plus on costs.	\$240,000
Research project(s) into goat density impacts, grazing pressure and threatened species impacts	Senior researcher including field costs \$260,000 p.a. for a minimum of 3 years Research assistant \$79,000 p.a. for 3 years	\$1,100,000
Construction of fenced areas to exclude goats from priority biodiversity assets	Materials cost for standard goat exclusion fencing is \$3,000 to \$4,200/km dependent on landscape (Sheep Central 2022, Long and Robley 2004). Labour typically doubles these costs. Fence maintenance costs will be on going.	Fencing 100ha (1km ²) of a threatened ecological community would cost a minimum of \$12,000 to \$16,800.
Ground control - shooting	Ground shooting initial control \$70 per goat, up to \$235 per goat for the remaining goats without assistance from trained dogs (PestSmart 2013).	–
Aerial shooting of goats	Aerial culling costs from \$5 per goat in open rangelands (Eyre Peninsula Landscape Board 2022), up to \$150 per goat (Dirk Hartog Island) (Heriot et al. 2019). In rangelands over 100 km ² with 25 goats/km ² cost of removing all goats predicted at \$515,000 (Adjusted to 2021 cost). Cost of initial reduction to 5 goats/km ² predicted to be \$53,000 (Adjusted to 2021). Cost of ongoing control to maintain 5 goats/km ² at \$26,000 (adjusted to 2021) (Maas 1998). Helicopter hire \$905 to \$2,475 per hour depending on the type (Bengsen et al. 2022). Agency staff and contractors (shooters and navigators) cost \$1,100 per day for deer culling (Bengsen et al. 2022).	Cost is dependent on goat density, terrain, vegetation type and density, use of a spotter and more.

Activity	Approximate cost of components of the activity	Minimum estimated cost over 5 years
Goat trap yard	One goat trap yard \$6,000 (\$3,000 materials and \$3,000 labour)(Australian Wool Innovation Limited, 2014). Annual repair and maintenance approximately \$400. There are additional labour and transport costs for removing goats from trap yard to a depot or abattoir, which depend upon number of head, weight and distance travelled.	\$6,000 initial outlay, minimum of \$500 for each time goats are removed from one trap yard
Island eradication	Total cost of goat eradication on Kangaroo Island (4,400 km ²) \$1.3 million; Dirk Hartog Island (630 km ²) \$1,055,184. Monitoring phase of island eradication campaign can be up to \$14,400 per remaining goat (Heriot et al. 2019).	Cost varies based on number of goats, accessibility, terrain, vegetation, inhabitants, and industries present. Expect minimum of \$1 million.
Development of new goat control options	Senior project officer \$160,000 p.a. over 18 months. On-ground trial of new bait \$10,200 APVMA regulatory approval for new bait \$116,501. APVMA permit for the use of an unapproved chemical \$350.	\$1 million
Update management guides, SOPs and COPs	Senior project officer \$160 000 p.a. Once every 3 years	\$350,000
Community engagement to increase public understanding about goat impacts and control and promote best-practice management for environmental outcomes	Social Media and Communication Officer 0.5 FTE \$100,000 p.a. Printing, photo licensing and distribution costs would be additional.	\$350,000

Cost estimates in 1998 were adjusted to represent the approximate cost in 2021, based on an average annual inflation rate of 2.5 % (RBA 2021).

3.2 Implementing the plan

This TAP provides a framework for undertaking targeted priority actions. As knowledge develops, proposed actions may be modified over the life of the plan with an adaptive management approach. The Commonwealth is committed, via the EPBC Act, to implement the threat abatement plan to the extent to which it applies in Commonwealth areas. The Department of Climate Change, Energy, the Environment and Water will support the establishment of the TAP implementation committee to assist and advise on the implementation of the plan. The team will draw upon expertise in vertebrate pest management from state and territory agencies and non-government organisations. Successful implementation of this Plan will depend on a high level of cooperation between all key stakeholders, across different land tenure types in all jurisdictions, including:

- Australian Government departments and agencies
- state and territory conservation, agricultural and natural resource management agencies
- local governments
- research institutes and universities

- the goat meat industry
- First Nation groups
- threatened species recovery teams
- the general community, including non-government environmental organisations and private conservation land management bodies, private landholders, animal welfare organisations and natural resource management bodies.

