

RAB007 rabbit warren destruction using explosives

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Background

Warren destruction with explosives is used to minimise the impact of the introduced European rabbit (*Oryctolagus cuniculus*) on agricultural production and the environment. Other rabbit control methods include poisoning, warren destruction using ripping, surface harbour removal, shooting, trapping, exclusion fencing and biological control with rabbit haemorrhagic disease (RHD) and myxomatosis.

In many areas of Australia, rabbits depend on warrens for shelter from climatic extremes, predator avoidance and also for successful breeding. Warrens are destroyed using ripping or, in rocky or inaccessible areas, explosives. Since rabbits do not readily dig new warrens, rabbit populations do not persist in areas where warrens are effectively destroyed and re-colonisation is made less likely.

Blasting will be more humane when the number of rabbits in the warren is low and when explosives are applied in a manner that achieves collapse of the whole warren, so that the rabbits are killed quickly. Because blasting gives long term management of rabbit populations the need for repeated control operations is reduced.

Ammonium nitrate mixed with fuel oil (ANFO) is the most commonly used explosive for warren destruction. Explosives are extremely hazardous and should only be used by suitably qualified and accredited operators.

This standard operating procedure (SOP) is a guide only; it does not replace or override the legislation that applies in the relevant State or Territory jurisdiction. The SOP should only be used subject to the applicable legal requirements (including OH&S) operating in the relevant jurisdiction.

Application

- Warren blasting should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control. Reducing and maintaining low rabbit numbers by a combination of control methods over time is more effective than repeated (seasonal) use of a single method.
- Where warrens are the principal shelter for rabbits, warren destruction is the most cost-effective and most long-lasting method of control. It is a critical component of rabbit control programs especially in extensive areas such as the rangelands.

- Warren destruction is most effective when rabbit numbers are already low, such as after a baiting program, drought or disease outbreak or at a time when rabbits are not usually breeding. The aim of blasting is to destroy the warren, not to kill large numbers of rabbits.
- Blasting is used to destroy warrens in areas that are inaccessible to ripping (e.g. rocky areas, under trees, along rivers and in steep sandbanks) and in areas where ripping is undesirable because of the risk of soil erosion. Correct blasting does not leave any craters, but lifts the subsoil and drops it back into place compressing the warren system in the process.
- In some awkward/inaccessible areas it may be better to use a ripping tine on an excavator (ripper arm) to destroy the warren rather than using explosives.
- Blasting is relatively expensive; however it does provide long-term control.
- Blasting has a greater effect on more moist and heavier soils, as gases are less able to escape through the subsoil.
- It is essential (and a legal requirement) that operators are adequately trained in handling and using explosives and hold the appropriate certificate, licenses or permits. Explosives must also be used in accordance with relevant State, Territory and other Commonwealth legislation (e.g. Dangerous Goods Acts and Explosives Acts). *See Appendix.*
- Clearing surface harbour such as blackberry stands, hollow logs and rock piles may need to be performed prior to warren destruction to enhance the effectiveness of control programs and to slow re-colonisation.
- Trained dogs can be used to chase rabbits underground prior to warren ripping. However, it is unacceptable, and in some jurisdictions illegal, to set a dog onto a rabbit with the intention of catching or killing it.
- Clearing of native vegetation or disturbance of sites with aboriginal or archaeological significance is subject to compliance with various local, State and Commonwealth legislation. If in doubt, always check with the appropriate authority before undertaking warren and harbour destruction programs.

Animal Welfare Considerations

Impact on target animals

- Depending on the distance from each blast, rabbits in the warren may be killed or injured by the following:
 - the disruptive effects of the blast on body tissues;
 - burns from the explosive gases produced (can be as high as 3000°C);
 - injuries caused by fragments of solid material e.g. rock, wood fragments propelled by the blast;
 - injuries and haemorrhages (especially to the lungs) caused by the air blast; and
 - crushing and suffocation from the collapse of the warren.
- In most cases the time to death is thought to be quick especially when complete destruction of the warren is achieved. Failure to cause complete collapse in deep warren systems may result in some rabbits becoming trapped in partly destroyed tunnels and then slowly asphyxiating. It is essential that

the tunnel system is completely destroyed so that the rabbit dies as quickly as possible.

