



**Local Land
Services**
Riverina

PESTS IN IRRIGATION LANDSCAPES

RESOURCE BOOK



A resource about the common pests in irrigation landscapes of the NSW Riverina region and their impact on farming and local threatened species.

© State of New South Wales published by Riverina Local Land Services 2015.

This publication has been prepared as a resource for schools. Schools may copy, distribute and otherwise freely deal with this publication, or any part of it, for any educational purpose, provided that Riverina Local Land Services is attributed as the owner

Acknowledgments: Owen Dunlop (Petaurus Education Group), Peter Beal (Riverina Local Land Services) and Jessica Marsh (Invasive Animals CRC).

Authors: Peter Coleman and Kelly Coleman, PeeKdesigns

Design: PeeKdesigns, www.peekdesigns.com.au

Cover photos: Courtesy of Invasive Animals CRC (Fox and Cat) and the NSW Department of Primary Industries (Alligator Weed)

Citation: Coleman, P. and Coleman, K. 2015. *Pests in Irrigation Landscapes - Resource Book*. Riverina Local Land Services, NSW.



Contents

Our Region	2
Irrigation Landscapes	3
The Irrigation Areas	4
Species Under Threat	5
<i>Under Threat in the Riverina</i>	6
<i>Australasian Bittern</i>	7
Pest Animals	8
<i>European Red Fox</i>	9
<i>Feral Cats</i>	10
<i>Rabbits</i>	11
<i>Feral Pigs</i>	12
<i>Goats</i>	13
<i>Alien Fish</i>	14
<i>Queensland Fruit Fly</i>	15
<i>Sustainable Insect Pest Control</i>	16
Pest Plants	17
<i>African Boxthorn</i>	18
<i>Alligator Weed</i>	19
Find out more	20

