

# A framework for the management of feral goats in semi-arid South Australia

Agnew, D.C.<sup>1</sup>, Patrick, G.P.J.<sup>1</sup> and Arnold, B.K.<sup>2</sup>

<sup>1</sup>South Australian Arid Lands Natural Resources Management Board, PO Box 2227 Port Augusta, SA 5700

<sup>2</sup>PO Box 1828, Port Augusta, SA 5700

**Keywords:** unmanaged goats; collaboration; integrated management

## Abstract

An environment modified for rangelands sheep farming has created conditions where feral goat (*Capra hircus*) populations can escalate if unchecked. The impacts of feral goats on native vegetation, fauna and land condition result from their unmanaged contribution to total grazing pressure. In South Australia there is a legislative requirement for control of feral goats, however this is contradicted by significant motivators to retain feral goat herds as an optional resource.

The SA Arid Lands Natural Resources Management Board sought to address the complex problem by developing a framework for management. To support the framework, funding for feral goat removal assistance was obtained. The removal program successfully reduced the feral goat population in the South Australian rangelands, however at only half the predicted natural annual rate of increase. Importantly, the project demonstrated that integrated control, using a combination of methods, could be cost neutral to a landholder.

To implement the framework completely, high priority removal areas will need to be defined where intensive feral goat removal activity can occur. To support the project and provide information, monitoring of feral goat populations and vegetation condition in these areas should be commenced. To ensure actions are cross-regional in scale a taskforce is proposed.

The involvement of community in developing district scale population reduction targets for removal will be critical. There will also need to be an extensive education and awareness program in place to convey the common vision of more resilient landscapes.

## **Introduction**

Feral goats (*Capra hircus*) are widespread in semi-arid areas of South Australia where they are unmanageable, as existing fencing infrastructure is not designed to restrict goats. Under legislation, there is a principle established that landowners are required to control feral goats in South Australia (DWLBC 1998). This provision provides a mechanism to address the significant impacts of feral goats on pastoral land and vegetation condition. However the situation is complicated by returns obtained from muster and sale of feral goats for meat that encourage retention of populations for future harvest.

A single year funded feral goat removal program, implemented across three South Australian natural resource management regions, has demonstrated successful integrated control. A total of approximately 18,000 feral goats were removed and an example of the immediate cost effectiveness of removal at a property level is provided. The SA Arid Lands Natural Resources Management Board (SAAL NRM Board) is seeking to develop strong collaboration with like-minded authorities and promote community input in order to reduce long-standing barriers and overcome feral goat contribution to total grazing pressure, and hence vegetation and land condition decline.

### *Background*

Control of predators, notably dingoes, and supplying water for sheep farming in the semi-arid zone of South Australia below the dingo fence has modified the natural habitat favourably for feral goats. Feral goats are found throughout the sheep pastoral zone (Fig. 1). Their relative distribution within that area is closely associated with ranges country including the Flinders Ranges, Gawler Ranges and the Olary Upland, and with heavily timbered areas further south towards the mallee country (Pople et al. 1996).

The impacts of feral goats are described in a range of references (Parkes et al 1996; DEH 2004; DWLBC 1998; DEWHA 2008; Norris and Low 2005). They compete with sheep for pasture and contribute to total grazing pressure in an unmanageable way. Fisher et al. (2004) describe total grazing pressure, including the particular implications of unmanaged

feral animal grazing in exacerbating loss of soil cover which in turn results in increased risk to land degradation through wind erosion. Overgrazing of preferred plant species can alter the composition of vegetation such that less palatable woody shrubs become more dominant over time. Feral goats also compete with native animals for food and habitat, for example; the dietary overlap of yellow-footed rock wallabies (*Petrogale zanthopus*) with feral goats is significant and competition during periods of drought can be particularly severe (Sharman et al. 1995).

