Rabbit biology/ecology
The impacts on effective management &
long term control

The 1st step is admit there is a problem

Urban Rabbit Control & Management

Two options

A) Eradicate B) Control numbers & damage

A). Eradicate 1. Fence in &/or 2. Fence Out
Assess own & neighbours for rabbit harbour
Remove rabbit harbour:- above ground
bait
fumigate
Secure property :- stop invading rabbits
maintenance

B). Control damage Assess own & neighbours for rabbit harbour
Remove rabbit harbour:- above ground
bait
fumigate

Live with damage / RPF what you want to protect

Work together

Quick facts;

Litter size Average 4 - 6 per litter (up to 10). ~28 kittens per year

Breeding season	**Seasonally when green feed is available.**
Kittens independent	**Can be continuously pregnant 6-8 months.**
Time from giving birth to re-mating	**21 days**
	½ - 2 hours

Can range from 1.5 - 20 km

Victorian Rabbit Action Network

Supporting community leadership for cooperative action

Reproduction & Survival

The fecundity of rabbits is high. They can quickly recover to maximum carrying capacity in 12-15 mths following drought or baiting programs e.g.

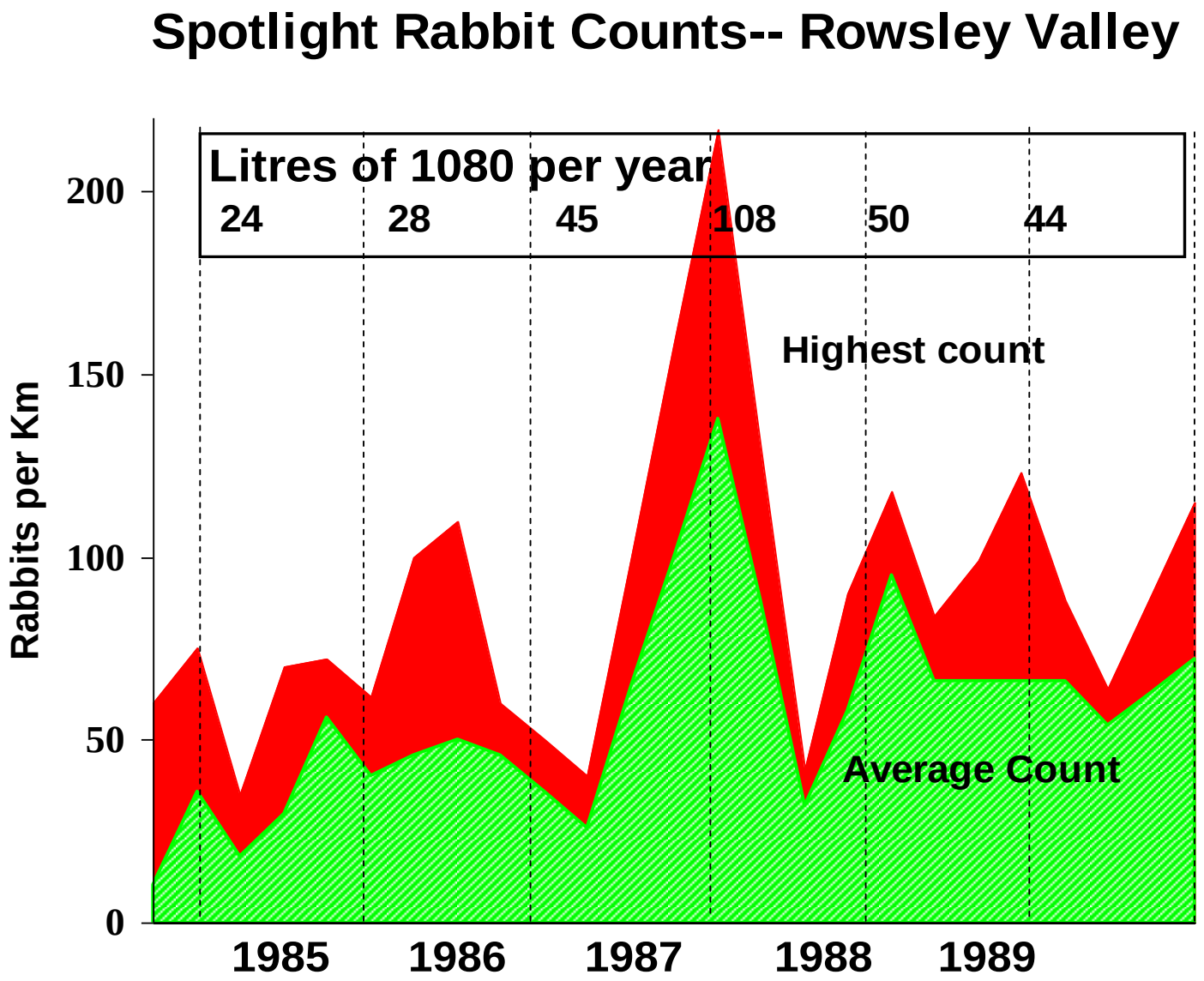
Rabbits within an enclosure, open to predators, were exposed to a myxomatosis outbreak and only one male and one female survived 18 months later the population peaked at 184

Management implications

Rabbit populations need to be reduced by 85-95% ; to be below the threshold level that allows them to recover

Victorian Rabbit Action Network

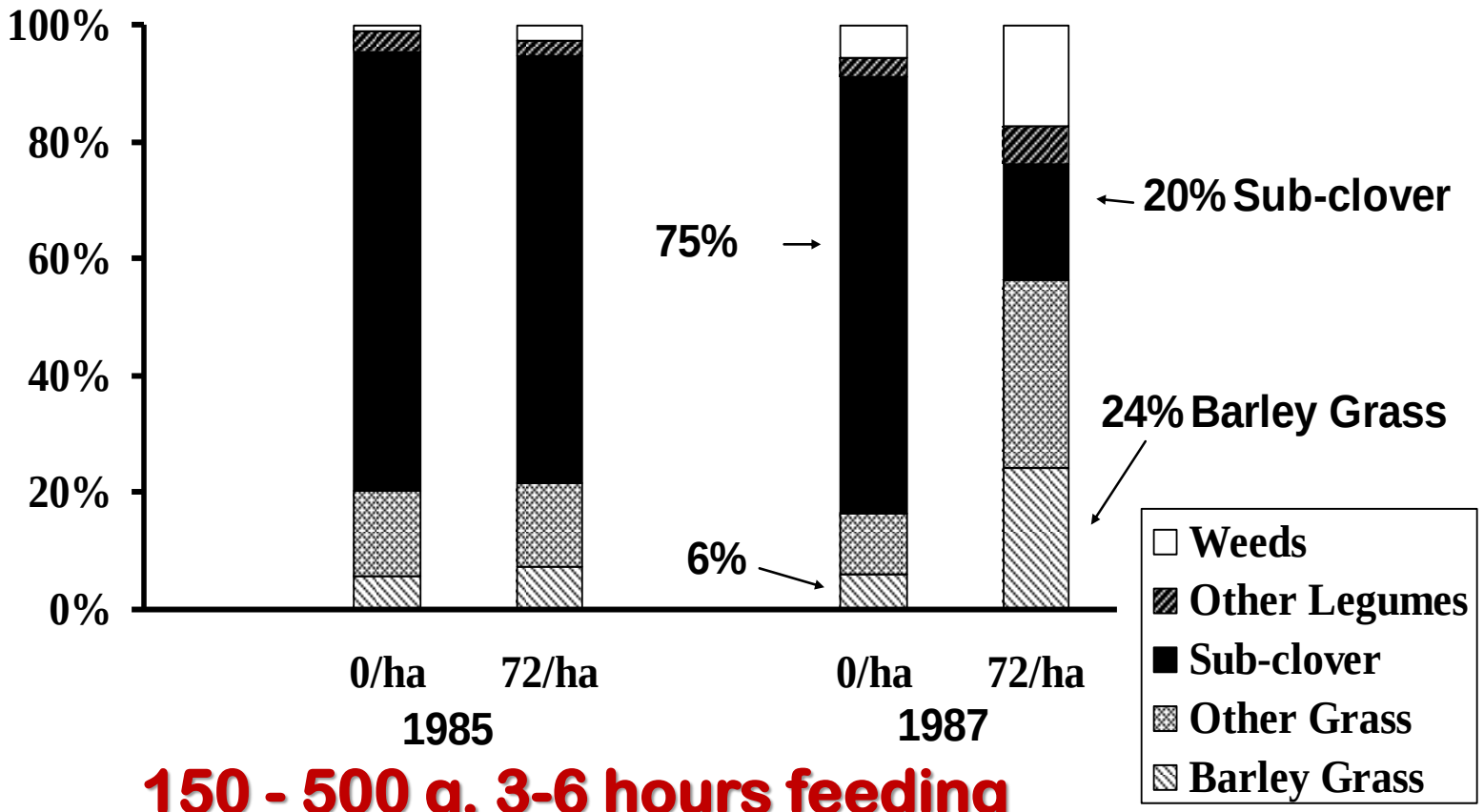
Supporting community leadership for cooperative action


