PREDATOR SMART FARMING

Modernising Australia's approach to livestock protection

HUMANE SOCIETY INTERNATIONAL
AUSTRALIA

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INTRODUCTION

Agriculture is essential to produce food and fibre. Extensive livestock grazing occurs across Australia, often in areas where dingoes live. Within these shared landscapes tensions can occur between grazing communities and predatory wildlife such as dingoes. One concern for graziers is how to keep livestock safe in an economically and environmentally viable way. To mitigate losses, many local dingo management plans aim to reduce or exterminate dingoes, yet this has detrimental ecological and social costs and can be counterproductive as a mitigation measure.

This guide introduces Predator Smart Farming that creates a win-win situation for graziers and dingoes, where livestock predation is reduced without the retaliatory killing of carnivores. Predator Smart Farming uses a variety of effective non-lethal tools and practices to protect livestock from predation risk in three main ways by using:

- **Humans or guardian animals** to supervise and defend livestock from dingoes and fencing to create a physical barrier.
- **Knowledge about dingo behaviour** to inform tools and approaches to deter dingoes from agricultural landscapes.
- **Land management and livestock** husbandry that increases the productive capacity of pastures and livestock resilience.

Predator Smart Farming aligns with what graziers and rural communities value in terms of increasing landscape and livestock resilience, secure livelihoods, productive agriculture, healthy soils and animal welfare that contributes to thriving communities. It focuses on working together to achieve multiple values and goals.

This guide aims to increase producers' skills, knowledge and confidence to adopt tools and practices that are part of a wider movement towards sustainable and high welfare animal agriculture.

This guide provides a starting point for graziers interested in adopting Predator Smart Farming practices. Section 1 provides practical information about tools and practices that either deter dingoes or increase livestock resilience to predation. Section 2 offers examples of how Predator Smart Farming has been successfully implemented by graziers across Australia and internationally.

The reputation and viability of animal agriculture enterprises are increasingly linked to issues such as environmental sustainability, animal welfare, food safety and nutrition. Consumers are demanding that food and fibre is produced in sustainable and ethical ways. Sustainable farming methods protect biodiversity by maintaining healthy ecosystems that underpin agricultural productivity.

Dingoes

The dingo is Australia's top land-based predator and is found across mainland Australia. Dingoes are a native animal of high conservation priority due to their ecological, cultural and evolutionary identity.[1] Dingoes belong to a biological family of dog-like carnivores called canids. Adult dingoes weigh between 10 and 24 kg, with variations in their colouration, diet and social organisation.[2]

Dingoes have a flexible diet that includes more than 200 species including rabbits, arthropods, birds, reptiles, possums and kangaroos.[3] When wild prey is not available, dingoes may injure or kill livestock or eat livestock that have died of other causes. There is little correlation between livestock losses and dingo abundance, particularly in areas where dingoes are not lethally controlled.[4]

Dingoes usually live in a family group that typically includes one breeding pair and their young of various ages, with group size ranging from three to 12 individuals.[5] This limits population growth and enables dingoes to perform their ecological functions and in some cases limits livestock predation.[6] [7]

Family groups maintain a distinct territory or territories within a home range. The size of the family and territory varies according to food and water resources. Top predators like dingoes self-regulate their numbers through hierarchal dominance, infanticide and territorial behaviour.

Cultural heritage of dingoes

First Nations peoples have strong belief systems that value nature. Dingoes are of cultural, social, and spiritual significance to a great many Australians, most significantly Indigenous Australians who hold kinship ties and traditional knowledge about dingoes, other native animals and the Australian landscape.

HSI Australia acknowledges and respects the deep cultural connection and coexistence between Indigenous Australians and dingoes.