Sheep and cattle graziers have an interest in controlling unmanaged goats to benefit production and land management. Projects that assist graziers to control unmanaged goats and lead to better outcomes for primary production, conservation and climate should be encouraged. Opportunities should be identified for implementing activities that build on existing and emerging collaborations and partnerships at the regional and national levels, to ensure faster implementation and increase cost-effectiveness. Opportunities exist to engage and work with First Nations' organisations and custodians of Country, including Indigenous Ranger groups, to achieve the objectives of this Plan and protect cultural values threatened by goat impacts.

Proposed developments within locations where unmanaged goats occur, or are likely to occur, that include the addition of artificial watering points (e.g. dams, artificial lake) could increase the goat populations, and therefore increase the threats from goats. In arid and semiarid areas, the range of goats is centred around water sources (Fleming 2004), and goat movement patterns relate to the availability of water (Lethbridge 2016). A new water source, or increased water availability, could lead to increases in the goat population or establishment of goats in a new location.

3.2.1 Links to legislation and to Australian Government plans and programs

This TAP sits within the context of national legislation, policy and programs directed to the long-term preservation of Australia's biodiversity. The TAP is a statutory document under the EPBC Act, Australia's central piece of environmental legislation. EPBC Act-listed threatened species that have been documented as impacted by unmanaged goats are shown in Appendix A, and the threatened ecological communities identified as impacted by unmanaged goats are shown in Appendix B.

The TAP also intersects with other high-level strategies and commitments including the Intergovernmental Agreement on Biosecurity, the Australian Pest Animal Strategy (2017–2027), the Australian Government's Threatened Species Action Plan (2022–2032) and will continue to work in line with future conservation strategies.

The Intergovernmental Agreement on Biosecurity is an agreement between all Australian Governments, designed to strengthen Australia's biosecurity system through agreed objectives, roles, and responsibilities, as well as governance arrangements. The Australian Pest Animal Strategy is a national strategy for managing vertebrate pests, and is overseen by the Environment and Invasives Committee, comprising representatives from all Australian, state and territory governments.

The Threatened Species Action Plan provides a broad framework for science, action, and partnerships to achieve Australia's long-term goal of reversing species declines and supporting species recovery. The plan identifies priority species and priority places for recovery, which will assist

with prioritising actions under the TAP. There are links and overlaps with the objectives and actions of the National Feral Deer Action Plan and this TAP.

This TAP provides guidance for abating the impacts of unmanaged goats and aims to improve public awareness, support, coordination of research and management and encourage best-practice management methods. The Environment and Invasives Committee could play a role in developing integrated pest management strategies where goats are one threatening process among multiple threats.

This plan was developed following broad consultation with relevant stakeholder groups. Local government and regional natural resource management programs are critical at a regional scale for progress towards some of the plan's outcomes. Australian Government funding for scientific research or management actions in line with the objectives and actions of this TAP may be possible.

3.3 Evaluating the plan

The TAP needs to be reviewed at intervals of no greater than five years as specified by the EPBC Act. The review will examine actions under the TAP and assess whether the TAP's objectives have been met. The review will also make a statement on the TAP's implementation success, specifically whether activity under the TAP has resulted in:

- A decline in the impact of unmanaged goats on threatened species, threatened ecological communities, ecosystems and cultural heritage.
- Increase in the abundance/cover/condition of threatened species and communities.
- A decline in the number of unmanaged goats, and a decline in their geographical distribution.

The TAP review's recommendations will form the basis of a revised plan, if required. Meetings of the newly established TAP implementation committee will help ensure implementation of the plan and monitoring of progress.