Spotlight Rabbit Counts-- Rowsley Valley
Litres of 1080 per year
24
28
45
108
50
44
Highest count
Average Count
Rabbits per Km
200
150
100
50
0
1985
1986
1987
1988
1989

‘Rabbits are the filter through which all plants must pass’*

Rabbits at low densities (0.5-3 per ha) can stop the regeneration of many native seedlings

Impact of Rabbits on Pasture Composition



150 - 500 g. 3-6 hours feeding

(Croft.et al

Rabbit damage on seedlings is immediate

(a)

(b)

Figure 6. Typical damage to seedlings by rabbits recorded eight days after planting. Manna gum (a) pruned and not eaten (typical clean oblique cut) and Drooping Sheoak dug out and partially consumed.

Feral Goat
Feral goat
Feral Goat
Rabbit graze line
Rabbit graze line

Daily movements

The length of time spent above ground can vary from 6.5 to 13.8 hours

A substantial proportion of a local population will never be on the surface at the same time.

Dusk counts recorded that only 42-66% of a known population were seen above ground

Management implications

Rabbit population estimates based on night or day time observations are highly variable with a propensity to markedly underestimate rabbit densities.

The efficacy of shooting is compromised when around half the population is not targeted ***(i.e. only for fun, not useful!)***

Victorian Rabbit Action Network

Supporting community leadership for cooperative action

Home Range

The centre of rabbit activity is the warren system

When feed is not limited most rabbits graze within 300 metres of warrens.

Dry pastures = home ranges increase.

Rabbits known to feed 300 m to 1500m from warrens

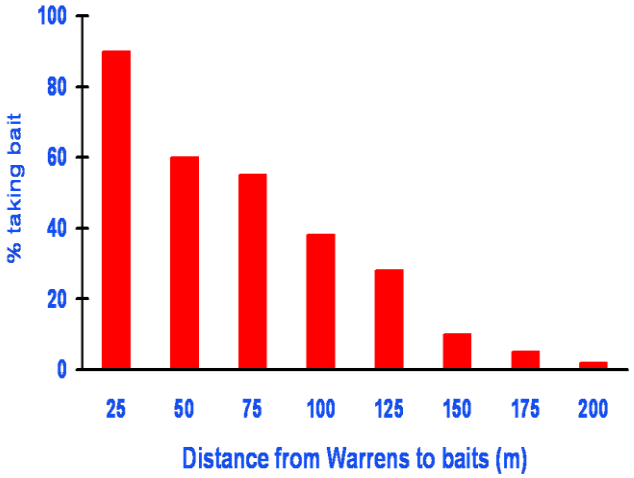
Studies showed the proportion of rabbits consuming bait decreased as the placement of bait increased to 200 meters from the warren

Management implications

Baiting best carried in summer when green feed limited

Summer months:- feeding ranges extended. You need to look for and find feeding areas prior to baiting.

Always lay bait close to active warren systems in rabbit feeding areas



The majority of rabbits must be able to find then consume the free feeds or poison bait take will be low
Ensure rabbits are feeding on free feeds then post baiting there can be +90% reduction in rabbits seen

Dispersal

Rabbits have high rates of dispersal: 36%- 72% of bucks & 8%-32% of does breed away from natal warrens

1 to 2 month old rabbits disperse during the current breeding season

Recolonisation untreated warrens +/- One K

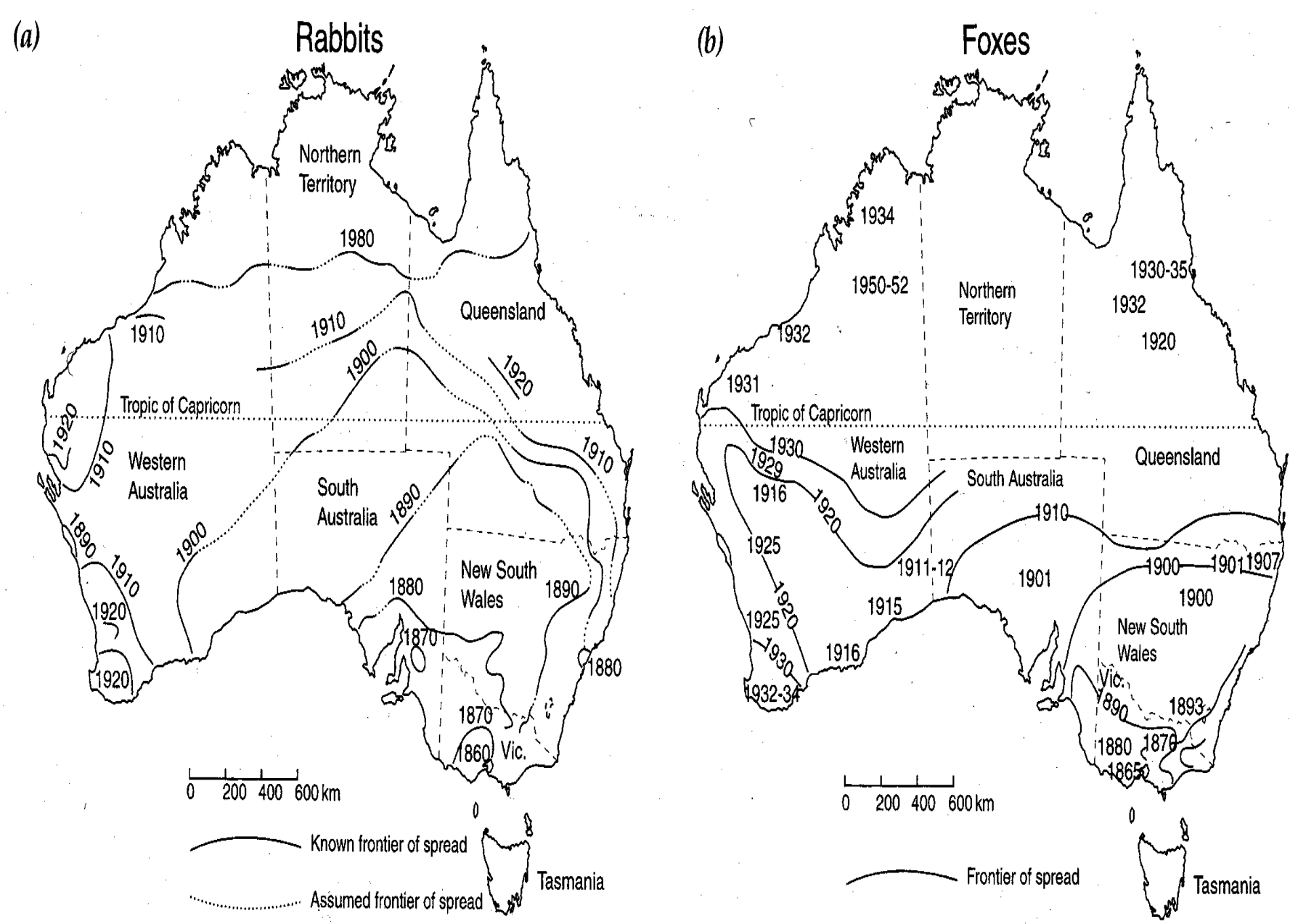
? What's your neighbour doing ?

Management implications

It is essential to destroy all warrens within the project area . YOUR rabbit management works must be coordinated with your neighbours.

Victorian Rabbit Action Network

Supporting community leadership for cooperative action



Can range from 1.5 - 20 km

Rabbits can shape the landscape…
Are the rabbits running the place?

