ENHANCING FERAL PIG MANAGEMENT THROUGH SPATIAL RESEARCH: REAL-WORLD APPLICATIONS

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ABSTRACT

Feral pigs *(Sus scrofa)* are an invasive species that cause significant ecological and economic damage worldwide. Feral pig management programs are often implemented in an ad hoc manner, lacking the coordination and precision needed for effective population management. Poor understanding of the ecology of feral pigs often results in ill-considered placement of control tools, limiting long-term success. As such, improvements are necessary for developing more effective and efficient programs.

A collaborative project involving the Department of Agriculture and Fisheries (DAF), Southern Queensland Landscapes (SQL), and Western Downs Regional Council (WDRC) will focus on utilising spatial science to enhance feral pig management in southern Queensland. Research indicates that feral pigs exhibit habitat preferences related to canopy cover, proximity to water, cultivation and vegetative ecotones. However, the challenge remains to apply scientific findings to practical feral pig management.

To improve the effectiveness and efficiencies of broadscale coordinated aerial shooting programs, research outcomes will be field tested on the Western Downs, Queensland. The study will encompass three locations representing different land use types, including cropping, grazing, and mixed cropping and grazing areas. Aerial shooting will be evaluated through two approaches: the traditional method based on contractor experience and an alternative approach informed by spatially-mapped "core habitat" areas. Aerial surveys will be conducted to measure changes in pig abundance before and after control events. Results will be used to develop case studies of best-practice aerial shooting. The goal of this research is to bridge the gap between academic research and its practical application on the ground by land managers.

Keywords: feral pigs, invasive species, pest management, habitat selection, aerial shooting, applied science

INTRODUCTION

Feral pigs *(Sus scrofa)* are found across a large portion of the Australian continent (West, 2008) and are regarded as an invasive species in all states and territories. This pervasive pest has considerable impact on agriculture (Choquenot *et al.*, 1997; Gentle *et al.*, 2015), the environment (Hone, 2002; Mitchell *et al.*, 2007; Taylor *et al.*, 2011), pose a potential risk to human health (Eales *et al.*, 2010) and present a considerable risk to emergency animal disease eradication attempts (Animal Health Australia, 2022). As a result, feral pigs are often targeted in lethal control programs aiming to suppress their impacts and lower their threat.

A range of control tools can be utilised in feral pig management, with each method presenting different advantages and disadvantages. While their use is contingent upon factors such as program objectives, population dynamics, environmental constraints, resource availability, and stakeholder coordination, to effectively manage feral pig populations it is often necessary to employ a combination of situation-appropriate control measures. This approach ensures a comprehensive and targeted strategy for mitigating the impact and threat of feral pigs.

Unfortunately, feral pig management programs are often implemented in an ad hoc manner, lacking the coordination and precision needed for effective population management. Poor understanding of the ecology of feral pigs often results in ill-considered placement or selection of control tools, thereby limiting long-term success. Incorporating feral pig spatiotemporal data into management programs may provide an important step in developing more effective and efficient programs.

A collaborative project initiated by Western Downs Regional Council (WDRC) and involving Southern Queensland Landscapes (SQL) and the Department of Agriculture and Fisheries (DAF) will focus on utilising spatial science to enhance feral pig management in southern Queensland. To improve the effectiveness and efficiencies of broadscale coordinated aerial shooting programs, feral pig spatial-use outcomes of Wilson *et al.* (2023a) and Wilson *et al.* (2023b) will be field tested on the Western Downs, Queensland. The study will encompass three locations representing different land use types, including cropping, grazing, and mixed cropping and grazing areas. Aerial shooting will be evaluated through two approaches: the traditional method based on contractor experience and an alternative approach informed by spatially-mapped "core habitat" areas. Aerial surveys will be conducted to measure changes in pig abundance before and after control events and results will be used to develop case studies of best-practice aerial shooting. The goal of this project is to bridge the gap between academic research and its practical application on the ground by land managers.

RESEARCH

A strategic, integrated approach that takes into account the ecology of the targeted species is essential for efficient and effective mitigation of impacts (Nogueira *et al.*, 2007). For example, the strategic positioning of control devices to improve encounter rates is an important step in increasing capture rate and efficacy during feral pig management programs. This may be achieved by identifying and targeting focal sites with a high probability of feral pig use. This approach has the potential to enhance the effectiveness of control efforts while simultaneously reducing the effort and cost involved (Recio *et al.*, 2017). But despite the benefits of an improved ecological understanding of feral pigs, there is a paucity of data on such fine-scale habitat selection for feral pigs.