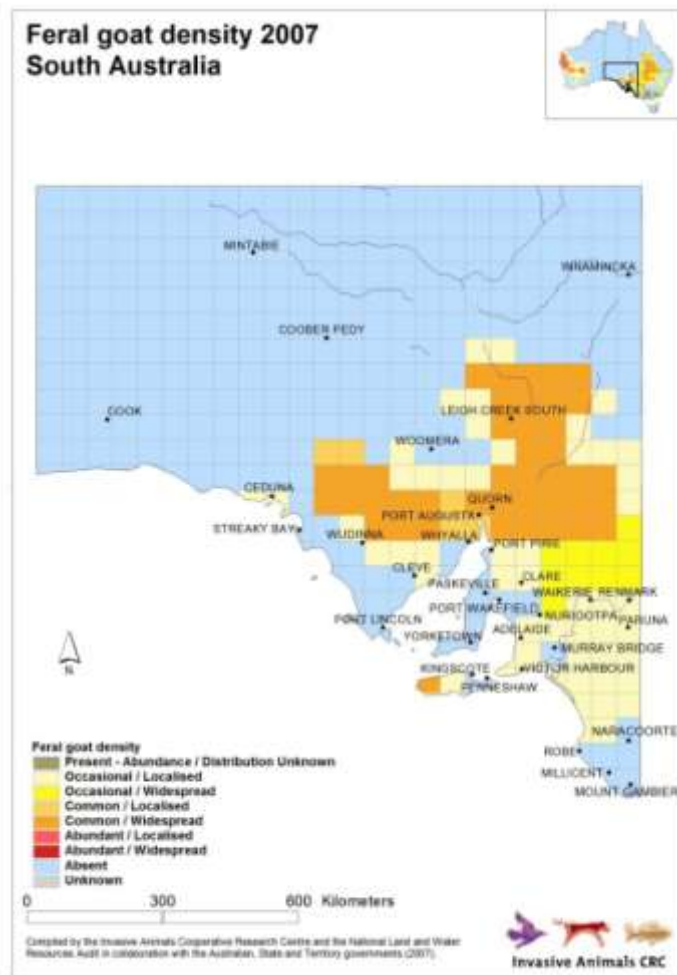


Figure 1: Distribution of feral goats in South Australia (Invasive Animals CRC, 2007)

At the same time, feral goats are harvested for meat and are valued by sections of the community as a source of income (Norris and Low 2005). Sources of property income in the sheep pastoral zone are confined to relatively few options and declining prices received for produce relative to costs places greater reliance on alternatives. There is some reluctance to control feral goats to low densities as they can be retained in a sense, despite being

unmanaged, for muster when sale prices are sufficiently high to make the undertaking financially worthwhile.

In South Australia feral goats are classed as pest animals under the Natural Resources Management Act, 2004, which specifies landowners as responsible for the control feral goats (s.182(3)). Also the Pastoral Board policy (DWLBC 2004) states that 'total eradication of feral goats on pastoral land will be pursued'. In practice these provisions provide statements of intent only, as they are rarely enforced.

### *A Framework for Management*

The SAAL NRM Board led the development of a framework to assist the regional community work towards achieving more effective feral goat management. A visionary goal was formed of 'significant and sustained reduction in feral goat numbers to ensure damage caused to economic, environmental and social values does not exceed an acceptable level' (Agnew 2008). The framework outlined principles by which this goal would be achieved. These include collaborating with partners, involving community, combined incentives and regulation and support for strategic, integrated control. These principles demonstrate recognition that mitigating the impact of feral goats is a complex, large-scale, long-standing issue that would involve significant effort to address social and economic factors, in addition to provision of technical solutions.

Implementation of the framework was to be through a series of activities in distinct phases of pre-planning, planning, control and monitoring (Table 1). Increasing feral goat numbers reported in four successive years since 2004 (Smyth and Rioux 2009), created a sense of urgency and funding was successfully obtained with support of State agency partners and neighboring South Australian natural resources management regions, through the Australian Government 'Caring for Our Country' program. The funded project; 'Improving NRM Outcomes in the Rangelands by Strategically Removing Feral Goats' (2008-09), proposed to deliver feral goat removal across three natural resources management regions within a single year timeframe using successful integrated control methods as had been established through feral goat control as a part of the Bounceback program on conservation reserves. However, in order to manage the ambitious scale of the proposed cross-regional removal program, it was necessary to compromise the logical progression of the framework and fast-track to the control phase.

**Table 1:** Objectives of the SA Arid Lands Natural Resources Management Board Feral Goat Management Framework (Agnew 2008).

Phase	Objective
PRE PLANNING	Initiate a review of State policy for feral goats
	Define the regional aim by identifying parameters for reduced economic, environmental and social impact caused by feral goats and set district control targets to achieve these outcomes.
	Develop an operative system of criteria for incentives and processes for compliance.
	Establish underpinning processes to ensure the arid lands community is genuinely involved in the processes of this feral goat framework.
PLANNING	Develop comprehensive recommendations for integrated methods of feral goat control and promote these to landholders.
	Define and rank areas within landscape according to priority for goat control.
	Establish: <ul style="list-style-type: none"> <li>- cooperative mechanisms with the Pastoral Board for administering management of feral goats on pastoral properties</li> <li>- communication with adjoining jurisdictions with an aim towards complimentary control programs.</li> </ul>
CONTROL	Promote Board expectations; assist landholders to coordinate goat control.
	Facilitate integration of goat control on properties that are assisted by Bounceback program
MONITOR	Evaluate progress towards the aim relative to management actions carried out and establish a method for long term monitoring of impact reduction