CONTROL OPTIONS

- Warren / Burrow Destruction
- Harbour Removal
- Warren / Burrow Fumigation
- Poisoning
- Myxomatosis
- Rabbit Calicivirus Disease
- Shooting, trapping and ferreting

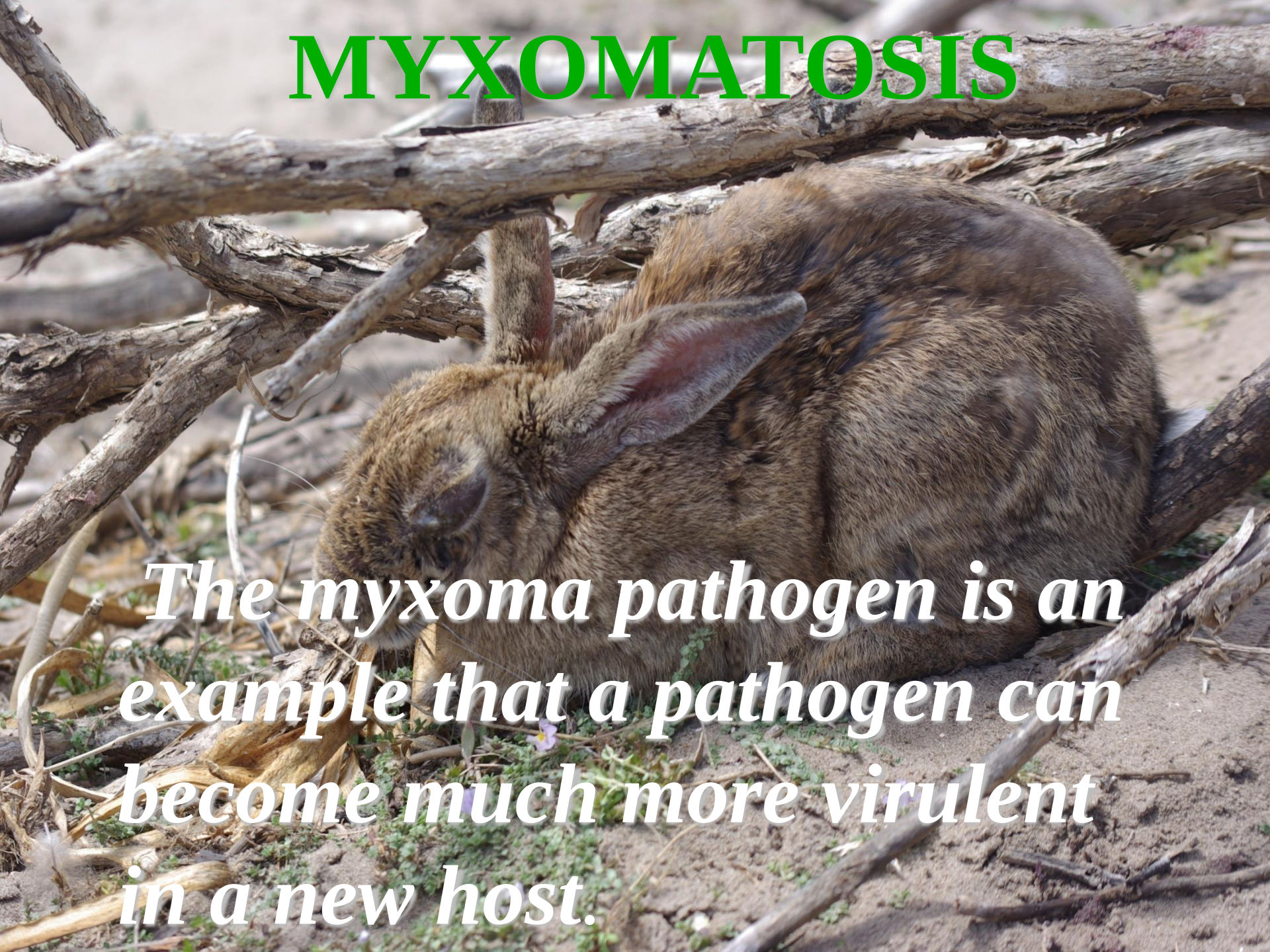
Shoot, spotlight & monitor

The length of time spent above ground can vary from 6.5 to 13.8 hours

Dusk counts recorded that only 42-66% of a known population were seen above ground

- Shooting must sustain 87% decline
- Maryborough site:- monitoring spotlight (rabbits per klm)
  - Burrow activity.(Active & Non-active entrances)
- Spotlight decline popn 95% decline
- Site heavily targeted shooters & change in rabbit presence under spotlights
- Burrow/Warren activity +5% increase

MYXOMATOSIS



The myxoma pathogen is an example that a pathogen can become much more virulent in a new host.

Current (endemic)
bio-control active in environment
Myxomatosis
Rabbit Calicivirus Disease/RHDV
RHDV1ARHDVK5/RHDV2

Impacts of disease: Combined prevalence of antibodies to RHD, RCV-A1 and Myxo

RHD, RCV-A1 and Myxo were investigated, in a six-year, study in Bacchus Marsh area.

RHD and RCV-A1 were endemic, persisting in the population, and continually exposing rabbits to infection.

Overt myxomatosis occurred mostly in spring and summer leaving most adult rabbits immune.

A high combined prevalence of antibodies to RHD. RCV-A1 and Myxo left very few breeding rabbits susceptible to disease.

Adequate numbers of immune rabbits were recruited into the breeding population to sustain it at the current high level of 5-25 rabbits/hectare

Victorian Rabbit Action Network

Supporting community leadership for cooperative action

There is a well-defined recipe proven by research (+1960-70s) for the management of rabbits, which includes;

Baiting prior to ripping to reduce rabbit numbers to lessen the potential of rabbits re-opening warrens

Followed by the removal of rabbit harbour, destruction of warrens and removal of surface harbour

Followed by maintenance of ripped warrens through fumigation or re-ripping re-opened entrances.

Research has shown that to deviate* from this basic recipe reduces the efficacy of the rabbit management program. *(*means:- u will fail)*

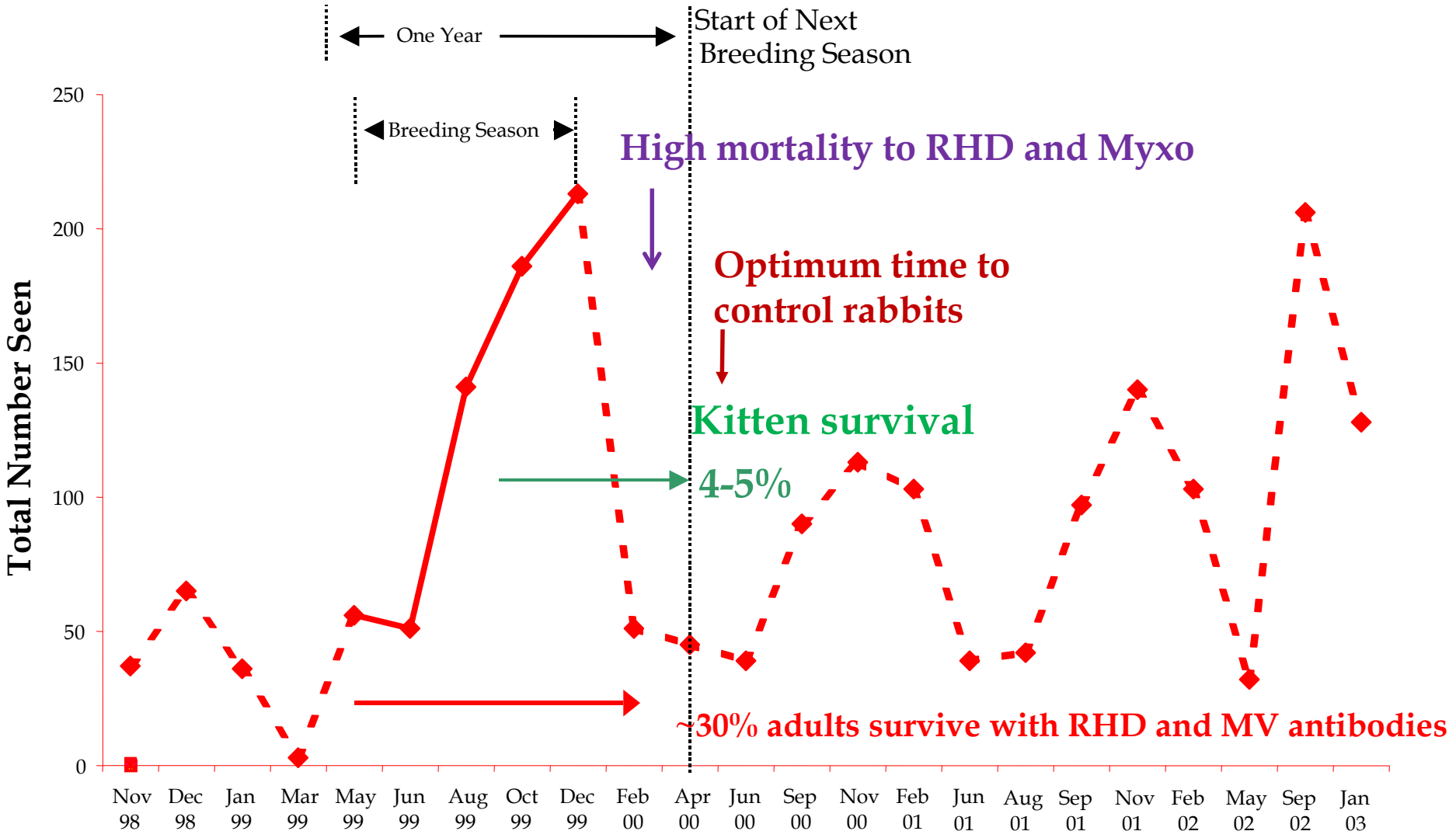
Population dynamics: Timing control operations