Wilson *et al.* (2023a) and Wilson *et al.* (2023b) utilised GPS tracking collar data to quantify the movements and habits of feral pigs across four sites in eastern Australia, between 2017 and 2021.Three sites were located in Queensland: Arcadia Valley (Arcadia); Downfall Creek (Downfall); and Gebar Island (Gebar). The fourth site was located at Palerang in New South Wales. Collars were programmed to take fixes at 30-minute intervals. Further information on study sites, pigs and methods can be found in Wilson *et al.* (2023a).

Wilson *et al.* (2023a) found that both sex and study site significantly influence home range size *($p < 0.001$),* while season and year do not. Additionally, they also found that home range size is scaled positively to body mass *($p = 0.001$).* More specifically to habitat selection, the pigs demonstrated a preference for habitat with between 20 – 40% foliage projective cover

(FPC), while vegetative cover of >50% was typically avoided. Use of very open vegetation (i.e. 1 – 10% FPC), was dependent upon site, but in general was also avoided. Wilson *et al.* (2023b) found that highly revisited sites of feral pigs were related to proximity to creeks, dams, cultivation and the interface between open and dense vegetation. More specifically, it was found that 51% of all highly-revisited locations were found within 150m of the distance to a watercourse (e.g. creek) and 89% of all highly-revisited sites found within wooded vegetation, were in fact, within 150m of the border with open vegetation. Female pigs demonstrated selection for habitat with close proximity to cultivation, while males did not.

Considering these findings, pest management programs should prioritise areas with characteristics preferred by feral pigs, such as habitats with convenient access to shelter, water and food. By concentrating control efforts in these key habitats, it is likely that encounter rates with feral pigs will be enhanced, resulting in improved effectiveness and efficiency of the culling program. This approach could lead to more successful control measures, ultimately contributing to a reduction in the impact of feral pigs on agriculture and the environment.

PRACTICAL APPLICATION

Bridging the gap between academic research and on-ground practical application is pivotal for achieving tangible outcomes in mitigating the impacts of invasive species. While scientific studies provide essential insights and foundational knowledge, their true value emerges when translated into actionable strategies that can be implemented in real-world scenarios.

Recognising the importance of turning research findings into practical solutions, the Western Downs Regional Council took a proactive step by seeking funding through the African Swine Fever Prevention and Preparedness Program from the Queensland Department of Agriculture and Fisheries. The aim of the project is to field-test the research's hypothesis that targeting core habitat areas for feral pigs can enhance management outcomes and contribute to reducing the impact of these invasive species.
The project's scope encompasses three distinct land use areas within the Western Downs region. These areas include a cropping dominant region around the townships of Brigalow and Warra, a mixed cropping and grazing area near Meandarra, and a grazing dominant region around the Wandoan district. Each area has unique ecological factors that influence core habitat availability, such as permanent water sources, woody vegetation cover, and food resources. Collaborating with established groups experienced in conducting regular aerial shooting programs, the project aims to engage their expertise and participation.

Two distinct methods of aerial shooting will be employed in the project. The traditional approach will rely on contractor experience and landholder knowledge of feral pig behaviour and movement patterns. In contrast, the second method will leverage spatial data to identify "core habitat" areas, which will inform the pre-programmed flight paths for pilots. The interval between each shoot is targeted to be a maximum of six months.

To evaluate the effectiveness of these methods, the project will measure the abundance of feral pigs within the designated shoot areas through aerial survey transects conducted both before and after the shooting events. Additionally, data such as flight times, cost per pig destroyed, cost per hectare covered, and pigs per hour of flight will be analysed. This comprehensive assessment aims to determine whether incorporating spatially-informed approaches can lead to a reduction in feral pig abundance or enhance the efficiency of control efforts in terms of costs and outcomes.

CONCLUSION

Effective management of feral pigs requires an integration of scientific insight and practical applications. The collaboration between researchers and feral pig practitioners in this study exemplifies this necessary bridge. The outcomes of this project, including the comparative evaluation of traditional contractor-based approaches and spatially-informed targeting methods, will be synthesized into a publicly available case study. This case study will serve as a valuable educational resource, providing a practical guide for land managers, practitioners, and stakeholders seeking evidence-based strategies to effectively manage feral pig populations and reduce their ecological and economic impacts.

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