Learn more at: *dingoculture.com*

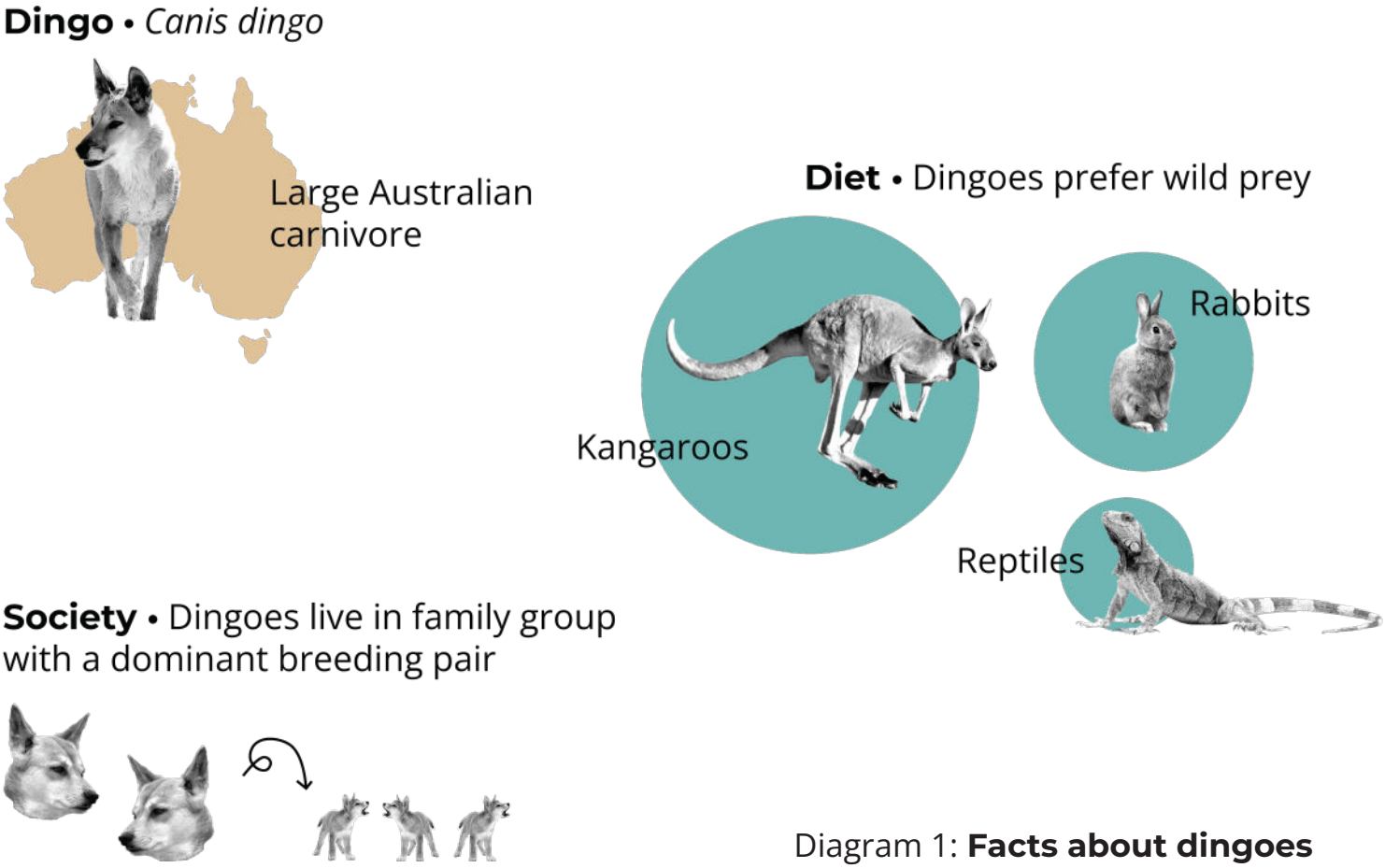

Diagram 1: **Facts about dingoes**

Can dingoes help farmers?

Predation is a natural part of the food web. Dingoes play a key role maintaining the health and function of ecosystems they inhabit. In some areas dingoes reduce the density or change the behaviour of non-native predators such as foxes and cats. This can aid the survival of small native mammals[8] and reduce fox predation on lambs, kids and poultry.

Herbivore control by dingoes allows management and resting of total grazing pressure in paddocks. This can help graziers to profit from conservative stocking densities, reducing the risk of pasture over-utilisation and degradation.

This improves both landscape and livestock health (livestock condition, weight gain and fertility due to less competition for pasture) that translates to higher financial returns.

Increasingly cattle graziers are seeing the dingo as a land management tool. Evidence from these graziers and ecologists indicates that stable family groups of dingoes can regulate the number and movement of grazing wildlife.

A group called Landholders for Dingoes combines evidence from scientific research with on-ground observations by land managers to show the benefits of dingoes across Australian landscapes: *landholdersfordingoes.org*

"Cattle producers throughout Australia should always work with the land and nature and consider the advantages of maintaining dingo family groups."

– **Gil Campbell**, cattle producer, Claravale Station, Queensland

An economic model was developed to calculate the costs and revenues associated with trade-offs between cattle density, kangaroo abundance, calf losses and dingoes. Assuming a typical stocking density for semi-arid rangelands and **an unbaited dingo population, pasture biomass would be increased by 53 kg per ha and gross margins increased by $0.83 per ha due to control of wild grazers.**

Source: Prowse, T., Johnson, C., Cassey, P., Bradshaw, C., and Brook, B. 2015. Ecological and economic benefits to cattle rangelands of restoring an apex predator

Limitation of the lethal control of dingoes

Lethal control undermines biodiversity conservation and efforts to improve landscape resilience. Biodiversity underpins agricultural production such as primary productivity, nutrient cycling, soil formation, predation and pollination.

Dingoes are killed via shooting, trapping or poisoning with meat baits. The aim is to reduce dingo numbers in the belief that it reduces livestock predation risk. Despite more than 200 years of killing dingoes, many graziers report worsening rates of predation as dingo groups become destabilised. Lethal control may relieve conflict temporarily, but new dingoes usually move into the vacated territory and, unless the root causes of predation are addressed, the cycle of loss will continue.

Ceasing dingo or wild dog control efforts and replacing them with non-lethal tools and practices can be an economical and sensible management option for graziers outlined in the case studies in section 2.

Lethal control incurs time and resource costs i.e. time spent stalking dingoes, setting up and checking traps and producing and distributing meat baits. As well as public funds spent on government run lethal programs.

Lethal control has significant animal welfare consequences. Trapping and baiting indiscriminately kills both non-target species and working dogs. Lethal control does not guarantee to reduce future livestock losses and often makes predation worse.

"Once you start killing dingoes you break up that family unit then there are all these dogs with no direction, no family constraints, they go out and form groups of young hoodlums and go around killing things. By broad scale baiting across huge areas that don't need it, we're actually creating the problem we're trying to prevent."

– **Angus Emmott**, cattle grazier, Queensland

Does killing dingoes really reduce livestock predation?

A recent study from South Australia reported that **calf loss to dingoes were higher in poison baited (20%) than non-baited areas (17%)**. The study concluded that scale and timing of foetal or calf loss was not correlated with dingo activity and that "ground baiting, as applied, was ineffective in protecting calves."