Appendix A: EPBC Act-listed species impacted by unmanaged goats

All species listed in Appendix A were determined using profiles, recovery plans and conservation advices from the Australian Government's [Species Profile and Threats Database](#) (SPRAT) as of June 2022 along with literature. The identification of these threatened species as being impacted by unmanaged goats is based on a range of evidence, both published scientific documents as well as expert opinion. This information is based on the most up-to-date information available on the database and it is important to note there are likely to be more species not represented on this list which are impacted by unmanaged goats.

Table A1 Species known or thought to be impacted by unmanaged goats based on information in the SPRAT database, conservation advices, recovery plans and scientific literature

Common name	Scientific name	EPBC Act status	Reference
Plants			
–	<i>Acacia ammophila</i>	Vulnerable	Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
Spidery wattle/ Balcanoona wattle	<i>Acacia araneosa</i>	Vulnerable	Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
Needle wattle/Dead finish/Purple-wood wattle	<i>Acacia carneorum</i>	Vulnerable	Listed as threat in Conservation Advice
Chalky wattle	<i>Acacia cretacea</i>	Endangered	Ward et al. (2021)
Curly bark wattle	<i>Acacia curranii</i>	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008
Gibson wattle	<i>Acacia imitans</i>	Endangered	Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
McNutt's wattle	<i>Acacia macnuttiana</i>	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Menzel's wattle	<i>Acacia menzeli</i>	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008 Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
Phantom wattle	<i>Acacia phasmoides</i>	Vulnerable	Listed as threat in Conservation Advice
Velvet wattle	<i>Acacia pubifolia</i>	Vulnerable	Listed as threat in Conservation Advice
Bolivia wattle	<i>Acacia pycnostachya</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Acacia unguicula</i>	Critically Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Woodman's wattle	<i>Acacia woodmaniorum</i>	Endangered	Ward et al. (2021)