Results from early research carried out before the 1970's have been very clear in recommending that the non-breeding season is the optimal time to control rabbit populations.

Furthermore, recent research monitoring the behaviour of RHD and myxomatosis concur with early research, recommending control operations should be delayed until late summer early autumn after disease inflicts maximum impact on the population.

Victorian Rabbit Action Network

Supporting community leadership for cooperative action


One Year
Start of Next Breeding Season
Breeding Season
High mortality to RHD and Myxo
Optimum time to control rabbits
Kitten survival
4-5%
~30% adults survive with RHD and MV antibodies
Total Number Seen
250
200
150
100
50
0
Nov 98
Dec 98
Jan 99
Mar 99
May 99
Jun 99
Aug 99
Oct 99
Dec 99
Feb 00
Apr 00
Jun 00
Sep 00
Nov 00
Feb 01
Jun 01
Aug 01
Sep 01
Nov 01
Feb 02
May 02
Sep 02
Jan 03

the landscape is defined by the decisions of land managers to treat or not to treat rabbit infestations effectively

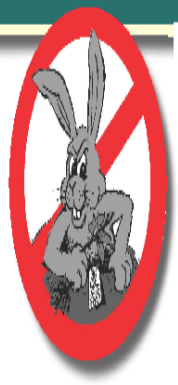
Baiting component of the Integrated Rabbit Management

1. Map warrens
2. Spotlight counts (no rbts /per klm)
3. Find major feeding areas near warrens
4. Choose bait & ensure quality bait
5. Choose the bait laying equipment
6. Decide quantity of bait to be laid
7. Calibrate bait layers
8. Place bait trails where rabbits are feeding

POISON

KEEP OUT OF REACH OF CHILDREN

READ SAFETY DIRECTIONS BEFORE OPENING OR USING



RABBAIT®

Pindone Oat Bait

ACTIVE CONSTITUENT: 0.5g/kg PINDONE, SODIUM SALT

For the control of rabbits in accordance with the directions of the appropriate State or Territory government department.

NET CONTENTS: 2.5kg

Animal Control Technologies (Australia) Pty Ltd
46-60 Freight Drive Somerton Victoria 3062 Australia
Emergency Contact Telephone 03 9308 9688

APVMA Approval No. 50951

RABBAIT PINDONE
2.5kg Oat Bait

9 931951 004319

DIRECTIONS FOR USE:

DIRECTIONS FOR USE:
Restrictions:
DO NOT lay bait baits in the vicinity of kangaroo, bandicoot and native rodent refuge areas.
DO NOT lay bait if heavy rain is expected in the next 24 hours.
DO NOT heap baits.

DO NOT use in urban areas on residential blocks less than 1000 square metres in size.

Situation	Pest	Rate	Critical Comments
Farms & farm buildings, urban and closely settled areas.	Rabbits	5kg bait per 100 rabbits per feed.	For more detailed information on use of Pindone see General Instructions. De-stock all paddocks or isolate the bait stations before baiting. Baits must be laid in the evening through rabbit feeding areas at a low enough rate to ensure overnight consumption of most bait by rabbits. Free feeding prior to the application of poison baits to encourage rabbits onto bait trail is optional, but may assist in determining the amount of bait required. Apply un-poisoned baits to the area where rabbits are feeding and adjust quantities so that no more than 20% of the bait remains on the following morning. 1. First Poison Feed: 3-5 days after the last free feed (if used). 2. Second Poison Feed: 3-5 days after first poison feed. 3. Monitor uptake after 1st and 2nd poison feeds and adjust the quantity laid to account for take. 4. Third Poison Feed: 3-5 days after second poison feed. 5. Collect all uneaten bait/cover trail within a period of 4 days after the last baits are laid. 6. Collect all carcasses for up to 12 days after the last poison feed.

WHERE THERE IS A SIGNIFICANT RISK OF EXPOSURE TO NON-TARGET ANIMALS MEASURES MUST BE TAKEN TO REDUCE THE RISK, OR BAIT SHOULD NOT BE LAID. If uncertain, users should seek advice regarding risk reduction measures from the Department of Agriculture/Primary Industries, Parks and Wildlife Service, Rural Protection Board or similar authority in their respective State/Territory.
NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION.

GENERAL INSTRUCTIONS
The most cost efficient method to control rabbits and prevent reinfestation is to work cooperatively with neighbours. The use of Pindone baits is only the first step in control of rabbits. Follow-up action consisting of harborage destructions, both above ground surface harbour and warren destruction are required if control is to be achieved. Consult your local authority for more information on how to complete a full control program.
Rabbits poisoned with Pindone usually die after a delay while body stores of clotting factors and vitamin K are exhausted. Overall rabbit numbers are expected to progressively decline, commencing about 10 days after the first application.
Although rabbit poisoning programs can be carried out year-round, baiting is most effective when alternative food for rabbits is scarce (eg. end of summer or early autumn). Baiting may be less effective during the breeding season. Check rabbit prone areas at least 4 times a year. Spotlight counts are the most common method used.

POISONING PROGRAM

1. Monitor Site and Assess Infestation

Before starting a poisoning program, locate warrens, rabbit harbour and feeding areas. Identify rabbit grazing and scratching areas. The placement of bait is critical. Consult your local authority if more information is required on how to implement any of the following:

- Map your paddocks and land areas identifying rabbit feeding areas, rabbit prone soils, areas of wildlife congregation, rocky areas, warrens/burrows (size and number), "impossible" warrens, steep areas unsuited to ripping with machinery, rives, streams, above ground surface harbour, and show any rabbit free areas, boundary fences (rabbit proof or not), spotlight transect routes.
- Spotlight counts should be undertaken 8 consecutive nights commencing 1 hour after it is dark identifying areas of high, medium or low rabbit infestation.

Other methods of assessing infestation can be used in conjunction with the spotlight counts:

- Warren monitoring counts to identify how many burrows are active or non-active over the monitoring period.
- Warren/rabbit counts - Involve counting of rabbits that have emerged from warrens. This method gives better appreciation of the age of rabbits on each warren.
- The Gibb, McLean and other modified Scales - these scales may be used as indicators of relative rabbit abundance.

2. Notify Neighbours

Landholders (in NSW) must ensure that at least three days notice is given to and received by all adjoining neighbours before laying Pindone baits. Notification can be given by telephone or personal contact or where this is not possible, by mail.
The landholder must put up notices specifying the target animal and date of poison application immediately before Pindone poisoning operations start on his/her property. These notices must remain up for at least four weeks and are placed at:

- All entrances to the property
- All entrances to the actual poisoning site, and
- At the extremities of property boundaries fronting a public thoroughfare.

Notices are available from APB (WA), Rural Lands Protection Boards (NSW), your local authority and chemical retailers.

3. Laying Bait

Shallow furrows and swathes of mown grass are commonly referred to as trails. Whatever the method of laying trails, they must be laid through feeding areas in the area of most rabbit activity as identified during monitoring of rabbit populations. Two locations are recommended for bait trails, one reasonably close (but not closer than 50m) to where rabbits are living and one a further 40m out. If rabbit populations are high, there may be a need for trailing a further 40m out. These trail positions are only a guide and depending on experience, they can be altered. The aim is to maximise the chance that all rabbits in the local area will encounter the bait trail.

