WESTERN AUSTRALIAN WILD DOG ACTION PLAN 2016 – 2021

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Prepared by the WA Wild Dog Action Group
with support from the Department of Agriculture and Food WA

Foreword

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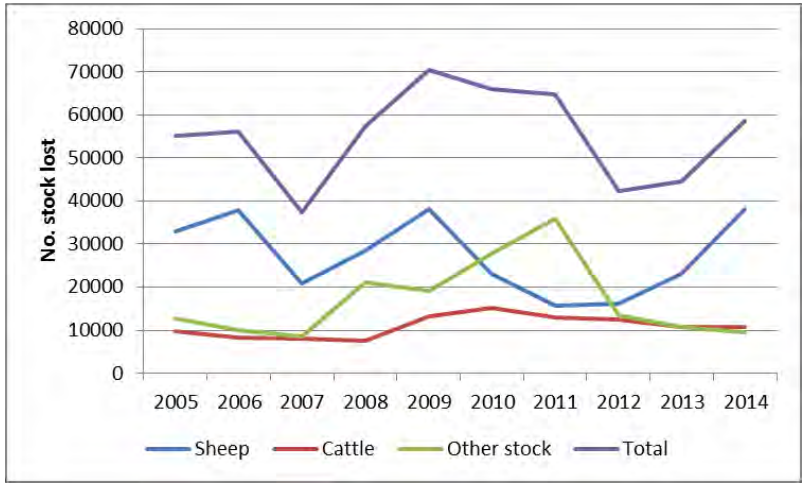
Chair - Wild Dog Action Group

Pastoralism is attracting renewed interest and investment in Western Australia, with growing Asian demand for meat driving market development and production improvements. At the same time the industry is emerging from a seriously challenging decade impacted by seasonal and market conditions and a major disruption to the live export trade.

Increasing pressure from wild dog predation has had a profound impact on stock production in some regions, and is recognised as a serious challenge for livestock producers from the Kimberley to Esperance as indicated in the Pastoral Lands Board reports on stock losses (see graph).

Producers and government have made significant investment in resources and effort to address the wild dog problem, but with the impact continuing to escalate there has been broad recognition of the need for greater coordination and a revision of the State's plan for wild dog management.

Reported stock lost to wild dogs across the rangelands of WA



Source: PLB Annual Returns

In July 2015 the Department of Agriculture and Food facilitated stakeholders to form the WA Wild Dog Action Group to oversee development of a new plan. I thank the Action Group members for their time and contribution to building the plan and keeping it relevant to all regions. Their passion and commitment to the pastoral and agricultural industries was invaluable to this process.

The WA Wild Dog Action Plan has had a very large amount of effort put into it with great work from Ag*knowledge*® to ensure broad stakeholder consultation and sound research and economic input to build a practical plan with direction on investment and implementation.

I believe this plan has addressed the short term concerns very well with key strategies in place and achievable recommendations that can be acted on with confidence. Ninety per cent of the concerns expressed at the Action Group meetings, along with those voiced during the industry consultation phase, have been addressed with a clear understanding of who the stakeholders are and what is expected from them going forward.

There is also a need for all industries 'inside' the State Barrier Fence to recognise, participate in and contribute to the growing problem of wild dog incursion.

Development of this plan has highlighted the need for further work to be undertaken on the longer term strategies and options for Western Australia's pastoral areas, particularly the Southern Rangelands, Meekatharra and Kalgoorlie. The work completed on the Benefit Cost Analysis of wild dog control options has provided an economic model for determining a direction for future spending in this plan, but it has also highlighted that more work needs to be done on analysing the contribution of these regions to the State on the economic, environmental and social levels.

Research to identify a broader assessment of the value associated with the rangelands and their management by landholders is important because as the commodity cycles revolve and the seasons fluctuate it is critical regions are not undervalued in their contribution or their requirement to spend capital in readiness for the next upswing when they are able to reach their full potential.

Addressing wild dog impacts with a coordinated and well-resourced plan is key to revitalisation of the livestock industry and this plan provides the strategy and confidence for industry to position itself for leadership on this issue.

Contents

Appendices

Acronyms:

ABARES - Australian Bureau of Agricultural and Resource Economics and Sciences
ABS - Australian Bureau of Statistics
AWI - Australian Wool Innovation
BCA - Benefit Cost Analysis
BCR - Benefit Cost Ratio
BG - Biosecurity Group (term describes RBGs and DSGs)
CSG – Controlled Species Group
DAFWA - Department of Agriculture and Food Western Australia
DPA – Declared Pest Account
DPaW - Department of Parks and Wildlife
DSG - Declared Species Group
IACRC – Invasive Animals Co-operative Research Centre
LPMT- Licensed Pest Management Technicians (Doggers)
MLA – Meat and Livestock Australia
MRVC – Murchison Regional Vermin Cell
NWDAP – National Wild Dog Action Plan
PLB – Pastoral Lands Board
RBG - Recognised Biosecurity Group
RDCs – Regional Development Commissions
R4R – Royalties for Regions
SBF- State Barrier Fence
WAWDAG - Western Australian Wild Dog Action Group

Front Cover photo – Source: M Kennedy

Western Australian Wild Dog Action Plan 2016-2021

Overview

The Wild Dog Action Plan 2016 - 2021 is an industry driven plan that considers the economic, environmental and social impacts of wild dogs and identifies key issues for managing them throughout Western Australia. The Plan is designed to protect the livestock industries and public safety, and recognises the ecological and cultural values of the dingo.

The Action Plan will coordinate the control of wild dogs by developing partnership arrangements between industry, Biosecurity Groups, Government and the community to deliver a sustained, whole-of-industry benefit.

The objective is to reduce the impact of wild dogs on agricultural production and biodiversity by 10% per annum, and to target control systems appropriate to the wild dog pressure in a local area and impact on assets in that area.

Recognising the need for the agricultural industry to take responsibility for long term management and with community consent on the need for action, the Action Plan highlights investment in developing the capacity of industry to manage the wild dog impact. Biosecurity Groups will lead integrated management programs to protect agricultural production and biodiversity.

The Action Plan will be driven by a representative group, the WA Wild Dog Alliance, to support Biosecurity Groups to assume leadership of wild dog management.

The State Barrier Fence (SBF) is a central focus of the Action Plan with a completed and maintained fence that retains its integrity, and a concerted effort to remove wild dogs inside the SBF to provide confidence to livestock production and investment.

A collaborative investment model will be used to demonstrate how barrier and exclusion fencing in concert with market supply chains can work together to revitalise effective production systems in the Southern Rangelands.

The key actions to support wild dog management in Western Australia to deliver improved control and increased confidence for industry and government to invest include:

- Establish the WA Wild Dog Alliance to provide integration and alignment of the WA Biosecurity Groups and the National Wild Dog Action Plan (NWDAP).
- Invest in efficient management of Biosecurity Groups to ensure coordinated and cost-effective wild dog management in each region.
- Complete the Esperance Extension to the SBF.
- Repair and replace 405km of the existing SBF with shared funding from Federal and State Governments.
- Commit to a handover for maintaining the integrity of the State Barrier Fence by investing in maintenance for the next three years while the Wild Dog Alliance determines options for assuming full responsibility.
- Invest in funding Licensed Pest Management Technicians (LPMTs) for a further four year period to assist in a concerted effort to manage the wild dogs.
- Recognising the already significant public and private investment, develop co-funding investment models for barrier fencing in strategic regions of WA including a pilot supply chain production cell, and alternative funding models for future investment capitalising on the long term strength of livestock markets.
- Additional funding to support identified gaps in research and development including surveillance technology.
- Develop a communication and engagement plan to support delivery and participation in the WA Wild Dog Action Plan.
- The Department of Agriculture and Food WA's (DAFWA) role with the Wild Dog Action Plan will be as a significant member on the Wild Dog Alliance, and it remains the responsible authority for managing the benefits and compliance of the *Biosecurity and Agriculture Management Act 2007*.
- There is an expectation that the National Metrics program being developed by the NWDAP and the integration of the *Feralscan* monitoring package will allow complete analysis and review of the ongoing investment.

Executive Summary

The Wild Dog Action Plan 2016 – 2021 is an industry led and driven plan that considers the economic, environmental and social impacts of wild dogs and identifies the key issues for managing them across Western Australia. The plan is designed to protect the livestock and tourism industries and public safety, and recognises the ecological and cultural values of the dingo.

Landholders and government are making a significant investment in resources, time and effort to control wild dogs and this Action Plan aims to ensure future effort is both targeted and effective. The intent is to provide leadership and coordination for all the stakeholders across landholders, biosecurity groups, and agencies to get traction on effective control.

Wild dog management is complex and demands a balance between the economic drivers to reduce wild dog impact on livestock enterprises in the pastoral and some agricultural areas, with the conservation values of the dingo and community expectations of humane treatment of all animals.

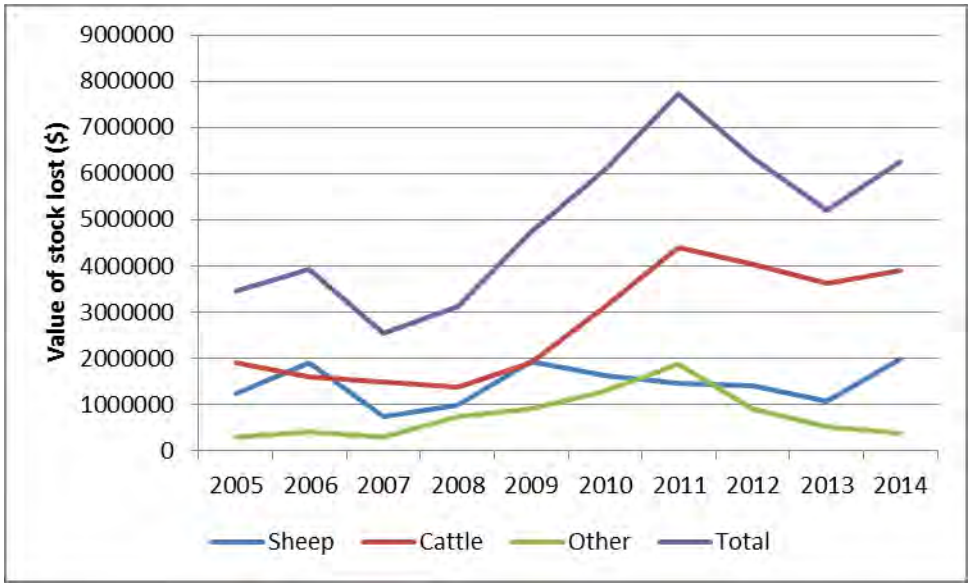
For several decades wild dogs have been largely excluded from the agricultural region of WA by effective control campaigns. However, in recent years wild dog impacts on small stock have increased in the pastoral and agricultural regions, including at the agricultural/pastoral region interface.

The extent of the economic losses due to wild dog predation is difficult to quantify, particularly under the extensive rangeland grazing conditions in Western Australia. The Pastoral Lands Board annual returns from 2007 to 2014 show an increase in stock losses from $2.4m to over $6.0m across the WA Pastoral Region.

In addition to direct impacts of predation, wild dogs can transmit endemic diseases like hydatids and would transmit exotic diseases such as rabies that can affect livestock, pets, native animals and humans. The impact of these diseases spread by wild dogs is difficult to quantify.

Wild dogs can have significant social impacts, causing considerable stress to individuals and communities affected by wild dogs. These impacts may include anxiety, sleep disruption and conflicts between community members.

Reported increasing financial loss from wild dogs in Western Australia



Source: Pastoral Lands Board Annual Returns

Emerging issues such as increased globalisation of trade, technological advances, increasing invasive populations, peri-urbanisation, changing climatic conditions, increased commercial use of pests, and social attitudes regarding animal welfare, will also affect the future management of pest animals.

The WA Wild Dog Action Group drew together private and public stakeholders to guide development of the Action Plan and set the direction and priority for investment, and adopted eight key principles to guide future investment and action. The guiding principle is for **targeted management to identify priorities for asset protection with management responses that are appropriate to the value of the asset to be protected.**

The investment in wild dog management in WA is estimated to be in excess of $10m per year. This cost is balanced against a range of economic activities including agricultural production, tourism and mining.

The two major livestock industries contribute $1.5 billion annually to the State's economy. While the WA sheep flock has been in decline since the collapse of wool prices in the early 1990s, there is an identified opportunity for growth in sheep production driven by growing global demand for high quality protein, and the industry is looking to rebuild to take advantage of improved profitability.

There is no tolerance for wild dogs in small livestock production due to the destruction they cause in direct attacks on lambs and adult sheep, and the production impacts from mis-mothering and stress on the mob.

In the southern rangelands the economic reality has combined with increasing wild dog predation and rangeland condition impacted by poor seasons and previous grazing pressure to remove sheep from many pastoral operations and areas. Pastoralists will need to gain confidence that there is both effective wild dog control and profitable new supply chains for sheep production to reinvest in the rangelands sheep industry.

Cattle enterprises across the northern and southern rangelands have reported significant and increasing levels of damage and losses from wild dogs. Calves are particularly succeptible to attack, while attacks on adult cattle may not be lethal but significantly impacts their productivity. The costs flow through to the processing sector with bite marks and scarring downgrading carcase values.

WA has a unique and internationally recognised biodiversity. There is recognition of the cultural and conservation value of the dingo within the conservation estate. There is also acknowledgement of the need to consider a range of values in the landscape including ecological, wildlife movement, cultural and heritage values. Conservation of dingoes is considered an important conservation goal.

For livestock producers the key is to manage the clear risk of continuing encroachment of wild dogs into the agricultural regions that is disrupting livestock production, and potentially stifling investment in the rangelands for both small and large livestock by impacting on the confidence to capitalise on the identified opportunities of meat exports to meet growing demand from south east Asia.

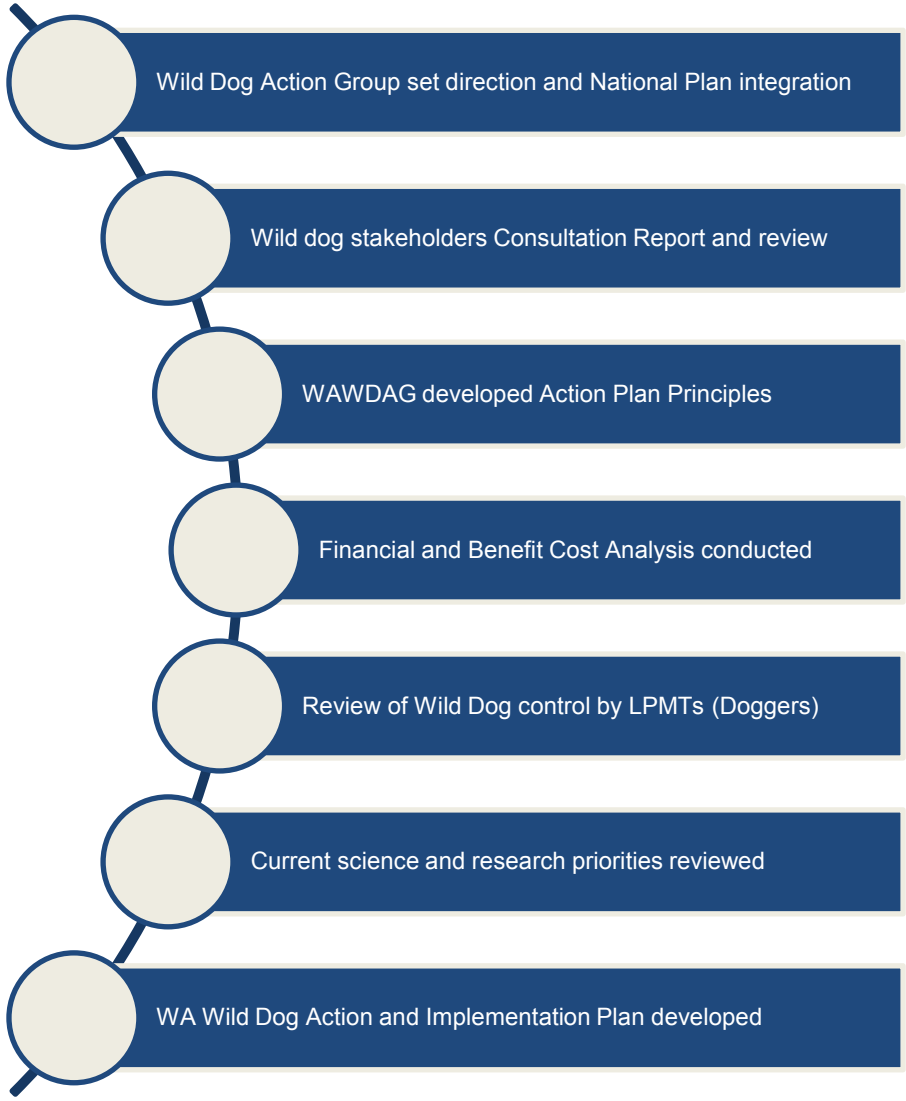
The balance for this plan is to understand and manage the needs of other landholders who have a different expectation for land use which is not necessarily impacted by wild dogs.

The network of stakeholders in wild dog management in WA:

The WA Wild Dog Action Plan was facilitated by Ag*Knowledge* and DAFWA working with the WA Wild Dog Action Group (WAWDAG) and it was built on an evidence-based framework to establish the best input from science, economics and the experience of the network of stakeholders impacted by wild dogs.

- *Literature review* - an extensive review of the literature, research, strategic plans and media coverage was distilled into a succinct overview of the key issues to inform development of the Action Plan, together with a scan of the current investment in wild dog management by all stakeholders.
- *Scientific basis* - a vast body of research was reviewed and distilled into an overview of the current science on wild dog management. Led by DAFWA Research Officer Dr Malcolm Kennedy, the review ensures there is integration with current activities and research investment so there can be direct linkage with other bodies at a National and State level for current and future research opportunities.
- *Economic analysis* - to provide an estimation of the cost effectiveness of various options for wild dog management Dr Elizabeth Petersen of Advanced Choice Economics worked with Ag*Knowledge* to complete a comprehensive Benefit Cost Analysis. Comparison of the return for investment across options and regions provides a means to calculate the effect of these measures on the gross margin of the livestock enterprise for each region. The information from this analysis assisted in prioritising decisions in the WA Wild Dog Action Plan 2016 - 2021.
- A study was undertaken on the benefit cost equation of the State Barrier Fence and its maintenance cost, and considered in the Plan.
- *Case studies* that examine existing barrier fencing projects are provided for some 'ground truth' on previous investments and the outcomes and key learnings to inform future investment in fencing projects.
- *Stakeholder consultation* - the project mapped the range of stakeholders and then conducted consultations to identify their issues and priorities and their views have underpinned a significant part of the Action Plan.
- Ag*Knowledge* completed a review of the Royalties for Regions funding of the equivalent of eight full-time Licensed Pest Management Technicians (LPMTs), commonly known as Doggers, to help address gaps.

Development of the WA Wild Dog Action Plan:



Key findings

Private, public and industry funds are invested in a range of measures to address wild dog impacts in WA. Despite the investment of time, money and resources on wild dog control measures, there is broad consensus that the wild dog problem and its impact on livestock industries is escalating in WA.

There are major gaps in data on the number, distribution and impact of wild dogs across WA. There has been limited monitoring and evaluation of past control efforts to quantify the effectiveness of different control strategies and methods. Recent modelling suggests in the absence of extensive wild dog control regimes within the agricultural area of WA (inside the SBF), populations of wild dogs will continue to increase in abundance and distribution.

Effective wild dog control involves integration of a suite of control techniques including trapping, shooting, fencing and 1080 baiting. Use of 1080 baiting provides one of the most efficacious means of controlling wild dogs on a broad scale. Community understanding of the need for integrated controls is important to develop.

The implementation of control techniques in a landscape-scale regime is critical to maintaining small stock. Given that wild dogs move across property and tenure boundaries, effective control is difficult and costly. *The Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated Regulations prescribe the responsibility for controlling declared pests to land owners, occupiers and managers.

Exclusion fencing provides a physical barrier allowing wild dogs to be controlled and landholders can work back from it. A fence on its own will not stop wild dogs; it requires vigilance, investment of funds, time and effort to support it with buffer baiting and a co-ordinated effort on internal dog control.

There is a renewed national effort to manage wild dogs with the National Wild Dog Action Plan launched in May 2014 and Federal funding announced to support its implementation. WA needs to identify how it can engage and participate in the national effort.

The WA Wild Dog Action Plan needs to recognise, encourage and work with existing local efforts and allow for local priorities and capacity to deliver regional efforts to manage wild dogs.

The Wild Dog Action Plan at a glance

The **Vision** for the Western Australia Wild Dog Action Plan is that the impact of wild dogs is minimised with broad social consent in identified high risk areas enabling revitalisation and long term growth of pastoral, agricultural and tourism industries.

The **Purpose** of the Western Australian Wild Dog Action Plan is to coordinate the control of wild dogs by developing partnership arrangements between industry, biosecurity groups, government and the community to deliver a sustained, whole-of-industry benefit.

The **Objectives** of the Action Plan are:

1. Target control appropriate to the local area and wild dog pressure, determined by impact on assets.
2. Reduce the impact of wild dogs on agricultural production and biodiversity by 10% per annum.
3. Biosecurity Groups are responsible for ongoing integrated control to protect agricultural production and biodiversity.
4. Develop the capacity of industry to manage the wild dog impact with identified public support.

Key benefits of the WA Wild Dog Action Plan:

- ✓ An industry-led plan providing strategic direction and practical actions.
- ✓ Implementation and support mechanisms are resourced to ensure delivery.
- ✓ Planned future infrastructure investment decisions are based on value of the asset to be protected, as well as economic, scientific and environmental considerations.
- ✓ Clarity on the future role of government in wild dog management.
- ✓ Integration with national funding, research and planning efforts.
- ✓ Priority for future investment has been identified.
- ✓ Recognition of the broader regional benefits from better coordination of wild dog management through economic activity, employment, human safety and amenity.

Priorities and recommendations for implementation

Bold new approaches are needed to address the escalating wild dog issues confronting Western Australia at economic, social and environmental levels. The following priorities will drive change in the implementation mechanisms for wild dog management:

1. Industry sets the priority and strategy for wild dog control: those with the greatest investment in this issue will provide leadership and collaboration across the stakeholder groups to drive the WA Wild Dog Action Plan and Implementation. The governance structure required to give oversight to this investment portfolio will include representation from the major stakeholders.

   Recommendation 1: Establish the WA Wild Dog Alliance as the State lead body and integrate actions with the WA and National Wild Dog Action Plan.

   Recommendation 2: Invest, via the Boosting Biosecurity Defences Royalties for Regions (R4R) project, in efficient and effective management of Biosecurity Groups to ensure coordinated and cost-effective wild dog management in each region.

2. Biosecurity groups and landholders are recognised, resourced and supported as the critical front line in wild dog management: ownership of the Wild Dog Action Plan and engagement of all landholders regardless of industry or activity, to participate in its implementation at the local level is imperative. Wild dog management is recognised as a cost of production, but with groups and landholders under extreme pressures measures will be put in place to ensure they can physically and financially deliver on the expectations.

   Recommendation 3: Recognised Biosecurity Groups (RBGs) review how to optimise funds raised via a Declared Pest Rate that is matched by the State Government. The funds are held in the Declared Pest Account (DPA), which is managed by DAFWA. The Government matched contribution via the DPA by providing financial assistance to RBGs for the control of declared pests and will be the State's recognition as an across tenure approach.

   Recommendation 4: Investigate the use of the Industry Funding Schemes as authorised under the Biosecurity and Agriculture Management Act 2007 (BAM Act), whereby producers can raise funds to tackle priority pests and diseases.

3. A collaborative partnership model between the private sector and all levels of government to ensure targeted actions are directed for greatest effect through least cost delivery models: sound economic analysis balanced with solid evidence and current science will build confidence in investment decisions for greatest benefit over time, beyond political cycles. Through the NWDAP and State Government linkages, ensure WAWDA is aware of all opportunities and not compromised from applying for further funding.

   Recommendation 5: Biosecurity Groups will use relevant best practice management as determined by local, economic, animal welfare and technical evaluation, and is consistent with national or other relevant codes of practice

   Recommendation 6: R4R continue to invest $3.0m towards additional LPMTs over the next four year period with the understanding that the RBGs by then will have reached a level of self-funding, and identified alternative funding models and management.

4. Capacity / skills development / participation: frontline delivery of action on wild dogs is the responsibility of the landholder and it is a priority to support them with coordinated group activities to encourage participation and ongoing capacity building so they have the skills, confidence and linkages to maintain the effort.

   Recommendation 7: Coordinated by the WA Wild Dog Alliance, develop a state-wide engagement and training program for land manager adoption of current wild dog management best practice. Include a clear understanding of the statutory obligations for wild dog control under relevant legislation.

5. Clear investment priorities will enable implementation: to direct investment and resources to have greatest impact at the local landscape level.

   Recommendation 8: Complete the State Barrier Fence (SBF) by completing the Esperance Extension, funded by a R4R grant of $6.5m.

   Recommendation 9: Repair and replace 405km of the SBF with State Government funding.

   Recommendation 10: Maintaining the integrity of the SBF is a priority. R4R to fund $600,000 per annum for maintenance for the first three years by which time the Wild Dog Alliance will have determined alternate funding sources to maintain the fence.

6. Private investment of individuals in fencing to exclude dogs is recognised. In support of this investment, new funding models will be developed to sustain wild dog management investment over time: which may include public/private partnership models, use of co-operative models for infrastructure development, collaboration on national funding and research priorities in WA, broader industry and/or community contribution to recognise the importance of wild dog management to the State.

   Recommendation 11: Development of Exclusion or Cluster fencing including co-funding investment models for cell fencing in strategic regions of WA.

   Be prepared to identify competitive co-funding opportunities when funds are made available (i.e. future cluster/cell fencing).

   That the WA Wild Dog Alliance makes available a contestable fund of $1.5m to support initial cell proposals. The optimal cell size is considered to be a neighbouring group of landholders who would benefit in reasonably equal proportion from an exclusion fence and where landholders are willing to commit to contribute at least 50% of the construction cost and all of the on-going maintenance and replacement costs.

7. Research, monitoring and evaluation will guide future investment decisions: to address current gaps in data and science investment will be made in systems and research that measures impact to provide greater confidence in investment decisions and priorities. Innovation and technology will be harnessed for more effective control.

   Recommendation 12: Leverage WA funds to support and work with the National research gap analysis plan and the National Metrics program. This work will be directed through the WA Wild Dog Alliance.

   Recommendation 13: DAFWA, where practical, will develop capacity to manage the compliance measures as identified in the BAM Act.

   Recommendation 14: Feralscan will be the medium for management activity and reporting.

8. Broader benefits of wild dog management will be recognised in investment decisions and future funding models: acknowledging that the broader agricultural industries, tourism, mining, nature conservation groups, the community, environment and the State have a vested interest in more effective management of wild dogs.

   Recommendation 15: Environmental values will be incorporated into management strategies to preserve the genetic integrity of the dingo as part of the Australian conservation estate. Impacts on other species and the landscape will be considered in managing wild dogs.

   Recommendation 16: Cultural values will be incorporated into management strategies to respect the Aboriginal cultural connection to the dingo.

9. Communication will build shared understanding and ownership of the wild dog problem and engagement with the WA community to support future efforts: build on effective programs and information developed by relevant research organisations (e.g. the Invasive Animals CRC).

   Recommendation 17: Develop and deliver a comprehensive engagement strategy to improve participation of all landholders to become involved in the control program, and provide education and information for the community and tourists.

The WA Wild Dog Action Group urges industry, government and the community to align with the WA Wild Dog Action Plan and collaborate to ensure maximum impact from the effort and investment made to address the wild dog problem in Western Australia.

