

# Developing a target selective bait delivery technique for control of feral goats.



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# Why control?

## Goats

- **Competition and habitat degradation – Key Threatening Process**
- **NSW Threatened Species Conservation Act**
- **Commonwealth Environment Protection & Biodiversity Conservation Act**

## Biggest threat

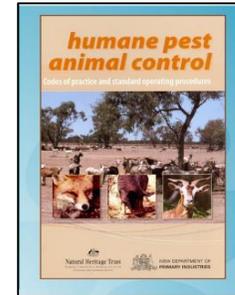
- **reliance on single method (aerial control/steep terrain)**
- **fluctuating levels of resource commitment**
- **reduction in frequency and duration of aerial control programs**
- **how do we maintain the benefit of aerial shooting between aerial programs?**



# Model code of practice for the humane control of pest animals

Trudy Sharp and Glen Saunders (Revised 2012)

Pest Animal	Sodium fluoroacetate (1080)
Fox	Conditionally acceptable
Wild dogs	Conditionally acceptable
Feral Pigs	Conditionally acceptable
Rabbits	Conditionally acceptable
Feral goats	<b>Not assessed as no target specific baiting technique available</b>



Target Species	Weight range of target species	LD50 1080	1080 mg required LD50	1080 ml's required LD50	1080 bait in grams required for LD50
Feral Goat	28-60kg	<sup>A</sup> 0.5mg/kg <sup>B</sup> 0.6mg/kg	30mg 36mg	0.9ml 1.1ml	60gms 74gms

(0.03ml 1080 solution = 1mg 1080 - NSW Vertebrate Pest Control Manual)  
Bait rate 15ml 1080 per kg bait

<sup>A</sup> Forsyth and Parkes 1995; <sup>B</sup> Eason et al 2011

## Previous research:

- 1956 – 1986 New Zealand Forest Service (goats/deer 1080 gel)
- 1995 – 1997 Animal Health Board (goats/deer 1080 gel)
- Parkes (1991) 1080 foliage paste – goats (NZ)
- Agricultural Board (1993) 1080 water troughs goats (WA)
- Forsyth & Parkes (1995) aerial baits for poisoning goats (NZ)
- Veltman & Parkes (2002) 1080 gel goats/deer islands (NZ)

## Limitations:

- potential non-target impact
- differing feral goat classifications
  - pest? - resource? - game animal?
- no registered toxicant (goats)
- bait/lure type (palatability/longevity)



# Attractant - lure



AUSTRALIAN OWNED & MANUFACTURED

# CALCIUM MOLASSES

**A HIGH CALCIUM NON UREA SUPPLEMENT  
DESIGNED TO AID DIGESTION AND OPTIMISE MILK  
& MEAT PRODUCTION OF GRAINFED LIVESTOCK**

**FOR ANIMAL TREATMENT ONLY**  
THIS PRODUCT DOES NOT CONTAIN RESTRICTED ANIMAL MATERIAL.

<b>GUARANTEED ANALYSIS</b>		<b>DIRECTIONS FOR USE</b>	
Bypass Protein Meal	3.5%	<b>FEEDING INSTRUCTIONS:</b>	
Total Protein Equivalents	1.0%	<b>SHEEP / GOATS:</b> 1 block per 50 head.	
Molasses	6.0%	<b>CATTLE / DEER:</b> 1 block per 15 head.	
Salt (NaCl)	Max. 54.4%	Replace immediately when consumed.	
<b>MACRO INGREDIENTS</b>		Place away from water to maximize pasture utilization.	
Calcium (Ca)	13.7%	<b>SAFETY DIRECTIONS</b>	
Phosphorus (P)	0.6%	Avoid contact with skin and eyes.	
Sulphur (S)	0.025%	Store below 30°C (Room Temperature).	
<b>MICRO INGREDIENTS</b>		Recommended two person lift.	
Magnesium (Mg)	200mg/Kg	<b>NET WEIGHT 20KG</b>	
Iron (Fe+++)	975mg/Kg		
Ferrous Iron (Fe+++)	1350mg/Kg		
Fluorine (Fl)	Max. 2000mg/Kg		
Selenium (Se)	26mg/Kg		