- Furrow baiting

Lay the bait in trails made by cutting continuous furrow 10cm wide and 2cm deep (to a maximum depth of 10cm) between rabbit feeding areas and harbour then around and through feeding areas. For large scale programs use 18km of trail per 100ha with baits 40m apart.
In areas of loose sand it is best to replace the cutting disc of the ballayer with car wheel and tyre so that the oats are laid on a compacted, flat surface. This technique is only necessary if the area to be baited consists largely or entirely of loose sandy soils with little or no vegetation. It is not recommended to scatter or aerial bait using RABBAIT® Pindone Oat Bait.
As a general guide, the amount of bait required is outlined in the following table.

Density of Rabbits Estimated by Spotlight Transect	LOW	MEDIUM	HIGH
	< 20 rabbits/km	21-50 rabbits/km	> 50 rabbits/km
Kg bait per km trail*	3	6	9

*Sufficient bait is required to enable all rabbits in an area to consume approximately 15-30g of bait/km each application.

4. Collect uneaten bait/Cover trail

All baits that are not eaten within a period of 4 days after bait consumption ceases are to be collected and destroyed by incineration (where permitted), or buried at a depth of 500mm, or covered with sufficient soil to prevent domestic animals or livestock from gaining access to the poison bait.

5. Collect Rabbit Carcasses

Collect unused bait and carcasses and dispose of unused baits and carcasses safely by burning (where permitted) or burying below 500mm in a disposal pit.

PRECAUTION STATEMENTS

DO NOT place baits in locations that are accessible to children.

DO NOT allow bait to contaminate foodstuffs or feed intended for human or animal consumption.

PROTECTION OF LIVESTOCK

DO NOT allow stock to graze in any treated areas.

DO NOT place baits in locations that are accessible to domestic animals or livestock.

PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT

DO NOT feed bait to birds or native wildlife.

DO NOT contaminate streams, rivers or waterways with the chemical or used containers.

STORAGE AND DISPOSAL INSTRUCTIONS

Store in the closed, original container at or below 35°C.
Triple or preferably pressure rinse containers before disposal. Dispose of rinsings in a disposal pit marked and set up for this purpose, clear of waterways, destitute vegetation and tree roots.
Break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury the containers below 500mm in a disposal pit. Empty containers and product should not be burnt.

SAFETY DIRECTIONS

Poisonous if swallowed. Do not touch the bait. DO NOT inhale dust. When preparing and distributing the bait wear above length PVC gloves. If product on skin, and after baiting wash thoroughly with soap and water. Wash hands and gloves after use.

FIRST AID

If poisoning occurs get to a doctor or hospital quickly. Vitamin K1 (phytomenadione) is antidotal.

MATERIAL SAFETY DATA SHEET:

Additional information is listed in the material safety data sheet which can be obtained from the supplier.

CONDITIONS OF SALE

Animal Control Technologies (Australia) Pty Ltd (ACTA) will not accept responsibility for losses or damage arising from the supply or use of these goods other than the responsibility for the merchantable quality of the goods. To the extent allowed by the relevant laws in each area, the liability of ACTA is limited to the replacement of goods in the event that a valid claim of deficiencies in merchantable quality is proven.

acla

DOM:

BATCH:

EXP:

Choose bait type (Carrot or Oats)

ensure you've got quality bait

CALIBRATE EQUIPMENT

Bait trails need to cover all major feeding areas

Harbour - Warrens

The warren is the key to the success of rabbits in Australia

Ideal location for warrens elevated, well drained, deep sandy or granitic soils under building, woody weeds, situated adjacent floodplains, drainage lines or watercourses, mowed lawns where green forage persist for longer periods or responds quickly to rain or irrigated

A warren 3 to <200 entrances; typically 3 to 15 entrances and up to 2 metres in depth

New warrens are not readily constructed.

Rabbits expand existing warren systems.

Locations of rabbit warrens (past or present) indicate the most preferred harbouring areas for rabbits.

Warren systems can take decades to build

Situated where most beneficial for long-term survival and productivity

Victorian Rabbit Action Network

Supporting community leadership for cooperative action

Warrens: *Although the rabbit makes the warren, it is the warren that makes the rabbit.*
(Andrewartha & Birch 1984)

Harbour - Warrens (cont)

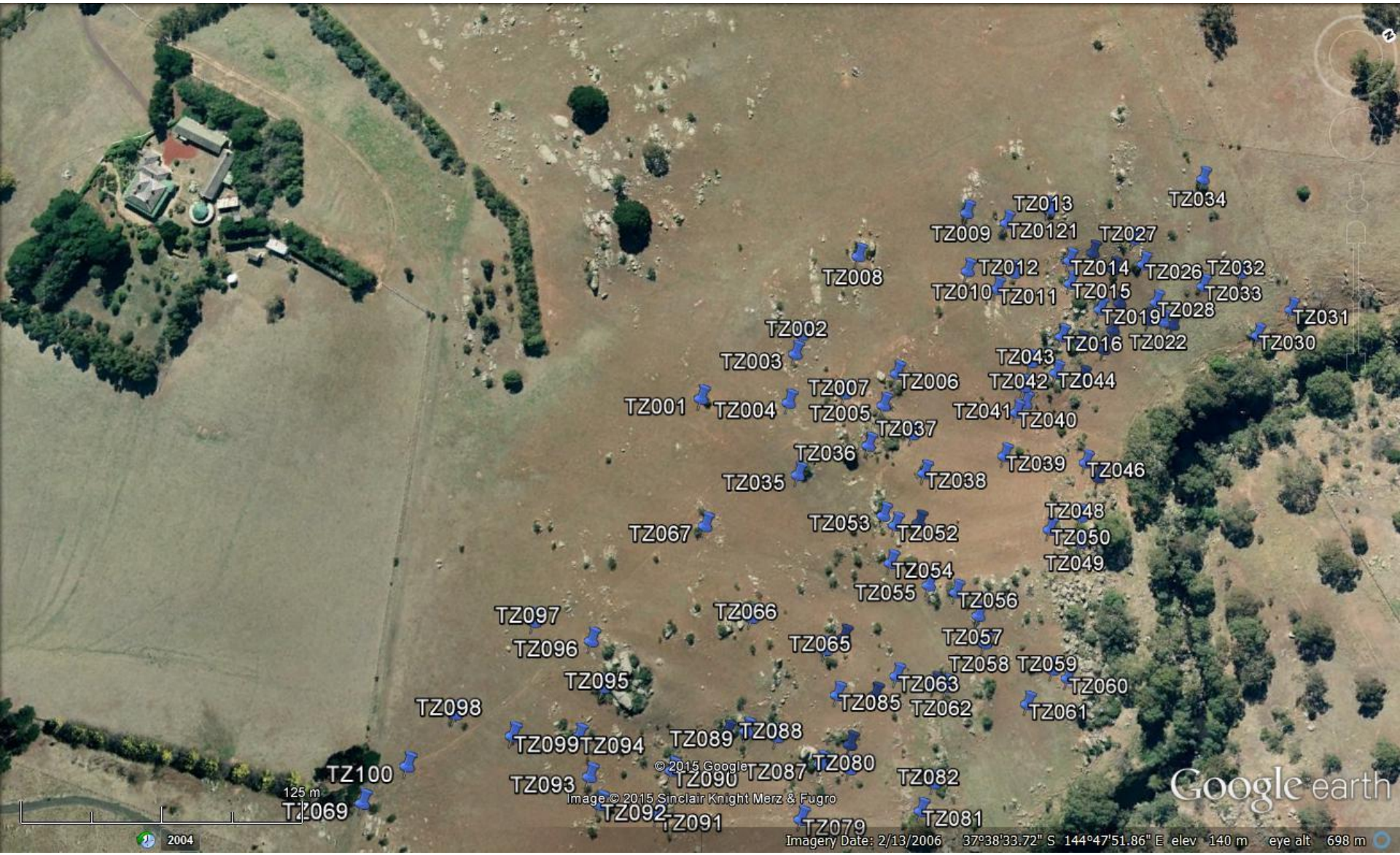
Management implications

Powerful (150 - 300 HP), tracked machinery, bulldozers / excavators, improve efficiency of warren ripping.