Benefit Cost Analysis of Wild Dog Management Options in Regional Western Australia

To provide an estimation of the cost effectiveness of various options for wild dog management in the pastoral and agricultural regions of Western Australia Dr Liz Petersen of Advanced Choice Economics worked with Ag*knowledge* to complete a comprehensive Benefit Cost Analysis (BCA). A BCA was conducted for ten regions within Western Australia, designed around the Biosecurity Groups.

The benefit cost ratio (BCR) is an indicator of the return on an investment and reflects the amount of money a management option returns for every dollar spent. Comparison of the BCR across options and regions provides a means to prioritise management options according to value for money.

A range of different wild dog management scenarios were considered for each of the ten regions founded on a baseline for understanding the change in economic returns generated by current and proposed wild dog control activities. Best practice use of Licensed Pest Management Technicians (LPMTs or doggers), and aerial baiting is included in each of the options where appropriate.

The options include: a fully maintained State Barrier Fence (currently the fence is under-maintained), the proposed Esperance Extension to the State Barrier Fence, the Murchison Regional Vermin Cell, the Goldfields Biosecurity Cell, and the use of additional surveillance technology.

Management of wild dogs is assumed to affect the profitability of livestock enterprises by reducing livestock deaths, increasing lamb/calf weaning percentages, and allowing increased stocking levels in each region.

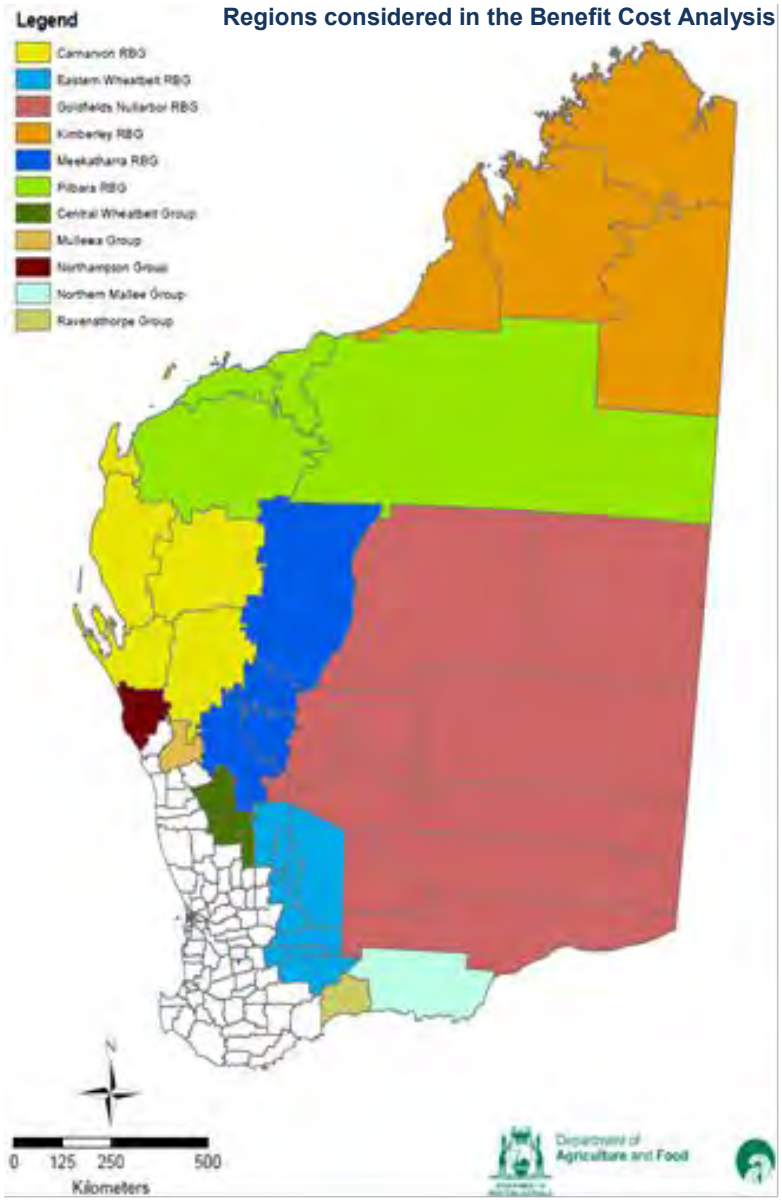
The benefit of wild dog management is estimated by calculating the effect of these impacts on the gross margin of the livestock enterprise for each region.

The information from this analysis has assisted in prioritising decisions in the 2016 Wild Dog Action Plan for Western Australia.

An overview of the Benefit Cost Analysis is provided later in this report. Details of the analysis (Management options, State Barrier Fence and Licensed Pest Management Technicians) are included in associated spreadsheets, available on request.

The BCA results are current as at April 2016. It should be noted that as change in control measures are implemented and come into effect the assumptions and modelling require re-evaluation. Sound input data will enhance better decisions.

Regions considered in the Benefit Cost Analysis



Returns to investment by proposed wild dog management activities

Western Australia currently spends approximately $8.8 million/year of private and public funds on wild dog management. The current cost of maintaining the 1,170km State Barrier Fence is approximately $171/km for a total maintenance cost of $200,000 per annum.

A **fully-maintained SBF** at a cost of $500/km to maintain could be expected to cost $600,000/year (an additional $368,000/year on current spending) and combined with other controls, it is estimated this would allow landholders to increase stocking rates by 5% compared with the current level of maintenance.

Completion of the proposed **Esperance Extension** is expected to require an construction cost of $12.5m (670km at $18,400/km) and an upfront property redevelopment cost of $6.7m across the whole region. Annual costs thereafter would include a $166,000/year landholder management cost (across the whole region) and $533,000/year in RBG management costs. Maintenance would be $500/km/year for the fence, accruing after 10 years.

The proposed Esperance Extension would allow landholders to increase current stocking rates by 10 per cent for sheep in the Ravensthorpe DSG (the SBF borders half of this region, with largely successful LPMT activities currently preventing most wild dogs from entering around the fence) and by 40 per cent in the Esperance DSG.

The Esperance Extension to the State Barrier Fence is expected to have a good return to investment (BCR = 6.6 and 4.8 in the Ravensthorpe and Northern Mallee regions, respectively).

The proposed **Goldfields Biosecurity Cell** (2.2m hectares of grazing land) is close to the modelled optimal size for cell fencing in this region as the region has the potential to increase carrying capacity sufficiently to allow a return to investment (BCR = 1.5).

The proposed **Murchison Regional Vermin Cell** (6.4m hectares of grazing land) is expected to provide a BCR = 1.5.

Current wild dog management activities in the Kimberley and Pilbara regions are estimated to have very good returns to investment (BCRs = 5.1 and 4.3 respectively). Management in these regions is focussed on aerial baiting at relatively low cost compared with the cost of management activities in other regions. Benefits are also relatively low, but far exceed the costs.

Current wild dog activities in the agricultural regions (focussed on the State Barrier Fence in all regions except the Northern Mallee) also have strong returns to investment (BCRs = 2.5 to 8.9).

Current management activities in the southern rangelands (Carnarvon, Meekatharra and Goldfields Nullarbor) deliver returns that are on par with other regions (BCRs = 1.5 – 1.8) with relatively high costs of activities by Licensed Pest Management Technicians over large areas.

Additional surveillance activities are also expected to provide strong returns to investment due to the relatively small cost of adopting proposed activities.

Priorities for future investment in wild dog management activities

The BCA results suggest that the priorities for investment in wild dog management could be:

- Invest in efficient and effective management of regional groups to ensure coordinated and cost-effective wild dog management in each region,
- Ensure the State Barrier Fence remains fully maintained into the future,
- Complete the Esperance Extension to the State Barrier Fence,
- Invest in additional surveillance technology, and
- Consider co-funding investment models for cell fencing in strategic regions of the pastoral zone of Western Australia.

Principles of the WA Wild Dog Action Plan

The WA Wild Dog Action Group adopted the following principles to guide future investment and action to manage wild dogs, informed by current research, broad stakeholder consultation and the benefit cost analysis.

1. **Targeted management**

   Wild dog management is integral to the management of natural resources to benefit the economy, the environment, community safety and amenity.

   Western Australia's strategy for managing wild dogs is focussed on targeted control appropriate to the local area and wild dog pressure, determined by impact on the assets to be protected.

   For example: the direct threat to small livestock by wild dogs inside the State Barrier Fence is a high priority for a coordinated campaign aimed at eradication of wild dogs.

2. **Coordination**

   Wild dog management requires shared solutions and coordination amongst industry and land managers, in partnership with all levels of government and the community - with a common sense 'no boundary' (nil tenure) approach and delivered at the local level.

3. **Shared responsibility and accountability**

   Managing wild dogs requires leadership and engagement from those with 'skin in the game' to invest in maintaining vibrant industries, and with a clear understanding of the roles, responsibilities and accountability under the BAM Act.

4. **Co-investment**

   Co-investment in the industry driven Action Plan moving within five years to a focus of self-reliance based on sound infrastructure, and clear systems for governance and funding between affected industries and the public sector.

5. **Proactive management to reduce impact**

   Setting strategic direction and priorities for and investment in wild dog management will be based on sound business analysis demonstrating potential for return on investment to achieve a balance between efficacy, humaneness, community perception, feasibility and emergency impact needs.

6. **Research and monitoring**

   The development, monitoring and review of integrated wild dog management strategies needs to be underpinned by science and measurable information which in turn will provide confidence to all parties for continued investment and support.

7. **Capacity development**

   Effective wild dog management requires capacity-building across industry, land managers, government and the community.

8. **Communication**

   Effective and collaborative communication and education will optimise public and community understanding of competing interests, interaction and support., and will assist to inform any future incentives.

Wild dogs collectively refers to feral domestic dogs, dingoes and dingo-dog hybrids. Dingoes, feral dogs and their hybrids are declared pests in Western Australia under section 22 of the *Biosecurity and Agriculture Management Act 2007*.

In WA the dingo is classified as an unprotected native species under the *Wildlife Conservation Act 1950*.

The conservation of the genetic purity of the dingo is key to preserving its cultural significance. Dingoes are woven into the fabric of aboriginal life, law and culture (Phelan 2007) and are an iconic Australian species. There is cultural and conservation interest in preserving the genetic integrity of dingoes from hybridisation with wild dogs.

WA WILD DOG ACTION PLAN 2016 - 2021

VISION

The impact of wild dogs is minimised with broad social consent in identified high risk areas enabling revitalisation and long term growth of pastoral, agricultural and tourism industries.

PURPOSE

The purpose of the Western Australian Wild Dog Action Plan is to coordinate the control of wild dogs by developing partnership arrangements between industry, biosecurity groups, government and the community to deliver a sustained, whole-of-industry benefit.

OBJECTIVES

- **Target control appropriate to the local area and wild dog pressure, determined by impact on assets.**
- **Reduce the impact of wild dogs on agricultural production and biodiversity by 10% per annum.**
- **Biosecurity Groups are responsible for ongoing integrated control to protect agricultural production and biodiversity.**
- **Develop the capacity of the agricultural industry to manage the wild dog impact with identified public support.**

STRATEGIES

Provide leadership and coordination for effective management of wild dogs in identified priority areas.	**Achieve a high level of adoption, responsibility and proactive management of wild dogs.**	**Reduce impacts of wild dogs on production to increase economic returns.**	**Monitor, evaluate and report to inform and continuously improve wild dog management.**

TACTICS

1. Establish the **WA Wild Dog Alliance** to provide integration and alignment with WA Biosecurity Groups and the National Wild Dog Action Plan. 2. **Priority 1** Invest in efficient and effective management of **Biosecurity Groups** to ensure coordinated and cost-effective wild dog management in each region. 3. DAFWA investment will support and collaborate with the Wild Dog Alliance. 4. Ensure the declaration of wild dogs under the *BAM Act* is appropriate for its current spread and distribution.	1. Develop and deliver a comprehensive engagement and communications strategy. 2. Investigate and map the impact of wild dogs on biodiversity and agricultural production. 3. Provide education and information for the community and tourists. 4. Improve engagement of all landholders to become involved in the control program.	1. **Priority 2** Complete the State Barrier Fence and strive to maintain its integrity. 2. **Priority 3** Targeted use of relevant best practice management determined by economic and technical evaluation. 3. Invest in on property best practice management and encourage and monitor participation. 4. Development of exclusion or cluster fencing including co-funding investment models for cell fencing in strategic regions of the impacted areas of WA. 5. Invest in ongoing research.	1. Integrate with the National metrics program. 2. Feralscan will be the medium for management activity and reporting. 3. Monitor landholder engagement and compliance. 4. Balance the actions of landholders with neighbours and public expectations.

Strategy 1 : Provide leadership and coordination for effective management of wild dogs.

A whole of industry approach to integrated and strategic wild dog management supported by scientific and measurable information.

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
1.	Establish the **WA Wild Dog Alliance** to provide integration and alignment with WA Biosecurity Groups and the National Wild Dog Action Plan.	A lead body with an Independent Chair , 2 selected persons from each of the Rangelands and the agricultural areas and including representatives from DAFWA, DPaW and AWI. The WA Wild Dog Alliance: • Formally communicates with the WA Biosecurity Council. • Coordinates research, interaction with the National Wild Dog Plan, and WA alignment issues. • Drives community consultation and communication. • Operates in a similar manner to the Grower Group Alliance body. • Works with metric information and monitoring tools (FeralScan).	Current Wild Dog Action Group will establish with DAFWA Invasive Species Manager Appoint 2 Executive and office	$50,000 convening cost $200,000 staff $100,000 operating	Boosting Biosecurity Defences R4R
		Invest an additional $1.4m over 3 years to employ 2 FT DAFWA staff (Development Officers) with skills and experience appropriate for 'knowledge-sharing, engagement and economic analysis'. One for rangelands and one for agricultural areas. The funding estimate includes $900k for employment costs and $500k for project and incentive payment costs. The purpose would be to provide high-level industry engagement processes for wild dog control and industry response (i.e. re-investment in livestock enterprises in response to removal of wild dog threat). The roles would include enterprise business case development and measures of benefits from wild dog control investment.	Wild Dog Alliance DAFWA	Year 1 $500,000 Year 2 $450,000 Year 3 $450,000	R4R
		Hosting and working with the AWI State Wild Dog Coordinator – shared office and resources.	AWI	$140,000 pa	AWI
2.	**Priority 1:** Invest in efficient and effective management of ***Biosecurity Groups*** to ensure coordinated and cost-effective wild dog management in each region.	Work with current industry-led Biosecurity Groups (BGs) to be responsible for well governed and planned operations. Support BGs to develop operational plans for the management of wild dogs and, where required, the setting of declared pest levies. Develop community engagement processes to change management of wild dogs from a government-led service to independent, industry or community-led BGs. Ensure good governance across all aspects of wild dog management by providing representative and governance training.	Recommendation by project and support from Minister Wild Dog Alliance	$750,000	Landholders in kind

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
		Identify current and future funding requirements and opportunities. Plan to have a long term funding solution in place by 2019. Review all sources of funding from Landholders, Federal and State Government, Industry Funding bodies (AWI/MLA), Treasury (DPA) and rating agencies (Shires) etc. Invest via the Boosting Biosecurity Defences R4R project in efficient and effective management of Biosecurity Groups to ensure coordinated and cost-effective wild dog management in each region. The RBGs review how to optimise funds raised via a Declared Pest Rate that is matched by the State Government. The funds are held in the Declared Pest Account, which is managed by the DAFWA.	Wild Dog Alliance DAFWA Invasive Species Individual BGs Declared Pest Account	 $450,000 $300,000 $300,000	 R4R BGs Treasury
		Work with the Management Committee to investigate the use of the Industry Funding Schemes for wild dog management, as authorised under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), whereby producers can raise funds to manage priority pests and diseases.		Funds to be determined	
		Develop partnerships with funding partners for inclusion of predator management in production activities.		$100,000 $50,000	AWI group matching DPaW regional budget
3.	DAFWA investment will support and collaborate with the Wild Dog Alliance.	DAFWA will continue to provide a lead role in working alongside the Wild Dog Alliance to provide support in establishment of the new body and development into an effective partnership. Hand over leadership and responsibility as soon as practical. Responsibility for compliance and collaboration. (see Strategy 4.3) Initiate a study to quantify the long term costs associated with a loss of stewardship on Government based Leasehold Land.	DAFWA, Director Invasive Species	$500,000	CF
4.	Ensure the declaration of wild dogs under the BAM Act is appropriate for its current spread and distribution.	Review the declaration status of wild dogs under the BAM Act Ensure that the control category of wild dogs is differentiated based on its spread and distribution in Western Australia Amend the declaration status of wild dogs, if review recommends a different declaration status, control category or keeping category.	DAFWA	Using existing DAFWA resources	DAFWA

Strategy 2 : To achieve a high level of responsibility, adoption and proactive management of wild dogs.

Improve wild dog management practices through maximising public and community support, with effective communication, education and training.

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
1.	Develop and deliver a comprehensive engagement and communications strategy.	Access and work with the Behaviourally Effective Communications for Invasive Animal Management Guide (NWDAP recommended package). Design and deliver cost-effective communication programs that change behaviours for the benefit of society and the environment. Communications activities will be clearly evaluated in terms of how much behaviour change they achieve. Develop and deliver a comprehensive engagement strategy, to improve engagement of all landholders to become involved in the control program, and provide education and information for the local community and travellers.	Wild Dog Alliance DAFWA Invasive Animals CRC NWDAP Tourism WA Respective Shires	$50,000 $100,000 $100,000	BGs DAFWA Industry funded project outcomes.
2.	Investigate and map the impact of Wild Dogs on biodiversity and agricultural production.	Invest in relevant research for social and community knowledge. Use mapping tools and promote the anecdotal feedback with case studies, web site content and local coverage in media. Work with Research organisations to continue impact research. Align collection of WA impact and control effort data at regional and state scale with the National Wild Dog Metrics project. Assess the effects of wild dogs/dingoes on natural ecosystems and encompass the negative and positive effects of wild dog presence and management on natural ecosystems.	Wild Dog Alliance DAFWA Invasive Animals CRC NWDAP	Strategy 3.3	
3.	Provide education and information for the non-farming community.	Engage stakeholders of the identified Wild Dog network (p5) including local councils, community groups, Men's Sheds etc. to participate in the program and promote control. Work with stakeholders identified in the communications and engagement strategy to address communication and education requirements – include the RAC to develop an education program to raise awareness of implications for the travelling public, and the Sporting Shooters Association to participate in responsible monitoring and management. Integrate Feralscan at all opportunities.	Wild Dog Alliance RAC Sporting Shooters Association Tourism WA	Strategy 2.1	
4.	Improve engagement of all landholders to become involved in the control program.	Present the achievements of the program in a format to demonstrate value to landholders and other stakeholders. Reward and recognition of effort, and identify the gaps to encourage uptake. Develop clear awareness across the State of the knock on effect if wild dogs are not controlled.		Strategy 2.1	

Strategy 3 : Reduce impacts of wild dogs on production to increase economic returns.

Best practice wild dog control in all planning and operations, evaluated as the impact on revitalisation of the specific landholding.

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
1.	**Priority 2:** Complete the State Barrier Fence and strive to maintain its integrity.	Complete the Esperance Extension to the State Barrier Fence. Complete the State Barrier Fence by completing the Esperance Extension, funded by R4R grant of $7.25m in addition to the funds currently held (total approx. $13m).	DAFWA and BGs	$6.5m one off	R4R
		Repair and replace 405km of the SBF with shared funding from Federal and State Governments.	Wild Dog Alliance	$1,000,000 $3,000,000	Federal gov WA R4R
		Ensuring the State Barrier Fence remains fully maintained into the future. The current SBF will be maintained by the most effective and efficient bodies. Maintaining the integrity of the SBF will be a priority. R4R to fund $600,000 per annum for the first three years by which time the Wild Dog Alliance will have determined alternate funding sources to maintain the fence.	Wild Dog Alliance DAFWA	$600,000pa	R4R
		Beyond year 4 – the total fence of 1,700km will be maintained by the Wild Dog Alliance and the agricultural community. A suggested option has been raised with the Sheep and Goat, the Beef and the Grains IFS management committees. It is possible for wild dogs to be included as an IFS priority pest, and industry contributions collected for program/s to address the issue. While there are clear benefits to the livestock industries for ongoing investment in the SBF the grains industry need to be aware the main benefit of the barrier fence is emu control from incursion into the cropping zone.	Wild Dog Alliance	$600,000pa	WA BGs
2.	**Priority 3:** Targeted use of relevant best practice Management controls determined by economic and technical evaluation.	Invest in targeted use of Licensed Pest Management Technicians (LPMT or Doggers). RfR continue to invest in a funding LPMTs for a further 4 year period with the expectation that the RBGs will have reached a capacity of self-funding..	Landholders BG	$1,000,000 $500,000 $3,000,000	BGs DPA R4R
		Invest in planned aerial and ground baiting programs through Landholders and BGs.	Landholders/BG DPaW	$700,000 $700,000 $150,000	Landholder DPA DPaW
		Invest in Veterinary Graduate program to sterilise dogs in Aboriginal Communities, in conjunction with the respective communities. Eg Animal Management in Rural and Remote Indigenous Communities	Wild Dog Alliance	$200,000	RfR
		Invest in additional surveillance technology.	Landholder/SBF/BG	$120,000 $120,000	Landholder DPA

WA WILD DOG ACTION PLAN 2016 - 2021 – IMPLEMENTATION PLAN

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
3.	Invest in on property best practice management and encourage and monitor participation.	Biosecurity Groups will determine targeted use of relevant best practice management controls as determined by local, economic, animal welfare and technical evaluation. Coordinated by the WA Wild Dog Alliance, develop a state-wide engagement program for land manager adoption of current wild dog management best practice. Provide training and support for landholders. Include a clear understanding of the Statutory obligations for activities of wild dog control under the BAM Act. Develop a state-wide engagement program for land manager adoption of current wild dog management best practice.	BG	$350,000 $350,000 $150,000 $150,000	Landholder BG/DPA DPaW AWI
4.	Development of Exclusion or Cluster fencing including co-funding investment models for cell fencing in strategic regions of the impacted areas of WA.	Landholders are anticipated to invest >$1.5m pa (construct ~ 185km/pa) as a self-determined return on investment.	Landholders	$1.5m	Landholders
		Development of Barrier or Cluster fencing including co-funding investment models for cell fencing in strategic regions of WA. Two example options are suggested: a. Create a pilot opportunity for the Southern Rangeland Revitalisation Strategy with the Mid West Development Commission and respective investors to develop a 50,000 breeding sheep flock as a single cell inside the current Murchison Region Vermin Cell, which will be part of a supply chain direct to existing processors. b. Work with the proposed Goldfields cell to investigate alternate funding schemes including a potential loan from the Department of Treasury, or a co-operative venture utilising Section 120 (1) (c) of the Co-operatives Act. The WA Wild Dog Alliance and DAFWA could prepare for future funding opportunities by recommending some competitive but co-funded cell or cluster fencing. Individual or collective groups of Producers could bid for funds and use the BCA tool to demonstrate return on investment.	DAFWA Mid West Development Commission $1,500,000	Investigation by DAFWA DAFWA	R4R
5.	Invest in ongoing R&D.	Continuing and new research and developing technologies to improve knowledge and management of wild dogs. Support and work with National research gap analysis plan. Focus on leveraging WA funds with other research institutions and providers. Leverage WA funds to support and work with National research gap analysis plan and the National Metrics program. This work will be directed through the proposed WA Wild Dog Alliance.	DAFWA BG Federal Funds AWI	$150,000 $150,000 $250,000 $50,000	BG DPA NWDAP AWI

Strategy 4 : Monitor, evaluate and report to inform and continuously improve wild dog management.

Support nationally consistent metrics for assessment of wild dog impacts on production, social and environmental benefit.

	Tactic	Actions - How we will go about it	Who is responsible	Investment	Source
1.	Integrate with the National metrics program.	Align with the National Wild Dog Action Plan to monitor the efficiency and effectiveness of the WA Wild Dog Action Plan. Operational monitoring on what was done, when and at what cost. Performance monitoring against the objectives of the plan. Incorporate data requirements for measures in information and knowledge systems. Work with the Pastoral Lands Board (Department of Lands) to align monitoring with annual landholder returns.	Wild Dog Group Alliance DAFWA National Wild Dog Facilitator	$250,000 $50,000 $50,000	DAFWA DPaW AWI
2.	Feralscan will be the medium for management activity and reporting.	Work with BGs, general public and all associated networks to develop Feralscan as the monitoring tool. Determine if public safety risks are managed, and incidents reported.	Wild Dog Group Alliance BGs National Wild Dog Facilitator	Strategy 3.4	
3.	Monitor landholder engagement and compliance.	Work with BGs to encourage best management practices to be adopted by land managers. Work with each landholder to engage in an appropriate level of participation. Specifically target the mining industry landholding to engage in active and responsible participation and contribution to wild dog management. Work with Indigenous pastoral properties and the local remote communities to encourage participation in programs. Develop clear processes around breaches of the *BAM Act* including a range of measures which may be implemented in line with compliance protocols. DAFWA where practical, will develop the capacity to manage the compliance measures as identified in the BAM Act.	Landholders BGs DAFWA	Strategy 1.2 DAFWA AWI	 $50,000 $50,000
4.	Balance the actions of landholders with neighbours and public expectations.	Work with environmental and heritage landholders to implement balanced and targeted strategies to complement respective objectives. Indigenous Ranger groups, Gondwana Link, Australian Wildlife Conservancy, Bush Heritage to build shared approaches in future investments. Environmental values will be incorporated into management strategies to preserve the genetic integrity of the species as part of the Australian conservation estate. Impacts on other species and the landscape will be considered in managing wild dogs. Cultural values will be incorporated into management strategies to respect the Aboriginal cultural connection to the dingo.	Landholders BGs Environmental bodies The Network	Strategy 3.4	

WA Wild Dog Action Plan Budget for Jan-Jun 2017 – Year 1

Strategy matched against principles	Strategy & Tactic	Landholder investment	Biosecurity Groups	Declared Pest Account	Federal government investment	DAFWA	RfR investment	DPaW	Other eg. AWI, Shires	Total	Principles allocation	Budget notes
Coordination	**refer Action Plan**		matched accounts $ for $								$1,695,000	
Overarching Group	1.1						$300,000		$50,000	**$350,000**		1
Biosecurity Groups	1.2	$375,000	$150,000	$150,000			$250,000	$50,000	$70,000	**$1,045,000**		2
DAFWA	1.3					$300,000				**$300,000**		3
Shared responsibility and accountability											$50,000	
Compliance	4.3					$25,000			$25,000	**$50,000**		4
Co-investment - Infrastructure											$5,550,000	
Public investment SBF	3.2									**$0**		5
Private landholder cells	3.2	$1,500,000	$450,000	$450,000	$1,000,000		$500,000			**$3,900,000**		6
Esperance extension	3.1					$1,500,000				**$1,500,000**		7
SBF Maintenance	3.1						$150,000			**$150,000**		8
Proactive management to reduce impact											$2,245,000	
Pest Control Managers	3.5	$250,000	$250,000	$250,000		$350,000				**$1,100,000**		9
Aerial baiting	3.5	$50,000	$200,000	$200,000						**$450,000**		10
Ground baiting	3.5	$100,000	$150,000	$150,000				$150,000		**$550,000**		11
Surveillance	3.5	$25,000	$60,000	$60,000						**$145,000**		12
Research and Monitoring											$350,000	
Research	3.3		$75,000	$75,000	$125,000				$50,000	**$325,000**		13
Monitoring and Evaluation	4.1								$25,000	**$25,000**		14
Skills development											$495,000	
Capacity Building	3.4	$175,000	$85,000	$85,000				$75,000	$75,000	**$495,000**		15
Community Communication											$125,000	
Communications	2.1		$25,000	$25,000	$50,000	$25,000				**$125,000**		16
	Total	**$2,475,000**	**$1,445,000**	**$1,445,000**	**$1,175,000**	**$2,200,000**	**$1,200,000**	**$275,000**	**$295,000**	**$10,510,000**		
		24%	**14%**	**14%**	**11%**	**21%**	**11%**	**3%**	**3%**	**100%**		

BGs funds raised via rates to match Declared Pest Account funds will grow with the development of additional groups and capacity.