- It is more humane to perform blasting when rabbit numbers are at their lowest e.g. not breeding, after drought, disease or poison baiting. This means that lower numbers of rabbits will be killed by this relatively inhumane technique.
- Blasting also affects rabbits that are not inside the warren at the time by removing their protection from extreme heat, cold and predators. Most rabbits that are forced to live above ground after their warren has been destroyed will have little chance of survival.

Impact on non-target animals

- Warren destruction using explosives can kill animals other than rabbits if they are inside the warren at the time. If a warren appears to be vacated by rabbits and possibly occupied by non-target species (e.g. wombats, snakes, lizards, dingoes), blasting must not be performed.
- Warren destruction may also have a negative impact on non-target species that use the warren or surrounding harbour, by removing their protection from extreme heat, cold and predators. Harbour such as native vegetation, logs and briars that are used by rabbits may also be an important habitat for native animals including amphibians, reptiles, small mammals and ground-dwelling or ground-feeding birds. The benefit of rabbit harbour removal should be assessed against the risk to native wildlife especially in conservation areas.
- Non-target native animals that are inadvertently injured or displaced during the blasting or harbour removal procedure should be taken to a registered wildlife carer or veterinarian for assessment.
- If using dogs to work an area prior to warren destruction, the following should be observed:
 - Dog handlers must be experienced and the dogs well trained i.e. they must be easily controlled by a whistle or call, obey the handlers' commands and will not chase or attack non-target animals including domestic livestock. Dogs that are deliberately bred or trained to attack without provocation must not be used. Suitable breeds would include terriers, labradors and others that are keen to chase but unlikely to catch a rabbit.
 - Handlers must not encourage dogs to attack and kill rabbits. Rabbits trapped in hollow logs etc. (where they are visible but the dogs can't access them) should be shot (refer to **RAB009 *Ground shooting of rabbits***).
 - Rabbits caught by dogs should be killed by a shot to the brain or by cervical dislocation. Rabbits should never be left to die a slow death after being maimed.
 - Ensure that small dogs are not inside the warren before blasting takes place. They should be well restrained during blasting operations to prevent them from entering the warren.
 - For more details refer to **GEN002 *The care and management of dogs used in the control of pest animals***.

Health and Safety Considerations

- There are extreme hazards associated with the use of ANFO requiring stringent OH&S procedures. Detonation may occur from heavy impact or excessive heating, particularly under confinement. Avoid all contact with other chemicals.
- Strictly observe the manufacturer's storing and handling recommendations.
- Always observe the recommended weights of explosives when setting up charges and never use less than the minimum length of safety fuse as set out in the relevant legislation for explosive use.
- Appropriate personal protective equipment, including long trousers, boots, helmet and a face mask or safety glasses must be worn.
- Always crimp a detonator to fuse with special crimping pliers.
- Do not leave explosives where they can be hit by flying fragments.
- All persons, animals and vehicles should be well out of range of flying fragments. Debris can be thrown up to 350 metres.
- Blasting produces oxides of nitrogen, carbon monoxide and carbon dioxide. Exposure to these fumes may induce methaemoglobinaemia which causes hypoxia and cyanosis. Take care not to return to the site until fumes have settled. If fumes or combustion products are inhaled, transport the affected person to hospital or a doctor.
- Further information on ANFO can be obtained from the material safety data sheet (MSDS) available from the supplier. Information on occupational health and safety aspects of using explosives can be obtained from the relevant State or Territory authority.

Equipment Required

- 500 gram charges of ammonium nitrate mixed with fuel oil (ANFO).
- 50 mm hand auger for boring holes (if using borehole method).
- Crimping pliers for crimping detonator to fuse.

Procedures

Assessment of site and estimation of rabbit numbers

- To maximise effect on rabbit populations, a careful on-site risk assessment should be undertaken. Map the location of all warrens, take note of surface harbour and topographic features. For large areas, experienced spotters on motorbikes can be used to log the location of warrens using GPS before warren destruction commences.
- The density of rabbits on the site should be estimated using spotlight counts and warren monitoring. The location and numbers of rabbits on neighbouring properties should also be approximated. If the density of rabbits is high it is best to poison or fumigate beforehand so that few rabbits are left.
- If it is suspected that native wildlife are using the warren, their presence can be determined by using sand pads – a 1m² area of raked earth or sand outside of the warren entrance – to detect and identify footprints.

