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DORA CREEK, NSW

DEER, FOX, WILD DOG, FERAL CAT, RABBIT and BIRD CONTROL

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In regards to rabbit control you have several options that can be completed by Central Coast Deer and Vermin Control.

- Pindone baiting
- Rabbit Haemorrhagic Disease Virus(RHDV) release
- Concussion
- Fumigation
- Shooting

Taking no action at all in the hope that we might one day find a more humane solution is unacceptable(Cooke D. Brian 2014).

Pindone baiting: Carrots

Although poisoning programs can be carried out year-round, baiting is most effective when alternative food for rabbits is scarce.

Benefits: 70% to 90% of rabbits exterminated and will typically die within burrows.

Warrens don't need to be accessible and all rabbits surface or burrow will be effected.

Drawbacks: Can only be completed in dry weather or intermittent (require a dry night/day every 3 to 5 days).

RHDV:

Central Coast Deer and Vermin Control was the only company to release the NEW RHDV-K5 Korean Strain on the Central Coast NSW for the Department of Primary Industries Biosecurity NSW in 2017.

Rabbit Haemorrhagic Disease Virus (RHDV) is a viral disease which affects only European rabbits. 3 to 4 trenches (30mm deep) totalling 500 metres in length need to be cut then two free feeds of carrots are distributed in trenches and one RHDV covered carrots.

Benefits: RHDV infects many organs including the lungs, gut and liver of the rabbit. The latter causes acute hepatitis that can kill the rabbit within 48 hours by precipitating a rapid and widespread blood clotting mechanism.

(50% guaranteed) to 90% of rabbits exterminated and will typically die within burrows.

Warrens don't need to be accessible.

No warning signs or notification required.

All rabbits surface or burrow rabbits will be effected.

Drawbacks: Whether RHDV is effective depends on age. Rabbits less than three weeks old are not affected and only 60% of rabbits between three to six weeks old are affected.

Does RHDV affect humans? This was considered in great detail by the government and health authorities from the outset. A major study was conducted in which blood from 259 people exposed to RHDV-infected rabbits was tested. There was no evidence of infection. International laboratories in many different

countries confirm that human infection with rabbit calicivirus is not known to occur and that no ill effects have been seen, even in people working very closely with the virus.

The virus has been present in more than 40 countries round the world, including most of Europe, since the 1980s, and there have been no scientific or medical reports of human infection from any of these countries.

Are other animals affected by RHDV? There is no scientific evidence, here or overseas, that RHDV infects other animals. Australia has tested for RHDV virus in at least 33 representative animal species, domesticated and wild, native and feral. They were all given large doses of the virus and there was no sign of infection. Worldwide 43 different species have been tested and the virus did not grow in any of them.

Is it safe to eat rabbits infected with RHDV? One should never eat a sick animal, as it is difficult to identify what it has suffered from, quite apart from considerations of taste. Nevertheless, if an animal infected with RHDV was killed and eaten prior to there being any signs of sickness, the virus would have no effect on humans.

Is a vaccine available for domestic rabbits? Yes. Effective vaccines to protect rabbits from RHDV have been developed in Europe and are applied through local veterinary clinics. The vaccine released in Australia is known commercially as Cylap HVD and is made in Spain by Cyanamid. Pet rabbit owners should consult their local vet about vaccination.

Conclusion:



At Central Coast Deer and Vermin Control we like to use a smoke identification unit first then Rodenator (concussion) of rabbits. The Rodenator can be viewed further at <http://www.rodenator.com>

Smoking to find the burrows: concussive force generated by the Oxygen-LPG detonation is sufficient to give humane control of rabbits and collapse the majority of a warren, this collapse varies depending on soil type, warren depth and amount of oxygen used.

Benefits: 90% of rabbits destroyed within burrows

Can be completed in dry or wet weather

Warren destruction prevents further rabbits from taking up residence.

Pests killed from the Rodenator's Concussive Force Process, die from the overwhelming pressure within the tunnel system. The animals are instantly crushed. They are not burned, asphyxiated, or chased away; they are instantly killed without the use of chemicals or poisons.