## Results

Landowners were encouraged to apply for (1) short term hire of feral goat yards to assist harvesting, (2) participation in a large scale aerial muster to move goats out of inaccessible country into yards for subsequent marketing followed by aerial culling to remove any remaining goats, and (3) fencing materials to set up semi-permanent trap yards that would facilitate ongoing follow-up of goats reinvading the control area. Criteria for allocation of funding included demonstration of:

- Preparedness to participate in a large scale coordinated area program, and
- Commitment to strategic control (use of a combination of control methods that would significantly reduce goat numbers).

The control program included 41 properties using a combination of integrated control methods that varied with situation, such that aerial shooting was carried out on 25 properties, aerial mustering on seven properties, 11 properties made use of portable yards and trap yard materials were supplied to 14 properties (O'Leary 2009). Of the expressions of interest received 15 applicants were seeking trap yard materials only and declined to participate when the condition of preparedness to participate in a strategic program involving aerial shooting to reduce feral goat numbers to very low levels, was made clear. The funded assistance resulted in a total of 18,083 feral goats removed from participating properties, of which 56% were aerially culled, 15% were aerially mustered and 29% were ground mustered into portable yards (O'Leary 2009). In addition, a number of feral goats will be subsequently removed using water-point trap materials as follow-up and as portable yards purchased for this project continue to be available for short-term hire.

The funded project enabled an effective large scale removal program, however this equates to only 4.8% of the feral goat population in the South Australian rangelands estimated to be 380,000 in 2008 (Henzell 2008). The rate of increase if no control was applied was predicted to be around 10% (Henzell 2008). Nevertheless, the project has provided useful case study examples of successful application of integrated control methods at a property scale that has nil total removal costs (refer below).

Mustering: aerial and ground mustering in combination (depending on terrain)

- aerial mustering of \$500 per hour
- ground mustering of \$200 per day/man

Average cost of \$2,500 (range of \$1,000 - \$4,000 per day)

Culling: cost of helicopter and marksmen to cull goats remaining after muster

- \$1,100 per hour, estimated 2 – 4 hours

Average cost of \$3,300

Transport: costs vary with distance travelled and efficiencies gained through load size

- \$5 - \$10 per animal

Average cost of \$7.50 per animal

Returns: it is reasonable to expect a mob size of 600 – 1200 goats removed, of which 60 per cent (average for this example of 540 goats ) are marketable at prices of \$30 - \$40 each, 30 per cent (270 goats) are marketable at around \$10 each, and 10 percent require destruction as they are non-saleable.

On this basis;

1. The total cost is: \$11,875 (mustering: \$2,500; culling: \$3,300; transport: \$6,075)
2. The total returns are: \$21,600 (540 goats at \$35each, 270 at \$10 each)

Trapping Investment: water-point trapping materials to establish ongoing capacity to maintain low numbers.

- cost of mesh water-point trap yards including gates is \$1,500- \$2,000 per set.

The returns allow for four - five sets of trap yards to be purchased.

As additional components of the large scale removal project, a cross-regional management plan was developed for the three participating natural resource management regions (O'Leary 2009), and an evaluation was undertaken of indicator plant species and techniques to inform monitoring of the environmental impact of feral goats (Brandle and McDonald

2009). These reports provide a foundation for planning ongoing action to address the persistent problem.

## **Future Recommendations**

To build on the project success, collaboration between the SAAL NRM Board and the Pastoral Board SA is committed to activities to implement the regional framework in its entirety. These authorities realise that to address the scale of the problem it will be necessary to conduct consistent removal programs in targeted high density areas of preferred goat habitat over a minimum five year program that includes robust monitoring of population reduction and of vegetation impact amelioration. Processes are in place to establish a cross-regional taskforce that will provide a mechanism to leverage funding and for complementary actions to be developed across jurisdictions.

Since the issues are complex, it will be critical that community have opportunity to participate in validating the targeted areas that are determined from available data, and in setting district scale population reduction targets, five-year action plans and methods to achieve local reduction targets. Additionally, community input is critical in assessing progress based on monitoring information obtained from target area population and vegetation condition surveys.

Finally, the importance of an intensive communication and awareness program to increase broad community understanding and support must be addressed. Success and achievement will depend on distribution of significant education and extension materials and a range of repeated key messages related to the common vision of improved landscape resilience.

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