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Torrington pea	<i>Almaleea cambagei</i>	Vulnerable	Listed as threat in Conservation Advice
Giant Andersonia	<i>Andersonia axilliflora</i>	Endangered	Listed as Priority Species in Threatened Action Plan Historic impact by unmanaged goats in Conservation Advice
Tall shrub (Slender)	<i>Asterolasia elegans</i>	Endangered	Listed as threat in Conservation Advice
	<i>Astrotricha roddii</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Southern shepherd's purse	<i>Ballantinia antipoda</i>	Endangered	Listed as threat in Conservation Advice Nevill and Camilleri (2010)
–	<i>Bertya ingramii</i>	Endangered	Listed as threat in Conservation Advice Department of Environment, Climate Change and Water NSW (2010).
–	<i>Bertya sp. Cobar coolabah (opponens)</i>	Vulnerable	Listed as threat in Conservation Advice
Granite boronia	<i>Boronia granitica</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Grampians pincushion-lily	<i>Borya mirabilis</i>	Endangered	Listed as threat in Conservation Advice Kohour and Coates (2010)
–	<i>Bossiaea fragrans</i>	Critically endangered	Ward et al. (2021)
Corunna daisy	<i>Brachyscome muelleri</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Budawang's cliff-heath	<i>Budawangia gnidioides</i>	Vulnerable	Listed as threat in Conservation Advice Listed in Threats on SPRAT profile
Ooline	<i>Cadellia pentastylis</i>	Vulnerable	Listed as threat in Conservation Advice
Sand-hill spider-orchid	<i>Caladenia arenaria</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Grazing by domestic stock and "feral herbivores" listed in Conservation Advice
Small dragon orchid, common dragon orchid	<i>Caladenia barbarella</i>	Endangered	Listed as threat in Conservation Advice
Northern dwarf spider-orchid	<i>Caladenia bryceana</i> subsp. <i>cracens</i> Hopper and A.P. Brown ms.	Vulnerable	Listed as threat in Conservation Advice
Hinged dragon orchid	<i>Caladenia drakeoides</i>	Endangered	Listed as threat in Conservation Advice Brown et al. (2003) TAP for competition and land degradation by unmanaged goats, 2008
French Island spider-orchid	<i>Caladenia insularis</i>	Vulnerable	Listed as threat in Recovery Plan, Duncan et al. (2009)
Kalbarri spider-orchid	<i>Caladenia wanosa</i>	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Pygmy cypress-pine/dwarf cypress-pine	<i>Callitris oblonga</i>	Vulnerable	Listed as threat in Conservation Advice
Slender bell-fruit/camel poison	<i>Codonocarpus pyramidalis</i>	Vulnerable	Listed as threat in Conservation Advice
White-flowered wax plant	<i>Cynanchum elegans</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008
Smooth Davidson's plum	<i>Davidsonia johnsonii</i>	Endangered	Listed as a Priority Species in Threatened Species Action Plan. Listed as threat in Conservation Advice
Narrow-lead bent-grass	<i>Deyeuxia pungens</i>	Vulnerable	Listed as threat in Conservation Advice. Some recorded impact by goat trampling but considered minor compared to impact of digging and grazing
Buttercup doubletail	<i>Diuris aequalis</i>	Endangered	Listed as threat in Conservation Advice
Kneeling hammer-orchid	<i>Drakaea concolor</i> Hopper and A.P.Brown ms.	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008 Listed in Threats on SPRAT profile. Listed as threat in Conservation Advice
Hinged dragon orchid	<i>Drakonorchis drakeoides</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Varnish bush	<i>Eremophila viscida</i>	Endangered	Listed in Conservation Advice and Interim Recovery Plan as threat. Evans et al. (2003)
Salt pipewort/button grass	<i>Eriocaulon carsonii</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 "Total Grazing Pressure from stock, natives and invasive animals" mentioned in recovery plan Fensham et al. (2010)
Wabbling Hill mallee/Yanchep mallee	<i>Eucalyptus argutifolia</i>	Vulnerable	Listed in Threats on SPRAT profile. Listed as threat in Conservation Advice
Beard's mallee	<i>Eucalyptus beardiana</i>	Vulnerable	Listed as threat in Conservation Advice as potential threat
Payne's find mallee	<i>Eucalyptus crucis</i> subsp. <i>praecipua</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Mount Beerwah mallee	<i>Eucalyptus kabiana</i>	Vulnerable	Listed as threat in Conservation Advice
Jingymia mallee	<i>Eucalyptus synandra</i>	Vulnerable	Listed as threat in Conservation Advice
Beadle's grevillea	<i>Grevillea beadleana</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
–	<i>Grevillea guthrieana</i>	Endangered	Ward et al. (2021)