Drawbacks: Warrens need to be accessible

Noise

Fumigation:



At Central Coast Deer and Vermin Control we like to use a smoke identification unit first then fumigate rabbits

Smoking to find the burrows: fumigation can be successfully used after or with other methods of control, treating small isolated populations.

Treated burrows should be inspected after about six days and re-treated if rabbits have opened them.

Benefits: 90% of rabbits destroyed within burrows

Drawbacks: Warrens need to be accessible.

Can only be completed in dry weather.

Only rabbits which live in burrows can be controlled; surface living rabbits are unaffected.

Shooting:



Shooting would be carried out between the hours of midnight and 500am unless otherwise requested. Rifles are equipped with suppressors, digital night vision, recorders.

Benefits: 70% to 90% of rabbits exterminated and removed.

Warrens don't need to be accessible.

All rabbits surface or burrow rabbits will be effected.

Silenced and Night vision equipped rifle with video recorder.

Drawbacks: Rabbits need to be sighted



CCD&VC has insurance covering \$20,000,000 Public Liability and \$20,000,000 Product Liability, licensed to shoot in council, crown, rural and non-rural (residential, golf courses, commercial, tourism, school and recreation) areas and certified/licensed to bait, fumigate and concussion.

Rabbit origins:

Spain, northern and southern.

Main arrival of rabbits to Australia	Xmas day 1859. Thomas Austin, Barwon Park, SW Victoria. Breeding for hunting
Baby rabbit	Kitten
Male rabbit	Buck
Female rabbit	Doe
Rabbit gestation period	1 to 14 kittens every 31 days
Population	More than one is too many

History:

Domesticated rabbits arrived in Australia with the First Fleet 1788. The first feral rabbit population was reported in Tasmania as early as 1827. On the mainland, Thomas Austin freed about a dozen on his property near Geelong, Victoria, in 1859. They reached the Queensland - New South Wales border by 1886 and covered most of their present range by 1910. This was despite the Western Australian Government's 1700 kilometre rabbit-proof fence, built between 1901 and 1907. Today, feral rabbits occur throughout Australia, except in the northernmost areas (Department of Sustainability, Environment, Water, Population and Communities).

Rabbit habitat:

In Australia, wild rabbits live in a variety of situations which can be classified broadly by the amount of surface cover that is available to them. Where cover is dense and abundant rabbits tend to dig only small warrens and live mainly on the surface (Section 3.3.2). Large warrens occur mainly in open country such as cleared land, grazed pasture and arid areas. Vegetation in the parts of Australia occupied by rabbits ranges from (1) shrub (scrub and bracken thickets), either with or without an overstorey of trees; (2) patches of dense scrub interspersed with patches of grassland in various proportions; (3) savanna woodland with extensive grassland; (4) grasslands of varying vegetation density; through to (5) short or sparse grass with varying extents of bare ground (Figure 6). This variation in vegetation cover can be viewed as a continuum in which the range or abundance of surface cover varies. As surface cover gets less, warrens become larger and the rabbits depend increasingly on underground shelter.

'Although the rabbit makes the warren, it is the warren that makes the rabbit' (Andrewartha and Birch 1984).

Contrary to popular opinion, rabbits do not readily dig new warrens, except on sandy soils (Parer 1977; Cowan 1987a). In newly colonised areas without warrens a rabbit will generally live in what is called a squat – a shallow depression in long vegetation or under fallen timber. A squat-dwelling pregnant female will dig a shallow burrow, a stop, in which to have her litter. The entrance to the stop is covered with soil and is difficult to detect. Separate tunnels may be dug within a stop for successive litters and the stop is then called a warren (Mykityowycz et al. 1960).

Nestlings in stops are often dug out by foxes (Lloyd and McCowan 1968; Mulder and Wallage-Drees 1979; Cowan 1987a), but as the warren develops and becomes deeper the nestlings are safer. Females do most of the digging although males may assist. Bursts of digging occur after rain and in relation to pregnancy (Myers and Poole 1962). Rabbits dig with the forefeet and throw soil back with the hind feet. Soil is bulldozed out of the warren with the forefeet and chest. Incisors are used to dislodge stones or gnaw through roots.

In areas with little rabbit harbour, rabbits spend most of the daylight hours in warrens. However a few subordinate rabbits may live in squats (Myers and Schneider 1964; Gibb 1990).