Source: Campbell et al. (2019). Dingo baiting did not reduce foetal/calf loss in beef cattle in northern South Australia

This is because baiting may kill some dingoes but not all dingoes. **Studies show increased predation by young dingoes as they recolonise bait-induced vacant territories that can lead to higher calf loss during summer.**

Source: Allen, B. L., L. R. Allen, and L. K. P. Leung. 2015. Interactions between two naturalised invasive predators in Australia: are feral cats suppressed by dingoes? Biological Invasions 17: 761–776

SECTION 1 – **PRACTICAL APPLICATIONS OF PREDATOR SMART FARMING**

Increasingly, graziers are innovating and adopting different approaches to reduce the vulnerability of livestock to all threats including predation.

Predator Smart Farming is a holistic and conscious approach to increase the resilience of landscapes, livelihoods and animals both domesticated and wild.

This section covers Predator Smart tools and practices that can be used to reduce human-dingo conflict and benefit the environment, economy, society and animal welfare.

Tools and practices are context specific, so the choice of which tools and strategies are suitable depends on the following factors:

- The number, age, health and type of livestock.
- Whether livestock are scattered or grouped together.
- Size, location and accessibility of grazing lands.
- Season.
- Frequency of direct supervision of livestock.

Diagram 2: **Three components of Predator Smart Farming (PSF)**

Table 1 details various effective tools and strategies to deter dingoes and reduce livestock vulnerability to predation risk.

A combination of tools and strategies may be most useful such as human presence, guardian animals and deterrents, especially during vulnerable periods such as lambing or calving or when dingoes are active.

Coexistence, or at least conflict avoidance, requires mutual adaptations by wildlife and humans.

Table 1: **Predator Smart tools and practices used by graziers**

Guarding livestock

Human presence and guarding

Human presence often deters dingoes and allows observation of livestock for signs of nervousness or injury, to detect and remove carcasses and signs of dingo activity e.g. tracks or howling. In large extensive grazing enterprises, human presence may not be feasible on a regular basis.

Livestock guardian animals

Guardian dogs and donkeys are effective to minimise predation from dingoes, feral dogs and foxes, as well as goannas, quolls, cats and birds of prey.

Aversive and disruptive predator deterrents

Dingoes can be wary of novel things in the landscape. Non-lethal deterrents can frighten or startle an approaching dingo to discourage them from livestock grazing landscapes.

Visual deterrents

Flashing lights or high-beam torches can deter predators at night. Automated lighting such as foxlights are battery or solar powered, turn on a dusk and emit lights until dawn. Foxlights flash randomly in three different colours and should be set up around the perimeter of the pasture. Inflatable tube men (wriggling figures around car dealerships) have loud and unpredictable movements that can scare dingoes. Fladry is a rope with suspended strips of fabric or coloured flags that move have been effectively used around calving or lambing paddocks in Canada and the USA to deter wolves.

Audio deterrents

Noise at random times from air horns, starter pistols and boom boxes can startle predators and deter them over long distances.

Olfactory deterrents

Dingoes use scent markings to send messages such as warnings to non-related dingoes, feral dogs and foxes. Human or guardian dog urine may be a deterrent.

Livestock and land management practices

Fencing

Predator-proof fencing provides a physical barrier between dingoes and livestock and prevents livestock from straying especially where it is electrified.

Removing attractants

Dingoes have a good smell and can detect rotting carcasses and prey over long distances. Hauling away, burning or deeply burying carcasses reduce attracting dingoes to your livestock. Other attractants include sick, injured or dying livestock, afterbirths, unsexed working dogs and water.

Nutrition and resources

Healthy livestock are less vulnerable to predation. A sound vaccine, nutrition and handling protocol will likely increase the health and overall resilience of your herd. Consider how to reduce the distance that livestock need to walk to access water, especially during lambing and calving. Young livestock are vulnerable to predation when separated from their mothers.

Livestock breed and temperament

Switching from smaller to large livestock will reduce predation from dingoes, as will selectively breeding cattle that exhibit strong antipredator behaviour and are amenable to herding.

Increasing vigilance and husbandry during lambing and calving

Lamb/calve closer to home in smaller paddocks for supervision and assistance with difficult labour or removal of afterbirths. Plant native vegetation (e.g. saltbush) to protect young livestock from wind, heat and cold stress. On smaller landholdings herd sheep and lambs into an electrified woven wire mesh pen at night. Keep lambing periods as short as possible (around 40 days) so young livestock mature at the same time, making them overall less vulnerable. Use guardian animals, deploy deterrents and limit young livestock grazing near forested areas.

Livestock handling and tracking

Low stress livestock handling keeps livestock calm when mustering, which reduces risk of disease and vulnerabilities. It is used extensively in Canada and the USA.[9] Counting livestock regularly is important way to detect missing or injured livestock in a timely way and take appropriate action.

Grazing management

Develop a grazing plan that reflects dingo presence and place livestock in parts of the landscape that dingoes use less or invest more heavily in non-lethal tools in high risk areas e.g. a known den site. High-density short duration grazing via herding or fencing allows paddock rest periods and bunches livestock in a herd, helping livestock to feel safe and possibly reduce predation. Effective grazing management such as rotational grazing prevents overgrazing and soil compaction that benefits soil health and pasture biomass.

Keep records

Good record keeping is a valuable tool to resolve dingo-livestock conflict. Keep record of interactions and observations to identify trends, conflict areas, losses to dingoes and vulnerable times of year to inform which strategies and tools to use to increase their success.