WA Wild Dog Action Plan Budget for 2017-18 – Year 2

Strategy matched against principles	Strategy & Tactic	Landholder investment	Biosecurity Groups	Declared Pest Account	Federal government investment	DAFWA	RfR investment	DPaW	Other eg. AWI, Shires	Total	Principles allocation	Budget notes
Coordination	**refer Action Plan**		matched accounts $ for $								$3,200,000	
Overarching Group	1.1						$600,000		$100,000	**$700,000**		1
Biosecurity Groups	1.2	$750,000	$300,000	$300,000			$400,000	$100,000	$150,000	**$2,000,000**		2
DAFWA	1.3					$500,000				**$500,000**		3
Shared responsibility and accountability											$100,000	
Compliance	4.3					$50,000			$50,000	**$100,000**		4
Co-investment - Infrastructure											$7,600,000	
Public investment SBF	3.2									**$0**		5
Private landholder - cells	3.2	$1,500,000	$600,000	$600,000			$500,000			**$3,200,000**		6
Esperance extension	3.1					$4,000,000				**$4,000,000**		7
SBF Maintenance	3.1						$400,000			**$400,000**		8
Proactive management to reduce impact											$4,250,000	
Pest Control Managers	3.5	$500,000	$500,000	$500,000			$750,000			**$2,250,000**		9
Aerial baiting	3.5	$100,000	$400,000	$400,000						**$900,000**		10
Ground baiting	3.5	$200,000	$300,000	$300,000				$150,000		**$950,000**		11
Surveillance	3.5	$50,000	$50,000	$50,000						**$150,000**		12
Research and Monitoring											$450,000	
Research	3.3		$50,000	$50,000	$250,000				$50,000	**$400,000**		13
Monitoring and Evaluation	4.1								$50,000	**$50,000**		14
Skills development											$950,000	
Capacity Building	3.4	$350,000	$150,000	$150,000				$150,000	$150,000	**$950,000**		15
Community Communication											$250,000	
Communications	2.1		$50,000	$50,000	$100,000	$50,000				**$250,000**		16
	Total	**$3,450,000**	**$2,400,000**	**$2,400,000**	**$350,000**	**$4,600,000**	**$2,650,000**	**$400,000**	**$550,000**	**$16,800,000**		
		21%	**14%**	**14%**	**2%**	**27%**	**16%**	**2%**	**3%**	**100%**		

WA Wild Dog Action Plan Budget for 2018-19 – Year 3

Strategy matched against principles	Strategy & Tactic	Landholder investment	Biosecurity Groups	Declared Pest Account	Federal government investment	DAFWA	RfR investment	DPaW	Other eg. AWI, Shires	Total	Principles allocation	Budget notes
Coordination	**refer Action Plan**		matched accounts $ for $								$3,200,000	
Overarching Group	1.1						$600,000		$100,000	**$700,000**		1
Biosecurity Groups	1.2	$750,000	$300,000	$300,000			$400,000	$100,000	$150,000	**$2,000,000**		2
DAFWA	1.3					$500,000				**$500,000**		3
Shared responsibility and accountability											$100,000	
Compliance	4.3					$50,000			$50,000	**$100,000**		4
Co-investment - Infrastructure											$7,550,000	
Public investment SBF	3.2						$1,850,000			**$1,850,000**		5
Private landholder cells	3.2	$1,500,000	$900,000	$900,000			$1,000,000			**$4,300,000**		6
Esperance extension	3.1						$1,000,000			**$1,000,000**		7
SBF Maintenance	3.1						$400,000			**$400,000**		8
Proactive management to reduce impact											$4,750,000	
Pest Control Managers	3.5	$500,000	$750,000	$750,000			$750,000			**$2,750,000**		9
Aerial baiting	3.5	$100,000	$400,000	$400,000						**$900,000**		10
Ground baiting	3.5	$200,000	$300,000	$300,000				$150,000		**$950,000**		11
Surveillance	3.5	$50,000	$50,000	$50,000						**$150,000**		12
Research and Monitoring											$450,000	
Research	3.3		$50,000	$50,000	$250,000				$50,000	**$400,000**		13
Monitoring and Evaluation	4.1								$50,000	**$50,000**		14
Skills development											$950,000	
Capacity Building	3.4	$350,000	$150,000	$150,000				$150,000	$150,000	**$950,000**		15
Community Communication											$250,000	
Communications	2.1		$50,000	$50,000	$100,000	$50,000				**$250,000**		16
	Total	**$3,450,000**	**$2,950,000**	**$2,950,000**	**$350,000**	**$600,000**	**$6,000,000**	**$400,000**	**$550,000**	**$17,250,000**		
		20%	**17%**	**17%**	**2%**	**3%**	**35%**	**2%**	**3%**	**100%**		

WA Wild Dog Action Plan Budget for 2019-20 – Year 4

Strategy matched against principles	Strategy & Tactic	Landholder investment	Biosecurity Groups	Declared Pest Account	Federal government investment	DAFWA	RfR investment	DPaW	Other eg. AWI, Shires	Total	Principles allocation	Budget notes
Coordination	refer Action Plan		matched accounts $ for $								$3,200,000	
Overarching Group	1.1						$600,000		$100,000	**$700,000**		1
Biosecurity Groups	1.2	$750,000	$300,000	$300,000			$400,000	$100,000	$150,000	**$2,000,000**		2
DAFWA	1.3					$500,000				**$500,000**		3
Shared responsibility and accountability											$150,000	
Compliance	4.3					$50,000	$50,000		$50,000	**$150,000**		4
Co-investment - Infrastructure											$11,350,000	
Public investment SBF	3.2						$2,150,000			**$2,150,000**		5
Private landholder cells	3.2	$1,500,000	$900,000	$900,000						**$3,300,000**		6
Esperance extension	3.1						$5,500,000			**$5,500,000**		7
SBF Maintenance	3.1						$400,000			**$400,000**		8
Proactive management to reduce impact											$4,800,000	
Pest Control Managers	3.5	$500,000	$750,000	$750,000			$750,000			**$2,750,000**		9
Aerial baiting	3.5	$100,000	$400,000	$400,000						**$900,000**		10
Ground baiting	3.5	$200,000	$300,000	$300,000				$150,000		**$950,000**		11
Surveillance	3.5	$50,000	$50,000	$50,000			$50,000			**$200,000**		12
Research and Monitoring											$550,000	
Research	3.3		$50,000	$50,000	$250,000		$50,000		$50,000	**$450,000**		13
Monitoring and Evaluation	4.1						$50,000		$50,000	**$100,000**		14
Skills development											$950,000	
Capacity Building	3.4	$350,000	$150,000	$150,000				$150,000	$150,000	**$950,000**		15
Community Communication											$250,000	
Communications	2.1		$50,000	$50,000	$100,000	$50,000				**$250,000**		16
	Total	**$3,450,000**	**$2,950,000**	**$2,950,000**	**$350,000**	**$600,000**	**$10,000,000**	**$400,000**	**$550,000**	**$21,250,000**		
		16%	**14%**	**14%**	**2%**	**3%**	**47%**	**2%**	**3%**	**100%**		

WA Wild Dog Action Plan Year In Year Out Budget from 2020

Strategy matched against principles	Strategy & Tactic	Landholder investment	Biosecurity Groups	Declared Pest Account	Federal government investment	DAFWA	Industry Funding	DPaW	Other eg. AWI, Shires	Total	Principles allocation	Budget notes
Coordination	**refer Action Plan**		matched accounts $ for $								$2,750,000	
Overarching Group	1.1		$175,000	$175,000					$100,000	**$450,000**		1
Biosecurity Groups	1.2	$750,000	$400,000	$400,000				$100,000	$150,000	**$1,800,000**		2
DAFWA	1.3					$500,000				**$500,000**		3
Shared responsibility and accountability											$100,000	
Compliance	4.3					$50,000			$50,000	**$100,000**		4
Co-investment - Infrastructure											$3,900,000	
Public investment SBF	3.2									**$0**		5
Private landholder cells	3.2	$1,500,000	$900,000	$900,000						**$3,300,000**		6
Esperance extension	3.1									**$0**		7
SBF Maintenance	3.1						$600,000			**$600,000**		8
Proactive management to reduce impact											$4,000,000	
Pest Control Managers	3.5	$500,000	$750,000	$750,000						**$2,000,000**		9
Aerial baiting	3.5	$100,000	$400,000	$400,000						**$900,000**		10
Ground baiting	3.5	$200,000	$300,000	$300,000				$150,000		**$950,000**		11
Surveillance	3.5	$50,000	$50,000	$50,000						**$150,000**		12
Research and Monitoring											$450,000	
Research	3.3		$50,000	$50,000	$250,000				$50,000	**$400,000**		13
Monitoring and Evaluation	4.1								$50,000	**$50,000**		14
Skills development											$950,000	
Capacity Building	3.4	$350,000	$150,000	$150,000				$150,000	$150,000	**$950,000**		15
Community Communication											$250,000	
Communications	2.1		$50,000	$50,000	$100,000	$50,000				**$250,000**		16
	Total	**$3,450,000**	**$3,225,000**	**$3,225,000**	**$350,000**	**$600,000**	**$600,000**	**$400,000**	**$550,000**	**$12,400,000**		
		28%	**26%**	**26%**	**3%**	**5%**	**5%**	**3%**	**4%**	**100%**		

WA Wild Dog Action Plan – Total Expenditure and Royalties for Regions Contribution 2016-2020

Budget notes	Budget Expense	2016-17		2017-18		2018-19		2019-20		Total	
		Total contribution	RfR investment	Total contribution	RfR investment	Total contribution	RfR investment	Total contribution	RfR investment	Total contribution	RfR investment
1	Overarching Group	$350,000	$300,000	$700,000	$600,000	$700,000	$600,000	$700,000	$600,000	$2,450,000	$2,100,000
2	Biosecurity Groups	$1,045,000	$250,000	$2,000,000	$400,000	$2,000,000	$400,000	$2,000,000	$400,000	$7,045,000	$1,450,000
3	DAFWA	$300,000		$500,000		$500,000		$500,000		$1,800,000	$0
4	Compliance	$50,000		$100,000		$100,000		$150,000	$50,000	$400,000	$50,000
5	Public investment SBF	$0		$0		$1,850,000	$1,850,000	$2,150,000	$2,150,000	$4,000,000	$4,000,000
6	Private landholder cells	$3,900,000	$500,000	$3,200,000	$500,000	$4,300,000	$1,000,000	$3,300,000		$14,700,000	$2,000,000
7	Esperance extension	$1,500,000		$4,000,000		$1,000,000	$1,000,000	$5,500,000	$5,500,000	$12,000,000	$6,500,000
8	SBF Maintenance	$150,000	$150,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$1,350,000	$1,350,000
9	Pest Control Managers	$1,100,000		$2,250,000	$750,000	$2,750,000	$750,000	$2,750,000	$750,000	$8,850,000	$2,250,000
10	Aerial baiting	$450,000		$900,000		$900,000		$900,000		$3,150,000	$0
11	Ground baiting	$550,000		$950,000		$950,000		$950,000		$3,400,000	$0
12	Surveillance	$145,000		$150,000		$150,000		$200,000	$50,000	$645,000	$50,000
13	Research	$325,000		$400,000		$400,000		$450,000	$50,000	$1,575,000	$50,000
14	Monitoring and Evaluation	$25,000		$50,000		$50,000		$100,000	$50,000	$225,000	$50,000
15	Capacity Building	$495,000		$950,000		$950,000		$950,000		$3,345,000	$0
16	Communications	$125,000		$250,000		$250,000		$250,000		$875,000	$0
		$10,510,000	$1,200,000	$16,800,000	$2,650,000	$17,250,000	$6,000,000	$21,250,000	$10,000,000	$65,810,000	$19,850,000

Notes - WA Wild Dog Action Plan Budget Notes 2016-20

<table>
<tr><th>Item</th><th>Budget notes</th><th>Total contribution</th><th>RfR investment</th></tr>
<tr><td>1.</td><td>Establish a lead body representative for the Biosecurity Groups called the WA Wild Dog Alliance. Representation of Chair , 4 other nominated producers EO and including a representatives from DAFWA, DPaW and AWI.
Two staff and host the AWI WA Co-ordinator.
Invest an additional $1.4m over 3 years to employ 2 FT DAFWA staff (Development Officers) with skills and experience appropriate for ‘knowledge-sharing, engagement and economic analysis’. One for rangelands and one for agricultural areas is currently suggested.</td><td>$2,450,000</td><td>$2,100,000</td></tr>
<tr><td>2.</td><td>The Biosecurity Groups comprising up to 15 RBG/DSG bodies in WA require executive support and development of committees and plans. $50k/group to underpin administration.
Access the Boosting Biosecurity Defences R4R project.</td><td>$7,045,000</td><td>$1,450,000</td></tr>
<tr><td>3.</td><td>DAFWA Invasive Species staff wild dog involvement. Currently 18 staff comprising ~4.75FTE
Reducing support and coordination.</td><td>$1,800,000</td><td>$0</td></tr>
<tr><td>4.</td><td>Compliance against the BAM Act and working with BGs to maintain participation and activation.</td><td>$400,000</td><td>$50,000</td></tr>
<tr><td>5.</td><td>Using a R4R grant to repair and replace up to 400km of the existing SBF as identified in DAFWA Report (C Robbins Feb 2015).
State Barrier Fence investment required to bring up to standard
<table>
<tr><th></th><th>Replacement Distance (km)</th><th>Replacement @ $8,500/km</th><th>Grid Upgrades</th><th>Total Annual investment</th></tr>
<tr><td>Per year</td><td>135</td><td>$1,147,500</td><td>$200,000</td><td>$1,347,500</td></tr>
<tr><td>3 yr total</td><td>405</td><td>$3,442,500</td><td>$600,000</td><td>$4,042,500</td></tr>
</table></td><td>$4,000,000</td><td>$4,000,000</td></tr>
<tr><td>6.</td><td>185km of new fencing per annum - private investment by landholders in dog proof fencing @ $8,000/km.
Development of exclusion or cluster fencing including co-funding investment models for cell fencing in strategic regions of WA.
Using the proposed funding announced by Federal Minister to matching R4R grant to provide a contestable fund of $1.5m and distributed as 6 X $500k grants.
Create a pilot opportunity for the Southern Rangeland Revitalisation Strategy with MWDC and respective investors to develop a defined single cell or cells inside the current MRVC, which will be part of a supply chain direct to processors.
Work with the proposed Goldfields cell to investigate alternate funding schemes , or a co-operative venture utilising Section 121c of the Co-operatives Act.</td><td>$14,700,000</td><td>$2,000,000</td></tr>
</table>

WA WILD DOG ACTION PLAN 2016 - 2021

Item	Budget notes	Total contribution	RfR investment
7.	Complete the Esperance Extension, an additional $6,500,000. Revision of costing for materials.	**$12,000,000**	**$6,500,000**
8.	Maintenance of SBF based on 1,170km current fence @ $500/km plus management. Working on 25yr lifetime and part replacement. Go to market for contractors, may be DAFWA. After three years the full SBF maintenance will be taken over by the WA Wild Dog Alliance and it is recommended that funds are contributed by the 3 Industry Fund Schemes which will also demonstrate a recognition of the scale of the wild dog incursion..	**$1,350,000**	**$1,350,000**
9.	Invest in targeted use of Licensed Pest Management Technicians. Further to the Ag*knowledge* review of the current investment and consultation it is imperative to utilise the SBF and work back to that point. Estimate $550/day - 27 LPMTs at 200days/year. R4R contribution for four more years. (Contribution of 2 years in Year 1 to accommodate timing) Shared with landholders, BGs, DPA and DPaW.	**$8,850,000**	**$2,250,000**
10.	Invest in planned aerial baiting programs through landholders and BGs where relevant.	**$3,150,000**	**$0**
11.	Invest in planned ground baiting programs matching with LPMTs through landholders and BGs.	**$3,400,000**	**$0**
12.	Invest in additional surveillance technology. Cameras, drones, using new technology to make location/target more precise. Include Veterinary sterilisation program	**$645,000**	**$50,000**
13.	Continuing and new research and developing technologies to improve knowledge and management of wild dogs. Support and work with the National research gap analysis. Focus on leveraging WA funds with other research providers. Shared investment between landholders/BGs/Declared Pest Account and AWI.	**$1,575,000**	**$50,000**
14.	Align with National Wild Dog Metrics Project to measure the effectiveness of the WA Wild Dog Action Plan.	**$225,000**	**$50,000**
15.	Develop a state-wide engagement program for land manager adoption of current wild dog management best practice. Provide training and support for landholders. Shared between landholders' time, BG investment and matching DPA funds. Contribution from AWI investment and DPaW activities. Work with BGs to develop Feralscan as the monitoring tool.	**$3,345,000**	**$0**
16.	A complete communications and marketing package - in conjunction with the National Wild Dog Action Plan, includes Feralscan, website and dedicated programs.	**$875,000**	**$0**

Context – asset protection

A guiding principle in developing the WA Wild Dog Action plan has been to identify priorities for asset protection with management responses that are appropriate to the value of the asset to be protected. To clarify this approach the range of assets and their values are quantified as:

Sheep meat and wool

The WA sheep industry currently runs 14.2 million sheep which contribute a gross value of agricultural production (GVAP) of $992m to the State economy. This is 48% of WA's total livestock GVAP and comprises $410m in meat and $582m in wool (DAFWA/ABS 2015). The estimated damage caused by wild dogs is valued at $14m annually in the WA sheep industry (Bell 2015).

Sheep are integral in the mixed crop / livestock farming systems of the south west land division of Western Australia where they are key to managing climatic, production, financial and herbicide resistance risks. Sheep are an important part of the State's pastoral industry in southern rangelands areas only suited for grazing by small stock.

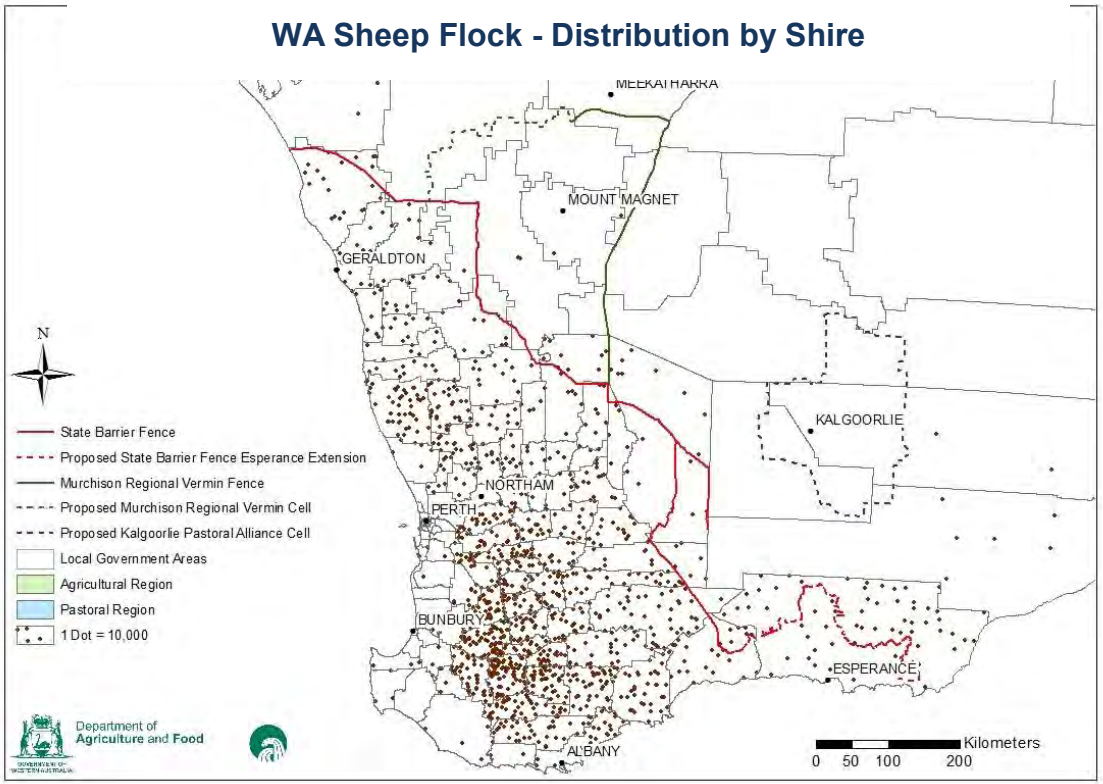
The WA sheep flock has been in decline since the collapse of wool prices in the early 1990s. In the southern rangelands this economic reality combined with increasing wild dog predation and rangeland condition impacted by poor seasons and previous grazing pressure to remove sheep from many pastoral operations and areas. WA has identified future opportunity for growth in sheep production driven by global demand for high quality protein, and the industry is looking to rebuild to take advantage of improved profitability. There is no tolerance for wild dogs in small livestock production due to the destruction they cause in direct attacks on lambs and adult sheep, and the production impacts from mis-mothering and stress on the mob.

***Action plan priority:** eradication of wild dogs in sheep grazing areas.*

Rangeland goats

The rangeland goat industry has been estimated to support a population of 900,000 animals with a modest harvest rate of 35% or 315,000 annually. Wild dogs have been a major factor in a rapid decline of goats in the southern rangelands from around 1,000,000 in 2005 to just 150,000 in 2011. With the annual harvest down to 65,000 goats, the total unrealised annual farm gate income to producers is calculated at around $11m. With current dog impacts and harvest rates the export goat meat industry is in a critical position (Bell 2015). While goats are very destructive to rangelands when unmanaged, the variability in the marketplace has seen goat prices escalate rapidly during 2015, making goat management a serious option for producers.

***Action plan priority:** targeted management of wild dogs in goat areas.*



Source: Department of Agriculture and Food Western Australia (ABS 2011)

Cattle

The WA cattle industry currently runs 2 million head, with 1m run on extensive pastoral stations in the northern and southern rangelands and the remainder in the south west agricultural region. The GVAP of beef production in WA is $517m. WA exported 220,000 live cattle valued at $154m and 99,000t of boxed beef worth $68m (ABS 2011/12)**. The value of the damage caused by wild dogs has not been estimated for WA, but nationally it is estimated to cost $32.4m annually** (Gong 2009).

Cattle enterprises across the northern and southern rangelands have reported significant and increasing levels of damage and losses from wild dogs. Calves are particularly succeptible to attack which usually results in death, while attacks on adult cattle may not be lethal but significantly impacts their productivity. The costs flow through to the processing sector with bite marks and scarring downgrading carcase values.

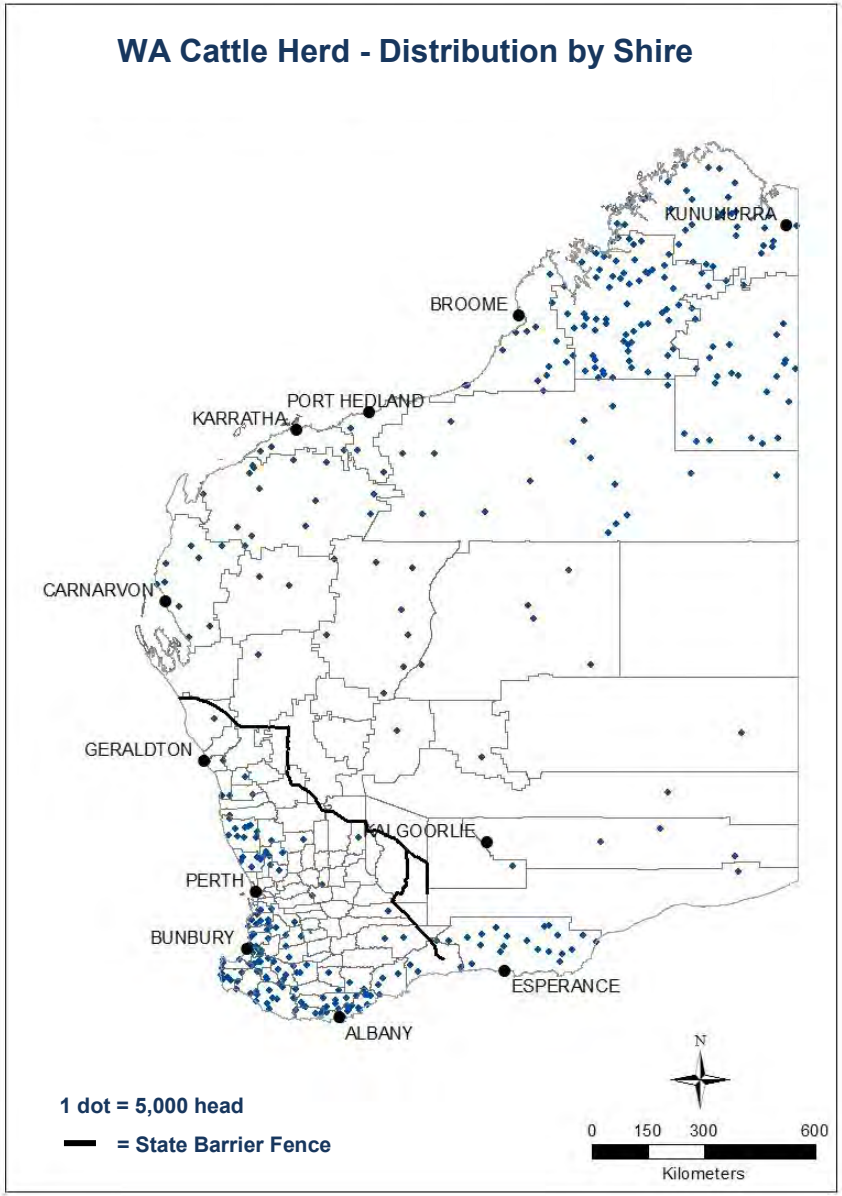
Action plan priority: *targeted management of wild dogs in cattle areas.*

Mining

As WA's major industry contributing $77.8bn to the economy the mining industry has a large presence across the remote regions of the State. At September 2015, WA had an estimated $171bn worth of resource projects under construction or in the committed stage of development. There is a significant workforce out on remote country every day performing tasks including geological surveying, heritage and environmental surveys, water drilling, asset maintenance etc. With their corporate priority for safety and commitment to a duty of care for their employees, the mining and services companies have a direct interest in ensuring wild dogs do not impact their staff. Evidence of wild dogs frequenting mining camps and remote worker campsites is of concern to these companies.

Mining companies are also significant landholders of pastoral lands as they retain the leases to control access to their mine sites and infrastructure. They are required to continue to operate pastoral leases as livestock enterprises, and have a direct financial and corporate social responsibility to protect these assets and to co-operate with neighbours in wild dog control programs.

Action plan priority: *targeted management of wild dogs on mining leases.*



Source: Department of Agriculture and Food Western Australia (ABS 2011)

Tourism

Tourism contributes around $3.4 billion to the WA economy and is a major drawcard for visitors is the State's vast wild spaces, remote natural features and abundant native fauna and flora.

The dingo in its natural state in the landscape has an intrinsic value as part of the conservation and cultural estate that the community and visitors have an expectation will be protected and preserved. Dingoes are woven into the fabric of aboriginal life, law and culture (Phelan 2007) and are an iconic Australian species. Western Australia has been recognised internationally for its oustanding biodiversity and the south east region of the State is home to the world's largest remaining mediterranean woodlands. The role of the dingo in this ecosystem is acknowledged in the WAWDAP and future planning must consider a balance of environmental, cultural and economic values.

Western Australia's wild dog population has tested 59% 'pure' dingo which is the second highest percentage of pure dingo genetics on the mainland (Northern Territory recorded 87% Stephens et al. 2015). With growing recognition and respect for the role of higher order predators in a balanced ecosystem, there will be increasing interest in the presence and role of the dingo in the Western Australian wild landscapes.