Our Region

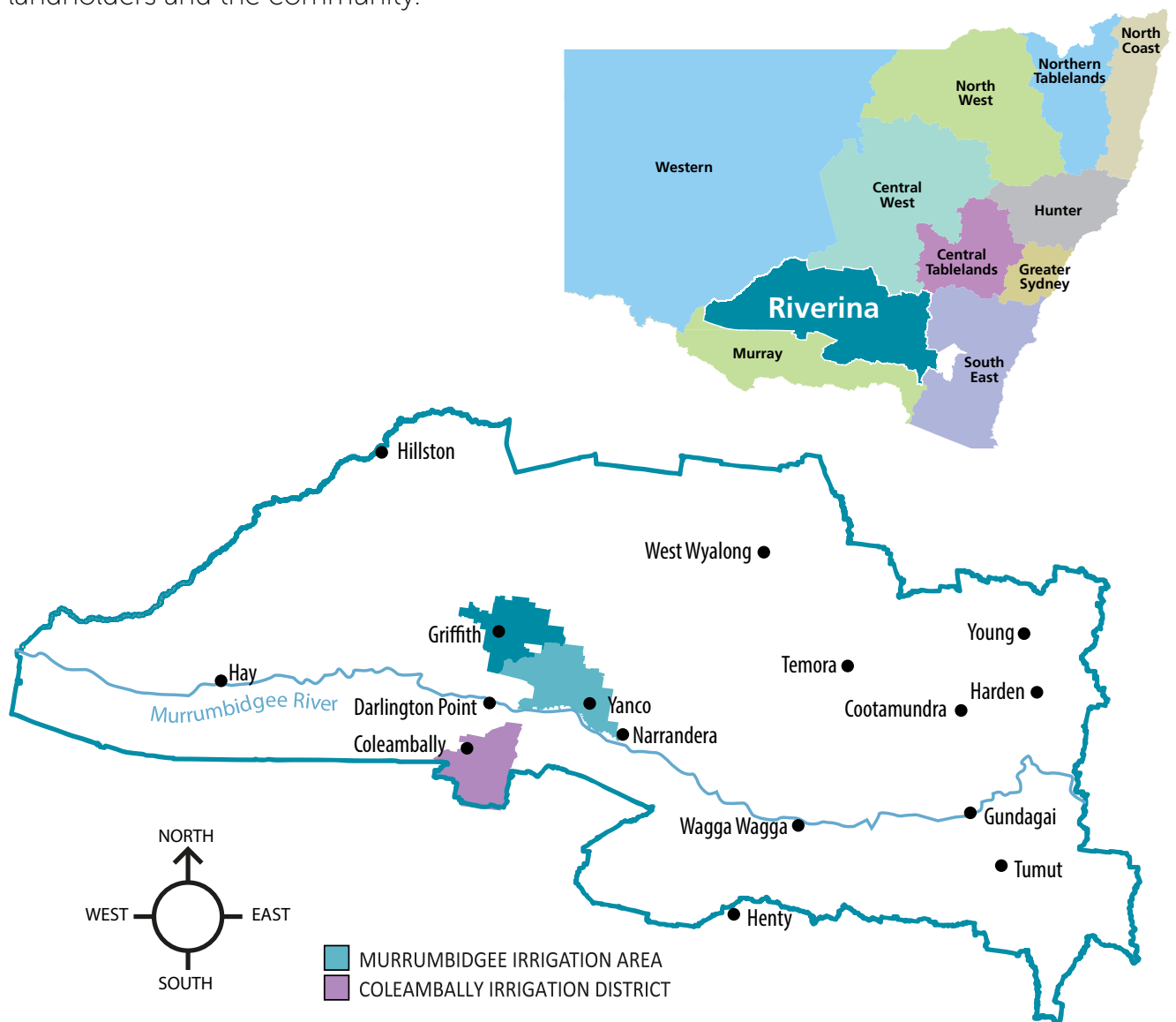
Riverina Local Land Services

The Riverina Local Land Services (LLS) region is an area of New South Wales that is bounded by Harden in the east, Hay in the west, Hillston in the north and Lockhart in the south.

Land use across the region is mainly agricultural, with dryland grazing and cereal based cropping accounting for over 80 per cent of land use.

Irrigation farming in the region also covers a significant area of agricultural land. The irrigation areas around Griffith, Leeton and Coleambally produce rice, grapes, citrus, vegetables and cotton.

Run by local people, Riverina LLS delivers quality, customer-focused services to farmers, landholders and the community.



Irrigation Landscapes

Frequently Asked Questions

What is dryland farming?

Dryland farming involves crops and pastures that rely entirely on the natural rainfall that occurs in an area.

What is irrigation?

Irrigation involves the artificial supply of water to aid in the growth of crops and pastures.

Why do farmers need irrigation?

Australia is one of the driest places on earth. To make use of farmland and grow a variety of crops and pastures we need to be able to water them consistently, even during times when there is no rain.

Where does irrigation water come from?

Irrigation water comes from rainfall that collects in either natural waterways like rivers, streams, creeks, aquifers (underground water) and lakes or artificial water storage like tanks, dams, ponds and channels.

How does the irrigation water get to the crops and pastures?

The water is diverted from the source to the farms by a series of channels, canals, pipes, bores and sprinklers.

Can farmers use as much water as they want?

Water is a very precious resource throughout rural areas. Therefore it is important that the water is shared between the community. Water licences are required throughout NSW that determine the amount of water that farmers are allowed to use for their farms.

Where does the water used for irrigation in the Riverina LLS region come from?

The most important water resource for irrigation in our region is the Murrumbidgee River. Our two main irrigation areas, Murrumbidgee Irrigation Area (MIA) and Coleambally Irrigation District (CID), both rely on water being diverted from the Murrumbidgee River.

EB AND FLO: A LONG WAY TO GO

This video tells the story of how water travels down the Murrumbidgee River from the Snowy Mountains to the Murrumbidgee Irrigation Area.

<https://youtu.be/VGW44cCrICg>



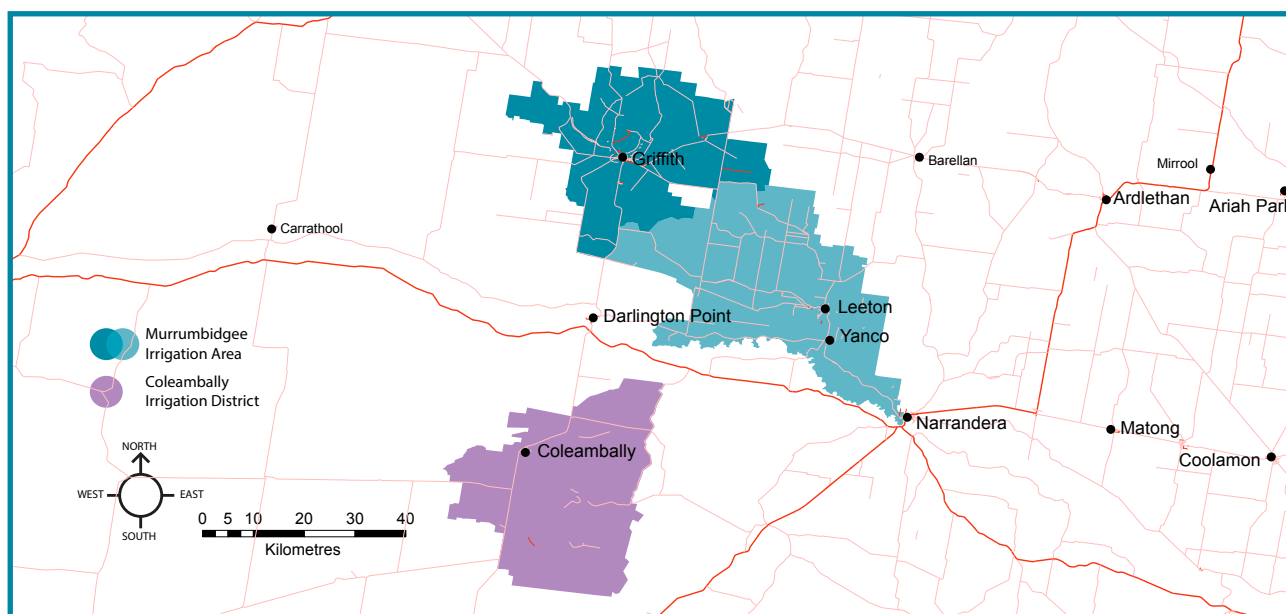
The Irrigation Areas

Murrumbidgee Irrigation Area (MIA)