Effectiveness of warren ripping programs enhanced by myxomatosis and RHD continually suppressing rabbit populations & reduce rabbit capacity to recover.

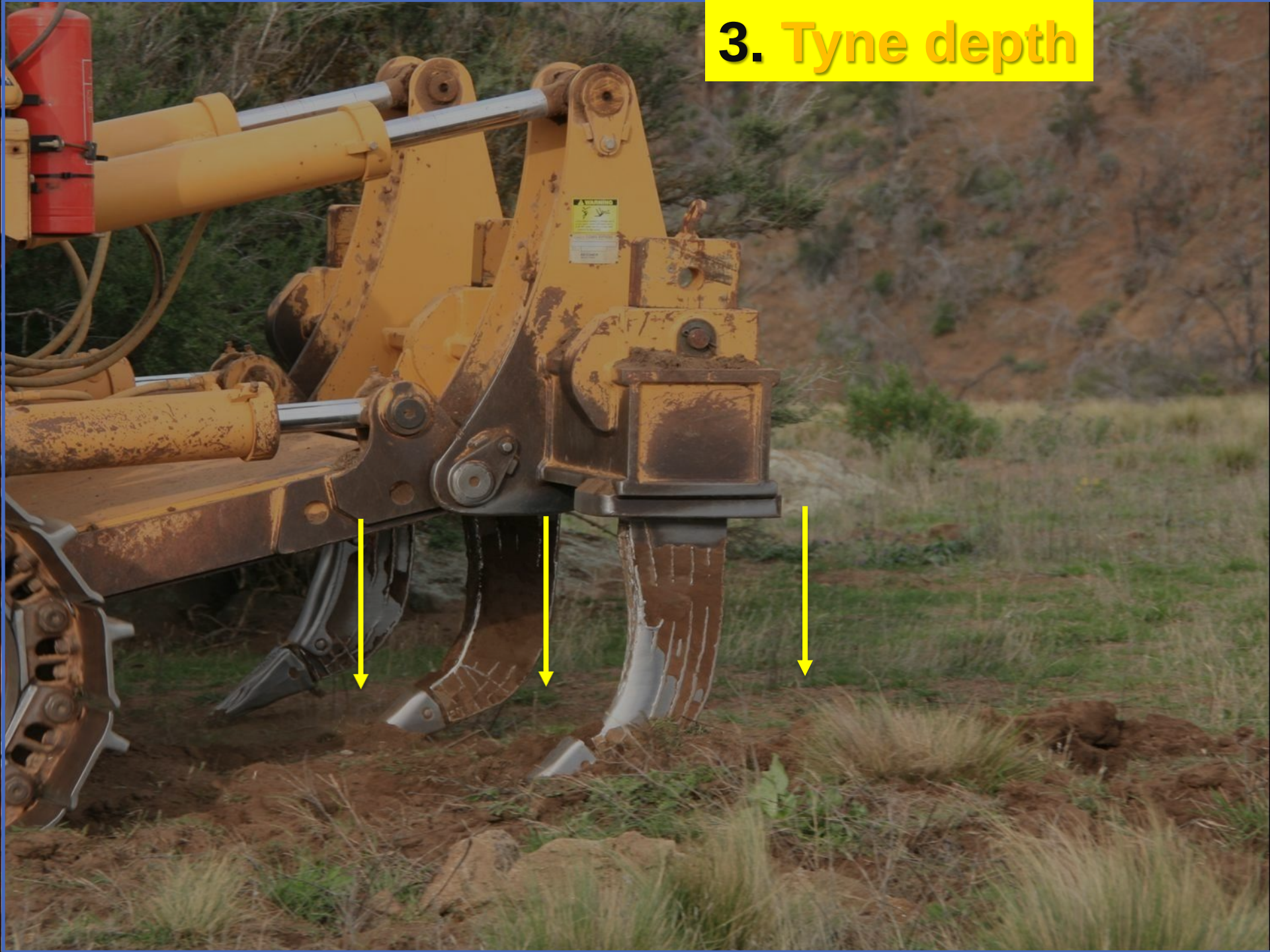
Warren ripping programmes across Victoria have been very successful in reducing rabbit numbers by ~83% for up to 18 years

PROCESS:- 1. MAP RECORD BURROWS/HARBOUR

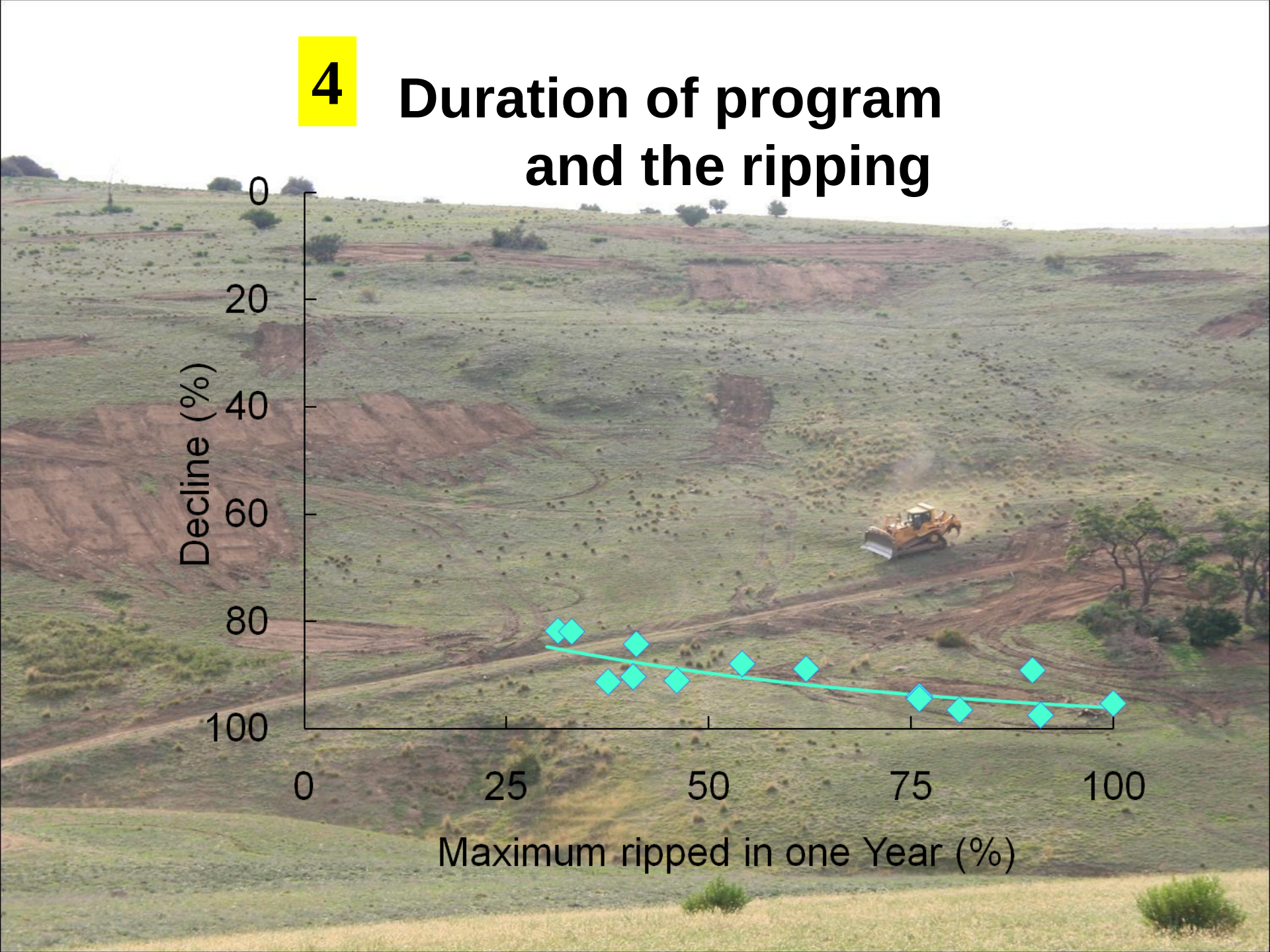


2
Use biggest machinery you can get
Big is quicker more efficient
More effective
D6H
NB Spotters get the
best value out equipment