However there is an expectation by travellers for human safety and amenity and that people can travel, camp, and hike in remote areas without threat of wild dog attack. This public safety requires careful management near remote tourist spots and camp grounds, with particular emphasis on public education on the need to avoid interaction with any wild dog.

Action plan priority: *targeted wild dog management near tourist attractions.*

Community

Escalation of wild dog populations pose a threat to human safety and amenity of remote pastoral settlements, aboriginal communities and small town centres across the rangelands. There is also concern for domestic animal safety and health.

Action plan priority: *targeted wild dog management near settlements.*

The conservation estate

Western Australia has a unique and internationally recognised biodiversity in its natural conservation estate. There is recognition of the cultural and conservation value of the dingo as part of this biodiversity. There is also acknowledgement of the need to consider a range of values in the landscape including ecological, wildlife migration, cultural and heritage values, in addition to those of pastoralism, mining and tourism.

Conservation of dingoes as a unique taxon is considered an important conservation goal. In some contexts dingoes may influence trophic interactions, meaning that predation by dingoes can affect herbivores and introduced meso-predators (cats and foxes), which can benefit other native species. Conversely predation by wild dogs (including dingoes) can have negative impacts on populations of rare and threatened species, particularly where populations are small and/or isolated.

A challenge for the Department of Parks and Wildlife in managing a large proportion of the conservation estate is how to balance preservation of the dingo species against the cost to the conservation estate if wild dog populations escalate and impact threatened species. DPaW has responsibility under its Good Neighbour policy to manage wild dog impacts emerging from parks, reserves and Unallocated Crown Lands. It is established that removal or control of wild dogs in areas where they pose no threat to livestock is economically unsound and may also alter ecological processes (Thomson and Rose 2006).

Action plan priority: *collaborate with DPaW regions to achieve appropriately targeted wild dog management in line with conservation and economic values.*

Social license

The WA community has a reasonable expectation as a major investor and stakeholder in wild dog management that the management response will be appropriate to the risk and that action will be evidence based, humane and based on best practice. Industry and DAFWA have responsibility to ensure compliance and minimise the risk to the industry's social license to operate.

Action plan priority: *best practice and compliance managed appropriately to the risk posed by wild dogs.*

Key facts informing development of the WA Wild Dog Action Plan

- There are major gaps in data on the number, distribution and impacts of wild dogs across Western Australia mainly due to the extensive rangeland grazing conditions over vast distances.
- For this reason the wild dog problem is measured by the economic impact they have on livestock industries, with estimates of WA livestock losses ranging from $7-25 million per annum.
- The Pastoral Lands Board annual returns 2007 to 2011 show an increase in stock losses from $2.4m to $7.7m across the WA pastoral region. In 2012 there were an estimated 42,200 stock reported killed by wild dogs, mostly sheep, with a value of $6.3m.
- In addition landholders bear the added costs of more intensive livestock management, wild dog control measures, and loss of production.
- In addition to direct impacts of predation, wild dogs can transmit endemic diseases that can affect livestock, pets, native animals and humans including hydatids (*Echinococcus hydatidosis*) and *Neospora caninum,* an important cause of cattle abortions. Wild dogs are also a potential vector for exotic diseases (e.g. rabies). The impact of diseases spread by wild dogs is difficult to quantify.
- Wild dog attacks result in: stock mortality, injury, loss of production through stress and impact on feeding/watering stock, mis-mothering and young stock death or decline, price impacts at the saleyards, carcase damage at meat processors, damage to infrastructure, death/injury to domestic pets, emotional and psychological impacts on humans from having to humanely destroy or tend to damaged stock, the stress of having to maintain hyper vigilance to protect stock.
- Wild dogs can have significant social impacts, causing considerable stress to individuals and communities affected by wild dogs. These impacts may include anxiety, sleep disruption, the loss of social fabric as farmers leave the industry and conflicts between community members.
- The WAWDAP has taken account of both the biological sciences around wild dogs and the critically important social sciences which inform the processes of engagement and consistent adoption and participation of landholders and other stakeholders in wild dog management. The communication strategy and capacity building actions in the plan are key priorities. Converting good science into management responses is the basis of the WAWDAP Implementation Plan.
- WA investment in wild dog control includes a private industry spend of $6,107,000 and government spend of $3,832,000 for a total of $9.9m/year.
- The Western Australian Wild Dog Management Strategy 2005, in place for over a decade, was developed and implemented following extensive stakeholder consultation, including oversight from a representative State Wild Dog Management Advisory Committee which was similar in structure to the WAWDAP and the proposed WA Wild Dog Alliance.
- There has been limited monitoring and evaluation of past control efforts to quantify the effectiveness of different control strategies and methods. As it is difficult to measure the effectiveness of control measures, evaluating the spend is also a challenge.
- Wild dog impacts are a factor that has contributed to the significant decline of sheep and goat enterprises in the pastoral region.
- For several decades wild dogs had been largely excluded from the agricultural regions by effective control campaigns, but in recent years wild dog impacts have increased particularly at the agricultural/pastoral region interface.
- The risk of wild dog impacts is increasing in the agricultural area (including inside the SBF) where the highest value and highest number of small stock occur. Early action now to address this risk would reap rewards, and is identified as priority 1 in this WA Wild Dog Action Plan.
- The risk is increasing for cattle in the Kimberley and Pilbara, with increasing calf fatalities and carcase damage to mature cattle being reported.

- Because wild dog impacts and risks differ between regions and livestock industries, this WA Wild Dog Action Plan has focussed on managing locally with appropriate control measures to protect the relevant regional assets. Those assets may be livestock, the natural estate, native fauna, tourism or mining.
- Wild dog management under the WAWDAP will be appropriate to the risks, to the impact the wild dog population is having and to the assets to be protected.
- The State planning needs to build on local efforts and align with/allow for local priorities and capacity to deliver.
- There is a need to recognise, encourage and work with existing on-ground landholders, local area and regional plans and on ground efforts being carried out to manage wild dogs.
- There is renewed national effort to manage wild dogs with the National Wild Dog Action Plan launched in May 2014 and recent Federal funding announced to support its implementation: WA needs to identify how it can engage and participate in the national effort/funding/research/resources.
- The *Biosecurity and Agriculture Management Act 2007* has shifted responsibilities and capacity for wild dog management in WA, with the emphasis on landholders/industry leading the effort through Biosecurity Groups.
- Wild dog management is complex and demands a balance between the economic drivers to reduce wild dog impact on livestock enterprises in the pastoral and some agricultural areas, with the conservation values of the dingo and community expectations of humane treatment of all animals.
- The wild dog issues are complicated by the severity of impact on individuals, their livestock and businesses, and historical, environmental, political and social impacts which all drive a diverse range of perceptions about the best strategies to manage the problem.
- A challenge for effective landscape scale wild dog control in the WA pastoral regions is the number of absentee landholders, the mining leaseholders, the producers who are not impacted by wild dogs and don't participate in programs, and the vast environmental and conservation estate lands held both publically and privately.
- With the escalation of the wild dog problem in WA pastoralists are increasingly looking to barrier or exclusion fencing to protect their livestock. While cell fencing is being adopted in the Eastern States and has been demonstrated to work long term on the Nullarbor at Rawlinna Station (See Case Study 1), the cost of fencing across the vast distances of the WA pastoral holdings has been a major barrier to its adoption.
- The WAWDAP has commissioned extensive Benefit Cost Analyses to provide an economic assessment of the fencing options under WA conditions, taking into account a broad range of values including current livestock values, carrying capacity of the land, current fencing prices.
- Barrier fencing must also take account of its ecological impacts and the needs of species for connectivity in the landscape which demands that future projects take into account an improved understanding of the environmental impacts of constructing barriers in the landscape.
- To build the Wild Dog Action Plan on solid evidence an extensive review was conducted of the vast quantities of literature, research, strategic plans and media coverage to inform development of the Action Plan. A vast body of research has also been reviewed by DAFWA and distilled into an overview of the current science around wild dog management.

- Landholders and government are making a significant investment in resources, time and effort to control wild dogs and this Action Plan aims to ensure future effort is both targeted and effective. The intent is to provide leadership and coordination for all the stakeholders across landholders, biosecurity groups, and agencies to get traction on effective control.

National wild dog impacts

The changing impact of wild dogs across Australia was analysed in a 2014 ABARES study for Australian Wool Innovation that looked at changes between two national surveys of sheep and cattle producers conducted in 2014 and 2010.

In the 2014 survey 71 per cent of landholders in wild dog affected areas knew of wild dog attacks occurring in their area and 67 per cent reported having a wild dog problem on their property, while 26 per cent rated the wild dog problem on their property as severe or extremely severe. Awareness and severity of the wild dog problem varied across the nation: 24 per cent of WA landholders rated the wild dog problem on their property as severe or extremely severe, compared to 75 per cent in the NT and 34 per cent in QLD.

Financial and personal impacts

Reported stock losses from wild dogs in 2014 were highly variable but nationally sheep losses per property as a proportion of current stock averaged 8 per cent, while cattle losses as a proportion of current stock averaged 2 per cent per property. Young sheep and cattle are highly vulnerable to wild dog predation: nationally 66 per cent of all sheep killed and 91 per cent of all cattle killed were aged under 12 months.

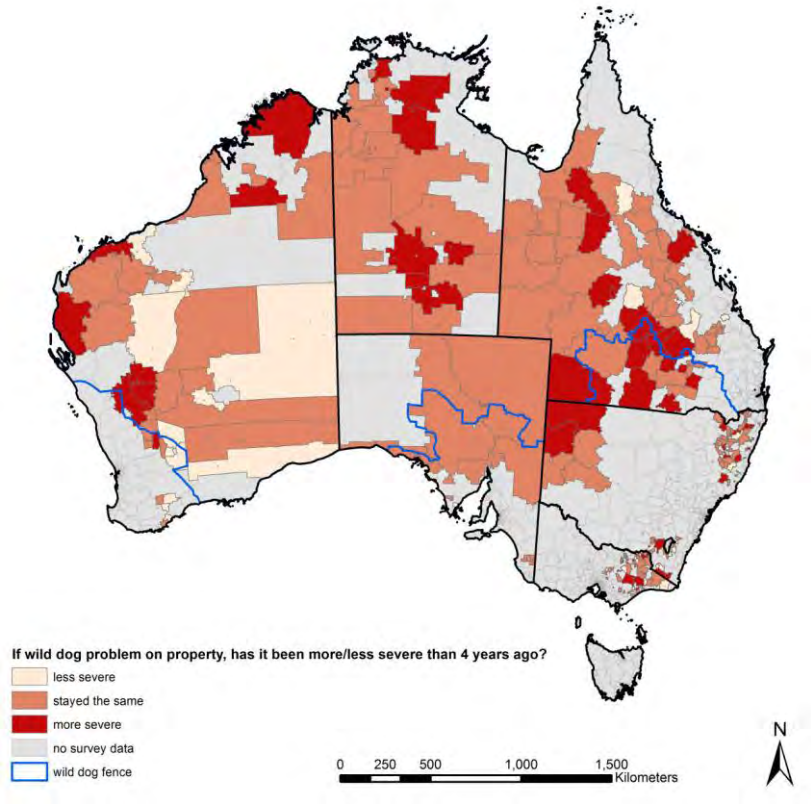
Landholders also reported flow-on production and personal impacts. A reduction in lambing or calving rate was reported by 42 per cent of landholders in 2014, while 20 per cent were concerned about the viability of their business, and 12 per cent had changed stock composition. Around 10 per cent reported they had either left, or were thinking of leaving the wool industry, because of wild dogs. A number of landholders had moved out of sheep into cattle production because wild dog problems had made running sheep unviable. Landholders were personally affected by wild dogs, leaving them angry (30 per cent) and distressed (16 per cent). Production and personal impacts remained fairly similar between 2010 and 2014.

Overall 88 per cent of surveyed landholders in wild dog affected areas reported taking actions to manage wild dogs. The time involved in managing wild dogs is significant; on average landholders in wild dog affected areas are spending 26 days and $7,197 a year on wild dog management. Management is a constant task, being vigilant every day especially during lambing season.

Management costs which can be a significant financial impost for landholders included baiting, trapping, shooting, materials, paid contractors, fencing, compulsory pest control levies and rates.

The primary reason for undertaking wild dog management was to reduce stock losses, followed by supporting other landholders in their area, but there was also a particular increase in the reason ‘because of the impacts wild dogs have on native wildlife’.

Perceived change in wild dog problem severity from 2010 to 2014



Source: ABARES survey 2014

Wild dog problems and management 2014

	NSW %	VIC %	QLD %	SA %	NT %	WA %	Aust %
Know of wild dog attacks in area	67	61	91	46	99	**67**	71
Reported wild dog problem on property	54	51	93	49	99	**71**	67
Problem severe or extremely severe	16	18	34	13	75	**24**	26
Problem getting more severe	33	25	42	32	47	**31**	35
Undertake management actions	86	79	94	92	93	**90**	88
Involved in a wild dog management group	26	20	27	22	32	**28**	25
Rated overall wild dog management actions moderately to very effective	51	48	66	56	58	**40**	55

Source: ABARES survey 2014 – Table 22 p57

Shooting, ground baiting, and trapping were the most common wild dog control methods used. Landholders in WA, QLD and NSW reported higher use of trapping and aerial baiting than in other states. Between 2010 and 2014 there was a decrease in the use of ground baiting (from 81 to 69 per cent); an increase in government action across all control methods; and an increase in all control methods being employed by groups, particularly trapping and exclusion fencing.

A key message from landholders was that a combination of control techniques is the most effective way of managing wild dogs, most commonly combining ground or aerial baiting, with trapping and/or shooting, which are often used for follow up management in targeted areas such as water points. A range of problems with baiting were raised on effectiveness because dogs learn not to take baits, off-target deaths of domestic and working dogs and native animals, and the complexity (red tape) of accessibility to baits.

Financial impacts and management inputs for landholders with a wild dog problem in 2014

Management inputs:	NSW	VIC	QLD	SA	NT	WA	Aust
Days a year spent on management actions, excludes contractors	24	28	20	21	44	32	26
Average annual property expenses for management actions, excludes family labour ($)	3,975	3,526	7,625	4,902	14,903	$9,096	$7,197

Source: ABARES survey 2014

Financial impacts and social impacts were ranked high and reported as being strongly linked, while environmental impacts were ranked lowest. Financial impacts differed depending on the severity of attacks, livestock composition and management strategies.

Social impacts were associated with contraction of the sheep industry, hence the link to financial impacts, and the stress on individuals from hyper vigilance and finding dead and mauled livestock. If the sheep industry was to become unviable which has occurred in some areas, the impact flows through to local communities and local businesses. Environmental impacts were regarded as difficult to report because of their complex nature. However, some interviewees had observed an increase in biodiversity as dog numbers decreased.

Effectiveness of management actions

Nationally around 55 per cent of landholders rated the overall wild dog management actions undertaken by all stakeholders in their area as 'moderately effective' to 'very effective'. Landholders in WA gave the lowest ratings of effectiveness. Landholders in wild dog management groups rated the overall effectiveness of management actions in their area more highly than those not in wild dog management groups.

Landholders nationally reported the most important action that would improve overall management was more management actions on public land, rated by more than 90 per cent as important or very important. Achieving coordination, cooperation and strategic alignment in baiting across landholder types was a key issue, and this is especially relevant to national and state parks. More action on public land was followed in importance by government support to apply different technologies.

Wild dog management group outcomes

Group members in areas with severe wild dog predation said they were at the frontline of managing the problem and struggling to maintain sheep farming in the region. Other groups were working to maintain the status quo and stop wild dog predation getting worse. In areas with relatively minor incursions of wild dogs, groups were focusing on stopping the dog problem advancing into their areas.

Group composition and structure

Groups varied greatly in their length of operation, number of members, and the area they covered. However common features across groups included: strong leadership; a central core of group members making decisions; regular informal communications; integration into a wider network; a focus on action.

Formal group structures were becoming more common because of the perceived escalation of dog numbers, legislative requirements for landholders to control dogs on their properties, and requirements to be incorporated to access resources. All groups expressed their dependence on external funding, having received funding variously from federal, state/territory and/or local governments, AWI and other sources. These sources complement internal resourcing through membership fees and in-kind contributions.

Generally groups were working well with good leadership and conflict management. Where there were conflicts, they largely concerned differing opinions on member responsibilities, funding allocation and control methods.

Support

Emphasis was placed on the importance of state coordinators, as well as the national coordinator, to the effective operation of their groups. Project coordinators were seen as playing a critical role in supporting the establishment of new groups and in the ongoing operation of groups. Effective collaboration with government agencies was strong, and local government is often playing a major support role.

The most useful external supports were reported to be regional coordination between groups, the availability of professional doggers, landholder training, mentoring, research, and assistance with administration.

Wild dog management groups function as important social networks that help farming communities cope with the detrimental effects of wild dogs.

Group effectiveness

Two thirds of groups self-rated their effectiveness as high, based on a range of factors including dog control success, participation levels, commitment and collaboration, and democratic decision-making processes.

Those in groups noted that rating group effectiveness highly did not necessarily mean there had been a decrease in dog numbers. Some expressed frustration that stock losses to wild dog attacks had not reduced as a result of the wild dog management group's activities, even when group members were considered to be working together effectively.

Dog numbers were actually on an upward trend in some areas but this was influenced by a range of other reasons, however some suggested that significantly more losses would have occurred without the groups' management activities. A positive outcome of wild dog management group activities had been more strategic and targeted actions and better communication between neighbours.

Barriers to group effectiveness included: insufficient funding; lack of cooperation from some land managers across different tenures, including farmers, absentee landholders, public land managers and non-agricultural landholders; finding the right control methods and delays in introduction of new technologies or more effective methods; time constraints; and maintaining enthusiasm and motivation.

Support measures that would improve the effectiveness of groups include:

- securing long-term funding.
- strategic planning, and access to specialist skills (for example mapping, surveying, data collection and monitoring), knowledge and scientific research.
- building relationships with industry and government agencies.
- encouraging positive internal group function in terms of participation, decision-making and cooperation.

The full ABARES report can be accessed:

http://data.daff.gov.au/data/warehouse/9aai/2015/WildDogSurveyResults/abares---wild-dog-management-2010-to-2014-national-landholder-survey-results.pdf

Current science on wild dogs

What is a wild dog?

The term wild dog is used to describe dingoes (*Canis lupus dingo*), free-living domestic dogs (*Canis lupus familiaris*) and their hybrids. Dingoes are an ancient breed of dog that form a discrete group within the domestic dog lineage (vonHoldt et al. 2010). The presence of dingoes in Australia dates back around 3,500-5,000 years ago, when they were likely brought to Australia by seafarers from southeast Asia (Savolainen et al. 2004, Smith and Savolainen 2014).

Since European arrival in Australia dingoes and domestic dogs have interbred and most wild dog populations now include some level of hybridisation (Stephens et al. 2015). The extent of hybridisation across the country broadly reflects the intensity of human settlement (Fig.1). In Western Australia over half (59%) of wild dogs have tested as 'pure' dingoes. This is the second highest proportion of pure dingoes in any state or territory (Northern Territory recorded 87% of individuals) (Stephens et al. 2015).Within populations of wild dogs there is a low proportion of purely domestic dogs (Stephens et al. 2015). Hybridisation is most likely to occur typically between dingo females and domestic males (Jones 1990, Stephens et al. 2015).

There are differences between domestic dogs and dingoes in breeding, behaviour and patterns of movement. For example, female domestic dogs come into oestrus twice a year, whereas dingoes are monoestrus. Despite these differences breeding characteristics of wild dogs do not appear to be markedly different from dingo breeding characteristics in areas of high hybridisation, although the breeding period has extended in time (Claridge et al. 2014). Similarly behavioural and movement patterns of wild dog populations appear to remain consistent with those of dingoes in areas of high hybridisation (Claridge et al. 2014). One feature which does appear to have changed in response to hybridisation is body size which has reportedly increased over time (Claridge et al. 2014).

Where conservation of pure dingoes is a management goal, the greatest threat to the existence of dingoes as a separate taxon to domestic dogs is introgression of genes from domestic dogs (Stephens et al. 2015). Some authors have argued that this process may be facilitated by lethal wild dog control (e.g. Wallach et al.2009).

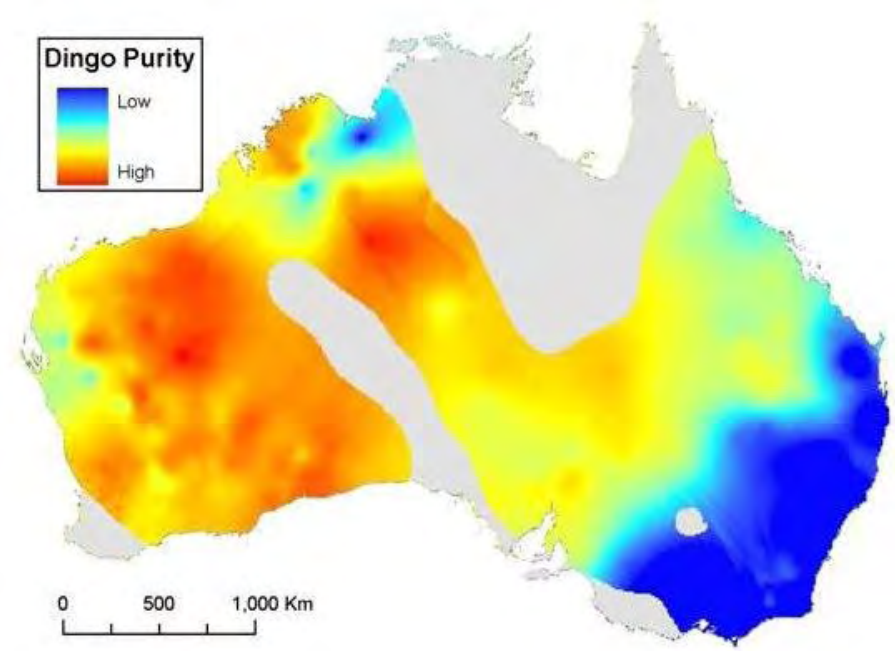


Fig. 1. Purity of dingoes across Australia. Red-yellow patches represent areas with a high level of dingo purity, blue regions contain individuals with lower purity categories. Un-sampled areas are shown in grey. (Stephens et al. 2015).

Movement and home ranges of wild dogs

Wild dogs are social animals that form packs comprised of related animals, which typically include a single alpha male and an alpha female and their offspring of various years (Thomson 1992a, Corbett 2001). Breeding generally occurs between the alpha male and female. While breeding can occur between the alpha male and subordinate females these litters may not survive (Corbett 1988).

Pack members each have their own home range (the area in which an individual undertakes routine activities: hunting, mating, raising offspring). The collective area used and defended by the pack, comprised of multiple home ranges, is the territory. Home range sizes are related to resource dispersal and abundance (Newsome et al. 2013) and average wild dog home range sizes for wild dogs across Australia vary from 10 to over 70km^2 (Corbett 2001).

Home range size has been recorded in wild dogs in the Fortescue area of WA as averaging 52km^2 for female and 61km^2 for males. Territory sizes in this area ranged from 45-113km^2 (Thomson 1992a). Daily wild dog movements in the Fortescue study were typically within the pack's territory and extended forays outside of the territory occurred rarely (Thomson 1992a).

Wild dog diet

Wild dogs are considered to be opportunistic, generalist predators capable of utilising a broad range of prey (Newsome et al. 1983, Corbett and Newsome 1987, Allen et al. 2012). Utilisation of prey is generally in proportion to availability (Corbett and Newsome 1987) although this can vary where food is supplemented by human activities (Newsome et al. 2013).

Within the northern rangelands of WA wild dog diet is dominated by macropods but prey switching can occur rapidly in response to changes in seasonal or resource conditions (Thomson 1992b). While wild dogs can prey on a suite of prey, from a livestock production perspective small stock are extremely vulnerable to the impacts of wild dogs, such that the sheep and wild dogs are considered mutually exclusive (Thomson 1984, Newsome 2001, Fleming et al. 2001, Fleming et al. 2014).

Cattle are considered to be able to withstand wild dog attacks to a greater extent. Considerable variation in losses of calves have been recorded ranging from negligible (Edwards 2002) to 30% p.a. (Allen and Gonzales 1988). There is some evidence that negative impacts of wild dog predation on cattle enterprises may be offset by reductions in kangaroo competition with stock (Prowse et al. 2014, Allen 2015a,b).

References used in this scientific review can be found in Appendix 6.

The potential for development of a biological control method for managing wild dogs is frequently raised, but it is not considered a viable option by CSIRO: their reasoning can be found at http://www.pestsmart.org.au/national-wild-dog-action-plan/media/wild-dog-biocontrol-is-no-magic-bullet/.

Wild dogs and trophic interactions

As predators, wild dogs may have the capacity to affect populations of prey species and other trophic levels. Wild dogs are recognised for their ability to regulate abundances of native and introduced herbivores such as macropods and goats (Caughley 1980, Pople 2000, Letnic 2012).

There is evidence that, in some contexts, wild dogs can affect abundance or activity of introduced predators (feral cats and foxes) such that smaller native prey can increase in abundance (e.g. Glen et al. 2007, Johnson et al. 2009, Letnic 2012) although this remains a focus of active scientific debate (e.g. Allen et al. 2011, Letnic et al. 2011, Glen et al. 2012).

Control efficacy

Effective wild dog control involves integration of a suite of control techniques including trapping, shooting, fencing and 1080 baiting (Thomson and Rose 2006). Use of 1080 baiting provides one of the most efficacious means of controlling wild dogs on a broad scale. Thomson (1986) tested efficacy of aerial baiting with 1080 meat baits in the northern rangelands of WA and demonstrated a reduction in the wild dog population of approximately 62%.

This is broadly consistent with other baiting efficacy trials (22-90%) (McIlroy 1986, McIlroy 1988, Fleming and Parker 1991, Thompson and Fleming 1991, Twigg et al. 2000). Thomson (1986) identified wild dog density, bait type, bait rate as well as age and social status of animals as key in influencing baiting efficacy.

While control tools have been demonstrated to be efficacious in reducing wild dog densities, depending on deployment, the implementation of control techniques in a landscape-scale regime is critical to maintaining small stock (Allen and Fleming 2004, Allen 2015b).

Recent modelling suggests that in the absence of extensive wild dog control regimes within the agricultural area of WA, extant populations of wild dogs within the agricultural area of the State will continue to increase in abundance and distribution (Pacioni and Kennedy unpublished data).

Wild Dog Research Gap Analysis

The need for further research investment was identified during development of this WA Wild Dog Action Plan. The National Wild Dog Action Plan Group has recently reviewed future research needs and their priorities are outlined in Appendix 1. These priorities align with the identified needs for WA and provide a basis for collaboration and future investment.

Legislative framework

DAFWA and wild dog management

In Western Australia the *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the primary legislation that applies to biosecurity and pest control. Dingoes (*Canis lupus dingo*), feral dogs (*Canis lupus familiaris*) and their hybrids (*Canis lupus dingo x Canis lupus familiaris*) are declared pests under section 22 of the BAM Act.

Dingoes and dingo-dog hybrids are declared pests for the whole of the State while dogs are declared pests for the whole of the State when running wild, feral or at large only. The three species are listed under the control category 3 (management) and exempt keeping category.

The BAM Act and associated Regulations prescribe the responsibility for controlling declared pests to land owners, occupiers and managers. Given that wild dogs can move across property and jurisdictional boundaries, effective control is both difficult and costly.

DAFWA works in partnership with industry and community adopting co-ordinated approaches to control wild dogs and to enable outcomes that could not have been achieved by individual land managers or groups in isolation.

At the State level, the WA Wild Dog Management Best Practice Manual provides operational guidance on managing wild dogs. The WA Wild Dog Action Plan 2016-21 will provide clear direction for the management of wild dogs in WA and alignment with the national plan.