Wee jasper grevillea	<i>Grevillea iaspicula</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Flame spider-flower	<i>Grevillea kennedyana</i>	Vulnerable	Listed as threat in Conservation Advice. NSW Parks and Wildlife (2000) Recovery Plan mentions grazing by stock
Mt Finke grevillea	<i>Grevillea treueriana</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Hakea dohertyi</i>	Endangered	Listed as threat in Conservation Advice
Gnarled corkbark/ Fraser's hakea	<i>Hakea fraseri</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Hakea maconochieana</i>	Vulnerable	Listed as threat in Conservation Advice
Ooldea guinea flower	<i>Hibbertia crispula</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Homoranthus bornhardtensis</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Homoranthus croftianus</i>	Vulnerable	Listed in Threats on SPRAT profile
Fairy bells	<i>Homoranthus darwinoides</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Homoranthus lunatus</i>	Vulnerable	Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
–	<i>Homoranthus prolixus</i>	Vulnerable	Listed in Threats on SPRAT profile. Listed as threat in Conservation Advice
Ninghan violet	<i>Hybanthus cymulosus</i>	Critically Endangered	Listed as threat in Conservation Advice Listed in Threats on SPRAT profile
Long-leaved myrtle	<i>Hypocalymma longifolium</i>	Vulnerable	Listed as threat in Conservation Advice
Illawarra Irene	<i>Ireneparsus trypherus</i>	Endangered	Listed as threat in Conservation Advice
Kalbarri Leschenaultia	<i>Lechenaultia chlorantha</i>	Vulnerable	Listed as threat in Conservation Advice
Scarlet Leschenaultia	<i>Lechenaultia laricina</i>	Endangered	Listed as threat in Conservation Advice
Ralston's Leionema	<i>Leionema ralstonii</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Leptospermum benwellii</i>	To be listed as critically endangered	Draft Conservation Advice and Listing Assessment
Torrington beard-heath	<i>Leucopogon confertus</i>	Endangered	Listed as threat in Conservation Advice
Ironstone beard-heath	<i>Leucopogon spectabilis</i>	Critically Endangered	Listed as threat in Conservation Advice as a potential threat. Listed in Threats on SPRAT profile as potential threat
Granite mudwort	<i>Limosella granitica</i>	Vulnerable	Listed as threat in Conservation Advice
Severn River health-myrtle	<i>Micromyrtus grandis</i>	Endangered	Listed as threat in Conservation Advice
Angus's onion orchid	<i>Microtis angusii</i>	Endangered	Goats no longer considered a threat – but likely to re-emerge as a threat according to Conservation Advice
Chiddarcooping myriophyllum	<i>Myriophyllum lapidicola</i>	Endangered	Listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Rusty desert phebalium	<i>Phebalium glandulosum</i> subsp. <i>eglandulosum</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Pimelea curviflora</i> var. <i>curviflora</i>	Vulnerable	Listed in Threats on SPRAT profile
George rice-flower	<i>Pimelea cremnophila</i>	Critically Endangered	Listed as a Priority Species in Threatened Species Action Plan. Listed as threat in Conservation Advice
–	<i>Pimelea venosa</i>	Endangered	Listed as Priority Species in Threatened Species Action Plan. Listed as threat in Conservation Advice
Pale pomaderris	<i>Pomaderris pallida</i>	Vulnerable	Listed in Threats on SPRAT profile. Listed as threat in Conservation Advice
Sturdy leek-orchid	<i>Prasophyllum validum</i>	Vulnerable	Listed as threat in recovery plan. Duncan (2010)
Desert greenhood	<i>Pterostylis xerophila</i>	Vulnerable	Listed as threat in recovery plan. Duncan (2010)
Genowlan point pultenaea	<i>Pultenaea</i> sp. <i>Genowlan Point</i>	Critically Endangered	Listed as threat in Conservation Advice
Waxy sarcochilus, blue knob orchid	<i>Sarcochilus hartmannii</i>	Vulnerable	TAP for competition and land degradation by unmanaged goats, 2008
Superb groundsel	<i>Senecio megaglossus</i>	Vulnerable	Listed as threat in Conservation Advice
Medindee nightshade	<i>Solanum karsense</i>	Vulnerable	Listed as threat in Conservation Advice
Grampians globe-pea	<i>Sphaerolobium acanthos</i>	Critically endangered	Ward et al. (2021)
Three-flowered stachystemon	<i>Stachystemon nematophorus</i>	Vulnerable	Listed as threat in Conservation Advice
Slender darling-pea, slender swainson, Murray swainson-pea	<i>Swainsona murrayana</i>	Vulnerable	Listed as threat in Conservation Advice
Small purple-pea, mountain swainson-pea, small purple pea	<i>Swainsona recta</i>	Endangered	Ward et al. (2021)
Jackson tetrateca	<i>Tetrateca harperi</i>	Vulnerable	Listed as threat in Conservation Advice
Mountain thryptomene	<i>Thryptomene wittweri</i>	Vulnerable	Listed as threat in Conservation Advice