Established in 1912, following the commissioning of the Burrinjuck Dam in the Snowy Mountains, the Murrumbidgee Irrigation Area (MIA) was conceived by the government. It is a purpose-built scheme, designed to feed and provide employment opportunities for a growing nation.

Today, Murrumbidgee Irrigation provides irrigation water, drainage and environmental services to the region known as the Murrumbidgee Irrigation Area. The MIA, located in the Murray-Darling Basin, covers an area of 660,000 hectares of which an average of 170,000 hectares is irrigated. The MIA is home to over 50,000 people with the majority of jobs tied to the water Murrumbidgee Irrigation supplies to farms and industry.

www.mirrigation.com.au



Coleambally Irrigation District (CID)

The Coleambally Irrigation District (CID) is located in the Riverina, south of Griffith and between Darlington Point and Jerilderie. The district encompasses 491 irrigation farms with the major crops produced being rice, wheat, corn, cotton, barley, soy beans and canola. A variety of fruit and vegetables are also grown.

Coleambally Irrigation Co-operative Limited (CICL) is wholly owned by its farmer members and is Australia's fourth largest irrigation company. CICL delivers irrigation water across an area of approximately 400,000 hectares of which only 79,000 hectares is intensively irrigated. The Co-operative's irrigation delivery system relies solely on gravity across 518 kilometres of supply channels and 734 kilometres of drainage.

www.colyirr.com.au

Species Under Threat

What is a threatened species?

Australia has been separated from the other continents for millions of years and it has developed a unique biodiversity. There are many species here that cannot be found anywhere else in the world. Unfortunately, some of these species' numbers have dropped to a point where they are struggling to flourish or survive at all. These species are called "Threatened Species."

Some reasons that plant and animal species become threatened are:

- Predation and competition from invasive plants and animals
- Loss or destruction of habitat
- Alteration of habitat
- Fragmentation of habitat
- Disease
- Food shortage
- Pollution
- Competition from human processes
- Competition from competing species



Levels of threat

Australia has many plants and animals that have so few numbers they are considered a threatened species. Threatened species can be put into a range of different categories depending on the severity of their situation. These levels are identified and enforced by government legislation (see right).

How can we help?

We can help preserve the biodiversity of our local environment and save many species from becoming extinct. Some ways to help are:

- Conserve/protect existing habitat
- Control introduced plants and animals
- Do not dump weeds or pets in the bush
- Control cats and other pets
- Reuse or recycle whatever you can
- Make compost
- Help provide wildlife corridors

VULNERABLE

A species numbers have dropped significantly but it is not yet classed as endangered.

ENDANGERED

A species numbers are so low that it is severely threatened.

CRITICALLY ENDANGERED

A species numbers are so low that it is very close to becoming extinct.

EXTINCT IN THE WILD

There are no more of a species left in their native habitats but there are some in captivity.

EXTINCT

There are no more of a species left anywhere in the world.

SOURCE: Coleman, P and Coleman K. 2013. *Save Our Species Education Kit*. PeeKdesigns.

Under Threat in the Riverina

The Riverina irrigation regions have a number of threatened species and communities. In a modified landscape it is important that the whole community works to help preserve and protect these species so that they will still be around for future generations. Actions that can be achieved include providing clean air and water, increasing soil health, protecting native habitats, revegetating important areas and maintaining good water flows.

Barrenbox Storage and Wetland and the Mirrool Creek restoration project are examples of how businesses, like Murrumbidgee Irrigation, farmers and the community can work together to repair habitats and help threatened species in the area.

www.mirrigation.com.au/Environment/Biodiversity

This is a list of some of the threatened plants and animals in the Riverina irrigation areas. It includes their threatened status in New South Wales.

Birds

Australasian Bittern	E
Australian Bustard	E
Black-Necked Stork	E
Brolga	V
Brown Treecreeper	V
Bush Stone-curlew	E
Diamond Firetail	V
Flame Robin	V
Freckled Duck	V
Glossy Black Cockatoo ¹	V
Grey Falcon	E
Malleefowl	E
Plains Wanderer	E
Regent Honeyeater	E
Spotted Harrier	V
Superb Parrot	V

E = Endangered

V = Vulnerable

Mammals

Bilby	E
Inland Forest Bat	V
Little Pied Bat	V
Koala	V

Amphibians

Sloane's Froglet	V
Southern Bell Frog	E

Plants

Claypan Daisy	V
Lanky Buttons	E
Sand-hill Spider Orchid	E
Slender Darling Pea	V
Winged Peppergrass	E

Communities

Inland Grey Box Woodland	E
Myall Woodland	E
Yarran (<i>Acacia melvillei</i>) Shrubland	E

¹ Although the Glossy Black Cockatoo species is listed as Vulnerable, the Riverina population is listed as Endangered.