The DAFWA Wild Dog Strategic Response 2013-2018 outlines the actions that DAFWA will take in partnership with other stakeholders to manage the impact of wild dogs. This document in turn informs the development of regional strategies and plans by community biosecurity groups.

Although DAFWA is responsible for the administration of the BAM Act, it is individual landholders that must take prescribed measures to control pests.

DPaW and wild dog management

The Department of Parks and Wildlife (DPaW) is one of the largest landholders in the State. It has a responsibility under the BAM Act to control pests on 22 million hectares of national parks, conservation parks, nature reserves, State forest, marine parks and marine nature reserves vested in the Conservation Commission, and six million hectares of freehold and ex-pastoral leases managed for conservation purposes. It has also been made responsible by a government agreement for fire preparedness and pest control on 89 million hectares of Unallocated Crown Land (UCL) and unmanaged reserves.

DPaW operates under the Good Neighbour Policy July 2007 which states:

4.6 Wild dogs

4.6.1 Wild dog control is undertaken in line with the current Wild Dog Management Strategy, often in partnership with neighbours. Some funds are currently allocated to the department to undertake feral animal control on UCL. Most of these funds are being directed towards the control of wild dogs. The funds that have been allocated to the department for this work are the same as those previously allocated to the Department of Agriculture and Food. These funds are limited, requiring rigorous priority setting within the control program.

4.6.2 The priorities and programs for wild dog control on DPaW-managed lands and UCL are developed in collaboration with the Department of Agriculture and Food, shires and landholders and local Recognised Biosecurity Groups (RBGs) committees, where they have been formed.

4.6.3 DPaW will continue to use both aerial baiting and on-ground dogging and baiting methods for wild dog control in cooperation with strategic management programs on adjacent land.

4.6.4 While dingoes are considered vermin in pastoral areas, they are an important component of the natural ecosystem. However, wild dog baiting (including dingoes) is carried out within and adjoining pastoral leases according to a program agreed with the Department of Agriculture and Food, and RBGs.

National Wild Dog Action Plan alignment

The National Wild Dog Action Plan released in May 2014 guides the implementation of a nationally-agreed framework for a strategic and risk based approach to wild dog management; emphasising humane, safe and effective management techniques and appropriate scales for mitigating the impacts of wild dogs.

The broad objective of the Plan is to provide private and public sector stakeholders with confidence that their investments in wild dog control will deliver long-term solutions to the national problem of wild dog management.

The Plan acknowledges that animal welfare and the use of humane control methods are fundamental considerations in all management actions, irrespective of the nature or scale of land tenure in which management actions are being taken.

The focus of the Plan is on managing the negative impacts of wild dogs on agricultural, social and biodiversity assets, acknowledging the environmental and cultural significance of the dingo and its conservation status and legal protection in a number of jurisdictions.

Participation in coordinated wild dog management programs varies across the country. Existing programs are often fragmented by jurisdictional and tenure boundaries. Methodologies and tools can vary from State to State.

Variations in legislation and regulations between State and Territory jurisdictions lead to different management approaches being permissible for controlling wild dogs. For example; the use of aerial baiting is available in some areas, but not in others, there are differing requirements for checking traps between jurisdictions, and jurisdictions vary in the conservation status of dingoes and associated management requirements.

A national approach will lead to more consistent action across jurisdictions that also meets local needs, as well as enhanced opportunities for collaborating and coordinating control efforts, and for developing and implementing nationally acceptable wild dog control practices. For example the draft *National Model Code of Practice for the Humane Control of Wild Dogs* also informs the policy documents in Western Australia in terms of animal welfare issues.

The WA Wild Dog Action Group agreed to engage and align with the National Plan while ensuring that the WA Wild Dog Action Plan is designed for WA.

"We are learning to co-exist with dingoes and wild dogs. We want profitable pastoral and tourism industries, we want to maximise indigenous values and mining needs. We are learning to do all this. We want pastoralism to grow, but we have these other values to balance. The key metric is production, as social and environmental benefits will flow from that." WAWDAG – July 2015

The National Wild Dog Action Plan is available at:

http://www.pestsmart.org.au/wp-content/uploads/2014/09/NWDAP_FINAL_MAY14.pdf

Vision

"Stakeholders work together to deliver effective, coordinated and humane management of wild dogs"

National Governance Structure

The governance structure of the National Wild Dog Action Plan reflects the major industry and government stakeholders whose memberships and investments are crucial to successful action against threats to a sustainable Australian agriculture industry.

WA has good representation at the national level across industry and science.

The national approach is to do things smarter and more effectively. Enhancing the existing efforts, doing things differently and getting better traction. The Plan has achieved leverage because it is consultative and has ownership, and is action based which is the key to the opportunity to develop the WA Wild Dog Action Plan to align the effort and attract funding to determined priorities.

The National Plan landed at a high level, providing the opportunity for WA to align with the four goals, but enabling the State plan to develop achievable actions which are accessible and practical to what is needed on the ground.

Harmonisation with the National Plan will be beneficial to WA's ability to attract resources and research effort appropriate to local conditions.

Recommendation for WA Wild Dog Alliance structure:

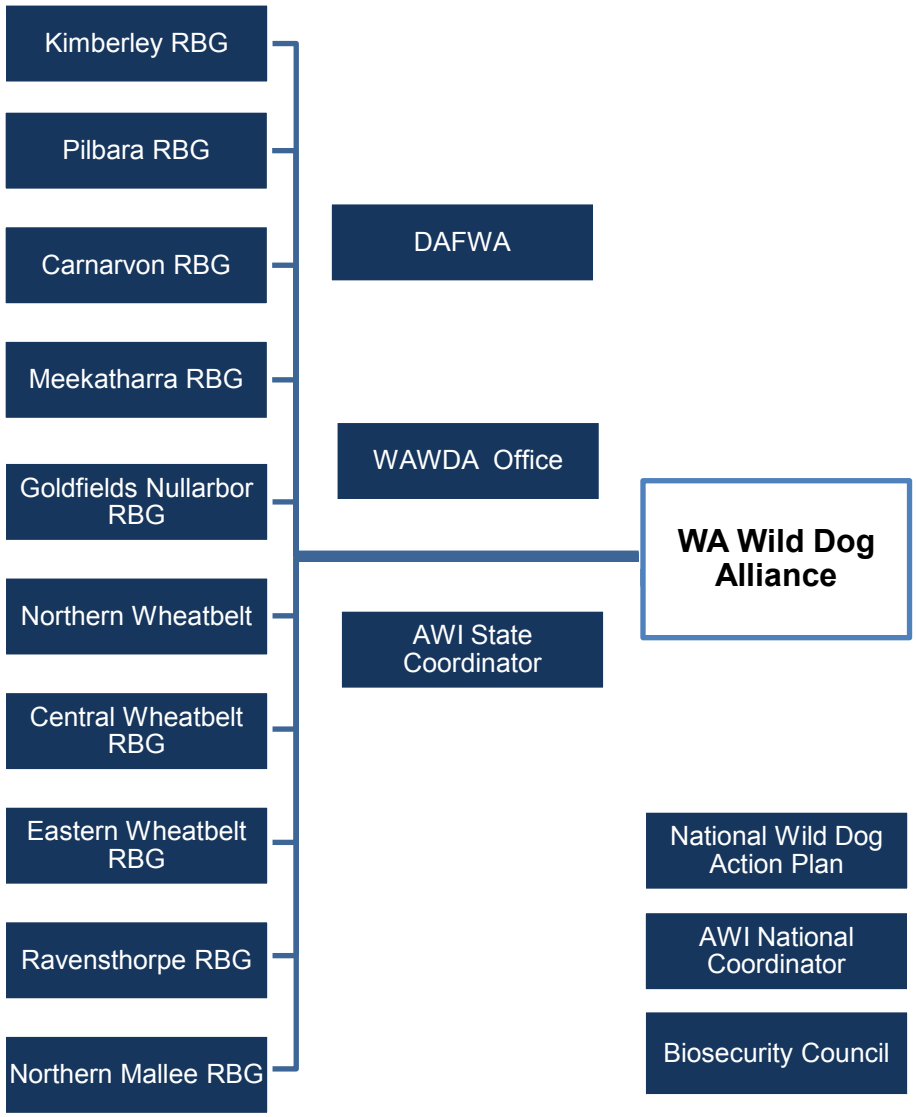
The WAWDA would be an Incorporated Association with responsibility for coordination of Wild Dog Management in WA.

The Committee would consist of 8 members:

- An Independent Chair with an agricultural/pastoral and RBG background
- 2 selected landowners from the Rangelands
- 2 selected landowners from the Wheatbelt
- A representative from DAFWA
- A representative from DPaW
- A representative from AWI

It is proposed that an inaugural Chair and a selection panel is appointed and responsible for determining the criteria and nomination of the 4 landowners.

WA Wild Dog Action Plan Governance Structure - proposed



Aligning the National and Western Australian Plans

National Wild Dog Action Plan	WA Wild Dog Action Plan
Goal 1	
Provide leadership and coordination for the management of wild dogs.	Provide leadership and coordination for effective management of wild dogs in identified priority areas.
The Plan will promote the adoption of nationally-consistent approaches to integrated and strategic wild dog management supported by a scientific and risk-based approach.	The Plan will promote the adoption of a whole of industry approach to integrated and strategic wild dog management supported by a scientific and risk-based approach.
Goal 2	
Increase awareness, understanding and capacity building with regard to wild dog management.	To achieve a high level of adoption, responsibility and proactive management of wild dogs.
The Plan will improve the adoption of wild dog management practices through maximising public, government and community support, based on effective communication, education and training processes	The Plan will improve the adoption of wild dog management practices through maximising public, government and community support, based on effective communication, education and training processes.
Goal 3	
Mitigate the negative impacts caused by wild dogs.	Reduce impacts of wild dogs on production to increase economic returns.
The Plan promotes the use of best practice wild dog control at all scales and in all planning, operations and evaluation.	The Plan promotes the use of best practice wild dog control at all scales and in all planning and operations, with each step evaluated by the impact on revitalisation of the specific landholding.
Goal 4	
Monitor, evaluate and report to inform and continuously improve wild dog management.	Monitor, evaluate and report to inform and continuously improve wild dog management.
The Plan supports the establishment of nationally-consistent metrics for assessing wild dog impacts as a basis for monitoring the effectiveness of actions and the efficiency of resource use under the Plan and reporting to stakeholders.	The Plan supports the establishment of nationally-consistent metrics for assessment of wild dog impacts on production, social and environmental benefits as a basis for monitoring effectiveness of actions and efficiency of resource use under the Plan and reporting to stakeholders.

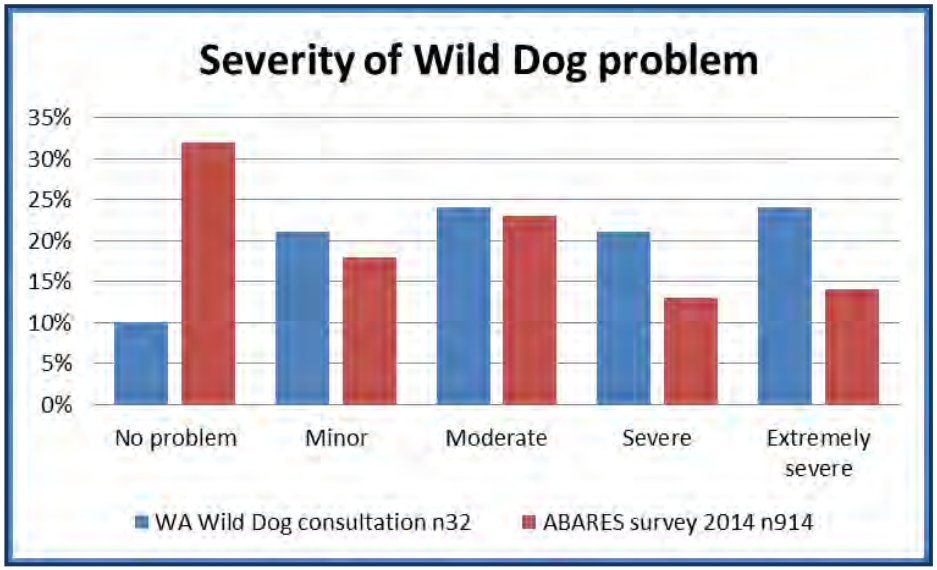
Consultation Summary

Summary of key issues from the WA Wild Dog Stakeholder Consultation

In August and September 2015 a total of 66 people were interviewed by Ag*knowledge* to provide their views and information to contribute to developing an agreed approach to wild dog control through the WA Wild Dog Action Plan. The participants included a range of industry stakeholders including landholders, both pastoralists and farmers, local government, Regional Biosecurity Group representatives, Sporting Shooters Association, industry groups and State government agency staff.

The clear message was that wild dogs are having a severe impact on the ability of landholders to run livestock in the pastoral regions of Western Australia, and that they are now moving into the agricultural areas of the State. This has significantly impacted landholders financially, emotionally and socially.

Landholders believe there is a place for pure bred dingoes within the environment, but they would like to see them exist on the other side of a fence and/or in places they won't impact on stock.



Of the 32 landholders (farmers and pastoralists) involved in the consultation the majority reported a moderate to extremely severe problem with wild dogs on their properties. Landholders realise the extent of the issue and they are actively involved in wild dog management through regular baiting programs, opportunistic shooting and using the services of a dogger through their local Regional Biosecurity Groups. Despite all these efforts, wild dogs continue to be a significant problem.

There is significant evidence of wild dogs throughout the rangelands and agricultural areas of WA including dog tracks, physical sightings, evidence of stock being maimed by dogs and general stock losses. Reports of stock losses range from 100 – 1,200 sheep/property/year that have died as a result of attacks or disturbances by wild dogs.

Wild dogs are having a huge financial impact on landholders through stock losses, reduction in lambing and marking percentages, reduced wool clips, reduction in calving rates as well as reduced prices for damaged carcases and a loss in export markets for cattle which all in turn affect financial viability. Wild dogs have also reduced the number of feral goats, which has prevented landholders from accessing alternative income through goat sales. In some circumstances the wild dogs have totally decimated the goat population.

There are significant flow-on effects of this issue with numerous off-farm industries directly affected by wild dogs including meat processors, stock firms, the shearing industry, transporters, rural suppliers and any business with a stake in the pastoral industry and agricultural areas that have been impacted by wild dog activity.

Aside from their severe impact on the livestock industry, respondents believe wild dogs do have a positive impact on the native flora and regeneration of vegetation as they can reduce the overall grazing pressure created by kangaroos, goats, sheep and cattle.

Identifying cost effective wild dog control methods

Ground baiting consumes most of the landholder's time, followed by shooting and trapping by landholders and doggers, and this doesn't take into account the labour and costs associated with doggers employed through RBGs. One landholder employs a full time dogger who works five days a week, 52 weeks a year shooting, trapping and checking / maintaining their own dog fence: they

estimate the cost to be $150,000. This doesn't allow for the extra time that station employees spend on controlling wild dogs on the inside of their fence and making baits.

There is also a lot of support for the State Barrier Fence and the extension of it given the effectiveness of some existing parts as landholders say it slows down the wild dog numbers and makes it easier to control wild dogs with a point to work back from and for doggers to work along the fence. They believe that without the fence, it would be impossible to run sheep.

Doggers have been the most effective in managing wild dogs in the past according to landholders. They believe without doggers they wouldn't have any sheep. Doggers have a lot of experience and the knowledge to follow prints and set traps.

Landholders are more supportive of ground baiting as opposed to aerial baiting as it allows for strategic placement of baits, however there is a place for aerial baiting in rough country that isn't easily accessible by ground. Fresh baits are also more effective than dried baits. One landholder believes his bird scarers / gas guns are proving to be effective in keeping wild dogs away from his sheep on the boundary of the fence. He admits that while the dogs do get used to them after a while, removing them for a few months and then re-introducing them works well.

Landholders were asked to indicate the number of days per year their business spent undertaking these actions, and the property's annual expenses on wild dog management options. Landholders spend an average of 43 days a year on managing wild dogs, which costs each property about $18,071 a year.

Management option	% of landholders using option	Range of days spent/yr	Average # of days spent/yr	Est. Annual Cost per landholder
Aerial baiting	**35%**	**0-5**	**2.5**	**$2,280**
Use of surveillance technology	**15%**	**0-20**	**10.5**	**$3,500**
Ground baiting	**75%**	**0-80**	**23**	**$9,190**
Use of Doggers	**65%**	**0-78**	**18**	**$5,400**
Exclusion or barrier fencing	**10%**	**0-16**	**12**	**$4,567**
Average			**43 days/yr**	**$18,071**

Note: the overall total does not include the extra time landholders put in to attend meetings for RBGs etc. The rate is based on $30/hour for labour but a lot of landholders earn more than that off property.

Source: Ag*Knowledge* Wild Dog Consultation Report 2015

Biosecurity Management Groups

Biosecurity Groups and their management of activities were found to be a critical part of the interaction with those interviewed during the consultation.

There are 10 Biosecurity Management Groups which were considered for their current and future needs for wild dog management in WA:

- Kimberley Recognised Biosecurity Group
- Pilbara Recognised Biosecurity Group
- Carnarvon Recognised Biosecurity Group
- Meekatharra Recognised Biosecurity Group
- Goldfields Nullarbor Recognised Biosecurity Group
- Northern Wheatbelt Declared Species Group
- Central Wheatbelt Declared Species Group
- Eastern Wheatbelt Recognised Biosecurity Group
- Ravensthorpe Declared Species Group
- Northern Mallee Declared Species Group

Interaction with the respective Committee Chair and Executive was integral in determining the current activities and perceived future requirements for each.

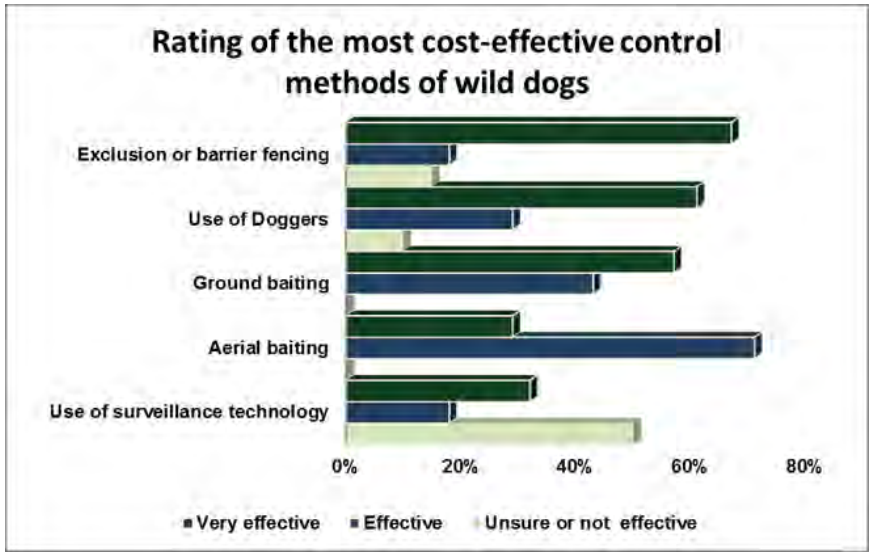
The range of activities invested in by the Groups matched the individual landholder report and is used to support the significant finding from the consultation interviews that these Groups must be the driving force in future wild dog activities.

The estimated expenditure by each Group can be seen in the table below. The specific sources for funding activities is not identified, however the mix is derived from Shire and specific rates, matching industry funds (DAFWA), R4R activities including the bounty and LPMTs, AWI and NRM grants, Shire contributions and importantly producers' time. In order to estimate the total funds expended on wild dog control in WA the numbers provided from the Biosecurity Groups are considered an accurate basis for future analysis.

The numbers derived from the ABARES Landholder Survey and Ag*knowledge* Consultation Report range from $9,100 to $18,000 per property and 32-43 labour days per year.

In estimating the number of properties/landholders impacted by wild dogs the ABARES report provides a guide for WA as 2,000 (WA was 12% of 17,000 wild dog affected properties). The multiplier at an average of $10,000 per property would indicate an annual expenditure in excess of $20 million.

This ground level expenditure is significantly greater than earlier estimates.



Wild dog expenses: estimated expenditure by Regional Management Biosecurity Groups 2014-15

Source: Ag*knowledge* Consultation Report 2015

Management Region	Kimberley RBG	Pilbara RBG	Carnarvon RBG	Meekatharra RBG	Goldfields Nullarbor RBG	Northern Wheatbelt	Central Wheatbelt DSG	Eastern Wheatbelt RBG	Ravensthorpe DSG	Northern Mallee DSG	
Activity	**Estimated Annual expense**										**Total**
Ground baiting				$95,400						$20,000	**$115,400**
Aerial baiting	$80,000	$212,700		$7,800	$498,000			$20,000		$4,000	**$822,500**
Shooting & trapping by doggers			$910,000	$457,000	$133,000	$32,000	$166,000	$285,000	$72,000	$200,000	**$2,255,000**
Exclusion or barrier fencing				$29,705							**$29,705**
Other eg R&D				$50,000	$20,000		$30,000			$9,000	**$109,000**
Administration (paid)	$2,000	$500		$56,000	$58,000		$70,000	$18,000		$6,000	**$210,500**
Administration (meetings)	$7,200	$3,000		$6,000	$7,000			$26,000	$27,000	$36,000	**$112,200**
Administration (Chair time)	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	**$50,000**
Total	**$94,200**	**$221,200**	**$915,000**	**$706,905**	**$721,000**	**$37,000**	**$271,000**	**$354,000**	**$104,000**	**$280,000**	**$3,704,305**

Key consultation issues to consider in the Wild Dog Action Plan

Based on the stakeholder feedback the WA Wild Dog Action plan needs to address the following issues:

1. **Effective and strategic coordination** - is required across all industries and stakeholders to allow landholders to run livestock without the impact of wild dogs. It is a shared problem which needs a shared solution to move forward. It requires good partnerships, co-operation and engagement across all sectors.
   - There is an opportunity to bring all the groups together to discuss issues and also to introduce an overarching group or an 'alliance' which would provide the necessary support to the groups.
2. **Ensure there is a co-ordinated RBG approach** - there could be more Recognised Biosecurity Groups (RBGs) across the State to ensure a good spread and uniformity in the approach to wild dog control. It is important to allow for local best practice relevant for each area.
3. **Maintain the RBGs and ensure they are adequately resourced** - through employment of an Executive Officer for each group, which would take the pressure off the volunteer landholders and allow them to get back on the ground to control wild dogs. Guaranteed funding is also important including support from the State Government through DAFWA, and landholders would also like to see the funds raised in a region, stay in the region. Investigate opportunities for RBGs to administer funding to avoid it getting caught up in costly administration.
4. **Funding options** - landholders see the Action Plan as a partnership between industry and government. It was suggested the Federal and State Governments have a large part to play in funding the State Barrier Fence (SBF) as the infrastructure of the fence is a State-owned asset. Funding for barrier fencing could be raised through a producer levy and matched by Government.
5. **Develop strong partnerships** - each region has a range of participants (network) with an interest in wild dog management: there is a strong drive to ensure all parties are engaged to achieve a shared contribution and a balanced approach to control and conservation. State and Local Government are seen as significant participants in the partnership.
6. **Rate all landholders** - revisit the Biosecurity and Agriculture Management (BAM) Act to ensure that all landholders within specified areas, regardless of their involvement (including mining companies), are rated and contribute to funding for control of wild dogs according to the determination of the local authorities.
7. **Encourage compliance** – needs to be about encouragement and education on landholders' responsibilities under the BAM Act. This should be undertaken by DAFWA in conjunction with the RBGs. In severe cases DAFWA may have to step in to enforce regulation compliance.
8. **Roll out FeralScan** - encourage landholders and RBGs to adopt the Feralscan application for ease of reporting and tracking wild dog activity throughout the State, which can also be aligned nationally.
9. **Invest in skills and training** - at all levels to build capacity for better management of wild dogs including management techniques, animal behaviours and conservation requirements.
10. **Increase accountability and resources from State Government** - ensure DAFWA has adequate staffing levels to support RBGs and DSGs in wild dog management, including employment of LPMTs. Develop Memorandums Of Understanding for Department of Parks and Wildlife properties, Unallocated Crown land and reserves with all groups moving forward to ensure an agreed and planned approach to wild dog control.
11. **Exclusion fencing** - provides a physical barrier allowing wild dogs to be controlled and landholders/ LPMTs can work back from it. A fence on its own will not stop wild dogs; it will require vigilance, investment of funds, time and effort to support it with buffer baiting along the fence and a co-ordinated approach to internal dog control. Preservation of the dingo species is a consideration in the argument for barrier fencing.

- Complete and maintain the State Barrier Fence (SBF) as a public asset and determine a long-term maintenance plan and replacement arrangements (cost-shared).
- Extend the barrier fence in the Esperance region (670km) and continue to work with the Northern Mallee Declared Species Group to extend the fence to protect the agricultural area from wild dogs and emus which will benefit livestock and cropping farmers.
- Optimise existing alignment (e.g. Yalgoo Triangle - 180km).
- Upgrade and maintenance of existing fence structures, with imminent replacement of around 300km of the SBF.
- Trial the Vermin Cell fence in the Murchison area – establish a public/private partnership agreement with pastoralists within the cell to fund the fence and look at opportunities to undertake research which could access research funds. Further investigate cell fencing options established in Queensland.
- Investigate fencing options and costs to allow landholders to invest with good information. Options will need to include both rangelands and agricultural options.

12. **Investigate current wild dog management practices in other States** -
    - Structure and management of the South Australian and New South Wales dog fences - the fences are very effective in controlling wild dogs, and involve not only a barrier but integration of all dog control tools and resources.
    - In Victoria non-compliant farmers are not an issue as the State government deals with wild dog issues. The LPMTs are funded by the State government and producers inside barrier fencing pay a levy on all sheep sales to fund maintenance of the fence.
13. **Increase the number of LPMTs** - as they are identified as the most effective method in controlling wild dogs and more are required on the ground. Train indigenous rangers and others who have knowledge of the bush to ensure dogging doesn't become a lost art.
14. **Integrate all the tools for wild dog management** - strategically plan how all the tools for wild dog control will be employed in a region including baiting, opportunistic shooting, trapping and doggers. Ensure continued use of baiting programs.
15. **Use full strength baits in controlling feral cats and foxes** - to ensure that wild dogs do not get bait shy after taking sub-lethal doses of bait such as Eradicat. The bait should be full strength to target feral cats, foxes and wild dogs in one hit.
16. **Research investment priorities** - investigate options for alternatives to 1080 poison and surveillance technology.
17. **Dingo versus wild dog debate** - acknowledge the differences, that the dingo is unique and that hybrid wild dogs are impacting on preservation of the dingo.
18. **Establish pure bred dingo zone/s** - to ensure the dingo is preserved and continues to be part of the natural ecology. This could include sanctuary areas, the desert and outside barrier fencing in areas where they don't impact on livestock production and where they can exist safely.
19. **Sterilisation programs** - actively encourage local Shires to oversee sterilisation programs of domestic dogs in rural towns and communities.
20. **Align monitoring and evaluation with the National Wild Dog Action Plan** - with specific reporting and data analysis for to meet WA's needs.
21. **Align wild dog management planning and investment with the Regional Blueprints** - which are looking at alternative land use options for the pastoral region that would enable landholders to diversify i.e. horticulture, tourism, carbon credits.

The full Wild Dog Consultation Report can be found in Appendix 2.

Benefit Cost Analysis of Wild Dog Management Options in Regional Western Australia

The aim of this Benefit Cost Analysis (BCA) is to provide an estimation of the cost-effectiveness of various options for wild dog management in the pastoral and agricultural regions of Western Australia.

A brief overview of the Benefit Cost Analysis is provided in this report. The detailed analysis work (on Wild Dog Management options, the State Barrier Fence and Licensed Pest Management Technicians) are included in associated spreadsheets, which are available on request.

The information from this analysis is intended to assist in prioritising decisions in the 2016-2021 Wild Dog Action Plan for Western Australia.