The ideal location for a warren is on elevated, deep sandy soils adjacent to a floodplain (Chapuis 1980; Myers and Parker 1975a, b; Rogers 1981; Rogers and Myers 1979). Here rabbit kittens are unlikely to be drowned or dug out by foxes, the vegetation responds quickly to rain and the adjacent floodplain vegetation remains nutritious after the vegetation on the sand has deteriorated.

Warrens are usually easy to detect because of different vegetation in their vicinity. Nitrophilous weeds, which take advantage of nutrients brought to the surface by digging, nutrients deposited by defecation and general soil disturbance, are common.

The main factor affecting the regional and local distribution of warrens is soil depth, soil hardness and permeability to water. Because rabbits are born with little fur, they thermoregulate poorly until 12 days of age (Poczopko 1969). In badly drained warrens, nestlings may die from hypothermia if the belly hair and the grass which is used to construct the nest become wet and loses its insulating properties. Drowning and hypothermia are significant causes of mortality in badly drained soils or in high rainfall areas (Myers 1958; Stodart and Myers 1966; Lloyd and McCowan 1968; Parer et al. 1987; Robson 1993). In contrast, adults appear to survive in warrens with water running out the entrances.

Soils with a high clay (greater than 40%) content or high silt plus clay content (greater than 50%) are not suitable for warrens as these soils become waterlogged in winter and are too hard to dig in summer. The absence of warrens on cracking clays is due partly to waterlogging but it is also due to burrows collapsing as the soil shrinks and swells with changing water content.

'The dependence on the warren is the weak link in the rabbit's armour. In those areas where rabbits extensively use warrens, destroying the warrens will virtually eliminate rabbit populations.'

The size of warrens is related to soil type and human activities. Warrens on sandy soils are smaller and have fewer underground interconnections than warrens on hard soils; it is probably easier for rabbits to extend a warren on hard soils than to start a new one (Kolb 1985; Cowan and Garson 1985). In areas where warrens are ripped, warren size tends to be small (Parer and Parker 1986) and restricted to rocky areas and cover. A warren may have 1-160 entrances; the average number tends to be from 3-15, but on calcareous soils it may be more. A six-year-old warren in an enclosure in Canberra

had 150 entrances, the total tunnel length was 517 metres and an estimated 10.35 m³ of soil had been excavated (Figure 7) (Parer et al. 1987). There are usually 2.4-3.4 metres of tunnel for each entrance, except in very sandy warrens where tunnel length is greater. Almost all tunnels are contained within an area defined by a line joining the outermost entrances, but sometimes they may extend to more than three metres outside this (Kolb 1985).

Because of its warren, the European rabbit is the only rabbit species that can colonise open grassland. Because young are protected by the warren they can be born blind, deaf and hardly able to move (Myers and Poole 1962). The short gestation period of 30 days contributes to the rabbit's high reproductive rate. The highest recorded densities of the European wild rabbit (200 per hectare) is much higher than the highest recorded densities of other leporids – 3.5, 4.0 and 9.0 per hectare for the brown hare (*L. europaeus*), the mountain hare (*L. timidus*) and the cottontail rabbit (*S. floridanus*) respectively (Flux 1993). The reason that other leporid

species do not attain such high densities is not because of low reproductive rates but possibly because of predation on surface nestlings and social intolerance to high densities.

Besides providing protection from predators, the warren also provides protection from climatic extremes (Hall and Myers 1978; Cooke 1990). However, in northern and central Australia even warren environments can become too severe. Relative humidities in warrens in summer are often below 40% (Cooke 1990) and warren temperature can exceed 33°C (Parer and Libke 1985). At these temperatures and low humidities rabbits have problems with water balance and thermoregulation in dry periods. Temperatures in excess of 27°C cause problems for lactating females because they need to dissipate large amounts of metabolic heat (Cooke 1977a). In its northern range the rabbit cannot live in sandy soils during hot dry years. Sand has a high thermal conductivity and is less favourable than heavier soils in hot environments (McDole and Frostberg 1974).

The dependence on the warren is the weak link in the rabbit's armour. In those areas where rabbits extensively use warrens, destroying the warrens will virtually eliminate the rabbit population.