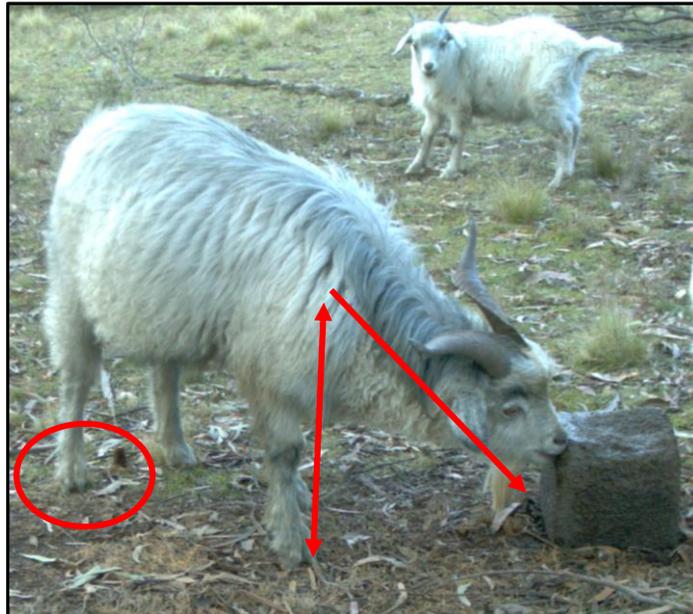




## Delivery method

### Differences in morphology:

- Foot size, length, stance & gait



Hunt et al (2014) Use of an ungulate-specific feed structure as a potential tool for controlling feral goats in Australian forest ecosystems. *Ecological Management and Restoration*.

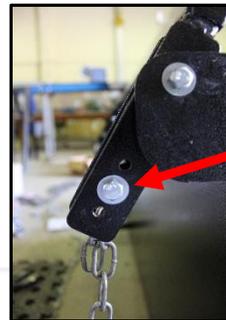
# Set-up

- Breaks down to 3 sections
  - box / treadle / mesh platform / salt block
- Approx. 20kg each section – vehicle access in close proximity to site for set up and service



## Weight Settings

- Light (7kg front / 5kg side)
- Medium (13kg front / 9kg side)
- Heavy (23kg front / 17kg side)



# Monitoring

- 3 m x 1m protocol Reconyx HC600 (Rapidfire - 10 pics per trigger - no delay - 16g cards - lithium batts.)
- 1 image captured every second (presence/absence vs behaviour)
- 30 minutes between visits or new species = new event
- Resulting in one or two images to be processed
- Identify dependant young – feral goats weaned approx. 3 months
- Ethics approval - Stage 1 (non-lethal) 4 weeks monitoring prior to Stage 2 (lethal)
- Any breach by non-target during Stage 1 requires additional 4 weeks monitoring



## Free feeding period



- 5 sites approx. 3km apart (Jan 2016 – Oct 2016)
- 20kg salt blocks free feed - raised presentation
- salt blocks on upturned mop buckets
  - lid open / partial closure / lid closed
- reverse blocks & buckets
- free feed oats & 2kg salt blocks (molasses powder)
- feed is contained 5 litre mop buckets
  - (approx. 4kg/bucket)
- safe handling & containment of poison baits
- 2kg salt blocks “reward for attendance & behaviour”
- Baiting when target species is ready takes time!



## Box feeder presentation

5 sites x 807 monitoring days captured = 4035 presentation nights = capturing 4,954,196 images across 21 species

Common name	Visits	Lick	Licks as % of visits
Eastern grey kangaroo	7690	1	0.01
Wombat	1548	0	0
Swamp wallaby	1081	0	0
Fallow Deer	489	0	0
<b>Feral goat</b>	<b>405</b>	<b>350</b>	<b>86%</b>
Brush-tail possum	1225	0	0
Fox	277	0	0
Feral pig	129	0	0
Red-necked wallaby	538	0	0
Rabbit	603	0	0
Magpie	160	0	0
Wonga pigeon	160	0	0
White winged chough	170	0	0
Black rat	11	0	0
Willie wagtail	10	0	0
Cat	26	0	0
Crow	83	0	0
Currawong	103	0	0
Bowerbird	5	0	0
Quail thrush	13	0	0
Echidna	3	0	0
<b>Total</b>	<b>14729</b>	<b>351</b>	