This BCA does not include the impact of management activities on emu or kangaroo damage, or the benefits of having maintenance teams working along the State Barrier Fence.

The benefit cost ratio (BCR) is an indicator of the return on an investment and reflects the amount of money a management option returns for every dollar spent. Comparison of the BCR across options and regions provides a means to prioritise management options according to value for money.

Regions

This BCA is conducted for ten regions within Western Australia which are defined as either Recognised Biosecurity Groups (RBGs) or Declared Species Groups (DSGs) as shown in Figure 1, with the one exception of the Northern Wheatbelt region which includes both the Northampton and Mullewa Groups and encompasses the local government areas of Northampton, Chapman Valley, Mullewa and Morawa.

How to read a Benefit Cost Ratio:

The BCR gives an indication of the likely return for every dollar spent.

So a BCR of 3.2 indicates that for each $1 spent you would expect a return to be generated of $3.20.

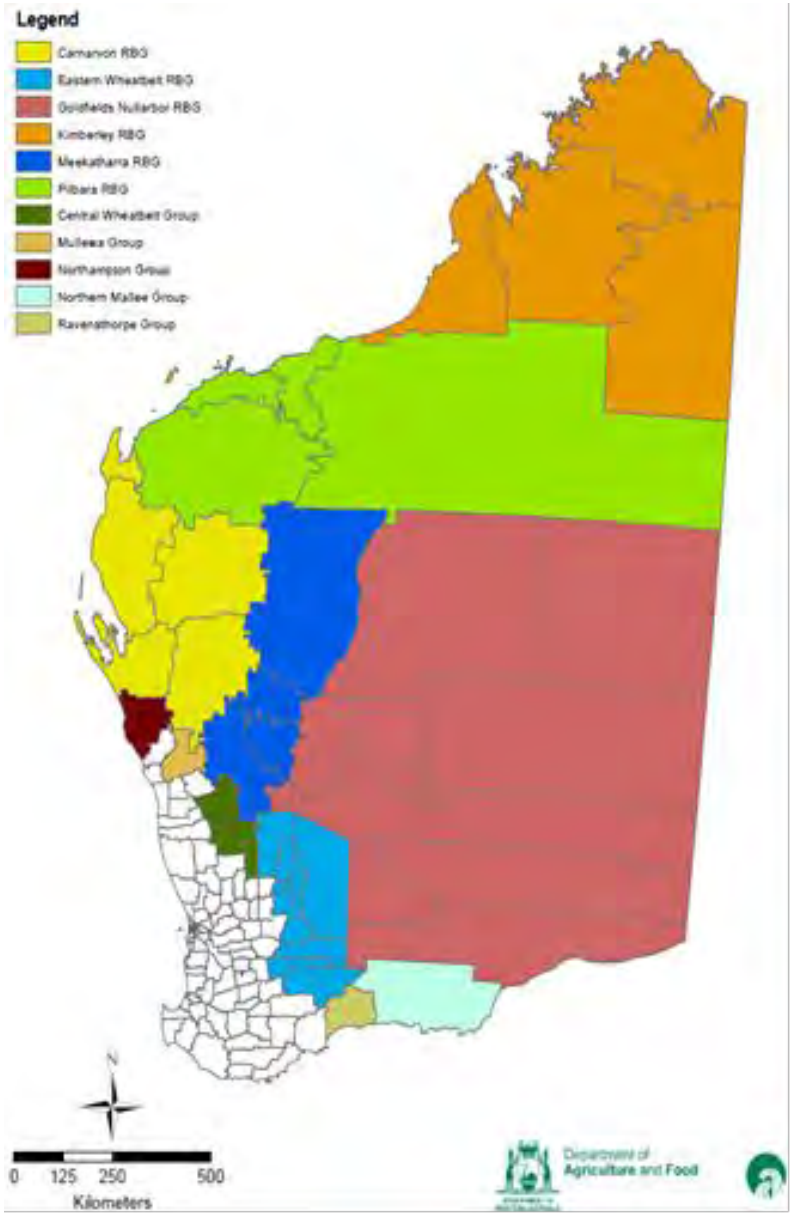


Figure 1: The ten regions of Western Australia considered in this Benefit Cost Analysis.

Options

Seven different wild dog management scenarios are considered for each of the ten regions as summarised in Table 1:

1. A 'No control' scenario is considered as a baseline for understanding the change in economic returns generated by current and proposed wild dog control activities. A further six scenarios are compared with the 'No control' scenario to understand the net value of potential options for wild dog management across the State heading into the future.
2. A fully maintained State Barrier Fence (currently the fence is under-maintained).
3. The proposed Murchison Regional Vermin Cell.
4. The proposed Goldfields Biosecurity Cell.
5. The Esperance Extension to the State Barrier Fence
6. Use of additional surveillance technology (such as additional heat or movement-sensing cameras mounted at strategic locations).
7. Options 2 to 6 combined.

Best practise use of Licensed Pest Management Technicians (LPMTs or doggers) is included in each of the options where appropriate.

For the options that include proposed additional cell or barrier fencing (Options 3 to 5), the use of LPMTs is assumed to be higher in the immediate years after the fence is contracted, and then reduced in remaining years.

Table 1: Details of the options considered in the Benefit Cost Analysis

OPTIONS: / REGIONS:	Option 1 Status Quo	Options 2,3 & 4 Fully maintained SBF, proposed MRVC and GBC	Option 5 Proposed EE	Option 6 Fully maintained SBF and surveillance	Option 7 All options together
1. Kimberley RBG	AB			AB, S	AB, S
2. Pilbara RBG	AB			AB, S	AB, S
3. Carnarvon RBG	D, AB			D, AB, S	D, AB, S
4. Meekatharra RBG	D, AB	D, AB, MRVC		D, AB, S	D, AB, MRVC, S
5. Goldfields Nullarbor RBG	D, AB	D, AB, GBC		D, AB, S	D, AB, GBC, S
6. Northern Wheatbelt	SBF – CM, D	SBF – FM, D		SBF – FM, D, S	SBF – FM, D, S
7. Central Wheatbelt DSG	SBF – CM, D	SBF – FM, D		SBF – FM, D, S	SBF – FM, D, S
8. Eastern Wheatbelt RBG	SBF – CM, D	SBF – FM, D		SBF – FM, D, S	SBF – FM, D, S
9. Ravensthorpe DSG	SBF – CM, D	SBF – FM, D	SBF – FM, D, EE	SBF – FM, D, S	SBF – FM, D, S
10. Northern Mallee DSG	AB, D		AB, D, EE	D, S	SBF - EE, D, S

Key: AB = Aerial baiting, S = Additional surveillance, D = Licensed Pest Management Technicians (Doggers), SBF = State Barrier Fence, CM = current maintenance, FM = fully maintained, MRVC = Murchison Regional Vermin Cell, GBC = Goldfields Biosecurity Cell, EE = Esperance Extension.

The colours represent specific analysis completed in the BCA spreadsheet i.e. Meekatharra RBG in green indicates a dedicated calculation reflected in Table 2: Estimated present value of the annual management.

Figure 2: Current and proposed wild dog standard fences in Western Australia.

Methodology

The Benefit Cost Analysis involves estimation of the various costs and benefits associated with each wild dog management option in each region. The cost and benefit are converted to present values using a 25-year time horizon and 5% discount rate, and summed over this time period.

The difference between the present value of the benefits and the present value of the costs is the net present value of the project.

The ratio of the present value of the benefits to the present value of the costs is the benefit cost ratio (BCR).

The benefit cost ratio is an indicator of the return on investment and reflects the amount of money the management option returns for every dollar spent (the bang for the buck). Comparison of the BCR across options and regions provides a means by which management options can be prioritised according to value for money.

Estimation of the present value of benefits associated with wild dog management

Management of wild dogs is assumed to affect the profitability of livestock enterprises in the following three ways:

1. Reducing livestock deaths.
2. Increasing lamb/calf weaning percentages (the ratio of the number of lambs/calves weaned to the number of females exposed during breeding season).
3. Allowing increased stocking levels in each region.

The benefit of wild dog management is estimated by calculating the effect of these impacts on the gross margin of the livestock enterprise for each region. The gross margins of the sheep and cattle enterprises are dependent on:

Wool sales: Average flock wool cut (3.4 - 5.2kg/hd greasy, depending on the region (ABARES 2015 and Planfarm and Bankwest 2014)).

Wool prices: Expected price received for wool ($5.15 - $6.27/kg greasy net taxes and selling costs, depending on the region (ABARES 2015)).

Sheep prices: Expected sheep sale price ($75/hd net of freight and charges (ABARES 2015)).

Cattle prices: Average cattle sale price ($730/hd net of freight and charges (ABARES 2015)).

Sheep variable costs: Costs associated with producing sheep that vary with the level of sheep production (i.e. not including fixed costs) ($30-$40/hd, depending on the region (URS 2007 and Planfarm and Bankwest 2014)).

Cattle variable costs: Costs associated with producing cattle that vary with the level of cattle production (i.e. not including fixed costs ($500/hd depending on the region (DoA 2015)).

The gross margin of the sheep or cattle enterprise on a $/ha basis depends on the number of head of livestock sold, which in turn depends on the three factors listed earlier which may be influenced by the level of wild dog control.

Livestock numbers in Western Australia have generally been decreasing through time (with the exception of cattle in the Pilbara and Kimberley) (see Figures 3 and 4). This decline is largely due to historical trends in management, economic and climatic variables. Trends in these variables over the past 25 years are described below:

Wool price - the long-term average real wool price has remained constant (ABARES 2014).

Sheep prices - sheep prices have increased in real terms (ABARES 2014).

Cattle prices - long-term prices have remained stable, medium term prices have been decreasing, but short-term prices have increased (ABARES 2014).

Rainfall - long-term annual rainfall has remained steady but summer rainfall has increased and winter rainfall has decreased (BOM 1960 – 2014).

Value of alternative livelihoods - the average wage has been increasing in Australia over this time period driven by the mining sector (ABS 2015).

The assumptions regarding the impacts of management on stocking, weaning and death rates are taken from a wide evidence-basis, and differ across management options and regions. For the sake of brevity, assumptions regarding the impact of key management options on stocking rates only are summarised below:

Current control activities allow landholders to increase stocking rates by 20 - 50% for sheep and 5-20% for cattle compared with the no control scenario, depending on the region.

A **fully-maintained SBF** would allow landholders to increase stocking rates by 5% compared with the current level of maintenance.

The proposed **Murchison Regional Vermin Cell** would allow landholders to increase current stocking rates by 300% for sheep and 5% for cattle.

The proposed **Goldfields Biosecurity Cell** would allow landholders to increase current stocking rates by 350% for sheep and 5% for cattle, based on size of cell and rangeland condition.

Increased use of surveillance technology would allow landholders to increase all stocking rates by 3%.

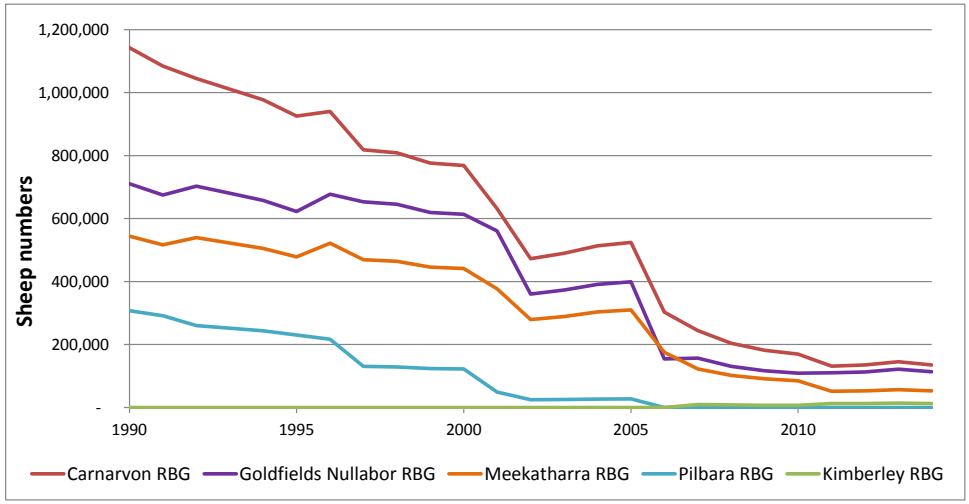


Figure 3: Estimated sheep numbers within pastoral Recognised Biosecurity Groups

Source: ABS (1991, 1996, 2001, 2006, 2011). Movements in sheep numbers between years are calculated to match movements in state-wide sheep numbers.

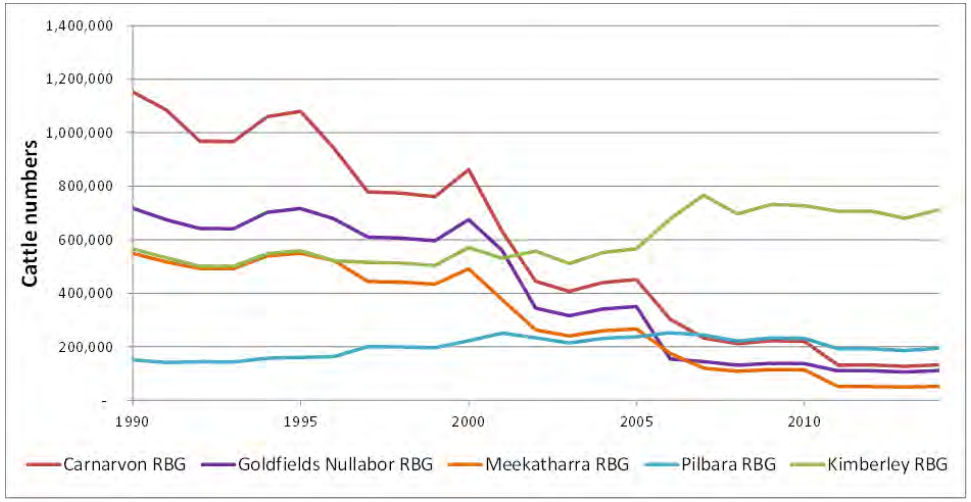


Figure 4: Estimated cattle numbers within pastoral Recognised Biosecurity Groups

Source: ABS (1991, 1996, 2001,2006, 2011). Movements in meat cattle numbers between years are calculated to match movements in state-wide meat cattle numbers.

Estimation of the present value of costs associated with wild dog management

Currently (the Status Quo) approximately $8.8 million/year is spent on wild dog management in Western Australia. The estimated costs of wild dog management options by region include:

1. The cost of fence construction and maintenance (ranging from 0 - 55% of management costs depending on the option and region, and averaging 14% of costs across all options and regions).
2. Control activities of landholders (on average 41% of costs across all options and regions).
3. RBGs, local and state government spending on wild dog management (on average 43% of costs across all options and regions).
4. The cost of redeveloping stations/properties in the case of proposed cell or barrier fencing (including the purchase of breeding stock, upgrading existing fences, water sources and sheds, staffing and vehicle upgrades) (ranging from 0 - 30% of management costs depending on the option and region, and averaging 2% of costs across all options and regions).

State Barrier Fence

The current cost of maintaining the 1,170km State Barrier Fence is approximately $171/km for a total maintenance cost of $200,000/year (2% of total management costs). If the SBF were to be fully-maintained at a cost of $500/km (URS 2009), the expected cost is $600,000/year, an additional $368,000/year on current spending.

Murchison Regional Vermin Cell

Completion of the proposed Murchison Regional Vermin Cell is expected to require an upfront construction cost of $2.6m (328km at $8,000/km) and an upfront station redevelopment cost of $14.5m across the whole region. Annual costs thereafter would include $0.5m/year in landholder management costs and $0.3m/year in RBG management costs. Maintenance would continue to be $300/km/year for the fence, accruing after 10 years for the newly constructed sections.

Goldfields Biosecurity Cell

Completion of the proposed Goldfields Biosecurity Cell is expected to require an upfront construction cost of $6.8m (850km at $8,000/km) and an upfront station redevelopment cost of $5m across the whole region. Annual costs thereafter would include a $0.2m/year landholder management cost and $67,000/year in RBG management costs. Maintenance would continue to be $300/km/year for the fence, accruing after 10 years.

Esperance Extension to the State Barrier Fence

Completion of the proposed Esperance Extension is expected to require an upfront construction cost of $13.0m (670km at $18,400/km) and an upfront property redevelopment cost of $6.7m across the whole region. Annual costs thereafter would include a $166,000/year landholder management cost (across the whole region) and $533,000/year in RBG management costs. Maintenance would continue to be $500/km/year for the fence, accruing after 10 years.

Additional surveillance

Costs of adding additional surveillance is expected to be between $20,000 and $100,000/region/year, depending on the region.

Benefit cost results

The estimated present value of the annual benefits and costs, and the Benefit Cost Ratio (BCR), of each of the wild dog management options by region are provided in Table 2. Upfront costs (e.g. fence construction costs) are included in this table as equivalent annual costs. The details of the management activities included in each option are highlighted in Table 1.

Returns to investment by current wild dog management activities

Current wild dog management activities in the Kimberley and Pilbara regions are estimated to have very good returns to investment (BCRs = 5.1 and 4.3, respectively). Management in these regions is focussed on aerial baiting at relatively low cost compared with the cost of management activities in other regions. Benefits are also relatively low, but far exceed the costs.

Current wild dog activities in the agricultural regions (focussed on the State Barrier Fence in all regions except the Northern Mallee) also have strong returns to investment (BCRs = 2.5 – 8.9).

Current management activities in the southern rangelands (Carnarvon, Meekatharra and Goldfields Nullarbor) deliver a smaller return than other regions (BCRs = 1.5 – 1.8) with relatively high costs of activities by Licensed Pest Management Technicians over large areas.

Returns to investment by proposed wild dog management activities

The proposed Esperance Extension to the State Barrier Fence is expected to have a good return to investment (BCR = 6.6 and 4.8 in the Ravensthorpe and Northern Mallee regions, respectively).

Additional surveillance activities are also expected to provide strong returns to investment due to the relatively small cost of adopting proposed activities.

The proposed Murchison Regional Vermin Cell (6.4m hectares of grazing land) is expected to provide a moderate return on investment (BCR = 1.5).

The proposed Goldfields Biosecurity Cell (2.2m ha of grazing land) is close to the modelled 'optimal' size for cell fencing in that region (2.9m ha of grazing land) as the region has the potential to increase carrying capacity sufficiently to allow a moderate return to investment (BCR = 1.5).

Understanding the potential optimal size of a fenced cell.

An estimation of the optimal size of a fenced cell was undertaken by considering impacts such as a minimum stocking rate that occurs in the absence of wild dog management, and a maximum stocking rate associated with full wild dog management. Factors including the proportion of the cell area that is grazing land, the cell area before stocking rate starts to decline due to wild dogs, and the minimum cell area for which fencing has no effect on stocking rates. Additional evidence relating to dog movement inside the cell and importantly the potential collaboration or lack of between landholders was also considered.

The optimal size of a fenced cell is estimated to be approximately 2.5m hectares of grazing land in the Rangelands (see Appendix 3).

Priorities for future investment in wild dog management activities

The results of the Benefit Cost Analyses suggest that the priorities for investment in wild dog management could be:

1. Investing in efficient and effective management of regional groups to ensure a coordinated and cost-effective wild dog management in each region.
2. Ensuring the State Barrier Fence remains fully maintained into the future.
3. Completing the Esperance Extension to the State Barrier Fence.
4. Investing in additional surveillance technology.
5. Consideration of co-funding investment models for cell fencing in strategic regions of the pastoral zone of Western Australia.

Table 2: Estimated present value of the annual management costs for each option and region (2015/region/year).

REGION	Present value (PV) and Benefit Cost Ratio (BCR)	Status Quo	Fully maintained SBF, proposed MRVC and GBC	Proposed EE	Fully maintained SBF and additional surveillance	All options together
1. Kimberley RBG	PV of benefits ($)	4,677,000			8,951,000	8,951,000
	PV of costs ($)	915,000			1,015,000	1,015,000
	BCR	*5.1*			*8.8*	*8.8*
2. Pilbara RBG	PV of benefits ($)	2,737,000			3,967,000	3,967,000
	PV of costs ($)	630,000			680,000	680,000
	BCR	*4.3*			*5.8*	*5.8*
3. Carnarvon RBG	PV of benefits ($)	3,540,000			4,869,000	4,869,000
	PV of costs ($)	1,925,000			1,975,000	1,975,000
	BCR	*1.8*			*2.5*	*2.5*
4. Meekatharra RBG	PV of benefits ($)	1,181,000	3,845,000		1,416,000	4,288,000
	PV of costs ($)	1,235,000	2,569,000		1,396,000	2,619,000
	BCR	*1.0*	*1.5*		*1.0*	*1.6*
5. Goldfields Nullarbor RBG	PV of benefits ($)	2,759,000	4,349,000		3,608,000	5,442,000
	PV of costs ($)	2,495,000	3,480,000		2,595,000	3,580,000
	BCR	*1.1*	*1.2*[a]		*1.4*	*1.5*
6. Northern Wheatbelt	PV of benefits ($)	1,344,000	2,052,000		2,460,000	2,460,000
	PV of costs ($)	151,000	220,000		240,000	240,000
	BCR	*8.9*	*9.3*		*10.2*	*10.2*
7. Central Wheatbelt DSG	PV of benefits ($)	763,000	975,000		1,094,000	1,094,000
	PV of costs ($)	309,000	332,000		352,000	352,000
	BCR	*2.5*	*2.9*		*3.1*	*3.1*
8. Eastern Wheatbelt RBG	PV of benefits ($)	5,247,000	7,311,000		8,482,000	8,482,000
	PV of costs ($)	620,000	773,000		793,000	793,000
	BCR	*8.5*	*9.5*		*10.7*	*10.7*
9. Ravensthorpe DSG	PV of benefits ($)	921,000	1,248,000	2,931,000	1,549,000	3,351,000
	PV of costs ($)	164,000	187,000	441,000	207,000	466,000
	BCR	*5.6*	*6.7*	*6.6*	*7.5*	*7.2*
10. Northern Mallee DSG	PV of benefits ($)	1,173,000		8,796,000	1,809,000	10,140,000
	PV of costs ($)	403,000		1,833,000	423,000	1,862,000
	BCR	*2.9*		*4.8*	*4.3*	*5.4*

Explanation: The expenditure of $1.015m delivers a return of $8.951m or a multiple (BCR) of $8.80 for each $1 invested.

Key: RBG = Recognised Biosecurity Group, DSG = Declared Species Group, PV = Present Value, BCR = Benefit Cost Ratio,
MRVC = Murchison Regional Vermin Cell, GBC = Goldfields Biosecurity Cell, EE = Esperance Extension and SBF = State Barrier Fence.
Note: Upfront costs (e.g. fence construction costs) are included in this table as equivalent annual costs.
[a] Note that this BCR is for the whole RBG. The BCR for the GBC only is 1.5.

Benefit Cost Analysis of Wild Dog Management by the State Barrier Fence

Introduction

The aim of this Benefit Cost Analysis (BCA) is to provide an estimation of the cost-effectiveness of the State Barrier Fence (SBF) for wild dog management in the agricultural regions of Western Australia.

The information from this analysis is intended to assist in prioritising decisions in the 2016 Wild Dog Action Plan for Western Australia.

This BCA does not include the impact of management activities on emu or kangaroo damage, or the border control benefits of having ongoing maintenance teams along the State Barrier Fence.

Regions

This BCA is conducted for five regions within Western Australia bordering the State Barrier Fence, which are Recognised Biosecurity Groups (RBGs) or Declared Species Groups (DSGs) (Figure 1) with the one exception of the Northern Wheatbelt region which includes both the Northampton and Mullewa Groups and encompasses the local government areas of Northampton, Chapman Valley, Mullewa and Morawa.

Three different wild dog management scenarios are considered for each of these regions as summarised below:

1. A 'No control' scenario is considered as a baseline for understanding the change in economic returns generated by the SBF.
2. A fully maintained SBF (currently, the fence is under-maintained).
3. The proposed Esperance Extension to the State Barrier Fence.

Best practise use of Licensed Pest Management Technicians (LPMTs or doggers) is included in each of the options where appropriate. For the proposed Esperance Extension, the use of LPMTs is assumed to be higher in the immediate years after the fence is constructed to eradicate wild dogs from the areas protected by the fence, and then reduced in remaining years. A map of current and proposed wild dog standard fences in Western Australia is provided in Figure 2.

Options

As for the previous wild dog management options analysis, the assumptions regarding the impacts of management on stocking, weaning and death rates are taken from a wide evidence-basis, and differ across management options and regions.

The additional options included in this analysis relate to the following:

Current control activities (which includes partial maintenance of the SBF) allow landholders to increase stocking rates by 20 - 50% for sheep and 5-20% for cattle compared with the no control scenario, depending on the region.

A **fully-maintained SBF** would allow landholders to increase stocking rates by a further 5% compared with the current level of maintenance.

The proposed **Esperance Extension** to the SBF would allow landholders to increase current stocking rates by 10% for sheep in the Ravensthorpe DSG (the SBF runs around half of this region, with largely successful LPMTs activities currently preventing most wild dogs from entering around the fence) and by 40% in the Esperance DSG.

Upgraded State Barrier Fence with lap wire.

Estimation of the present value of costs associated with wild dog management

The estimated costs of wild dog management options associated with the SBF by region is dependent on:

1. RBG, local and state government spending on wild dog management which is focused on baiting, shooting and trapping activities by LPMTs.
2. The cost of fence construction and maintenance.
3. Control activities of landholders.
4. The cost of redeveloping properties in the case of the proposed Esperance Extension (including the purchase of breeding stock, upgrading existing fences, water sources and sheds, and staffing and vehicle upgrades).

Currently, approximately $8.8m/year is spent on wild dog management in Western Australia. The current cost of maintaining the 1,170km SBF is approximately $171/km for a total maintenance cost of $200,000/year. If the SBF were to be fully-maintained at a cost of $500/km (URS 2009), the expected cost is $600,000/year, an additional $400,000/year on current spending.

Completion of the proposed Esperance Extension is expected to require an upfront construction cost of $13.0m (670km at $18,400/km) and an upfront property redevelopment cost of $6.7m across the whole region.

Annual costs thereafter would include a $166,000/year landholder management cost (across the whole region) and $533,000/year in RBG management costs. Maintenance would be $400/km/year for the fence, accruing after 10 years.

Benefit cost results

The estimated present value of the annual benefits and costs, and the Benefit Cost Ratio (BCR), of each of the wild dog management options by region are provided in Table 3.

Upfront costs (e.g. fence construction costs) are included in this table as equivalent annual costs.

Table 3: Estimated present value of the annual management costs for each option and region (2015/region/year)

REGION	Present value (PV) and Benefit Cost Ratio (BCR)	Status Quo	Fully maintained SBF	Proposed EE
1. Northern Wheatbelt	PV of benefits (S)	1,344,000	2,052,000	
	PV of costs (S)	151,000	220,000	
	BCR	***8.9***	***9.3***	
2. Central Wheatbelt DSG	PV of benefits (S)	763,000	975,000	
	PV of costs (S)	309,000	332,000	
	BCR	***2.5***	***2.9***	
3. Eastern Wheatbelt RBG	PV of benefits (S)	5,247,000	7,311,000	
	PV of costs (S)	620,000	773,000	
	BCR	***8.5***	***9.5***	
4. Ravensthorpe DSG	PV of benefits (S)	921,000	1,248,000	2,931,000
	PV of costs (S)	164,000	187,000	441,000
	BCR	***5.6***	***6.7***	***6.6***
5. Northern Mallee DSG	PV of benefits (S)	1,173,000		8,796,000
	PV of costs (S)	403,000		1,833,000
	BCR	***2.9***		***4.8***

Key: RBG = Recognised Biosecurity Group, DSG = Declared Species Group, PV = Present Value, BCR = Benefit Cost Ratio and SBF = state barrier fence.
Note: Upfront costs (e.g. fence construction costs) are included in this table as equivalent annual costs.