Technology

New technology such as drones are being used to monitor watering points and livestock to check whether livestock is bunched or spread out. Ranchers in the USA are using automated mineral bins that contain salt and other minerals to herd livestock together overnight when they are vulnerable to predation.

Livestock Guardian Dogs

Guardian dogs are medium-to large-sized dogs that live permanently alongside domesticated livestock to guard and protect them. Guardian dogs are one of the most effective ways to protect livestock and their use is becoming increasingly popular in Australia.[10]

A survey of 150 Australian livestock producers found that 65.7% of respondents reported that predation ceased after obtaining guardian dogs, with a further 30.2% reporting that predation decreased.[11]

Generally, guardian dogs are bigger than dingoes which can intimidate and deter them. Guardian dogs are used in a variety of ways such as under the supervision of a herder or owner on a small-medium farm, or working unsupervised on large rangeland enterprises in semi-isolation. The guarding ability depends on breed and training that takes the form of socialisation and bonding pups to livestock.

In Australia, the majority of working guardian dogs are the Maremma Sheepdog (see image below).

Breeds used internationally include the Anatolian Shepherd, Great Pyrenees Mountain Dog and Akbash. Guardian dogs are effective at deterring predators due to:

Territorial exclusion
Guardian dogs maintain territories around areas where livestock are grazing; through scent marking and patrolling deter and exclude predators from those territories.

Disruption
Guardian dogs detect approaching dingoes and interrupt their hunting behaviour by barking and placing themselves between the predator and livestock.

Confrontation
Guardian dogs can charge when a predator approaches livestock; violent confrontations are uncommon because predators do not want to risk being injured or killed, and over time learn to avoid a guardian dog's territory.

Photography by Andy Fitzsimon

Effectiveness of Livestock Guardian Dogs

Dr. Linda van Bommel has researched and written extensively on livestock guardian dogs. She authored a *Best Practice Manual for the use of Livestock Guardian Dogs*[12] produced by the Invasive Animals Cooperative Research Centre. This manual contains case studies on farmers' experiences with guardian dogs, how to train and bond guardian dogs to livestock and comparisons with lethal control.

The effectiveness of guardian dogs depends upon factors such as number of livestock, size of property, size and number of predators, vegetation and terrain. Extensive operations with large numbers of livestock requires more dogs than a smaller operation.

Training Guardian Dogs

How the guardian dogs are raised, handled and bonded to livestock influences how they perform as a guardian. It takes time and effort to raise a puppy correctly to become an effective guardian.

Depending upon the breed, dogs take around two years before they are reasonably mature, trustworthy and fully effective.

Place pups with the livestock species they will guard between the ages of eight and 16 weeks. Keep the pup in a small yard with between two and six individuals from the livestock herd.

The pen must have protection from the weather, a feed and watering station and an area where the pup can retreat to if the livestock get too pushy. Although guardian dogs must be fed and checked on two times per day it is best to minimise handling and stroking the pups. Increased effort to bond to livestock at this stage may make it less likely that the guardian dog will roam off the property.

Learn more from the Best Practice Manual for the use of Livestock Guardian Dogs: *pestsmart.org.au/wp-content/uploads/sites/3/2020/06/Guardian-Dogs-web.pdf*

"There is a lead-up time in which they need training and management to work properly and become effective, but then they're out there 24/7 keeping the stock safe."

– Dr. Linda van Bommel

Important considerations for Guardian Dogs

- Guardian dogs need to be feed with nutritious food twice per day either in person or with an automated feeding system in the paddock with the livestock; they require access to clean water, shelter from extreme weather, regular worming and flea and tick prevention.
- Puberty can start anywhere from six months to two and a half years and may require a larger investment in time and patience; discourage behaviour such as roaming, biting, chasing or rough play; immediately remove dogs that continue these behaviours as this is a safety risk to livestock.
- Owners may need to retrieve guardian dogs if they have roamed into a neighbouring property; de-sexing can prevent roaming.
- Talk to your neighbour about your guardian dogs especially if they bait or trap; poison baits such as 1080 will kill guardian dogs; birds or foxes can move baits and they may be consumed by the guardian dogs accidentally.

Costs of Guardian Dogs

Guardian dogs are a cost-effective way to reduce livestock losses and may indirectly improve productivity. The cost to purchase a guardian dog is around $600 plus food ($350-400/year) and costs for neutering, vet checks and vaccinations (approx. $340).[11]

The cost of purchasing and maintaining a guardian dog is usually fully offset by the values of stock saved within one to three years of the guardian becoming fully effective.[12]

"There is a clear difference in the behaviour of the livestock once they get used to a guardian dog. They become a lot less flighty, become calm and easier to handle. You can imagine if you have a flock of sheep that gets hit by wild dogs every night or even just once a week, they are going to be pretty stressed, [and] that affects productivity."

– Dr. Linda van Bommel

“My ideal team is four guardian dogs per 1,000 sheep, two dogs that stay close to the sheep, and then two roamers that work the perimeter. That’s the main protection. They’re marking their territory.”

– **Sheep producer**, Oregon, USA

Guardian Donkeys

Donkeys are effective guardians of sheep, goats and cattle. They show aggression towards dogs and dingoes and work by disrupting an attack by chasing a predator, making noise or by placing themselves between the predator and livestock. Both gelded males and female donkeys (jennies) are suitable as guardians.

The behaviour of individual donkeys and the capacity of individuals to protect livestock varies. A jenny (female donkey) with a foal is a good choice as she will guard her foal and in doing so guard nearby livestock. The presence of her foal increases her protective instinct.