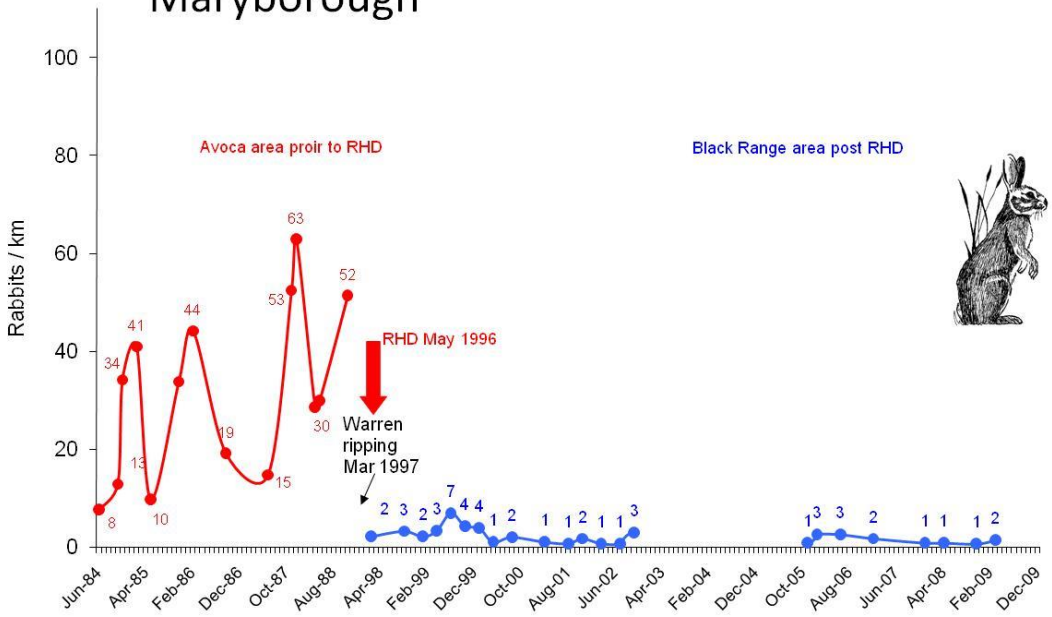
Excavators work precisely near fences, rocks & vegetation