Current wild dog activities in the agricultural regions (focussed on the State Barrier Fence in all regions except the Northern Mallee) have strong returns to investment (BCRs = 2.5 – 8.9).

The proposed Esperance Extension to the State Barrier Fence is expected to have a good return to investment (BCR = 6.6 and 4.8 in the Ravensthorpe and Northern Mallee regions, respectively).

Benefit Cost Analysis of Wild Dog Management by Licensed Pest Management Technicians

Introduction

Funding of $3.65m from of the Royalties for Regions - Regional Grants Scheme Strategic Reserve has been provided for the practical implementation of Wild Dog Management. This report accompanies a review of the investment made by the WA Government to determine current performance and management of the program and to identify requirements for future ground-based pest control in areas of high wild dog impact.

The aim of this Benefit Cost Analysis is to provide an estimation of the cost-effectiveness of Doggers, referred to as Licensed Pest Management Technicians (LPMTs) in the pastoral and agricultural regions of Western Australia. The information from this analysis is intended to assist prioritising decisions within the 2016 - 2021 Wild Dog Action Plan for Western Australia.

LPMTs are defined as people employed to manage wild dogs using ground and aerial baiting, trapping and shooting. Landholders may also conduct similar activities to LPMTs, but their activities are not included in this analysis.

Options and Regions

This Benefit Cost analysis (BCA) is conducted for ten regions within Western Australia as indicated in Figure 1 and the Northern Wheatbelt region which includes both the Northampton and Mullewa groups and encompasses the local government areas of Northampton, Chapman Valley, Mullewa and Morawa.

Wild dogs are currently managed through a variety of activities in each of the regions as highlighted below:

1. **Kimberley and Pilbara RBG**: conducting aerial baiting exclusively.
2. **Carnarvon RBG, Meekatharra RBG, Goldfields Nullarbor RBG and Northern Mallee DSG**: all management activities (ground and aerial baiting, trapping and shooting).
3. **Northern Wheatbelt, Central Wheatbelt DSG, Eastern Wheatbelt RBG and Ravensthorpe DSG**: the State Barrier fence and LPMTs conducting all management activities.

A ‘No control’ scenario is considered as a baseline for understanding the change in economic returns generated by current wild dog control activities by LPMTs.

Estimation of the present value of costs associated with wild dog management

The estimated costs of wild dog management options by region is dependent on the RBG, local and state government spending on wild dog management which is focussed on LPMT activities, management activities of landholders and where appropriate the cost of fence maintenance. Currently, approximately $8.8m/year is spent on wild dog management in WA.

Approximately 59% of this total cost is private costs spent by landholders on wild dog management ($5.5m/year). The cost of LPMTs is approximately 34% of the total cost ($3.2m/year); administration, research and in-kind costs of RBGs and DSGs are approximately 5% ($0.5m/year); and maintenance is approximately 2% ($171/km over 1,170km for a total maintenance cost of $200,000/year).

Benefit cost results

The estimated present value of the annual benefits and costs, and the Benefit Cost Ratio (BCR), of the different wild dog management activities by region are provided in Table 2 earlier in this report.

Current wild dog management activities in the Kimberley and Pilbara regions are estimated to have very good returns to investment (BCRs = 5.1 and 4.3, respectively). Management in these regions is focussed on aerial baiting at relatively low cost compared with the cost of management activities in other regions. Benefits are also relatively low, but far exceed the costs. As the predominant management activity in these regions is aerial baiting, the BCR attributable to LPMTs is similar at 5.2 and 4.4 in the Kimberley and Pilbara RBGs, respectively.

Current management activities in the southern rangelands (Carnarvon, Meekatharra and Goldfields Nullarbor) are smaller than other regions (BCRs = 1.5 – 1.8) with relatively high costs of activities by Licensed Pest Management Technicians over large areas. Management of wild dogs in these regions is focussed on LPMTs, and hence the BCR of LPMT activities is the same as all activities for these regions.

Current wild dog management activities in the agricultural regions rely on both the State Barrier Fence and LPMT activities. In the Northern Wheatbelt region, LPMT activities commenced in 2015 and the majority of benefits are derived from the State Barrier Fence. Hence the BCR of LPMTs is relatively low for the agricultural region at 1.4.

The activities of LPMTs are a more important part of wild dog management strategy in other agricultural regions, reflected in higher BCRs which range from 2.0 in the Central Wheatbelt CSG to 5.5 in the Ravensthorpe DSG.

Overall, the activities of LPMTs provide strong returns to investment in all areas with the exception of the Meekatharra and Goldfields Nullarbor RBGs, where wild dog management activities are marginal due to the vast expanse of the landscape and poor rangeland condition.

Case Study 1 - Benefit Cost Analysis of Rawlinna Station Wild Dog Fencing

Objective

This case study of Rawlinna Station's Wild Dog Fencing is prepared to assist in prioritising decisions in the 2016-2021 Wild Dog Action Plan for Western Australia. It is a Benefit Cost Analysis of Rawlinna both from the perspective of building a similar fence now (with a view to understanding whether it is cost-effective to build similar vermin cells in WA) as well as the investment value of the already established fence. This Analysis does not include the impact of management activities on emu or kangaroo damage along the fence.

Background[1]

Rawlinna Station was first taken up in very early 1960s as a new pastoral lease. It was the consolidation of a number of leases extending between the Transline and Eyre Highway. The Homestead is 365km east of Kalgoorlie about 10km from the now largely abandoned Rawlinna Siding. Rawlinna was taken up by BH MacLachlan from South Australia at the same time as his relations took up neighbouring leases: the McGregor's at Kanandah and his son-in-law Alistair Angas at Moonera.

Initially the McGregor's and MacLachlan's planned to create a wild dog cell encompassing all of Kanandah and Rawlinna properties. This enclosed some 24,000 square kilometres and a negotiated straightened internal boundary. The concept was revised after some years when difficulties accessing good water in much of the Kanandah operations precluded development of a large section of Kanandah. An internal netting of some 90 miles was then constructed and this completely separated the two properties. At the same time Alistair Angas had built approximately 250km of netting around Moonera Station which was located 50km further South East of Rawlinna. This created two unique cells. The Rawlinna and Moonera cells have continued to be maintained to the present.

Fence specifications: The Rawlinna Wild Dog Fence encompasses approximately 12,600km^2 (1,260,000ha) of pastoral land. It is a rectangle approximately 140km x 90km and is approximately 480km in length. It is comprised of a skeleton fence 5ft high on which 6ft marsupial netting with 100mm weave is attached. The lapping of 1ft lays on the ground and has a strain wire to keep this flat. The fence line was generally not cleared to prevent water lying on lapped wires (preventing unnecessary rust) and was mostly unnecessary in any event as the area is mostly treeless. Myall wooden posts were used every 100m and steel pickets at 7m intervals. Plain wire was strained to 400m to support netting. The division between Rawlinna and Kanandah used wire produced in Belgium and was two 3ft rolls joined. Supply of original netting was the issue. The netting was constructed by several contractors and took approximately 4 years.

Maintenance requirements: There was virtually no maintenance on the fence for the first 12 years. The fence was checked monthly to ensure the gates were closed. After 20 years, a netting rider was employed to maintain both Moonera and Rawlinna fences. This was a weekly trip along 850km to ensure any kangaroo holes or fox holes under the netting were fixed. Currently a netting rider is employed to control wild dog incursions as well as perform maintenance such as fixing holes in the body of netting, and fixing any camel damage and rusted lapping.

Production benefits: Once constructed, the enclosed dingoes were trapped and poisoned. Some 360 dogs were destroyed by a private dogger over several years. Although production over the years has been higher, the property currently stocks approximately 60,000 sheep. Fence maintenance, baiting and trapping carried out by the netting rider continues to keep wild dog predation to a minimum, as predation has a significant effect on lambing percentages and therefore eventual sales. An average of 15 staff/year are employed on Rawlinna.

[1] Information provided by Ross Wood, Executive Officer of the Goldfields Nullarbor Recognised Biosecurity Group.

Benefit Cost Analysis

This Benefit Cost Analysis is an assessment of the cost-effectiveness and investment value of the Rawlinna Wild Dog Fence. It involves summing all the costs associated with the investment, as well as all the benefits of the investment. The difference between the benefits and the costs is the net value of the project, and the ratio of the benefits to the costs is the benefit cost ratio (BCR). The benefit cost ratio is an indicator of the return on investment, and reflects the amount of money the fence returns for every dollar spent (the bang for the buck). A 25-year time horizon and a 5% discount rate are used to convert future costs and benefits into present values.

Estimation of the present value of construction, maintenance and station redevelopment costs

The present value of the costs of constructing and maintaining the Rawlinna Wild Dog Fence, as well as redeveloping the station (including the purchase of breeding ewes and rams, upgrading existing fences, water sources and sheds, and staffing and vehicle upgrades) are provided in Table 4. Costs are provided for each year the cost item is required, and then as an annualised cost (or equivalent annual cost). The annualised cost is the equivalent amount of money if the value of the construction cost were spread out over the 25-year time horizon of the benefit cost analysis, rather than in the first year (in the case of construction) or in later years only (in the case of maintenance).

If Rawlinna were to be constructed today, the annualised cost of construction, maintenance and station redevelopment per year over the 25-year time horizon is estimated to be $745,000/year. The estimated annualised costs associated with the already-established Rawlinna are significantly less at approximately $299,000/year.

Table 4: Estimated costs of the Rawlinna Wild Dog Fence

Cost item:	Cost if Rawlinna was constructed today	Cost with Rawlinna already established
Fence construction 480km of fencing at $8,000/km[2]	$3,840,000 in year 1 Annualised cost: $259,000/year	-
Fence maintenance Materials cost only. Labour cost is included in landholder control costs	$144,000 in years 11 – 25 Annualised cost: $106,000/year	$144,000/year (all years)
Landholder control costs Rawlinna currently employs one full-time Licensed Pest Management Technician to control wild dogs and perform fence maintenance at a cost of $150,000/year	$400,000 in year 1 $300,000 in year 2 $200,000 in year 3 $150,000 in years 4 – 25 Annualised cost: $180,000/year	$150,000/year (in all years)
Station redevelopment $500,000/220,000ha of pastoral land – Wood (2012))	$2,884,000 in year 1 Annualised cost: $195,000/year	-
Additional administrative and in-kind costs	$5,000/year	$5,000/year
Total annual cost of Rawlinna	**$745,000/year**	**$299,000/year**

[2] Paul Jones, Regional Sales Manager, Waratah. Fence Design Calculator Wild Dog Fence 11/90/15 LL Stocksafe-T, 6m post spacings with Apron and 2 line barbed wire. $5,400 materials and $2,600/km erection.

Currently in the Goldfields Nullarbor region excluding Rawlinna landholders are spending approximately $16,600/year on wild dog management (Binks *et al.* 2015), and the RBG is spending approximately $700,000/region/year on ground and aerial baiting (including associated administrative costs) (Petersen *et al.* 2015). This equates to an annualised cost of approximately $2,495,000/region/year. This cost is spent over a grazing area of 23,370,000ha. For a region the size of Rawlinna, this would equate to approximately $135,000/year. This cost is used in later sections to compare the net value of Rawlinna with current wild dog management activities.

Estimation of the present value of benefits

Management of wild dogs is assumed to affect the profitability of livestock enterprises by:

- Reducing livestock deaths.
- Increasing lamb weaning percentages (the ratio of the number of lambs weaned to the number of females exposed during breeding season).
- Allowing increased stocking levels.

The benefit of wild dog management is estimated by calculating the effect of these impacts on the gross margin of the livestock enterprise.

The gross margin of the sheep enterprise (GM_{Sheep}) ($/hd) is calculated as:

$$GM_{Sheep} = (Wool\ sales * Wool\ price + sheep\ price) - VC_{sheep}$$

where:

- Wool sales = Average flock wool cut (kg/hd greasy).
- Wool price = Expected price received for wool (2015 $/kg greasy net taxes and selling costs).
- Sheep price = Expected sheep sale price (2015 $/hd net of freight and charges).
- VC_{sheep} = Costs associated with producing sheep that vary with the level of sheep production (i.e. not including fixed costs) (2015 $/hd).

The following assumptions are used for Rawlinna, and are taken from ABARES (2014):

- Average flock wool cut = 4.4 kg/hd greasy.
- Expected wool price = $5.15/kg greasy net of taxes and selling costs.
- Expected sheep sale price = $80/hd net of freight and charges.
- Expected sheep variable costs = $30/hd.
- Sheep gross margin = $68/hd.

Parameters which differ depending on the level of wild dog control, and the estimated annual benefits of the Fence, are provided in Table 5.

The change in economic returns of the Rawlinna Wild Dog Fence compared with no wild dog management is estimated to be $950,000/region/year, and compared with current wild dog management is estimated to be $802,000/region/year.

Table 5: Estimated annual benefits of Rawlinna Wild Dog Fence (modelling results)

Parameter:	Parameter in the absence of any control activities	Parameter in the absence of fence but with current control activities	Parameter in the presence of a fence
Sheep weaning rate – sheep (%)	65	70	80
Post-weaning death rate – sheep (%)	12	10	6
Average sheep stocking rate (DSE/Wgha)	0.0083 (0.0119 * 0.7)	0.0119	0.0476 (0.0119 * 4)
Average sheep stocking rate (DSE/region)	10,000	15,000	60,000
Lambing percentage (%)	60	69	84
Sheep sold (hd/region/year)	1,300	2,800	17,900
Cattle sold (hd/region/year)	700	1,000	-
Sheep returns ($/region/year)	93,000	189,000	1,214,000
Cattle returns ($/region/year)	171,000	233,000	-
Total economic returns ($/region/year)	**264,000**	**413,000**	**1,214,000**

Benefit cost results

The results of the benefit cost analysis are provided in Table 6. Current wild dog activities have a benefit cost ratio (BCR) of 1.1, indicating that for every dollar spent on these activities, the benefits are approximately $1.1/year. This is an expected 10% return on investment.

It is estimated that if the Rawlinna Wild Dog fence were constructed today, it would have a stronger return on investment (30%) with a BCR of 1.3.

The already constructed Rawlinna Wild Dog Fence has a very strong return on investment with a BCR of 3.2.

Table 6: Benefit cost results

Parameter	Current control activities - no fence	Rawlinna Wild Dog Fence - constructed	Rawlinna Wild Dog Fence - already established
Present value of costs ($/region/year)	135,000	745,000	299,000
Present value of benefits ($/region/year)	149,000	950,000	950,000
Net value of management activities ($/region/year)	14,000	205,000	652,000
Benefit cost ratio	**1.1**	**1.3**	**3.2**

Fence integrity is critical and management must be focused on maintaining this. **Rawlinna Station.**

Case Study 2 - Benefit Cost Analysis of Tambo Cluster Wild Dog Fencing in Queensland

Objective

This case study of the Tambo Cluster Wild Dog Fencing is prepared to assist in prioritising decisions in the 2016-2021 Wild Dog Action Plan for Western Australia. The Dog Fencing was completed to fully enclose the Tambo Cluster in Central Queensland in mid-2015.

While costs of constructing the fence are known, it is too early to obtain data evidence of the impact of the Dog Fencing, or of the ongoing costs.

This analysis includes information on the expected long-term costs and benefits to understand the expected return on investment of the fence, with a view to understanding whether it might be cost-effective to build similar vermin clusters in Western Australia. The Analysis does not include the impact of management activities on emu or kangaroo damage.

Benefit Cost Analysis

This Benefit Cost Analysis is an assessment of the cost-effectiveness and investment value of the Tambo Cluster Dog Fence. It involves summing all the actual and expected costs associated with the investment, as well as all the expected benefits of the investment. The difference between the benefits and the costs is the net value of the project, and the ratio of the benefits to the costs is the benefit cost ratio (BCR). The benefit cost ratio is an indicator of the return on investment, and reflects the amount of money the fence returns for every dollar spent (the bang for the buck). A 25-year time horizon and a 5% discount rate are used to convert future costs and benefits into present values.

Estimation of the present value of construction, maintenance and redevelopment costs

The present value of the costs of constructing and maintaining the Tambo Cluster Wild Dog Fence, as well as redeveloping the stations (including the purchase of breeding ewes and rams, upgrading existing fences, water sources and sheds, etc.) are provided in Table 7.

Table 7: Estimated costs of the Tambo Cluster Wild Dog Fence

Cost item:	Cost of Tambo Cluster Wild Dog Fence
Fence construction (380km of fencing at $8,000/km)[3]	$3,040,000 in year 1 Annualised cost: $205,000/year
Fence maintenance (Materials cost only. Labour cost is included in landholder control costs.)	$38,000 in years 11 – 25 Annualised cost: $28,000/year
Control costs of the Management Cluster (estimated at half a full-time LPMT to control wild dogs and perform fence maintenance at a cost of $75,000/year.)	Annualised cost:$75,000/year
Landholder control costs (with higher costs accruing in the initial years after the cluster is complete, and then reducing when the wild dogs are largely controlled.)	Annualised cost:$10,000/landholder/year or Annualised cost:$210,000/cluster/year
Station redevelopment ($350,000 per station over 21 stations – Wood (2012) and Andrew Turnbull *pers. com.* 2015.)	$7,350,000 in year 1 Annualised cost:$497,000/year
Additional administrative and in-kind costs (estimated to be 3x one-day meetings/year for 10 people at a cost of $400/day.)	$12,000/year
Total annual cost of Tambo Cluster	**$1,027,000/year**

[3] Paul Jones, Regional Sales Manager, Waratah. Fence Design Calculator Wild Dog Fence 11/90/15 LL Stocksafe-T, 6m post spacings with Apron and 2 line barbed wire. $5,400 materials and $2,600/km erection. Verified by Andrew Turnbull, President of the South Tambo Collaborative Area Management Cluster.

Costs are provided for each year the cost item is required, and then as an annualised cost (or equivalent annual cost).

The annualised cost is the equivalent amount of money if the value of the construction cost were spread out over the 25-year time horizon of the benefit cost analysis, rather than in the first year (in the case of construction) or in later years only (in the case of maintenance). The annualised cost of construction, maintenance and station redevelopment per year over the 25-year time horizon is estimated to be $1,027,000/year.

Table 8: Estimated annual benefits of Tambo Cluster Wild Dog Fence (modelling results)

Parameter:	Parameter in the absence of any control activities	Parameter in the absence of fence but with current control activities	Parameter in the presence of fence
Sheep weaning rate – sheep (%)	65	70	90
Post-weaning death rate – sheep (%)	12	10	5
Average sheep stocking rate DSE/Wgha	0.0917 (0.1310 * 0.7)	0.1310	0.5678 (0.1310 * 4.33)
Average sheep stocking rate DSE/cluster	30,000	21,000	130,000
Lambing percentage (%)	60	69	85
Sheep sold (hd/cluster/year)	2,800	5,600	45,500
Cattle sold (hd/cluster/year)	1,400	1,800	900
Sheep returns ($/cluster/year)	214,000	435,000	3,532,000
Cattle returns ($/cluster/year)	852,000	1,088,000	517,000
Total economic returns ($/cluster/year)	**1,066,000**	**1,523,000**	**4,049,000**

Currently, it is estimated the landholders within the Tambo Cluster are spending approximately $10,000/year on wild dog management (adapted from Andrew Turnbull *pers. com.* 2015[4]), and the RBG is spending approximately $75,000/cluster/year on ground and aerial baiting (including associated administrative costs). This equates to an annualised cost of approximately $285,000/cluster/year. This cost is spent over a grazing area of 228,965ha.

Parameters which differ depending on the level of wild dog control, and the estimated annual benefits of the Fence, are provided in Table 8.

The change in economic returns of the Tambo Cluster Wild Dog Fence compared with no wild dog management is estimated to be $2,983,000/cluster/year, and compared with current wild dog management is estimated to be $2,526,000/cluster/year.

Estimation of the present value of benefits

The following assumptions are used for Tambo Cluster, and are taken from ABARES (2014) and Andrew Turnbull:

- Average flock wool cut = 4.4 kg/hd greasy.
- Expected wool price = $5.15/kg greasy net of taxes and selling costs.
- Expected sheep sale price = $75/hd net of freight and charges.
- Expected sheep variable costs = $20/hd.
- Expected sheep gross margin = $78/hd.
- Expected cattle sale price = $800/hd net of freight and charges.
- Expected cattle variable costs = $200/hd.
- Expected cattle gross margin = $600/hd.

[4] Andrew Turnbull is current President of the South Tambo Collaborative Area Management Cluster.

Benefit cost results

The results of the benefit cost analysis are provided in Table 9. Current wild dog activities have an estimated benefit cost ratio (BCR) of 1.6, indicating that for every dollar spent on these activities, the benefits are approximately $1.6. This is an expected 60% return on investment. It is estimated that the Tambo Cluster Wild Dog Fence will have a stronger return on investment (290%) with a BCR of 2.9.

Table 9: Benefit cost results

Parameter	Current control activities (no fence)	Tambo Cluster Wild Dog Fence
Present value of costs ($/cluster/year)	289,000	1,027,000
Present value of benefits ($/cluster/year)	457,000	2,983,000
Net value of management activities ($/cluster/year)	168,000	1,956,000
Benefit cost ratio	1.6	2.9

Lessons for the potential cost-effectiveness of vermin clusters in the Western Australian pastoral zones

There are a number of significant differences between sheep grazing activities in the Tambo cluster of Queensland and the pastoral regions of Western Australia. Some of these differences include:

1. Average station size: The average property size in the Tambo cluster is approximately 10,900ha. This is significantly smaller than the station sizes in the Western Australian pastoral zones. The average station size within WA pastoral Recognised Biosecurity Groups (RBGs) are:

a. **Kimberley RBG:** 229,000ha
b. **Pilbara RBG:** 222,770ha
c. **Carnarvon RBG:** 151,000ha
d. **Meekatharra RBG:** 164,000ha
e. **Goldfields Nullarbor RBG:** 218,000ha.

2. Pre-fence stocking rate: The sheep stocking rate in the Tambo cluster before the Wild Dog Fence was erected was approximately 30,000 DSE over the 228,965ha of the cluster. This equates to 0.131DSE/ha. Current sheep stocking rates in the Carnarvon, Meekatharra and Goldfields Nullarbor RBGs are significantly lower at 0.013, 0.004 and 0.012DSE/ha which is 10 – 40 times smaller than the Tambo cluster.

3. Size of proposed clusters: The size of the Tambo cluster is 228,965ha of grazing land. The size of the proposed Murchison Regional Vermin Cell and Goldfields Biosecurity Cell are 6,364,000ha and 2,179,000ha of grazing land, respectively,

4. Rangeland suitability for increasing stocking rates: Both the Tambo and Rawlinna case studies suggest that wild dog fences increase stocking rates by 400%. It is unlikely that cells the size of that currently proposed in WA will lead to increased stocking rates of this dimension. However, Petersen and Cooke (2015b) suggest that if stocking rates were increased by 400% for proposed vermin cells in WA, the estimated Benefit Cost Ratios are likely to be marginal at approximately 1.5 for the Murchison Regional Vermin Cell and 1.3 for the Goldfields Biosecurity Cell.

Due to relatively poor rangeland condition, the building of clusters in WA the size of the Tambo cluster is unlikely to yield the same return to investment that is expected to be generated by the Tambo cluster. This is verified by Petersen and Cooke (2015a) who estimate that the Rawlinna Station Wild Dog Fence is currently generating a BCR of approximately 3.2 (already established with no construction or station redevelopment required), but if it was to be built now, would yield an estimated BCR of 1.3 (due to costs of construction and station redevelopment).

References can be found in Appendix 6.

Review of R4R funding for additional capacity for wild dog control by licensed pest management technicians

Royalties for Regions (R4R) funding of $3.65 million was approved in 2010 to fund the equivalent of eight full-time Licenced Pest Management Technicians (LPMTs), commonly known as Doggers, to operate for five years for the period from 2010/11 to mid-2016. The project was instigated to help address gaps and reduce the area covered by existing LPMTs.

To alleviate the impact of wild dogs on small livestock enterprises, the additional contract 'doggers' undertook wild dog control activities consistent with the Western Australian Wild Dog Management Strategy (2005) and the Wild Dog Management Best Practice Manual (2006). This included ground and aerial baiting and wild dog trapping in strategic locations within pastoral and agricultural lands adjacent to Unallocated Crown Land Reserves.

Overview

Ag*knowledge* completed a review of the investment in LPMTs in October 2015 firstly through a consultation process across industry to seek views and current opinion of the effectiveness of the wild dog management options. This was further developed with analysis of the Biosecurity Management Group activities and the private and public investment in wild dog management which provided substantial background for Advanced Choice Economics to complete a rigorous benefit cost analysis.

The estimated costs of wild dog management options vary by region and are dependent on the local need and activities undertaken. Currently, approximately $9.4m/year is spent on wild dog management in WA, of which landholders are spending approximately 60 per cent. The cost of operating the LPMTs is in excess of $3m/year.

As outlined in the agreements, the deliverables are used to measure the success of the R4R funding. The results are outlined in the table opposite and are only separate for each group for the 2014/15 financial year otherwise it is a total over the duration of the project.

Note: The full report from this review can be found in Appendix 5.

Benefit Cost Results

The estimated present value of the annual benefits and costs, and the Benefit Cost Ratio (BCR), of the different wild dog management activities in the agricultural regions rely on both the State Barrier Fence and LPMT activities. In the Northern Wheatbelt region, LPMT activities commenced in 2015 and the majority of benefits are derived from the State Barrier Fence. Hence the BCR of LPMT is relatively low for the agricultural region at 1.4. The activities of LPMT are a more important part of wild dog management strategy in other agricultural regions, reflected in higher BCRs which range from 2.0 in the Central Wheatbelt CSG to 4.3 in the Ravensthorpe DSG.

Overall, the activities of LPMT provide strong returns to investment in all areas with the exception of the Meekatharra and Goldfields Nullarbor RBGs, where wild dog management activities are marginal due to the vast expanse of the landscape and poor rangeland condition.

In terms of the most cost effective way to manage wild dogs, exclusion or barrier fencing works best to slow dog numbers into the agricultural areas. It then allows LPMTs to control the dogs on the outside and inside of the fence and work within a buffer zone.

Besides LPMTs and barrier fences, there is no other one tool that has been as effective, rather it is about using the combination of a number of tools including trapping, baiting and opportunistic shooting and to be truly effective this requires a co-ordinated and sustained approach.

Year	Baits laid	Trap nights	Wild dogs destroyed	Reported stock deaths attributed to wild dogs	Complaints about wild dogs from land managers
2014/15	130,054	174,753	352	487	97
2013/14	103,414	80,260	184	468	76
2012/13	73,524	65,832 732 traps	151	661	153
2011/12	134,357	No record 543 traps	165	256	160
Total	**564,538**	**485,674**	**1152**	**2201**	**552**

The key issues identified in this review that the Wild Dog Action Group needs to consider in developing the WA Wild Dog Action plan are:

1. Increase the number of LPMTs - as they are identified as the most effective method in controlling wild dogs and more are required on the ground. Train indigenous rangers and others who have knowledge of the bush to ensure dogging doesn't become a lost art.
2. Increase accountability and resources from State government – ensure DAFWA has adequate staffing levels to support RBGs and Declared Species Groups (DSGs) in wild dog management, including employment of LPMTs. Develop Memorandums Of Understanding for Department of Parks and Wildlife (DPaW) properties, Unallocated Crown land (UCL) and reserves with all groups moving forward to ensure an agreed and planned approach to wild dog control.
3. Integrate all the tools for wild dog management – strategically plan how all the tools for wild dog control will be employed in a region including baiting, opportunistic shooting, trapping and LPMTs.
4. Exclusion fencing – provides a physical barrier allowing wild dogs to be controlled and landholders/LPMTs can work back from this point. A fence on its own will not stop wild dogs; it will require vigilance, investment of funds, time and effort to support it with buffer baiting along the fence and a co-ordinated approach to internal dog control.