- Contact your vertebrate pest control local authority for more information and advice on site assessment and monitoring of rabbit numbers.

Blasting procedure

- Clear warrens of loose logs, rocks, woody weeds and large shrubs etc. Take care not to endanger any native wildlife that may be using the harbour.
- All warrens with open entrances should be destroyed even if they are not currently active.
- It is important to drive any rabbits in the area underground before blasting takes place. This can be achieved by making loud noises or using dogs to work the area, chasing the rabbits into the warrens. Most rabbits will be underground during the middle of the day especially when the weather is hot.
- There are two main ways of applying explosives to warrens:

(1) Borehole method

- Involves inserting charges into holes strategically bored across the warren.
- With this method the force of the explosion is well below ground and there is limited disturbance to the surface. This gives a better collapse of the warren and reduced the likelihood of forming craters.
- Holes are bored using a 50 mm diameter auger. The best depth and spacing for borehole charging will depend on warren depth, soil type and amount and type of surrounding vegetation.

(2) Burrow entrance method

- Involves inserting charges down burrow entrances.
- Recommended for deep burrows (> 1 metre deep) or in situations where holes cannot be augered easily for the borehole method.
- This method is more likely to lead to the formation of craters, which may cause erosion and could encourage re-colonisation by rabbits.
- The charges are positioned as far down the burrow as possible, using a shovel handle or a long stick.

When the charges are positioned, the bore holes or burrow entrances should be backfilled with sand or soil and well compacted to stop blow out and maximise blast effectiveness. Charges for each warren are then connected by detonating cord trunkline and fired simultaneously using a plain detonator and safety fuse.

Assessing effectiveness

- The effectiveness of warren blasting should be monitored by noting the presence of re-opened entrances 2–3 days after treatment. Any re-openings can be treated using further blasting or fumigation.

Procedural Notes

More detailed information on warren destruction using ripping can be found in various State guidelines (e.g. vertebrate pest control manuals, Landcare Notes, Farmnotes etc.).

Further Information

Contact the relevant Commonwealth, State or Territory government agency from the following list of websites:

Commonwealth	Department of Environment and Heritage http://www.deh.gov.au/
ACT	Environment ACT http://www.environment.act.gov.au/
NSW	NSW Department of Primary Industries www.dpi.nsw.gov.au
NT	Parks & Wildlife Commission www.nt.gov.au/ipe/pwcnt/
QLD	Department of Natural Resources and Mines www.nrm.qld.gov.au
SA	Animal & Plant Control Commission http://sustainableresources.pir.sa.gov.au
TAS	Department of Primary Industries, Water & Environment www.dpiwe.tas.gov.au
VIC	Department of Primary Industries, Agriculture & Food www.dpi.vic.gov.au
WA	Agriculture WA www.agric.wa.gov.au

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Appendix

Relevant Commonwealth, State and Territory Legislation for the Use of Explosives

- **Commonwealth**
 - Explosives Act 1961*
 - Explosives Regulations*
 - Australian Explosives Code
 - Australian Dangerous Goods Code
- **Australian Capital Territory**
 - Dangerous Substances Act 2004*
 - Dangerous Substances (Explosives) Regulations 2004*
- **New South Wales**
 - Explosives Act 2003*
 - Dangerous Goods (General) Regulation 1999*
- **Northern Territory**
 - Dangerous Goods Act*
 - Dangerous Goods Regulations*
- **Queensland**
 - Explosives Act 1999*
 - Explosives Regulation 2003*
- **South Australia**
 - Explosives Act 1936*
 - Explosives Regulations 1996*
- **Tasmania**
 - Dangerous Goods Act 1998*
 - Dangerous Goods (General) Regulations 1998*
- **Victoria**
 - Dangerous Goods Act 1985*
 - Dangerous Goods (Explosives) Regulations 1988*
- **Western Australia**
 - Explosives and Dangerous Goods Act 1961*
 - Explosives and Dangerous Goods Regulations 1963*
- **Other relevant legislation**
 - Occupational Health and Safety Acts

A range of standards and codes of practice are referenced to in the relevant legislation. These provide specific details which must be complied with to meet minimum safety requirements.



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