Donkeys work best when they can see most of the paddock from one location. A donkey has a better chance of seeing approaching predators on a hill rather than in a valley. They are long-lived animals, with a life span of 30 years or more. Once they are trained, they provide long lasting protection for your livestock.

This echoes the experiences of innovative sheep producers in other parts of the world. For example, a sheep producer in western USA has successfully used donkeys to guard sheep against wolves, bears and mountain lions. He has also raised the various benefits of donkeys, stating:

"They've got very good hearing. They're always moving around. They're inquisitive, they're loud, they're a lot bigger than sheep."

– Sheep producer, Montana, USA

"The best donkey would bray when a predator was near. Those heifers would come crashing out of the trees, trying to get back together in a herd."

– Cattle producer, Oregon, USA

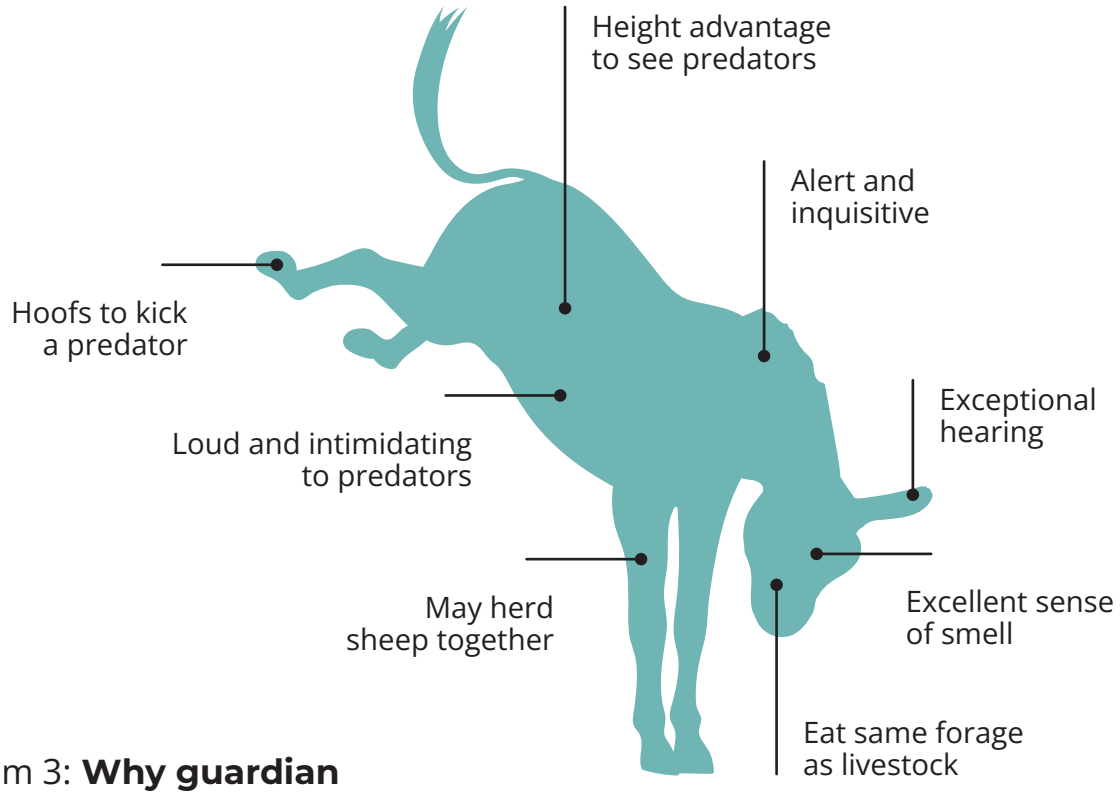

Diagram 3: **Why guardian donkeys are effective**

Determining how many donkeys are required

To determine how many donkeys are required, consider the following factors:

Type of terrain and vegetation – If the paddock is open with a good line of sight, then one donkey per 200-300 sheep can be used. In undulating/scrubby paddocks, use one donkey per 100 sheep.[14]

Size of paddocks – Donkeys will have difficulty guarding widely scattered sheep or goats. In extensive grazing situations, aim for one donkey per sheep camp.

Livestock number and behaviour – Consider whether the sheep camp in one area or split and go to multiple areas or camps. If the latter, more donkeys are needed.

Socialising and training a donkey

Donkeys need to be bonded to the livestock. Place the gelding or jenny and foal or weaner foal into a small yard along with between two to five livestock so that the donkey becomes familiarised and learns to live with other livestock. Minimise human contact during this time to facilitate bonding.

Important considerations for guardian donkeys

- A bonded donkey may harm a newborn lamb or calf as they may detect it as an intruder to the herd; exercise caution during the breeding or birthing process.
- Donkeys require routine annual worming and vaccinations for influenza and tetanus.
- Proper care is essential to minimise hoof problems; hooves should be cleaned regularly and trimmed every eight weeks by an experienced farrier.
- Donkeys require adequate shelter from rain and snow.

Guardian donkey and sheep

One Australian sheep producer with a flock of 2,500-3,000 sheep has been using 35 guard donkeys and a predator-proof fence with netting on the bottom to protect sheep from dingoes.