Suggested actions to be included in the WAWDAP implementation

Based on the outcomes of the review of the R4R funding for additional capacity for wild dog control, the following actions suggested by respondents could be included in the implementation phase of the WA Wild Dog Action Plan 2015-21:

1. Interim government funding – with the project due to be completed in mid-2016 and with some Groups still going through the process of becoming an RBG, there is expected to be a lapse period and funding in the meantime is crucial to ensure the groups can maintain the line of defence.
2. Support for RBGs and DSGs – ensure that DAFWA or a specified group can oversee and provide continued support for the Groups and networking opportunities.
3. Annual RBG and DSG forum - organise an annual get together for employees and volunteers of RBGs/ DSGs to exchange ideas, address the gaps and network with key people to get a bigger picture of the issue aside from their own backyard.
4. MOU's for cross tenure access – to allow groups continued access to UCL and government managed land and to clarify the requirements and responsibilities of LPMTs when working on that land.
5. Access to National Parks - determine and simplify the procedures for groups to access and control nuisance wild dogs in National Parks.
6. Review the process for landholders to apply for 'risk assessment permits' - to determine if expiry notification notices can be sent out in advance to ensure that properties continue to be accessible to LPMTs. The permits have a maximum expiry of 5 years.
7. Continue the employment of LPMTs – to ensure a landscape approach in controlling wild dogs. LPMTs complement any barrier or exclusion fencing as a fence allows LPMTs to use it as a buffer to work back from.
8. Develop an industry standard for LPMT rates/packages – review rates across the State that will recognise their skills and qualifications.
9. Organise a 'dogger convention' – to allow LPMTs from across the State to learn from each other and encourage communication across boundaries and tie in with additional training and a presentation from DPaW on the requirements and obligations of LPMTs in accessing their land.
10. Promote LPMTs as professionals – who are working on the frontline to protect the livestock industry and encourage new people into the industry.
11. Offer professional development opportunities for LPMTs – through workshops run by DAFWA, experts in the field, first aid training, 4 x 4 driving, bush survival etc.
12. Ensure consistencies across the groups in their reporting activities and to address personal safety issues.
13. Enforce the use of recording/mapping technology for all LPMTs – to overcome any legal issues and for reporting activity on government managed land.

Program benefits

The Royalties for Regions funding has been an excellent investment on behalf of the government as it has enabled landholders and government to use the $3.65m funding to work together to control wild dogs across the rangelands and agricultural region of Western Australia.

The funding spread over five years allowed six groups to employ an additional eight LPMTs to help control wild dogs on government managed lands in the southern rangelands and neighbouring agricultural regions to enable increased stocking of small stock.

The program has been well received by the groups who greatly benefited and they are planning to continue to use LPMTs. The Biosecurity Management Groups say that the funding has made them viable, enabled them to cover a broader area in targeting wild dogs and has also given landholders the confidence to run small stock.

Contract management

According to the review participants the Financial Assistance Agreement (FAA), which was agreed by all groups, provided enough flexibility to determine what tools to utilise in managing wild dogs and on what areas to focus their activities. While the original intent was to focus on Unallocated Crown Land (UCL) and government managed land, the FAA does state 'areas adjacent to' which has enabled the groups to follow leads and control wild dogs on neighbouring properties.

The Goldfields/Nullarbor Rangelands Biosecurity Association (GNRBA), which covers 37% of the State, has found aerial baiting to be more effective and given the flexibility of the FAA they were able to conduct an aerial baiting program at the equivalent cost to that of employing a LPMT.

There was some concern that the agreement states 'small farm stock' especially in circumstances where cattle are run in the midst of small stock properties.

Feedback reported that the FAA does have excessive requirements to report on funding expenditure which requires groups to report quarterly, six monthly and annually. The R4R funding has a lot more reporting than other funding sources and group administrators spend a lot of time fulfilling the requirements which is not accounted for in the administration budget. With calls from the groups to increase the allowance for administration and to cover the costs of replacement data loggers and traps, DAFWA are adamant that the funding was always intended as financial assistance to get the LPMTs on the ground, not to cover all the costs.

DAFWA manages the project and has raised concerns that many reports were late, making it difficult for them to report back to the Department of Regional Development (DRD) on their investment. Following up the outstanding reports took up a great deal of DAFWA's time and resources.

Reporting and accountability

The deliverables for this project are focused on numerical performance measures which include the number of baits laid, number of trap nights, number of dogs destroyed, number of reported small stock killed by wild dogs and number of reported wild dog complaints by landowners. This did concern some who believe that there needs to be standard measures of benefits through tracking livestock impact. In the case of the GNRBA who are putting out baits it is hard for them to fulfil the reporting requirements as there is little alignment in measureable numbers.

Initially, all the Groups used a data logger supplied by DAFWA to assist with reporting, however some Groups have experienced problems and no longer utilise the technology while others say it is the best tool they have.

The data logger also allows the Groups to produce a map that enables them to keep track of where baits and traps have been laid and dogs caught. In a situation where the Groups no longer use these units, they now note the GPS co-ordinates in a diary or report.

The concern from DAFWA is that in the event of accidents or unforeseen events, they would not be able to defend the Group's activities unless they are proven and recorded. This is a particular issue of concern given the Groups are operating on UCL and government managed land.

Groups need to utilise some form of technology to back up their activities, to ensure all reporting is consistent across the State and that their activities are mapped. A concerted effort to work with the Feralscan technology to deliver a consistent reporting and monitoring tool across the State will be required for future management.

Funding and contracts

Payment of the funds is made to the respective Groups every six months in arrears on lodgement of their reports, however with funding harder to source Groups are dependent on cash flow and are looking to re-arrange the timing.

The original 2010 FAA established the LPMT rate at $400/day and given it was very difficult to engage the services of an independent LPMT at that rate, the setting was eliminated in the 2014/15 FAA, allowing the groups to determine their rates to meet the market.

Since the introduction of the FAA in 2010/11 the DAFWA environment has changed, resulting in a lack of permanency in the staff overseeing the project which has made it difficult for Groups in communication and lack of support. The R4R Wild Dog Management project budget had no provision for resources or salary for DAFWA to oversee it, which could explain that as the project has progressed more responsibility has been handed back to Groups.

The project results over a four year period (with one year to go) show that 1,152 wild dogs have been destroyed through more than 480,000 trapping nights and opportunistic shooting. These figures don't account for the wild dogs that would have died as a result of more than 560,000 baits that have been laid across the landscape.

In 2014/15 the GNRBA put out nearly 70,000 baits, the Meekatharra RBA was very successful in destroying 153 wild dogs followed by the Carnarvon RBA which killed 82 wild dogs. The statistics provided by the Groups are very open to interpretation.

The overall objective of the funding as outlined in the FAA was to establish enhanced wild dog control operations on Government managed lands to enable increased stocking of small stock near these areas. A mid-term survey of landholders' perceptions conducted by DAFWA showed that while landholders believed the employment of additional LPMTs in the R4R project had reduced the impact of wild dogs in the area, and their confidence to run small stock had increased, there was no reported increase in small stock numbers since the implementation of the project.

With the current economic environment, Groups are struggling to find other funding to employ LPMTs and in some circumstances Groups are heading down the path of becoming an RBG to be able to secure funding in the future.

LPMT investment

Overall there is the belief that LPMTs on the ground are the best investment in managing wild dogs as they use a combination of tools in baiting, trapping and shooting to manage wild dogs and deliver a measurable outcome. In the case of dealing with a cunning dog, they are the last line of defence. LPMTs are the frontline of wild dog control and they not only mentor landholders but also work in parallel with landholders, DPaW and local Shires.

LPMTs are specialists in their role as they have the skills and experience to deal with wild dogs, can respond quickly to reports, and they have the time to spend days following the lead of a cunning dog while landholders are limited in their time as they are concurrently busy running their own businesses. LPMTs also have permission to work across tenures and to handle poisons. LPMTs on the ground create a sense of community with everyone working together to manage wild dogs.

BM Group	Baits laid	Trap nights	Wild dogs destroyed	Reported stock deaths attributed to wild dogs	Complaints about wild dogs
GNRBA	69635	0	4	4	2
MRBA	15970	134910	153	Data not kept	Data not kept
CWDSG	6140	12905	54	316	68
EWBG	9722	7174	49	73	0
NMDSG	8901	1809	10	12	3
CRBA	19686	17955	82	82	24
Total	**130054**	**174753**	**352**	**487**	**97**

Without LPMTs participants involved in a recent stakeholder consultation report believed they wouldn't have any sheep left. The survey also found that aside from exclusion or barrier fencing, LPMTs were the most effective way to manage wild dogs as they utilise a number of tools in their approach.

The Groups believe that LPMTs complement any fence used for wild dog control as they use it as a buffer zone to control wild dogs. A fence on its own will not stop wild dogs: there will still be dogs on the inside and incursions or gaps that allow dogs to get through.

LPMTs are employed as independent contractors. A number of Groups have an official contract with them that states their functions, duties, rates and allowances along with their legal requirements to carry out their obligations and functions as a LPMT. In the interests of personal safety all of the Groups ensure that their LPMT carries a safety device in the form of a SPOT tracker or EPIRB.

The payment rates of LPMTs are reflective of their responsibilities, their expertise and their expenses associated with carrying out their duties. The overall average, across five groups, was $503 a day exclusive of GST over a 200 day period with the rate ranging from $425 a day up to $600. Groups would like to increase the rate next year and look to offset their operating costs in some capacity.

Public land

Groups are concerned that without finding a sustainable solution to funding their efforts would contract and wild dog numbers would increase, along with stock attacks, and the dogs would further encroach into the agricultural area. While landholders are capable of managing wild dogs to some degree, the concern is when it comes to UCL and Government managed land as to who will control the wild dogs. The Department of Parks and Wildlife (DPaW) cooperates with adjacent land managers and Recognised Biosecurity Groups to participate in strategic wild dog management programs.

A recent ABARES report also highlighted landholders' concerns about the lack of management action on public land.

The Groups agree that the R4R project has allowed them to work across tenures in targeting wild dogs, but there are still numerous requirements LPMTs must abide by when operating on DPaW land in regards to reporting, record keeping and licencing requirements. DPaW expressed disappointment that some LPMTs hadn't met their requirements and in the future they would be looking to develop a Memorandum Of Understanding (MOU) with Groups.

Without the R4R FAA in place the question is raised regarding the right for LPMTs, employed by Groups, to access Government owned land and UCL. Groups believe that DPaW would struggle to meet their obligation to control wild dogs, which the majority of landholders are able to fulfil, and the Groups don't have the resources to cover these areas without access to additional funding.

While landholders may be rated through a Declared Pest Rate (DPR), the same does not apply to Government land. Landholders believe that if Government aren't rated, then it is reasonable for Government to continue financial support for some of the costs associated with the management of wild dogs.

The supported additional eight LPMTs means that the RBGs and DSGs have had a landscape approach in their efforts to control wild dogs and revive the small stock industry.

Future funding

Biosecurity Management Groups would like to see the funding continue into the future. In 2016/17 they have requested a total of $1.35m across the six Groups to fund 11.5 LPMTs, up from 8 in the current project.

The Central Wheatbelt Declared Species Group (CWDSG) has requested funding for one year only as they are confident that they will get the funds they need once they become a Recognised Biosecurity Group next year, for which they are currently in the consultation phase. The Northern Mallee DSG and Eastern Wheatbelt DSG are also looking into becoming a RBG in the future.

While some of the Groups are still going through the necessary processes associated with becoming a RBG it will take some time before they are approved and the funding starts to flow through.

These Groups are concerned that there will be a lapse period and continued funding through R4R would provide some breathing space for the Groups to settle into their new funding source without letting their guard down in controlling wild dogs.

Overall the Groups say the R4R money has been well spent, however they believe that a continued public contribution to oversee the wild dog management on Crown land is a reasonable proposition.

Recommendations for enhancing the effectiveness of LPMTs

- ✓ Ensure future contracts are flexible enough and less descriptive to allow Groups to suit the needs and requirements for their region, as long as the action addresses the original objective of the funding (i.e. allowing the GNRBG to substitute baiting for a LPMT).
- ✓ Review the inclusion of the term 'small stock' and change to 'livestock' as there are cattle amongst sheep properties in some regions and there should be some flexibility in these situations.
- ✓ Review the deliverables/measures; outcome/impact versus numbers and standardise the measures of success for the funding across the State.
- ✓ Clarify the definition and the expectations of 'Government managed lands and adjoining pastoral/agricultural lands' as it allows LPMTs to follow leads onto pastoral properties.
- ✓ Ensure that there is some continuity in the staffing of the Government position that oversees the contracts and communicates with the Groups.
- ✓ Agreements and reporting requirements could be standardised in alignment with other funding sources to simplify the process for Groups.
- ✓ Simplify and minimise the reporting layers. If the agreement requires Groups to prepare several reports to justify funding, it could be reflected in the administration fee.
- ✓ Provide an allowance for the Executive Officer of the Group to undertake all administrative work, accounting, reporting and provide support.
- ✓ Funds should not be released until all reporting requirements have been met.
- ✓ Ensure that the agreement states that the funding is for financial assistance and the Group is to determine the rate that they pay their LPMTs.
- ✓ That payment of funds is made in advance six monthly and the second payment is only made upon meeting the reporting requirements.
- ✓ Allow a degree of flexibility in payments to Groups in special circumstances, without allowing them to build up a backlog of payments over a period.
- ✓ Review and determine what technology is best suited to the requirements of the Groups i.e. reporting requirements, GPS ability and to address safety issues.
- ✓ Ensure all Groups are provided with the same technology for consistency with reporting and mapping and to overcome any issues that could relate to poisoning allegations in the future and cover the legal aspects.
- ✓ Allow for purchase of replacement tracking / reporting technology and repairs.
- ✓ Encourage landholders to report wild dog attacks, livestock deaths etc. to their RBGs/ DSGs.
- ✓ Follow up information from exporters, saleyards and abattoirs on the impact of wild dogs and damage impacts.
- ✓ Promote the success of the program through media outlets.
- ✓ Review and establish an industry rate for LPMTs that will recognise their skills, qualifications and responsibilities.
- ✓ Investigate the opportunity for a fuel allowance to be provided through local Shires.
- ✓ Assist Groups to work together to develop a contracts for their staff with a template to work with and discuss the issue of contracts at an RBG workshop where all Groups are bought together to discuss issues of concern. Groups may need to work together to seek legal advice.
- ✓ Provide job security for LPMTs through the provision of a contract.
- ✓ Organise a workshop that allows LPMTs across the State to learn from each other and encourage communication amongst Groups.
- ✓ Each Group is responsible for their staff and must ensure they have the appropriate qualifications, permits and licences to undertake the job.
- ✓ Ensure every LPMT has a personal safety device and make it a requirement of the position.

Biosecurity and Agriculture Management Act project (BAM)

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) requires the Director General and the Minister to compile essential information for the control of organisms and make it available to the community.

BAMA project

Phase one of the BAM project established the Western Australian Organism List database, which addressed these specific requirements of the Act:

- the establishment and maintenance of lists of both permitted and prohibited organisms and declared pests.
- the establishment and maintenance of a website for the purposes of the Act.
- the publication on the website of the lists, and related information including application for import permits.
- that all information under the Act is available to the public at no cost, on both the website and at the department's head office.

Additionally, as delegated to DAFWA within the BAM Act, the project built an application to collect funds for Recognised Biosecurity Groups (RBGs) to control or eradicate pests, weeds or diseases. RBGs are made up of independent leaseholds, landholders and industries that form a recognised legal entity in order to control local pest priorities.

Before the BAM Act, rates were collected from pastoral leases only (under the *Agriculture and Related Resources Protection Act 1976*), whilst the BAM Act now allows for collection from freehold land as well.

Biosecurity rate assessment management service (BRAMS)

The resulting tool is called BRAMS. BRAMS is a tool for DAFWA to use when a declared pest rate (DPR) is to be determined by the Minister. It is also used to inform community groups that are looking at seeking recognition and having funds coming through a DPR. BRAMS calculates and models the rate to charge land to raise finances for the Declared Pest Account under part 6 of the *Biosecurity and Agriculture Management Act 2007*.

Case Study - Central Wheatbelt Biosecurity Group Rates modelling

The Central Wheatbelt Biosecurity Group requested some rate modelling to raise $300,000 per year with $150,000 in rates revenue and the other $150,000 being the state government matched contribution from the DPR.

Below is a table modelling application of a flat sum per valuation entity (VEN), and then allocates or raises the revenue based on VEN value.

Table 1 applies a flat sum per VEN. This means VENs (properties) in the RBG would ideally pay the same amount of rates. In applying the flat sum the system takes into account the property value and the 2% and 10% cap on freehold and pastoral lease land.

In addition VENs with rates below $25 have been excluded and represent some loss of income to the RBG. These are shown on the revenue lost column on the extreme right of the table.

Table 1 indicates that a flat sum of $87.50 is required to raise $150,000.

Table 1: Flat sum per Valuation Entity (VEN) @ $90

Range	Rate	Rates Rev	No: VENs	Rated	Pot Revenue lost
20ha plus	$87.50	$149,349	1751	1717	$680 (34 VENs)
State contribution		$149,349			$680
Total		**$298,697**			**$1,360**

Table 2 shows that 98% of the VENs pay rates of less than $90 and contribute the largest share of the rates.

Range Rates payable $	Number VENs	% of VENs
25 -50	11	1%
50 - 85	23	1%
85 - 90	1686	98%
Total VENs	1720	

Note: This information is indicative only.

Research Gap Analysis - National Wild Dog Action Plan

The need for further research investment was clearly identified during development of the Western Australian Wild Dog Action Plan. The National Wild Dog Action Plan Group has reviewed future research needs and their research priorities are outlined below. These priorities align with the identified needs for Western Australia and provide a basis for collaboration and future investment.

Theme	Current situation	Strategic objective	Suggested projects	Proposals
Defining the problem	**1. Optimised management:** Management of wild dogs provides a temporary respite to the costs on production imposed by wild dogs. There are few control techniques which permanently reduce costs of wild dog impacts. There is a need to optimise wild dog management strategies for economic outcomes. This may entail alteration (both increases and decreases) to timing and intensity of control regimes as well as modifying production and processing systems to offset unavoidable costs.	Impacts of wild dogs are quantified across the supply chain. Levels of predation which can be tolerated at each stage of the supply chain and consumer are quantified. Wild dog control and livestock management strategies are economically optimised.	Supply Chain analysis. Identification of uses for wild dog damaged stock. Better systems for collecting and collating information on impacts from producers. Quantification of production loss impacts. Triple bottom line quantification of impacts in the cattle industry of Northern Australia.	1. Economic analysis of different wild dog control strategies (for a suite of production systems and environments) including: • identification of costs of wild dog control and impact at each stage of the supply chain. • identifying what costs the market can absorb. • what opportunities are available to mitigate costs along the supply chain (e.g. alternate use of carcases).
	2. Understanding the density: impact relationship The relationship between wild dog density and impact is poorly understood. This limits the ability of industry to set wild dog control targets based on manipulating density.	Understanding if there are relationships between wild dog density and impacts in a suite of production systems (of greatest utility in cattle production). Accurate descriptions of the relationships between wild dog density and impacts.	A number of groups identified potential methods or requirements to improve estimates of density which is critical to this research priority.	2. Identification if there is a relationship between wild dog density and impact. 3. Description of the density-impact curves in a suite of production systems.
Control effectiveness (techniques)	**3. Development of new control tools**: There is a limited number of methods of wild dog control.	Improved utility of current techniques (e.g. Lethal Trap Devices - LTDs for traps). Development of new alternate techniques.	GPS Tags – early alert system. Non-lethal controls for specific circumstances.	4. Current project on LTDs. 5. Identifying non-lethal controls for specific circumstances where lethal control is not acceptable or effective (e.g. gaps in barrier fencing). 6. Benefit costs analyses of new approaches (e.g. guardian animals).

Theme	Current situation	Strategic objective	Suggested projects	Proposals
	4. Understanding the efficacy of common control methods: Effectiveness of commonly used methods such as ground baiting are poorly understood. Best approaches to commonly used methods could be improved among producers.	Producers have sufficient knowledge to respond appropriately to new incursions of wild dogs using common control techniques. Producers have clear understanding of appropriate bait rates and delivery in a suite of representative livestock production systems. All stakeholders have accessible information on what constitutes effective best practice wild dog management.	Evaluating existing management practices (Bait size, bait rate, bait distribution, bait placement). Evaluating existing management practices (Extension, What is Best Practice? Bait size, bait rate, bait distribution, bait placement).	7. Investigation of appropriate response approaches (rates, densities, distributions) to new incursions. 8. Examination of effectiveness of key techniques (aerial baiting, ground baiting, use of doggers) across a range of different production systems. 9. Examination of bait rate efficacy across a range of different production systems. 10. Identification of optimal bait type for wild dogs.
	5. Investigation of fencing as a control option: There is currently a national move towards increased landscape-scale fencing. However, there is limited information on optimisation of location and scale of landscape-fencing and efficacy in tandem with internal control regimes. Greater information would allow optimal allocation of fencing resources.	An understanding of appropriate scales, internal control regimes and cost-sharing arrangements for landscape-scale fencing in a suite of production systems.	Optimal Fence Placement	11. Modelling efficacy of wild dog control under a range of scales of landscape-fencing in a suite of production systems. 12. Review of fencing efficacy (triple bottom line). 13. Investigation of changes to and management of total grazing pressure in landscape-scale fences.
	6. Development of new toxin/s: There are a limited number of toxins and toxin delivery methods available for wild dog control.	Producers have access to a suite of effective species-specific, socially acceptable toxins and delivery methods.		14. Development of new species-specific, socially acceptable toxins and/or delivery methods.
	7. Social acceptability of 1080: Community acceptability of 1080 poses significant risks to the continued use of 1080 as the primary toxin for control of wild dogs.	Clear information on the requirement for the use of 1080 for effective pest animal control and welfare implications of 1080 are available to stakeholders.		

Theme	Current situation	Strategic objective	Suggested projects	Proposals
Barriers to adoption	**8. Effective adoption of wild dog control:** Techniques exist to control wild dogs but are not being sufficiently utilised to decrease wild dog impacts.	Adoption of effective wild dog control not unduly constrained by social limitations within producers wishing to control wild dogs.	Management of dogs in sheep production depleted areas. Analysis of economics of enterprise mix, pest management requirements for different landscapes. Landholder attitudes – qualification of landholder behaviour. Extension - signs of wild dogs.	15. Project identifying and surmounting barriers to effective control across a suite of production systems. 16. Case studies of effective control. Current CRC Program - 4 projects
	9. Integrated pest management: Wild dogs are often one pest in a suite of vertebrate pests that producers manage.	Stakeholders have accessible information on what constitutes effective integrated vertebrate pest management for their region.	Effective management of dogs in sheep production depleted areas.	This priority links to Item 3: Efficacy of control methods.
Wild dog ecology	**10. Reliable estimates of wild dogs:** There is currently not an accurate, cost effective, readily accessible method of enumerating wild dogs. This poses problems for adopting and understanding efficacy of control programs.	Adoption of technological approaches to effectively, rapidly and cheaply enumerate and locate wild dogs.	Drones Wild Dog Alert Further work on camera traps: image recognition	17. Potential approaches: a) camera traps - either individual recognition (e.g. Wild Dog Alert) and improved enumeration methods (e.g. Ramsay *et al.* 2014). b) Use of remote imagery (from aircraft/drones) to identify, locate and estimate populations. c) development of alternate simple cheap monitoring tools.
	11. Wild dogs and total grazing pressure: Increased clarity on the role of wild dogs in affecting total grazing pressure especially in the rangelands would benefit producers.	Clarity on role of wild dogs in regulating non-domestic livestock in cattle production systems and associated benefits and costs. Clarity on appropriate wild dog control regimes for specific production systems.	Triple bottom line quantification of impacts in the cattle industry of Northern Australia.	18. Wild dogs and total grazing pressure in rangelands.

Theme	Current situation	Strategic objective	Suggested projects	Proposals
	12. Wild dog impacts under climate change: Medium - long term viability of livestock enterprises will be affected by climate change. It is unknown what impacts wild dogs will have under climate change.	Understanding of likely density, distribution and impact patterns under different climate scenarios.	Changes in density and locality in response to climate patterns.	19. Changes in density, distribution, diet and likely production impacts under different climate change scenarios. Current project IA CRC wild dogs and trophic interactions
Wild dogs and disease	**13. The role of wild dogs in endemic livestock disease:** There is a poor understanding of the role and cost of wild dogs in endemic livestock disease. As such industry carries unknown costs with limited options for mitigating those costs	Clear information on the distribution and impacts of *Neospora caninum* and other relevant livestock diseases.		20. Project investigating the distribution of key diseases for which wild dogs are vectors and the impacts and costs associated with them.
	14. The role of wild dogs in incursions of exotic disease: Varied jurisdictional preparedness for rabies (and other exotic disease) incursion poses risks in terms of understanding the type and how to implement responses to an incursion.	Clear understanding of the management requirements for responding to rabies and other exotic disease incursions across all northern jurisdictions.	Rabies preparedness – movement through landscape under control regimes.	21. Investigation of interactions between community dogs, hunting dogs and wild dogs. 22. Examination of pack responses to lethal control (affecting contact rates and disease spread) and modelling of disease spread.

APPENDIX 2 - WA Wild Dog Action Plan Stakeholder Consultation Report

APPENDIX 3 - Benefit Cost Analysis of Wild Dog Management Options in Regional WA

APPENDIX 4 - Benefit Cost Analysis of the State Barrier Fence

APPENDIX 5 - Review of R4R funding for additional capacity for wild dog control by licensed pest management technicians

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Ag*knowledge*®

Ag*knowledge*® is a small company providing management advice to a range of agribusiness companies and farming enterprises across Australia. Ag*knowledge* principals Peter Cooke and Nicol Taylor work nationally from a base in Western Australia, and combined they have over 50 years of involvement in agribusiness at all levels from strategic planning for agribusiness companies, government and industry policy making, research, and business development.

Ag*knowledge* has extensive experience of working closely with agribusiness to assist in the development of individual business unit and overall group strategy. We have a reputation for bringing clarity and depth of thinking to complex strategic situations and for identifying viable strategic pathways that will build value and stand the test of time.

Our advice and contribution is informed by:

- **Extensive specialist knowledge of key industry sectors** and the issues that are driving operational and strategic change, a significant first-hand experience of working in roles with responsibility for strategic development, and the practical factors that may constrain the implementation of strategic initiatives.
- **Government strategy development experience:** Ag*knowledge* has completed many successful strategy and innovation engagements with government. We also bring practical experience of how to develop strategy in the government context.
- **Industry and infrastructure experience.** We draw on our team's strong knowledge of regional industries as well as our numerous engagements in conducting industry analysis and building strategic business cases. Our robust quantitative analysis supports the qualitative perspectives, underpinned by strong analytical capabilities.

Advanced Choice Economics

Dr Elizabeth Petersen (Liz) has a Bachelor of Science in Agriculture (with Honours) and a PhD in Agricultural Economics from the University of Western Australia. Liz has held research positions at the Australian National University, the University of Western Australia and the Department of Agriculture and Food, Western Australia. She is currently an Adjunct Senior Lecturer at the University of Western Australia. Liz founded *Advanced Choice Economics Pty Ltd* in 2000.

Liz has extensive experience developing Benefit Cost Analysis for Project Assessment, including projects relating to soil biology, strategies for managing subsoil constraints (acidity, compaction, sodicity and transient salinity), various options for sustainable farming systems across Western Australia, and the Western Shields Aerial Baiting Program.

Liz has contributed to the drafting of DAFWAs Declared Pest (Plants) Policy and Impact Assessment of Declared Plants, and has experience collating Demographic and Economic Profiles of Western Australia rural towns. Recently she provided a quantitative estimation of the economic impacts of investment in National Landcare Program activities over the last 25 years for the Australian Department of Environment.

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