Whipstick westringia	<i>Westringia crassifolia</i>	Endangered	Listed as threat in Recovery Plan Nevill and Camilleri (2010)
–	<i>Westringia davidii</i>	Vulnerable	Listed as threat in Conservation Advice
–	<i>Westringia kydrensis</i>	Endangered	Listed as threat in Conservation Advice
–	<i>Xerothamnella parvifolia</i>	Vulnerable	Listed as threat in Conservation Advice
Araluen zieria	<i>Zieria adenophora</i>	Endangered	Listed as threat in Conservation Advice and Recovery Plan NSW National Parks and Wildlife Service (2001)
Box range zieria	<i>Zieria buxijugum</i>	Critically Endangered	Ward et al. (2021)
–	<i>Zieria floydii</i>	Endangered	Listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Parris's zieria	<i>Zieria parrisiae</i>	Critically Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice
Birds			
Slender-billed thornbill (western)	<i>Acanthiza iredalei iredalei</i>	Vulnerable (South Australia – no EPBC listing)	Listed as threat in Conservation Advice
Short-tailed grasswren	<i>Amytornis merrotsyi merrotsyi</i>	Vulnerable	Listed as threat in Conservation Advice
Grey grasswren	<i>Amytornis barbatus barbatus</i>	Endangered	Listed as threat in Conservation Advice
Thick-billed grasswren (eastern)	<i>Amytornis textilis modestus</i>	Vulnerable	Listed as threat in Conservation Advice
Thick-billed grasswren (Gawler ranges)	<i>Amytornis textilis myall</i>	Vulnerable	Listed as threat in Conservation Advice
Spotted quail-thrush	<i>Cinlosoma punctatum anachoreta</i>	Critically Endangered	Listed as threat in Conservation Advice and Recovery Plan Wilson and Bignall (2009)
Malleefowl	<i>Leipoa ocellata</i>	Vulnerable	Listed as threat in Recovery Plan. Benshemesh (2007) Listed as a priority species in Threatened Species Action Plan
White-winged fairy-wren (Dirk Hartog Island)	<i>Malurus leucopterus leucopterus</i>	Vulnerable	Listed as threat in Conservation Advice. Goats now eradicated from Dirk Hartog Island
Black-eared miner	<i>Manorina melanotis</i>	Endangered	Ward et al. (2021)
Red-lored whistler	<i>Pachycephala rufogularis</i>	Vulnerable	Ward et al. (2021)
Eastern regent parrot	<i>Polytelis anthopeplus monarchoides</i>	Vulnerable	Ward et al. (2021)
Round Island Petrel, Trinidad Petrel	<i>Pterodroma arminjoniana</i>	Critically Endangered	Ward et al. (2021)
Fish			
Flinders Ranges purple-spotted gudgeon	<i>Mogurnda clivicola</i>	Vulnerable	Goat threat via habitat degradation in translocation plan
Mammals			
Large-eared pied bat	<i>Chalinolobus dwyeri</i>	Vulnerable	Ward et al. (2021)
Kowari	<i>Dasyercus byrnei</i>	Vulnerable	Listed in Threats on SPRAT profile Listed as threat in Conservation Advice
Banded Hare-wallaby	<i>Lagostrophus fasciatus fasciatus</i>	Vulnerable	Ward et al. (2021)
Black-flanked rock-wallaby	<i>Petrogale lateralis lateralis</i>	Endangered	TAP for competition and land degradation by unmanaged goats, 2008 Listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Common name	Scientific name	EPBC Act status	Reference
Brush-tailed rock-wallaby	<i>Petrogale penicillata</i>	Vulnerable	Listed as a Priority Species in Threatened Species Action Plan Listed as threat in Conservation Advice
Yellow-tailed rock-wallaby	<i>Petrogale xanthopus xanthopus</i> / <i>Petrogale xanthopus celeris</i>	Vulnerable	Listed as threat in Conservation Advice
Invertebrates			
Cave-dwelling crustacean, Cape range remipedede	<i>Kumonga exleyi</i>	Vulnerable	Listed as threat in Conservation Advice. Listed as Threats on SPRAT profile via nutrients in sinkholes
Gray's helicarionid land snail	<i>Mathewsoconcha grayi ms</i>	Critically Endangered	Goats listed as a previous threat – now eradicated from the island but listed as a lasting effect via soil erosion
Purple copper butterfly/Bathurst copper butterfly	<i>Paralucia spinifera</i>	Vulnerable	Listed as threat in Conservation Advice
Mount Lidgbird charapid land snail	<i>Pseudocharopa ledgbirdi</i>	Critically Endangered	Listed as a Priority Species in Threatened Species Action Plan Historical impact from goats on Lord Howe Island.
Stoddart's helicarionid land snail	<i>Quintalia stoddartii</i>	Critically Endangered	Historical impact with ongoing effect
Reptiles			
Lord Howe Island southern gecko	<i>Christinus guentheri</i>	Vulnerable	Historic habitat destruction with ongoing effect
Yinnietharra rock dragon	<i>Ctenophorus yinnietharra</i>	Vulnerable	Ward et al. (2021)
Broad-headed snake	<i>Hoplocephalus bungaroides</i>	Vulnerable	Listed as threat in Conservation Advice
Border thick-tailed gecko, granite belt thick-tailed gecko	<i>Uvidicolus sphyrurus</i>	Vulnerable	Listed as threat in Conservation Advice Listed in Threats on SPRAT profile