He notes that *"donkeys will naturally chase the dog because they view them as a predator. Donkeys are smart, aware and make a noise to alert the presence of a dingo and are constantly with the sheep. Donkeys have the same diet as a sheep, they are easy to manage. They breed easily and the donkeys seem to like living with the sheep. If we happen to lose a few less sheep every time a dog came in, or they chase the dog away, they've done their job. They're easy to manage and look after."*

While donkeys can minimise the predation risk, which can provide some peace of mind *"donkeys are another tool to minimize your losses. If the donkeys have had a chase or run of them, that is enough to deter that dog and send him somewhere else. It probably makes us sleep a bit better at night."*

Predator deterrents and using knowledge about dingo behaviour

Dingoes are curious yet cautious and suspicious of people and anything new in their territory. This is referred to as neophobia which means they react to new or strange things on the landscape and likely avoid that area in fear. Deterrents work by tapping into this fear response. **This provides negative experiences associated with livestock, so they do not associate livestock as suitable prey.**

Dingoes learn quickly and can overcome their fear of scare devices - to avoid this habituation, it is important to frequently change the location or type of deterrents in use.

Dingoes are most active in Autumn during the breeding season and in Spring when pups are born. Extra care is required to protect livestock during these periods. Observation of your local environment is key to determine if natural prey is available for dingoes such as rabbits, kangaroos and wallabies. If natural prey is scarce, extra supervision is required for your livestock.

It is vitally important to maintain the stability of dingo families. The lethal control of dingoes can destabilise a family group especially if the primary male or female is killed. Dingo family stability is key to protecting livestock. Resident dingoes can be conditioned by deterrents to avoid livestock and intact family groups exhibit territorial behaviour to exclude rival groups from invading that territory, reducing predation risk.

Removing experienced adults that can kill larger or more difficult wild prey may encourage opportunistic feeding on livestock. It seems counterintuitive, but the killing of dingoes to reduce livestock predation can increase predation risk.

Fladry is an effective non-lethal deterrent used in North America

Livestock and land management practices

Specific husbandry practices can reduce encounter rates between predators and livestock. This includes extra vigilance and husbandry when livestock are vulnerable, such as during drought when they are weakened and during lambing or calving.

It is important to ensure that young calves and lambs remain with their mothers for protection.

Livestock herding is another strategy to reduce livestock vulnerability to predation. Dingoes prefer to isolate and attack one animal and are wary of getting into a big herd, especially of cattle, as they may become injured. Strategies on smaller landholdings include tighter herding of livestock, especially with the use of night pens which work well with non-lethal deterrents.

Planned grazing strategies such as more intensive, short-term grazing have also been shown to encourage herding.

Challenges with non-lethal tools and methods

Despite global studies that indicate the effectiveness of non-lethal tools and practices, studies with dingoes have been limited to date.

Extra costs may be incurred by landholders to implement deterrents listed in Table 1, especially for smaller livestock that are vulnerable to predation. This could be overcome by greater government and industry support (financial and capacity building) to support adoption of alternatives.

Management difficulties on large landholdings are frequently cited as limiting options for adoption of non-lethal practices such as use of livestock guardian dogs.

Possible issues include landholders potentially not being able to easily locate and feed guardian dogs, although new GPS tracking technology could overcome that issue.

SECTION 2 – **CASE STUDIES IN PREDATOR SMART FARMING**

Australian case studies

Increasingly, cattle graziers are choosing not to kill dingoes due to the belief that they are essential for healthy and productive landscapes.

Two cattle graziers in Queensland and Western Australia share their stories about regenerative agricultural practices:

Angus Emmott (Noonbah Station, Queensland) – less intervention has led to less problems

David Pollock (Wooleen Station, Western Australia) – using dingoes to build landscape resilience

International case study

Predator Smart ranchers such as **Cameron Krebs from Oregon, United States of America** have switched their focus from the lethal control of predators to the core concern of maintaining livestock health and resilience.

This case study shows how proactive livestock husbandry can reduce predation risk to sheep.

Noonbah Station

Noonbah is a 52,000-hectare cattle station located 130 km south-west of Longreach in western Queensland.

The property consists of native grasslands and semi-arid Mulga and Gidgee woodlands. Noonbah is situated on an ancient flood plain in an arid landscape with an average of 300 mm of rain annually.

This station has been run by the Emmott family since 1914.

Noonbah was converted from a sheep station to a beef cattle operation in 2001. This came about due to the collapse of the Reserve Price Scheme that removed the floor price for wool, as well as a personal preference to manage cattle.

Stocking levels on the station vary from close to zero to 3,000 depending on rainfall and stock prices. The cattle graze almost entirely on native grasses, herbs and shrubs.

"We spend zero time and resources seeking to control our dingo population. The financial outcomes we obtain I believe are much better than cattle producers who spend considerable time and resources seeking to persecute dingoes.
The losses are very small."

– Angus Emmott, Noonbah Station, Queensland

Strategy to manage predation risk

When the family switched from sheep to cattle in 2001 they decided to stop killing dingoes. The benefits of ceasing lethal control took between two to five years to become apparent, as the dingoes settled into family groups and maintained territories.

The Emmotts observed a reduction in bite marks on the cattle and less calf losses. Currently, a small, stable population of three dingo families inhabit Noonbah.

The family groups are territorial, meaning they protect the property from rival dingoes and escaped pig dogs. Stable family groups are also self-regulating as only the alpha female breeds, which Angus believes keeps numbers low. Angus has not seen a fox since 2009 and says cats are present only in low numbers.

"It took a while for families to get established. There were still the odd dogs roaming here and there and they did kill calves, but after a while they actually come together and you get a male and a female form their territory and have the offspring and you've got a family unit taking an area and once you've got that, they protect that area, it doesn't grow in population except for what they breed themselves and they only, as I said, had one litter a year – not even that if it's dry."