Australasian Bittern

Scientific name: *Botaurus poiciloptilus*

Colour: The Australasian Bittern's upperparts are patterned dark brown, buff and black. It has streaked brown and buff underparts with a pale throat. The beak is brown and legs are greenish.

Size: Length 66 to 76cm, wingspan 1050 to 1180cm, weight: males 1400g, females 900g

Conservation Status: Endangered in NSW and Australia.

Habitat: The Australasian Bittern lives mainly in freshwater wetlands with tall dense vegetation. They feed on small birds, fish, yabbies, snails, insects and spiders. They have also adapted to heavily irrigated crops like rice.

Major threats

- Predation by feral and domestic cats.
- Predation by foxes.
- Clearing of native vegetation habitats around wetlands.
- Salinity problems in swamps and wetlands.
- Low water levels in wetlands due to human use.
- Low number of natural flooding events due to modified waterways.
- Climate change.

Conservation methods

- Understanding the Australasian Bittern through research will help us to preserve their numbers for future generations.
- Restoration of the Australasian Bittern's native wetland habitats is an essential step in helping to protect their populations. This includes planting and revegetating areas and maintaining natural water flows.
- Working with land owners to protect nesting sites on both public and private land.
- Controlling predators including foxes and cats.
- Community awareness and education programs.



Pest Animals

Feral animals have a devastating effect on our farmland, farm animals and our native species. The two main ways feral species have an effect are through:

Predation: they hunt and eat native species and young farm animals (cats, foxes, dogs, pigs etc).

Competition: they compete with native species and farm animals for food or damage food sources (rabbits, deer, pigs, and goats).

Australia has a large number of small native mammals, marsupials, birds and reptiles that are particularly susceptible to feral animals. These little creatures are extremely important to the Australian biodiversity and therefore must be protected.

Controlling pests

Controlling pests takes an integrated approach and includes the following:

1. Understanding the problem and identifying impacts.
2. Setting objectives to reduce the damage caused by the pest.
3. Developing a plan of action. Identify what is to be done and who does what, where, when and how often. For successful pest control it is best to involve many parties such as Riverina Local Land Services, neighbours, local councils, weed management authorities and scientists who can help you understand the pest better.
4. Choosing a strategy (control method) or a combination of strategies.
5. Monitor and evaluate the plan to record:
 - the objectives met,
 - objectives not met and why and
 - recommendations for future action.



SOURCE: McLeod, L. 2013. *Glovebox Guide for Managing Foxes*. PestSmart Toolkit publication. Invasive Animals Cooperative Research Centre, Canberra, ACT

European Red Fox

Scientific name: *Vulpes vulpes*

Colour: Rusty red body, white belly and throat, black lower legs and around ears and a bushy tail with a white tip.

Size: Body length ranges from 45 to 90cm. Weight 5 and 14kg. (www.feral.org)

Origin: Europe. Introduced for recreational hunting in the 1850s.

Habitat: Foxes have adapted to most environments throughout the Australian mainland apart from the tropics. They particularly like patchy bushland where there is plenty of food, cover and den sites. Foxes live in habitats ranging from deserts, semi-arid areas, plains, mountains, coastal areas and even urban environments.

Problems they cause

Foxes are omnivorous - they eat both plants and animals. They will scavenge on fruits and vegetables, eggs, insects, carrion (dead animals) and rubbish. They prefer eating small animals including many of our native birds, small mammals and reptiles. Currently there are 76 threatened, native species at risk of becoming extinct from fox predation. Foxes will also prey on lambs, poultry, calves, goats and other domestic farm animals.

Foxes have been known to spread skin conditions (mange) and other diseases, as well as transporting seeds from invasive weeds such as African boxthorn and blackberry. The European Red Fox is a declared pest species under the *Local Land Services Act 2013*.

Control methods

- **Poisoning:** A poison known as 1080 is often used to bait foxes.
- **Shooting:** Usually done with high powered rifles and a spotlight at night. Shooting is an effective way to control small known fox populations.
- **Fencing:** Large areas of fencing is costly and difficult as foxes are great climbers.
- **Trapping:** Involves setting bait in a wire cage where the fox gets trapped if they enter.
- **Fumigation:** Carbon monoxide is put in the fox den to deprive the foxes of oxygen.
- **Den destruction**
- **Guard animals:** Maremma dogs have been used to help protect flocks.