Radio tracking has shown that where there is abundant surface harbour, a high proportion of rabbits may live above ground during the day (Boyce 1984; King et al. 1984).

Rabbit food:

Star Jasmine plants at Masters, West Gosford within the carpark over \$5000 worth of Star Jasmine destroyed.

Carrot is the main platform used in baiting rabbits on the Central Coast.

Relevant legislation:

European wild rabbits are a declared pest animal under the Rural Lands Protection Act, 1998. Section 155 and 156 of the Act require private and public land managers to control rabbits on the land they occupy by any lawful method. The Local Land Service (NSW DPI) enforces this legislation.

Competition and grazing by European wild rabbits has been declared a key threatening process under the Threatened Species Conservation Act, 1995. Competition and grazing by rabbits is also recognised federally and rabbits have been declared a key threatening process under the Environment and Biodiversity Conservation Act, 1999.

Rabbits are not recognised as a companion animal under the Companion Animals Act, 1998 and are not defined as stock under the Rural Lands Protection Act or the Impounding Act (1993). Therefore, rabbits are considered wild if they are free-range and uncontrolled.

Control Methods:

Native animals:

David Peacock (Conservation Biologist) suggest bringing back the Western Quoll to reduce rabbit numbers. www.abc.net.au/landline/content/2015/s4176144.htm

Pindone:

Pindone was developed as a rodenticide in the US in 1940s (Kilgore et al. 1942) but initial high production costs did not see it commercialised until the 1950s (Crabtree and Robinson 1953). Developed as a rabbit (*Oryctolagus cuniculus*) control agent in Australia in the late 1970s (Oliver and Wheeler 1978).

Registered in all states and territories for the control of rabbits (*Oryctolagus cuniculus*). Not to be used in urban areas <1000m².

Formulation types are Bait concentrate(coated on carrot) and ready to use oat baits.

Pindone is absorbed through the gastrointestinal tract, skin and respiratory system.

Mode of action: blocks the vitamin K cycle by inhibiting vitamin K reductase, depleting the level of blood coagulation factors such as prothrombin, and disrupting the blood's ability to clot. In addition toxic doses can cause damage to the capillaries, increasing their permeability and causing internal bleeding. These

effects are cumulative in nature, developing over several days and lead to shock, loss of consciousness and eventually death (Petterino and Paolo 2001).

Latent period: More effective in small multiple feeds over several days than large single dose to elicit lethal effects. As with all anticoagulants, displays a considerable delay before the onset of symptoms, which is not dependent on the size of the dose or means of administration (Beauregard et al. 1955, Saunders et al. 1955, Heisey et al. 1956, Coon and Willis 1972).

The symptoms of pindone poisoning are excess salivation, vomiting, bloody fluid in the mouth, blood in the faeces and a progressive general weakening.

Time to death is 5-20 days in rabbits (*Oryctolagus cuniculus*) (Oliver and Wheeler 1978, Eason and Jolly 1993), and 1-2 weeks for brushtail possums (*Trichosurus vulpecula*) (Jolly et al. 1994)

It is extremely difficult for a dog to eat enough poisoned rabbits to take a toxic dose of pindone. However, a dog that eats the bait may be poisoned. A cat would need to eat most of a dead rabbit each day for several days to be poisoned.

Animal Control Technologies (the outfit that supplies pindone in Australia) has calculated the number of rabbits a dog would need to eat to contract secondary poisoning: "In the unlikely worst case event that a rabbit that has just eaten a full feed of bait is killed and eaten whole by a dog, the dose of bait would be less than a 10th of what is need to kill a mid-sized dog with a single dose. We have calculated that a dog would need to eat about 13 rabbits that had each just eaten the maximum dose of bait to get an acute lethal exposure. While there is always a range of outcomes (some succumb to less and some need much more etc) the risks are still low. The risks increase a bit if the dog eats a few rabbits each time the bait is applied (i.e. gets a series of doses a few days apart) but to date we've had no reports of this occurring.

In the event of a domestic animal showing symptoms of pindone poisoning, an antidote is available from most veterinarians. It consists of an injection of Vitamin K, (1mg/kg liveweight) which counteracts the effects of pindone in the body by increasing the blood clotting abilities.