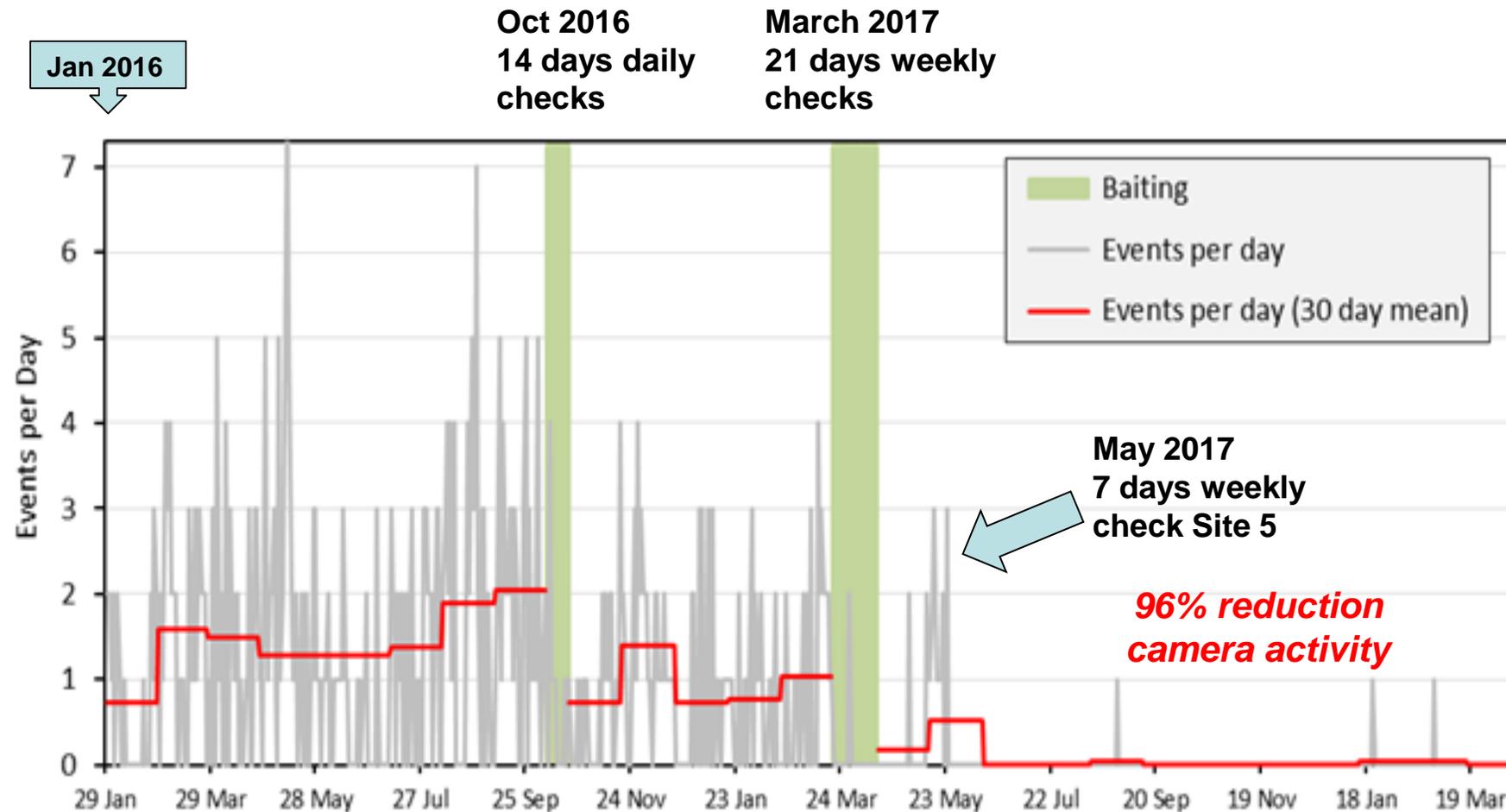


Kangaroo breach 27<sup>th</sup> August 2016



Feeder set at "light setting  
5kg from the side of feeder

# Lethal Trials - Central Site (1080)



Jan 2016

Oct 2016  
14 days daily  
checks

March 2017  
21 days weekly  
checks

Baiting  
Events per day  
Events per day (30 day mean)

May 2017  
7 days weekly  
check Site 5

96% reduction  
camera activity

10 months free feeding to  
identify target selectivity

5 months negotiation with  
Ethics daily to weekly checks

# Lethal Trials - Central Site (1080)

Month	Days	Checks	No. male carcasses found	No. female carcasses found	Ave weight	Ave distance
Oct 2016	14	daily	16	2	45kg	65m
March 2017	21	weekly	7	13	?	51m
May 2017	7	weekly	3	0	60kg	72m
Totals			26	15		