Feral Cats

Scientific name: *Felis catus*

Colour: Can be a range of colours including black, tabby, tortoiseshell, ginger and grey.

Size: Length 40 to 60cm and weigh 3 to 4kg.

Origin: Europe. Introduced as pets in 1788 and to control rodent populations.

Habitat: Feral cats are considered widespread across Australia. Numbers are estimated to be in excess of 18 million.



Problems they cause

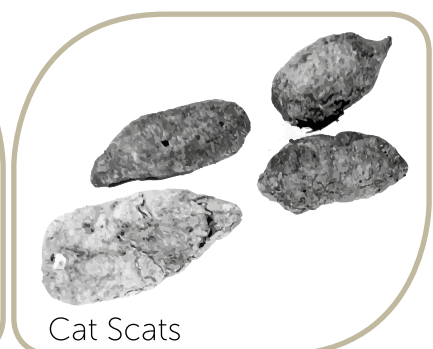
Feral cats have been identified as the main cause for several native species including small mammals, birds and reptiles becoming critically endangered or going extinct. Australia's *Environment Protection & Biodiversity Conservation Act* (1999) and *Threat Abatement Plan* (2008) have identified over 80 threatened species that are directly at risk of extinction from feral cats. It is estimated that over 70 million native animals are killed by feral cats each night.

"The loss inflicted by feral and domestic cats, based on bird predation alone, has been estimated at \$144 million annually." (McLeod, R. 2004. *Counting the Cost: Impact of Invasive Animals in Australia* 2004)

Feral cats are also a major health risk to livestock, native animals and humans because they carry diseases such as toxoplasmosis and sarcosporidiosis.

Control methods

- Trapping is suitable for individual animals in residential areas.
- Shooting is suitable for farmers. Cats are attracted using fox whistles and shot at night.
- Poisoning using fresh meat baits containing 1080 can be used with a permit.
- Exclusion fencing is effective for protecting special areas. Fences must have a netted mesh with a curved overhang to avoid cats climbing overtop. The alternative is to have an electric wire 10cm out from the fence and 15cm from the top.



Rabbits

Scientific name: *Oryctolagus cuniculus*

Colour: Feral rabbits are generally greyish-brown with a white belly. Domestic rabbits can range in shades of black, grey, brown and white.

Size: Length 35 to 45cm and weigh 1 to 2.25kg.

Origin: Europe. Introduced as food in 1788.

Habitat: Rabbits are widely distributed across Australia.

They live in open grasslands, pasture, natural forests, planted forests, shrublands, arid land, coastal environments, rangelands and even urban areas. Rabbits prefer areas that have low vegetation and deep sandy soils where they can dig. The hot, humid climate and greater number of predators keep them out of the far north tropics.



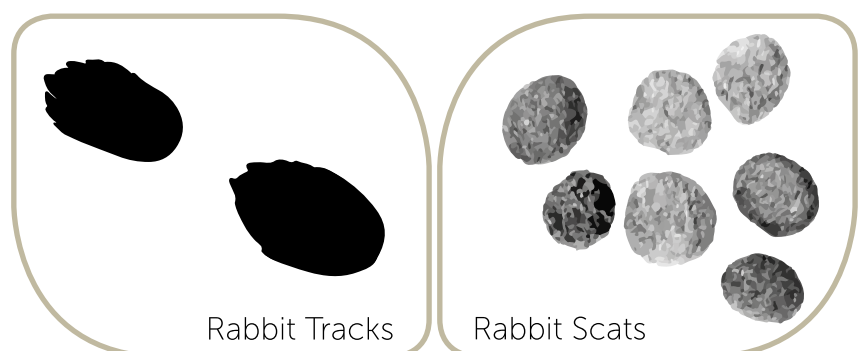
Problems they cause

- Land degradation both in native bush areas and on farms, from digging warrens or for food.
- Competition with livestock for food resources leads to lower stocking capacities. Feeding on crops leads to lower yields
- Competition with native species for food resources. "There are at least 156 threatened species that may be adversely affected by competition and land degradation by rabbits." (www.pestsmart.com.au)
- Damaging native grasses.
- Preventing revegetation and ring-barking trees and seedlings.

Control methods

Poisoning by mixing bait (carrots, oats or pellets) with 1080 or pindone. Warren ripping using heavy machinery or tools. Removing logs and weeds like blackberries where they like to shelter. Shooting removes rabbits in lower numbers. Fencing off sensitive areas prevents rabbits from causing damage in those areas. Biological controls, like myxomatosis and calicivirus, have been introduced to rabbit populations in the past to control population numbers.

Fumigation is the use of carbon monoxide gas that gets pumped into the warren and deprives rabbits of oxygen.



Feral Pigs

Scientific name: *Sus scrofa*

Colour: Mainly black or a dark rusty colour. Some are black and white spotted.

Size: Females 50 to 60kg, Males 80 to 100kg.

Origin: Europe. Introduced as food in 1788.