Rabbit biocontrol in Australia:

Myxoma virus: Trialled by the CSIRO in the late 1930's and 40s. It was released into the feral rabbit population in the 1950s and spread predominately by fleas and mosquitoes. Within months it knocked over 90% of some rabbit populations but became less effective over time due to developing genetic resistance in the rabbits. Today it affects an estimated 40-50% of the rabbit population.

RHDV(calicivirus): With the emergence in 1984 in China then later trialled by the CSIRO in the early 1990s and released into the feral rabbit population in 1996. It initially knocked down 90% of the feral rabbit population but was less effective in cooler climates. Immunity and again resistance have become an issue.

Caliciviruses are so named because they have 32 cup like depressions on their outer surface (Cooke D. Brian 2014).

RHDV2: Found in Australia in May 2015, RHDV2 is a variant of RHDV that was not released but has been detected in Europe and now Australia and may cause deaths to European rabbits. If RHDV2 is highly virulent it could potentially benefit rabbit biocontrol efforts within Australia³.

Benefits of rabbit biocontrol in Australia

- Significant regeneration of native vegetation and population increases of native animal species.
- Cumulative benefit of rabbit biocontrol to Australia's pastoral industries at ~\$70 billion (over 60 years).
- **RHD is confined to rabbits, and European rabbit *Oryctolagus cuniculus*. The virus is not known to cause disease in any other species, even other closely related rabbits and hares (Cooke D. Brian 2014).**

Impact:

Feral rabbits compete with native wildlife, damage vegetation and degrade the land. They ringbark trees and shrubs, and prevent regeneration by eating seeds and seedlings. Their impact often increases during drought and immediately after a fire, when food is scarce and they eat whatever they can.

Australia's most costly pest animal, rabbits cause:

- \$206 million in losses each year to the agricultural industry(Gong W, Sinden J, Braysher M, Jones R 2009).
- They compete with grazing stock for food, contribute to soil erosion, damage crops and destabilise the land, potentially leading to injury of livestock.
- Rabbits threaten the survival of more than 300 Australian native flora and fauna species. This includes 24 critically endangered species such as the pygmy possum, orange-bellied parrot and ballerina orchid(Australian Government, Department of the Environment 2015).
- Less than one rabbit per football field sized paddock is enough to stop the growth of some native species and negatively affect biodiversity.

Environmental vandals

The rapid spread of the rabbit led to the destruction of large tracts of vegetation, leading to the extinction of many plant species. Loss of vegetation leads to soil erosion as the exposed soil is washed or blown away, removing valuable soil nutrients required for new plants to develop. This soil is typically deposited in waterways, causing siltation and destroying aquatic ecosystems.

This destruction of habitat has contributed to the demise of many native marsupial species such as the bilby and the bandicoot as their feed sources were outstripped by marauding rabbits

Feral rabbits compete with native wildlife, damage vegetation and degrade the land. They ringbark trees and shrubs, and prevent regeneration by eating seeds and seedlings. Their impact often increases during drought and immediately after a fire, when food is scarce and they eat whatever they can.

Feral rabbits may have caused the extinction of several small (up to 5.5 kilograms) ground-dwelling mammals of Australia's arid lands, and have contributed to the decline in numbers of many native plants and animals.

In the Norfolk Island group, feral rabbits and goats reduced Philip Island to bedrock, leaving at least two plants locally extinct. Feral rabbits even threaten colonies of seabirds such as Gould's petrel (Department of Sustainability, Environment, Water, Population and Communities).

Environmental Damage By Wild Rabbits In Australia by the Commonwealth Scientific and Industrial Research Organization (CSIRO)

WILD EUROPEAN RABBITS are Australia's most serious animal pest and New Zealand's second most serious (after the brushtail possum). Damage by wild rabbits in Australia, including the annual cost of control and production losses, has been estimated at \$600 million.

Feral rabbits now inhabit all southern parts of Australia.

Rabbits are not by any means harmless passengers within Australian ecosystems: nor have they become an essential element. To achieve ecosystem recovery, a high level of rabbit control is necessary (Cooke 2013).



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