Benefits of not killing dingoes

A key benefit has been the reduction in the number of herbivores such as pigs, goats and kangaroos. This allows the family greater control over the total grazing pressure (TGP) providing an economic advantage.

"The country is improving, you're getting more feed, you're getting better stock, you're getting better biodiversity outcomes. The gains are so great that you'd have to get a reasonable size loss to negate that. I see dingoes as crucially important for the long-term maintenance of most sustainability of agriculture but also for biodiversity conservation, for making sure our different ecosystems are functioning properly."

Wooleen Station

"I reckon my dingoes are worth $20,000 each, probably more. So killing them would be the last thing that I did."

– David Pollock, Wooleen Station, Western Australia

David Pollock is a second-generation pastoralist who runs Wooleen Station in the southern rangelands of Western Australia. The station contains a mix of vegetation types including mulga and chenopod shrublands. The climate is semi-arid, with a nominal average of 210 mm of rain annually. Wooleen is a 153,000-hectare station that has been in operation since 1886, primarily as a sheep station. The land was degraded from grazing pressure from both managed and unmanaged grazing.

Dingoes on Wooleen Station

Dingoes were eradicated from the station in the early 1900s. In 2006-07 Wooleen converted to a cattle station under the management of David Pollock and his wife Frances. They destocked to recover vegetation, especially perennial plants and grasses, to aid landscape recovery. However, grazing pressure from unmanaged grazing remained which, combined with the dry climate, made recovery slow. In 2008, David saw a dingo on Wooleen and realised that dingoes were the answer to the challenge of unmanaged grazing. Current stocking levels vary between zero to 600 head depending on rainfall and stock prices. The Pollocks trade stock, which involves buying cattle, fattening them and selling them when prices improve.

The cattle are rotationally grazed and are sustained by perennial pasture, even during droughts. They stay in a 20,000-hectare paddock for three months which has up to eight watering points. The arid environment means water quantity and quality is limited, which is the major constraint to a rotational grazing system. Breeding cattle generally limit their activity and grazing to within 10 km of available water.

Rotational grazing reduces the distance that cattle have to walk for food and water, which aids weight gain. According to David this strategy also reduces the vulnerability of the calves to dingo predation, as young calves struggle to follow their mothers for large distances while they walk to water, especially in dry conditions. Rotational grazing allows calves to remain with their mothers, who protect them from dingoes.

Rotational grazing also means that cattle are not always in the territory of the same dingo pack, which reduces the dingoes understanding that calves are possible prey.

Benefits of dingoes

Dingoes seem an unlikely ally to the good grazing that is key to successful livestock production, but David believes that they are the only viable option for lowering the pressure from unmanaged grazers.

"Without some control over the unmanaged grazers, paddocks do not get a rest in between rotations, which means the rotational grazing system can't function, because it relies upon periods of rest for the pasture to recover. Dingoes are essential for rotational grazing."

The Pollocks are accepting of the possibility that they will see some loss of production through predation, but to date they have not experienced a single predation event.

The Pollock's general philosophy is responsible and sustainable land management. In his book *The Wooleen Way*, David makes it clear that they aren't following this strategy "not because we loved dingoes, but rather because we need them as a tool to help us manage grazing pressure" (p307).

Dingo on Wooleen Station

Since dingoes have recolonised, David has noticed a recovery of trees such as she-oak, bottlebrush and river red gums which, along with valuable perennial shrubs and grasses, acts to stabilise riverbanks, thereby slowing the movement of the water through the property, retaining more water in the landscape and preventing erosion.

Despite the benefits of dingoes in the landscape, the Western Australian government policy is still focused on landscape-wide eradication of dingoes. Landholders are required to pay biosecurity levies that fund Regional Biosecurity Groups, who allocate the majority of this funding to baiting with 1080 despite the high animal welfare and conservation costs.

Krebs Ranch

Photography by Krebs Livestock

Cameron Krebs is a fifth-generation rancher that has run a successful sheep and cattle operation since 2009. Krebs grazes his livestock in eastern Oregon, USA which is home to large predators such as bears, mountain lions, coyotes and wolves.

In 2015 Cameron and his friend Shane Stevenson developed a plan of coexistence that included:

- Non-lethal deterrents such as lights, noise, guardian dogs and human presence.
- Husbandry practices to limit the encounter-rates between predators and livestock, such as tighter herding of livestock especially penning the sheep at night using a portable electrified mesh fence; reducing the isolation of young calves and lambs from their mothers; and avoidance of heavily forested areas, riparian areas or sites of known predator activity.
- Human presence is critical to observe for signs of disease, nutritional deficiencies or restlessness with increased vigilance during high-risk periods (i.e. lambing and calving).

"Sound predator management is sound animal husbandry. If you have sick animals on the landscape, you're going to have a prey. It's not about conflict avoidance, it's about reducing risk. Your animal husbandry should be the baseline, then you deploy tactics on top of that."

– Cameron Krebs, sheep and cattle producer, Oregon, USA

In 2016, losses to predators included two livestock guardian dogs, six sheep to wolves and a further 14 sheep to bears. Since implementing their plan however, predation has reduced and in 2020 only three sheep were killed by predators.

By reducing the vulnerability of livestock through husbandry you reduce the likelihood of predation.

Factors that increase the vulnerability of livestock include:

- Whether livestock are stressed e.g. lacking in adequate nutrition or access to adequate quality water.
- Exposure to bad weather.
- Diseases and predators.

Krebs has a strong vaccine and animal nutrition programs (including a sound mineral package).