Habitat: Feral pigs have adapted to most conditions within Australia with exception to the arid interior. They live in wetlands, floodplains, rainforests, alpine areas, and rangelands. Feral pigs need water sources as they do not have sweat glands.



Problems they cause

Feral pigs eat both plants and animals. They eat native animals like frogs, turtles and their eggs, ground nesting birds and their eggs, beetles, worms, lizards and other small mammals. There are 40 threatened, native species directly at risk of extinction from feral pigs. Pigs will also prey on newborn lambs. They will eat and trample crops like sugarcane, fruit, grain and vegetables.

Feral pigs cause a lot of agricultural and environmental damage by wallowing, defecating, digging, up-rooting, trampling and eating plants, damaging fences and other structures and competing with livestock for pasture and water sources. Feral pigs can carry about 20 different exotic diseases including swine flu, foot-and-mouth, brucellosis, tuberculosis and leptospirosis.

Control methods

There are a number of different ways that we can control feral pigs in Australia.

- Ground based poisoning is economical and effective on a broad scale.
- Trapping is suitable for managing feral pigs in low numbers or in sensitive areas.
- Exclusion fencing is a physical, non-lethal way of protecting lambs, crops or wildlife.
- Intensive ground shooting, both recreational and professional, can be effective where pig numbers are low.
- Aerial shooting by helicopter is suitable for harder to access areas.
- A radio collared 'Judas' pig(s) is released to associate and reveal the location of other pigs in the area.



Goats

Scientific name: *Capra hircus*

Colour: Goats can be white, brown, tan, black or various combinations of these colours.

Size: Females about 45kg, Males about 60kg

Origin: Europe. Introduced as food in 1788.

Habitat: Feral goats like rocky, hilly and rugged country in semi-arid areas where they can escape from predators. They can also be found in high rainfall and farming areas. Feral goats can digest foliage (grasses, herbs, shrubs and leaves), twigs, bark, flowers, fruit and roots so this makes them very adaptable to a range of habitats.



Problems they cause

- Compete with livestock for grazing resources.
- Contribute to land degradation (soil erosion).
- Compete with native species for vegetation.
- Spread disease.

Control methods

- Mustering.
- Trapping.
- Aerial and ground shooting.
- Harvesting industry worth \$29 million annually.
- Judas technique uses a radio collared 'Judas' goat which is released to associate and reveal the location of other goats in the area.



Goat Tracks



Goat Scats

Alien Fish

Variety of Fish

There are five main alien fish found in the waterways of the irrigation districts:

- European carp
- Redfin perch
- Eastern gambusia
- Oriental weatherloach
- Goldfish



Problems they cause

Since European settlement, many non-native fish have been accidentally or deliberately introduced into Australian waterways and have become pests. Some of the problems they cause include:

- altering or degrading the natural environment,
- feeding on or destroying native plants,
- preying on invertebrates, native fish and their eggs,
- competing with native species for food, habitat or spawning grounds.

Control methods

There are a range of methods that can be used to stop the spread.

- Don't transfer fish between waterways.
- Don't return pest fish to the water.
- Prevent unwanted hitchhikers on boats.
- Don't dump unwanted pet fish!
- Prevent accidental escape from open fish ponds.
- Report alien fish sightings to the NSW DPI's Aquatic Biosecurity Unit on 02 4916 3877



<http://bitly.com/dpifish>

Photos: © Murray-Darling Basin Authority

Queensland Fruit Fly

Scientific name: *Bactrocera tryoni*

Colour: Reddish-brown with yellow markings.

Size: 6 to 8 mm long

Origin: Native to eastern Queensland and north eastern New South Wales.

Habitat: Queensland fruit fly numbers swell in Spring when the weather warms up. They like warm, humid temperatures and are most active after rain. They can often be seen walking on the underside of leaves and maturing fruit. Numbers will drop in the Winter months, but some may shelter in protected areas.



Problems they cause

Queensland fruit fly are a big problem in horticultural areas, especially where there are lots of fruiting orchards. The female will lay her eggs in maturing and ripe fruit, or in fallen fruit that has been left to rot on the ground. Small puncture marks in the skin of the fruit show where the female has been. In citrus and avocado, a small bump may be visible. Once the maggots (larvae) hatch, they eat the fruit from the inside, which results in fruit decay. A Queensland fruit fly epidemic can cause huge losses in the horticulture industry.

Control methods

Orchard hygiene: This is the most important part of managing Queensland fruit fly. Harvest fruit as soon as possible. Fallen fruit should be picked up and disposed of properly.

Traps and Sprays: Parapheromone traps are used to monitor male fruit fly populations within an orchard - they do not control Queensland fruit fly. Cover sprays are often not cost effective, however can be used in areas with high Fruit Fly concentrations.