Total of 41 carcasses found



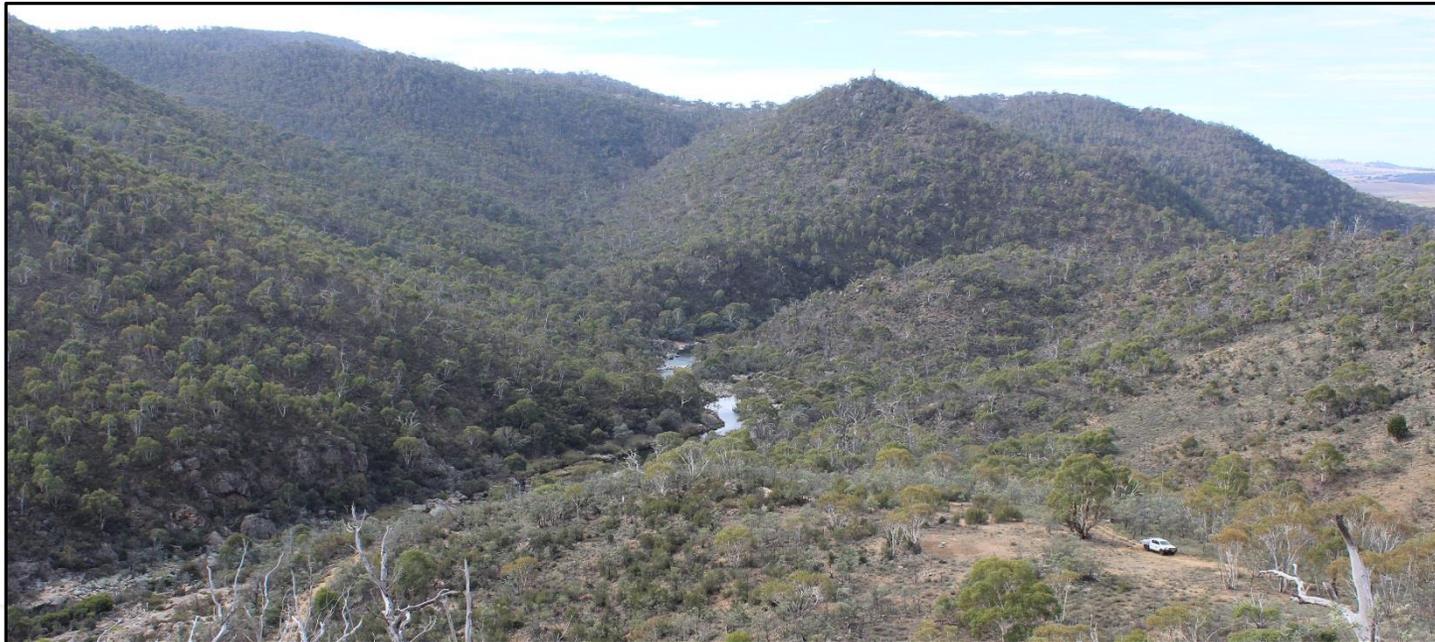
## Lethal Trial (1080) Results - Central Site

- Billies dominate feed structures (billies 3/4 - 4+ years age class 55-65kg)
- Carcass distance from feeders (average 60m) of those found!
- 8 occasions where goats were disturbed during daily checks
  - goats had consumed bait but ran away (12 – 15 individuals??)
  - only 3 carcasses recovered 221m, 270m & 453m from feeders
- No non-target impact (no carcasses/images)
- 96% reduction in goat activity on cameras
- Apart from transient billy (3 passes in 11 months) no goats detected 18 months post baiting (time to re-invasion?)



## Future use of the technique

- Sites approx. 5km apart depending on topography (goat home range?)
- Set up salt blocks in suitable sites where goats are suspected to be present
- Monitor sites to determine need for feeders
- Integrate feeders with aerial control and ground shooting (timings)
- Control separation time/space (don't ground shoot at feeders)
- Remote salt block locations suitable for aerial/ground shooting (go to sites)
- What management methods are being used more broadly – next door
  - fencing - mustering - trapping



# To sum up....

- **Developed a target selective bait delivery device for feral goat control**
  - use of technique relevant to land manager classification of goats
  - technique relies on an extended free feed period
  - salt blocks – open feeders – closed feeders – lethal baiting
  - positive reinforcement allows for extended use of the technique over time
  - goats become habituated to sites and structures allowing flexibility of control timings (fires / floods / availability of staff)
- **Further lethal feral goat trials required (NPWS Estate only)**
  - NSW 1080 Ungulate Feeder PCO approved (NPWS Estate)
  - Ethics approval extended
  - APVMA research permit extended
  - commercial manufacturer of feeders in SA (flat-packed)
- **Investigate next step in approvals process**
  - APVMA minor use permit / registration
  - Develop SOP/COP 1080 feral goat baiting
  - Publish results