Appendix B: EPBC Act-listed threatened ecological communities impacted by unmanaged goats

The threatened ecological communities listed in Table B1 were determined using the profiles, Recovery Plans and Conservation Advices from the Australian Government’s Species Profile and Threats Database (SPRAT). The identification of these communities as being threatened by unmanaged goats is based on a range of evidence, both published scientific documents as well as expert opinion. Table B1 only includes threatened ecological communities whose EPBC Act listing refers to ‘unmanaged/feral goats’, or the previous TAP “Threat Abatement Plan for competition and land degradation by unmanaged goats 2008”.

Table B1 EPBC Act-listed threatened communities impacted by unmanaged goats according to the Species Profile and Threats Database as of June 2022.

Community name	EPBC Act status	Reference
Araluen scarp grassy forest	Endangered	Goats listed as threat in Conservation Advice
Brigalow (<i>Acacia harpophylla</i>) dominant and co-dominant	Endangered	Goats listed as threat on Conservation Advice
Brogo vine forest of the south east corner Bioregion	Endangered	Goats listed as threat in Conservation Advice
Buloke woodlands of the Riverina and Murray-Darling depression bioregions	Endangered	Goats mentioned as widespread threat in Recovery Plan
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Goats listed as a threat in Appendix E of Conservation Advice
Coastal swamp oak (<i>Casuarina glauca</i>) forest of New South Wales and Southeast Queensland ecological community	Endangered	Goats listed as a threat in Appendix D of Conservation Advice
Coastal swamp sclerophyll forest of New South Wales and South East Queensland	Endangered	Goats listed as a key threat via degradation and overgrazing in Conservation Advice
Drooping sheoak grassy woodland on calcrete of the Eyre Yorke block bioregion	Critically Endangered	Goats listed as a threat in Conservation Advice
Eyre Peninsula blue gum (<i>Eucalyptus petiolaris</i>) woodland	Endangered	Goats listed as a threat in Conservation Advice
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Goats listed as a potential threat in Conservation Advice
Illawarra-shoalhaven subtropical rainforest of the Sydney basin bioregion	Critically Endangered	Goats listed as a threat in Conservation Advice
Karst springs and associated alkaline fens of the Naracoorte coastal plain bioregion	Endangered	Goats listed as threat in Conservation Advice
Lowland grassy woodland in the southeast corner bioregion	Critically Endangered	Goats listed as threat via erosion and shrub damage in state level management plan
Mallee bird community of the Murray Darling depression bioregion	Endangered	Goats listed as threat in Conservation Advice

Draft threat abatement plan for competition and land degradation by unmanaged goats