Fruit fly control is no longer regulated. ***It is everyone's responsibility to control Queensland Fruit Fly.***

riverina.lls.nsw.gov.au/our-region/key-projects/riverina-fruit-fly-campaign

www.preventfruitfly.com.au



Sustainable Insect Pest Control

Beneficial animals

Our native wildlife can help to make a healthy farm. They can help with pollination of crops and native plants, as well as controlling pest problems. Encouraging these animals can help reduce the need for chemical pesticides and fertilisers. They are known as “beneficials.” Beneficials can be any range of animals that help a farm. They can be birds, bats, small mammals, insects, spiders, mites, worms and even bacteria.

Examples of beneficial animals

- Birds eat insects like moths, beetles and thrips.
- Bats eat insects like moths and mosquitoes.
- Beneficial insects eat other pest insects (e.g. lady beetles eat aphids)
- Small mammals eat insects that forage close to the ground or on trees.
- Spiders will catch a variety of insects.
- Worms and bacteria help to decompose rotting material and reintroduce nutrients into the soil.



Looking after our beneficials

Patches of native vegetation are a great way to encourage the beneficial creatures to your farm. These bush patches provide habitat and, if linked together with corridors of bush, provide a way for wildlife to move around the farm.

To attract our local beneficials we need bush patches that are left natural and messy. This means leaving fallen branches, logs and rocks where they are. This provides habitat for the beneficial animals. A healthy habitat needs a lot of layers within it to support all types of animals. Leaf litter, trees, grasses, logs, dead standing trees, shrubs, herbs and other flowering plants all help to attract beneficials to a farm.

Supporting the beneficials

Beneficials can't do the job alone, sometimes they need a little help from the farmer. Farmers might still need to use pesticides to protect their crops. When using pesticides there are two important things a farmer needs to remember:

1. Use pesticides that have the least effect on beneficial animals.
2. Do not let pesticides drift into the native vegetation that provides habitat for the beneficials.

Farmers can also do things on the farm like removing weeds as they can encourage pests and diseases and providing water sources for beneficials.

SOURCE: Coleman, P. 2012. *Our Farmers, Our Future Education Kit*. PeeKdesigns.

Pest Plants

Weeds

A WEED IS ANY PLANT THAT IS GROWING WHERE IT IS NOT WANTED.

Weeds often out-compete local, native species and are also known as invasive plants. Many plants introduced into Australia in the last 200 years are now weeds.

Weeds typically produce large numbers of seeds, assisting their spread. They are often excellent at surviving and reproducing in disturbed environments and are commonly the first species to colonise and dominate in these conditions.

A weed can be an exotic species or a native species that colonises and persists in an ecosystem in which it did not previously exist. Weeds can inhabit all environments - from our towns and cities through to our farming and bushland areas.

Some weeds are of particular concern and, as a result, have been listed for priority management or in legislation.

Throughout Australia, weeds are spreading faster than they can be controlled and management of them is consuming an enormous amount of resources. Climate change poses an additional challenge to our ability to manage weeds.

Photos: (R) Alligator Weed,
(B) African Boxthorn



NSW Department of
Primary Industries



NSW Department of
Primary Industries

SOURCE: PeeKdesigns. 2009. *My Local Creek - Teachers Guide*. Burnett Mary Regional Group.

African Boxthorn

Scientific name: *Lycium ferocissimum*

Origin: South Africa

Legislation: Declared a noxious weed in all Australian states and territories except WA. It is listed as a Weed of National Significance (WoNS).

Growth: African boxthorn forms a thick, hedge-like structure that is largely impenetrable due to its long thorns (up to 15cm) that occur at right angles along its many branches. They can grow from 3 to 6m tall and wide at the base. The flowers are 12mm in diameter, tubular at the base and consists of five white to mauve coloured petals. The leaves are about 12mm long, have a fleshy texture with often-visible signs of small hairs. They produce bright orange-red berries that range from 5 to 12mm long.



Problems it causes

The African boxthorn is highly adaptive to the Australian climate. It can store excess water in its fleshy leaves, has long thorns to prevent predation by animals, out competes native plants, degrades threatened communities by reducing biodiversity and the berries are highly attractive to birds and mammals. The berries can harbour pest insects and are eaten by foxes and birds that will spread the seeds – often, long distances from the host plant. Due to its growth habit, the thorny shrub provides shelter to feral animals like rabbits, foxes, starlings and sparrows, as well as limiting access for livestock, native animals, people and vehicles.

Control methods

Like any weed, the effective, long-term control of African boxthorn involves the combination of many different methods.

- Herbicide is used for spraying on leaves or applied when using the cut stump method - whereby the plant is cut close to the soil surface and herbicide is applied immediately to the cut surface.
- Mechanical removal (by bulldozer, stick raking or blade ploughing) of large stands of boxthorn removes the plants and their roots but can be damaging to the soil.
- Revegetating treated African boxthorn infestations with locally native plants can help by providing habitat for animals that may be displaced with the removal of the boxthorn, as well as providing competition for African boxthorn seedlings.
- Removing feral/pest animals from infested areas will help to reduce the seed carriers. Without the foxes and pest birds transporting the seeds around an infested area, then the African boxthorn is less likely to establish growth in new areas.