3. Tyne depth

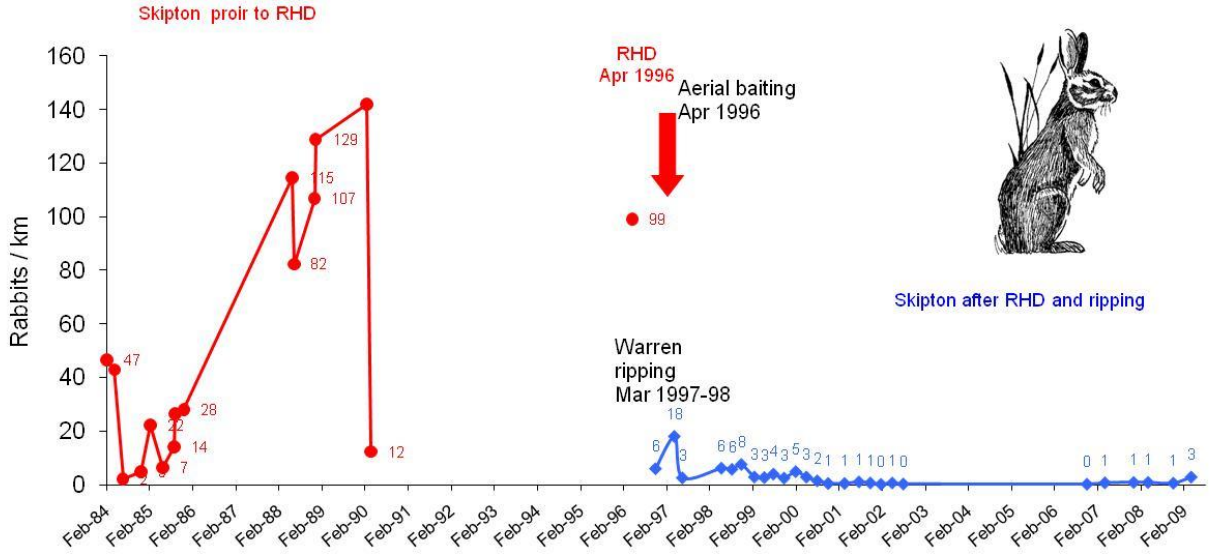
4 Duration of program and the ripping



Maryborough

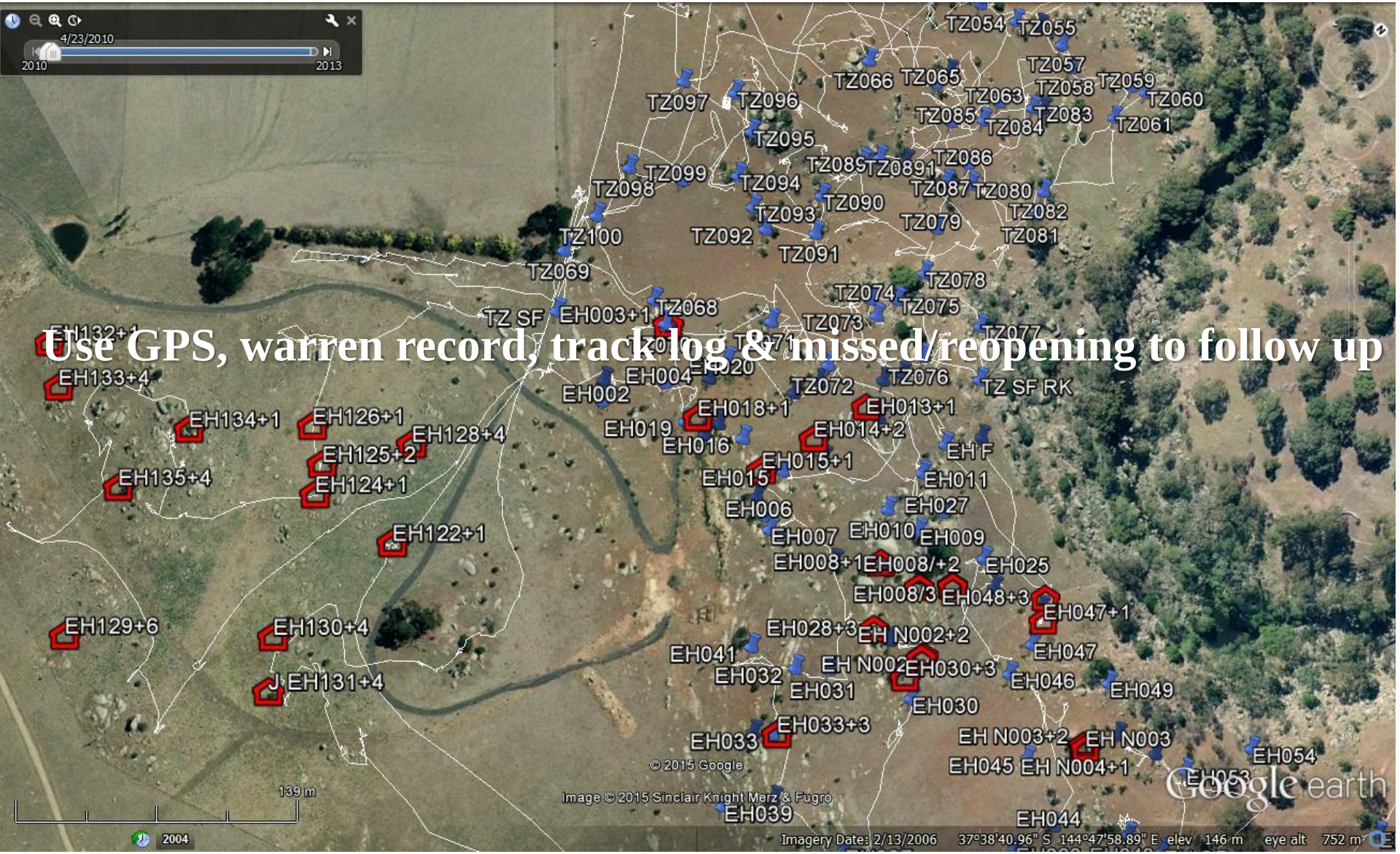


Skipton



5

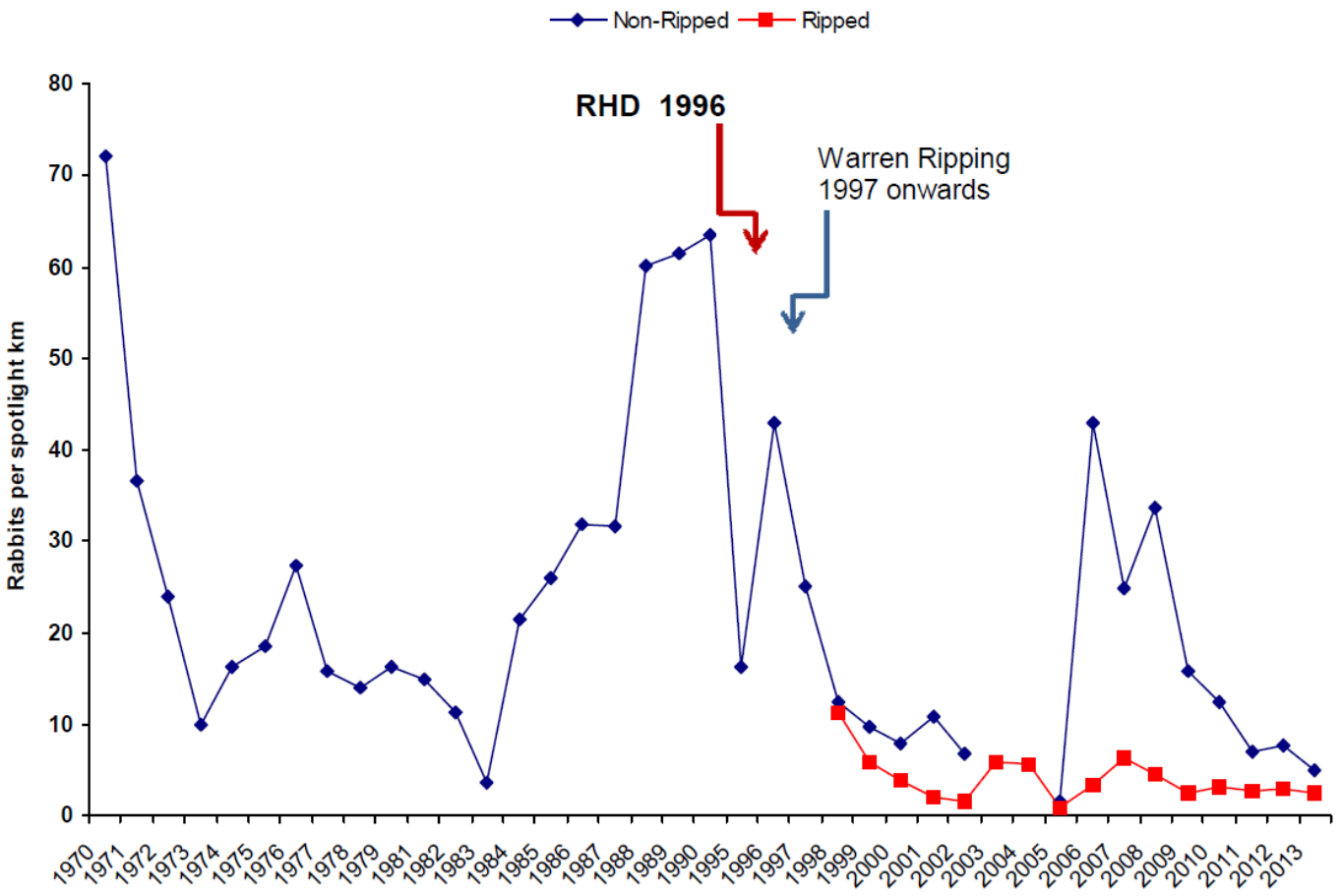
Assess our warren destruction work



Use GPS, warren record, track log & missed/reopening to follow up

All the expenditure up to now vs. time finding & dealing last burrows & rabbits

Long-term impact of warren ripping



Burrow Fumigation

All entrances should be treated whether active or not

Unused burrow sections could be quite extensive and if not treated may provide safe refuges

Treat every entrance/hole

Invest in a smokey

The smoke generated by the blower helps you find all the burrows

Successful follow up requires considerable search effort

Warren Destruction :- Explosives

Advantages

- Effective rocky/difficult access
- Compatible fumigation
- Humane
- Close to urban areas

Above ground surface harbour

Harbour - Rabbits living above ground

Fallen timber or logs, rocks, dense thickets of spiny weeds or woody weeds and heaps of debris create ideal shelter for rabbits

Comparisons of the survival of radio-collared rabbits living within warrens to those living outside warrens (surface dwellers) showed there was negligible survival of both adults and yearling surface dwelling rabbits.

Management implications

If funds are limited, the destruction of warrens should be the first priority as rabbit survival in the absence of warrens can be very poor

Surface dwelling rabbits would most likely not sustaining broader rabbit populations

Victorian Rabbit Action Network

Supporting community leadership for cooperative action

Woody weed & rabbit dominated landscape
Hand removal boxthorn

Excavator plucks woody weeds out

Burn using 5t rubber tracked

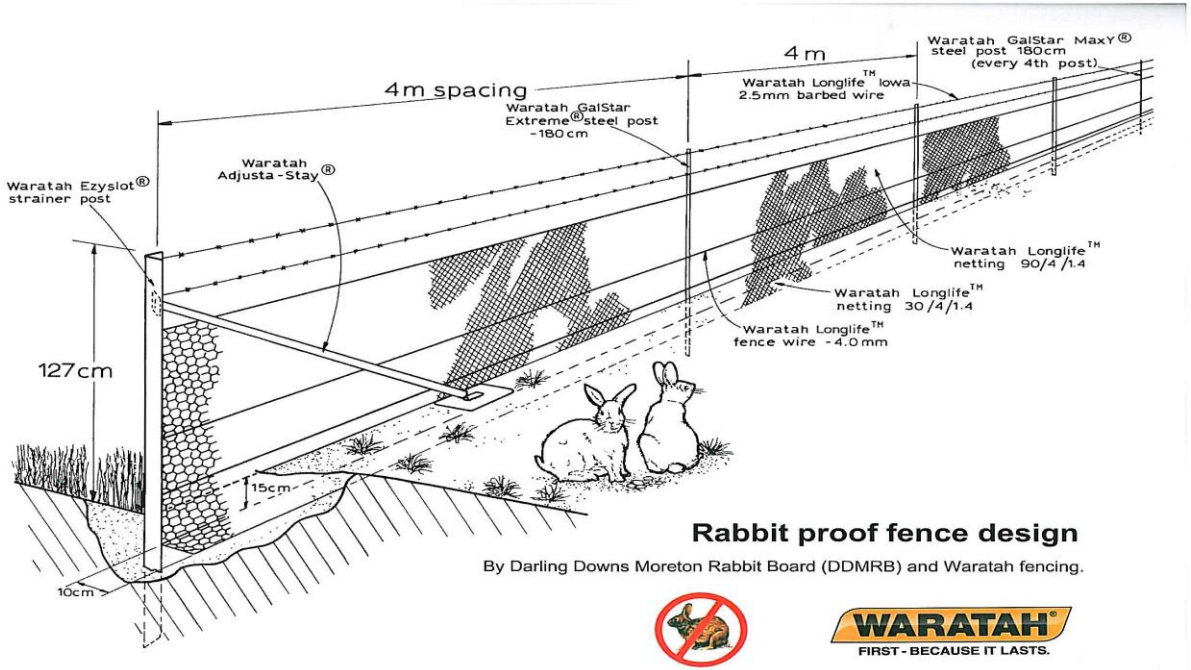
Spiny woody weed removed
Replacement Planting post works

Almost rabbit proof

Fence them in or fence them out

When dealing with rabbit harbour remember:

- If possible destroy it;
- If it can't be destroyed, remove it;
- If it can't be removed, modify it;
- If it can't be modified, exclude it by fencing it with rabbit proof fencing



Urban Rabbit Control & Management

Two options

Eradicate Control numbers & damage

Eradicate 1. Fence in &/or 2. Fence Out
Assess own & neighbours for rabbit harbour
Remove rabbit harbour:- above ground
bait
fumigate
Secure property :- stop invading rabbits
maintenance

Control damage

Assess own & neighbours for rabbit harbour
Remove rabbit harbour:- above ground
bait
fumigate

Live with damage / RPF what you want to protect