Krebs focuses on maintaining appropriate body condition score: "we focus heavily on their nutritional needs to make sure that we do not have an energy shortage on that cow. You tend to see predation on calving if the cows' needs aren't met (protein and energy requirements), she's going to abandon that calf and then go meet her needs first and then come back to the calf".

Krebs utilises technology to inform his risk reduction strategies. Krebs recently developed automated mineral bin to herd livestock into larger groups, reducing the risk of predation by large predators.

He scans pregnant ewes to understand the risks and nutritional needs to inform livestock management. Krebs' livestock management gives him peace of mind and confidence, as he explains: **"predators don't keep me up at night. I run a sound non-lethal program."**

Livestock handling and training

The handling protocol focuses on low stress livestock handling that reduces risk of disease and vulnerabilities, whether that is prey, predator or disease.

Krebs also trains heifers and mother cows to not run but instead stand their ground when a predator is around.

The idea is based on studies that show that predators from the canid family such as dingoes and coyotes do not attack groups of livestock and prefer to chase individuals, and so livestock in herds are safer than individuals who run.

Other Predator Smart techniques

Training cattle to stand their ground instead of running is a key tool to reduce predation. Cattle grouping into a defensive herd provides comfort and safety when predators are near, which eliminates the flight fear response. Californian producer Mark Coats trains his cattle to form a defensive herd. His predator awareness solution covers the three things he wants cattle to learn:

The standing solution

When a single animal receives pressure, instead of running or fleeing, it will stand.

Herd awareness

Animals know where the herd is and how to return to the group for safety.

Predator awareness

This is the defensive posture of the herd against predators.

Mark starts training with a herd of replacement heifers that are unaccustomed to dogs. He uses dogs as pseudo predators and he teaches the cattle not to chase dogs, this is a tactic used by predators use to separate animals for the attack. Like good stockmanship the training is based on pressure and release.

Learn more at *rancherpredatorawareness.com*

How technological advancements can help with grazing

Virtual fencing can aid rotational or high density, short duration grazing. Virtual fencing is an electronic system that trains livestock to be confined or moved without using physical fences. It can be used to keep livestock out of sensitive riparian areas or areas that they will be difficult to muster or control. It has the potential to make livestock handling simpler, cheaper and more efficient. This technology could be applied to prevent livestock from accessing areas where dingoes frequent, however further research is needed. For example, if you know that dingoes are using a den on your property it is sensible to keep livestock away from that area to reduce the encounter rate and risk of predation. It can also be used to keep livestock away from densely vegetated bush where they may be more prone to an attack. Any technology such as this should have animal welfare considerations in mind.

Learn more at:
www.csiro.au/en/Research/AF/Areas/Livestock/Virtual-fencing

Current management of dingoes

Although dingoes are a native species, in most states landholders are compelled by law to control dingoes by designating them a declared pest or biosecurity threat. Across Australia, with the exception of Victoria, the management responsibilities for dingoes have devolved to regional-based institutions such as Local Land Services in New South Wales (NSW), Local Councils in Queensland, Landscape Boards in South Australia, and Recognised Biosecurity Groups in Western Australia.

In legislation and policy documents dingoes are referred to as wild dogs, a definition that includes roaming domestic dogs and the hybrid offspring of dingoes and dogs.

Are dingoes wild dogs?

Dingoes are referred to as either a separate species *Canis dingo*, a subspecies of wolf *Canis lupus dingo*, or as a domestic dog *Canis familiaris.*[15]

While all canids share genetic similarities, modern genetic testing indicates that dingoes, wolves, and dogs are readily distinguishable from one another.

Canids can interbreed which is a process referred to as hybridisation. Dingoes and dogs share common features, yet dingoes are distinguished by particular genetic features that enable them to survive in the wild. This includes a head that is wider than its body, a narrow chest and anatomy to enable movement over long distances and flexible joints that assist with hunting.

In contrast, domestic dogs have been altered to the extent that they are largely unable to successfully persist in the wild. New research is showing that hybridisation between dogs and dingoes in Australia appears to have been overstated. Dr. Kylie Cairns analysed DNA samples over 5,000 wild canids and found just 31 were feral dogs, 27 were likely dingo-dog hybrids and the rest were dingo.[16]

Contrary to widespread beliefs, this study shows that feral dogs and hybrids are rare across mainland Australia and that interbreeding between dingoes and dogs occurs infrequently.

With stable dingo groups, unrelated canids such as other dingoes or dogs are rarely able to successfully join an existing pack.

SUMMARY

The Predator Smart tools and practices outlined in this guidebook can reduce the indiscriminate killing of dingoes, allowing them to form stable family groups that can lessen threats from hybridisation, reduce livestock predation and capitalise on the ecological, social and cultural benefits of dingoes.

This guide provides examples of evidence-based non-lethal solutions to protect livestock and carnivores; informs innovative policies and practices; and identifies pathways towards coexistence in ways that are beneficial for people, animals and the natural world. Global advances in Predator Smart Farming methods offer hope and inspiration.

Adoption of Predator Smart Farming is an important step towards more ecologically sustainable agriculture and can help change our relationship to the dingo from conflict to coexistence.

More research and collaborations to co-produce research investigating the efficacy of Predator Smart Farming across a range of cattle or sheep grazing and different ecosystems is needed.

Humane Society International is interested in talking to landholders who wish to innovate and trial these strategies.

For more information about research opportunities, please contact:

Louise Boronyak
lboronyak@hsi.org.au

Photography by Jim Oatley

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Disclaimer

“It's surely our responsibility to do everything within our power to create a planet that provides a home not just for us, but for all life on Earth."

– Sir David Attenborough

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