Alligator Weed

Scientific name: *Alternanthera philoxeroides*

Origin: South America

Legislation: Listed as a Weed of National Significance (WoNS).

Growth: This summer growing, perennial herb produces masses of creeping and layering stems up to 10m long. Over water, stems grow to 60cm high and have large, hollow internodes.



NSW Department of Primary Industries

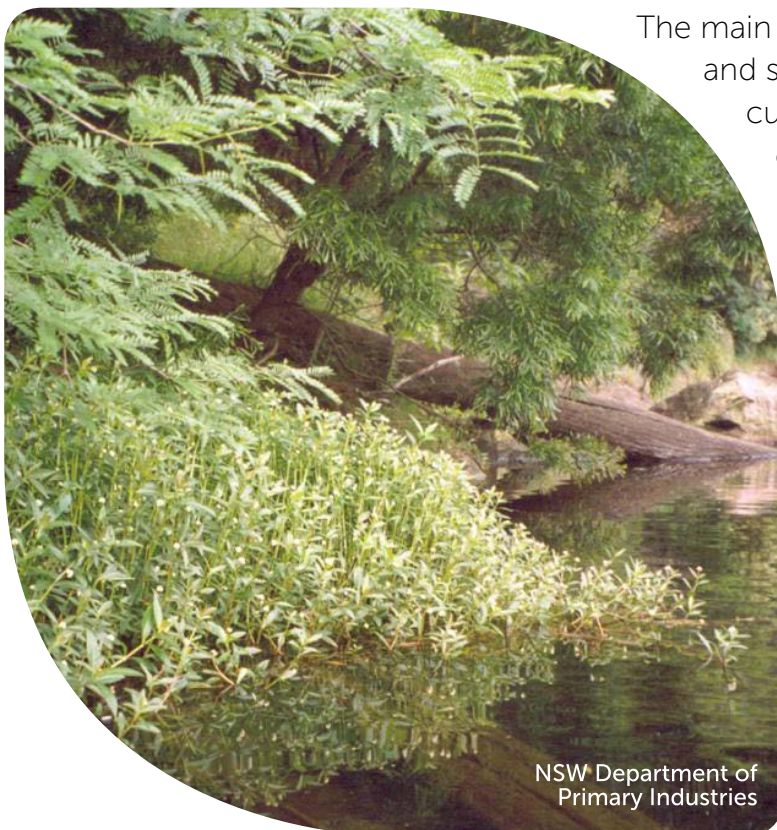
Problems it causes

Alligator weed forms a thick ground cover, competing with other organisms in both conservation and agricultural systems. It is difficult to control and seriously threatens riverine, wetland, lowlands and irrigated areas not already invaded.

Control methods

Many attempts to control Alligator weed have been tried but few have provided eradication or containment.

The three principal means of controlling Alligator weed in Australia have been chemical, biological (using the flea beetle - *Agasicles hygrophila*) and physical control.



NSW Department of Primary Industries

The main issue is that effective, affordable and sustainable control strategies are currently limited. It is difficult and costly to eradicate even small, accessible, terrestrial patches. Better management practices are essential, including an effective early detection and eradication program, to containing this weed.



NSW Department of Primary Industries

Find out more

Websites

Riverina Local Land Services	riverina.lls.nsw.gov.au
Wirraminna Environmental Education Centre	wirraminna.org
PestSmart	pestsmart.org.au
PestTales - Primary School Education Resources	pestales.org.au
FeralFocus - Secondary School Education Resources	feralfocus.org.au
NSW Department of Primary Industries	www.dpi.nsw.gov.au
Murrumbidgee Irrigation	mirrigation.com.au
Coleambally Irrigation	www.colyirr.com.au
Murray-Darling Basin Authority	www.mdba.gov.au
Weeds Australia	www.weeds.org.au

Apps

Field Guide to Pest Animals of Australia Download the app for iOS devices
<https://itunes.apple.com/au/app/field-guide-to-pest-animals/id634197149?mt=8>

Field Guide to Animals of NSW Download the app for iOS or Android devices
<http://australianmuseum.net.au/field-guide-to-nsw-fauna-mobile-app>

Weed ID: The Ute Guide Download the app for iOS or Android devices
<http://www.grdc.com.au/Resources/Apps>

People

Peter Beal, Riverina Local Land Services (Leeton office)
Tel: 02 6953 0716 Email: peter.beal@lls.nsw.gov.au

Jessica Marsh, Invasive Animals CRC (Orange office)
Tel: 02 6391 3907 E-mail: jessica.marsh@dpi.nsw.gov.au

Owen Dunlop, Wirraminna Environmental Education Centre
Tel: 02 6023 5608 Email: owen.dunlop@det.nsw.edu.au



**Local Land
Services**
Riverina