Community name	EPBC Act status	Reference
New England peppermint (<i>Eucalyptus nova-anglica</i>) grassy woodlands	Critically Endangered	Goats listed as threat in Conservation Advice
Plains mallee box woodlands of the Murray Darling depression, Riverina and Naracoorte coastal plain bioregions	Critically Endangered	Goats listed as a threat in Conservation Advice
Poplar box grassy woodland on Alluvial plains	Endangered	Goats listed as a threat in Conservation Advice
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Goats listed as a threat in Conservation Advice
Robertson rainforest in the Sydney basin bioregion	Critically Endangered	Goats listed as a threat in Conservation Advice
Shale sandstone transition forest of the Sydney basin bioregion	Critically Endangered	Goats listed as a potential threat in Conservation Advice
Swamps of the Fleurieu Peninsula	Critically Endangered	Goats are listed as a potential threat via grazing, trampling and browsing
Tasmanian forests and woodlands dominated by black gum or brookers gum (<i>Eucalyptus ovata</i> / <i>E. brookeriana</i>)	Critically Endangered	Goats are listed as a potential threat in Conservation Advice especially in rugged forested terrain
Upland basalt Eucalypt forests of the Sydney basin bioregion	Endangered	Goats are listed as a threat in Conservation Advice
White box-yellow box-blakely's red gum grassy woodland and derived native grassland	Critically Endangered	Goats considered a threat NSW Department of Environment, Climate change and Water (2010).

Appendix C: Heritage listed and Ramsar sites impacted by unmanaged goats

Table C1 Nationally listed Heritage places known to be impacted by unmanaged goats as of 2018

Heritage listed place	State/Territory
Willandra Lakes Region	NSW
Warrumbungle National Park	NSW
Australian Alps National Parks and Reserves	NSW, ACT, Vic
The Greater Blue Mountains Area	NSW
Ediacara Fossil Site	SA
Budj Bim National Heritage Landscape – Mt Eccles Lake Condah Area	Vic
Budj Bim National Heritage Landscape – Tyrendarra Area	Vic
Grampians National Park (Gariwerd)	Vic
Lesueur National Park	WA
Shark Bay	WA
The Ningaloo Coast	WA
Great Artesian Basin Springs - Elizabeth	Qld

Table C2 Ramsar wetlands known to be impacted by unmanaged goats as of 2018

Wetland	State/Territory
Currawinya Lakes	Qld
Hattah-Kulkyne Lakes	Vic
Lake Pinaroo	NSW
The Coorong and Lakes Alexandra and Albert Wetland	SA
Paroo River Wetlands	NSW
Shoalwater and Corio Bays Area	Qld

Table C3 Islands within the Great Barrier Reef World Heritage area with known established goat populations

Island	Reference
Brampton Island	Baxter et al. 2021
Curacoa (Noogoo) Island	Baxter et al. 2021
Curtis Island	DES 2013
Digby Island	Baxter et al. 2021
East Repulse Island	DES 2013
Fantome (Eumilli) Island	Baxter et al. 2021

Draft threat abatement plan for competition and land degradation by unmanaged goats

Island	Reference
Grassy Island	Baxter et al. 2021
Great Palm Island	DES 2013
Great Keppel (Wop-pa) Island	Baxter et al. 2021
Havannah Island	Baxter et al. 2021
Hamilton Island	Baxter et al. 2021
Hook Island	DES 2013
High Peak Island	DNPSR 2013a
Henning Island	Baxter et al. 2021
Hotspur Island (Islet)	Baxter et al. 2021
Knight Island	Baxter et al. 2021
Long Island	DNPSR 2013: Baxter et al. 2021
Magnetic Island	Baxter et al. 2021
Mackenzie Island	DES 2013
Middle Island	Baxter et al. 2021
Orpheus (Goolboddi) Island	DES 2013
Prince of Wales (Muralug) Island	Baxter et al. 2021
Saddleback Island	Baxter et al. 2021
St Bees Island	DNPSR 2013b
Walter Island	Baxter et al. 2021

There could be additional islands within the GBR World Heritage area with goats present, as there are over 900 islands within the GBR World Heritage area, which are managed by local government, private landowners, The Queensland Government or the Commonwealth Great Barrier Reef Marine Park Authority. Goat control programs have taken place on some of these islands. Goats have been successfully eradicated from some islands within the GBR World Heritage area.

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