Department of Agriculture and Fisheries

Biosecurity Queensland

Research Prospectus

Invasive Plants and Animals Research

Research priorities and outlook for the period 2020-25

July 2020

Version 1.00

Queensland Government

This publication has been compiled by Dr Tony Pople of Invasive Plants and Animals Research , Biosecurity Queensland, Department of Agriculture and Fisheries.

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Summary

The Invasive Plants and Animals (IP&A) Research group of Biosecurity Queensland undertakes applied research to better manage Queensland's weeds and pest animals, reducing their impacts on agriculture, the environment, and the community.

To guide prioritisation and decision making on where invasive species research investment from the land protection fund is directed is via the Research Review Committee. The Research Review Committee comprises representatives from the Council of Mayors South east Queensland, Darling Downs South West Queensland Council of Mayors Central Queensland, Far North Queensland, North Queensland, North West Queensland Wide Bay Burnett and Whitsunday Regional Organisation of Councils, Remote Area Planning and Development Board, Local Government Association of Queensland, Biosecurity Queensland, AgForce Queensland, Natural Resource Management Regions Queensland, Queensland Conservation Council and Queensland Farmers Federation. The committee developed the Research Prospectus and approved it on July 13, 2020.

The prospectus gives an overview of the current research program, how it is managed and how new research projects are determined. This prospectus identifies projects over a five-year timeframe, 2020-2025 with an annual review that adds new projects as projects are completed or funding allows.

The prospectus explains to local and state government executives how government funds are allocated to pest animal and weed research and who is responsible. In addition, the prospectus will enable potential partners in universities, other research bodies, industry and others to understand the process involved in setting pest research priorities in Biosecurity Queensland and the role of local government.

The prospectus covers projects that develop effective control strategies and methods (e.g. biological control and pesticides), as well as research that improves knowledge of pest species' biology and assessment of pest impacts. Templates are included to assist the development of future research proposals.

Purpose

The Research Prospectus gives an overview of the current research program, how it is managed and how new research projects are determined. This involves prioritising research areas and projects according to criteria such as feasibility, likely reduction in pest impact and capacity of the research group to undertake the research.

The Invasive Plants and Animals (IP&A) Research group of Biosecurity Queensland undertakes applied research to better manage Queensland's weeds and pest animals, reducing their impacts on agriculture, the environment and the community. Research covers the development of effective control strategies and methods (e.g. biological control and pesticides), as well as improved knowledge of pest species' biology and assessment of pest impact.

The group currently comprises approximately 40 scientific and technical staff. Their work is undertaken from five research centres across the state:

- Ecosciences Precinct, Dutton Park
- Health and Food Sciences Precinct, Coopers Plains
- Pest Animal Research Centre, Toowoomba
- Tropical Weeds Research Centre, Charters Towers
- Tropical Weeds Research Centre, South Johnstone.

Researchers collaborate with numerous Queensland, interstate and overseas organisations. Higher degree students are supported to work on several research projects in weed and pest animal management.

Core research funding comes from the Queensland state government and local government contributions via the Land Protection Fund. Additional funding comes from a range of external partners including AgriFutures Australia, Meat and Livestock Australia and the Centre for Invasive Species Solutions. In 2019-20, there were approximately equal amounts of state government, local government and external funding providing a combined budget of approximately $6 million. The Queensland government also provides research infrastructure, support services and other overheads. Further in-kind support is provided by local government staff and Biosecurity Queensland operational staff.

Audience

This is primarily a guiding document for the Queensland Statewide Oversight Group (SOG), local government Regional Biosecurity Sub-committees and IP&A Research. It will be updated by the SOG and IP&A Research team as priorities are reviewed and projects are developed or completed.

The document explains to local and state government executives how government funds are allocated to pest animal and weed research and who is responsible. In addition, the prospectus will enable potential partners in universities, other research bodies, industry and others to understand the process involved in setting pest research priorities in Biosecurity Queensland and the role of local government.

Proposal development, assessment, and reporting

This prospectus contains both existing and recommended project targets (e.g. control tool needs, pest management for particular taxa, environments and land uses) set within an investment portfolio across a weeds program and a pest animals program.

These targets are initially identified through consultation and collaboration with industry and external agencies or at a grassroots level by Regional Biosecurity Sub-committees convened by local governments. These subcommittees have wide representation from local government, industry, conservation, NRM and catchment groups, Biosecurity Qld operational staff, utility providers and transport corridor authorities.

The management problems or species-related issues and knowledge gaps identified by these subcommittees are collated by the SOG. IP&A Research then designs and frames the necessary research requirements. In many cases, projects will be developed in partnership from the ground up through forums and conversations between pest managers and researchers.

Ultimately, researchers will be best placed to determine feasibility, past work and access to interstate and overseas collaborators and external funding as well as designing the research project and approach most fit for purpose.

Feedback will be provided on projects which are currently deemed unfeasible or unsuitable to either reframe the research question; or identify alternative means of addressing the management issue or knowledge gap.

Priority projects for research, development or engagement will be selected for inclusion in the prospectus by the Research Review Committee (RRC), comprising the SOG, IP&A managers and external stakeholders including AgForce, Queensland Conservation Council, Queensland Farmers Federation and the NRM Regions Queensland.

These will be the basis for project plans prepared by IP&A researchers. Where possible, research projects will involve teaming with local governments as well as other relevant

stakeholders and research partners. The overall pathway from management problem to research project is shown in Figure 1.

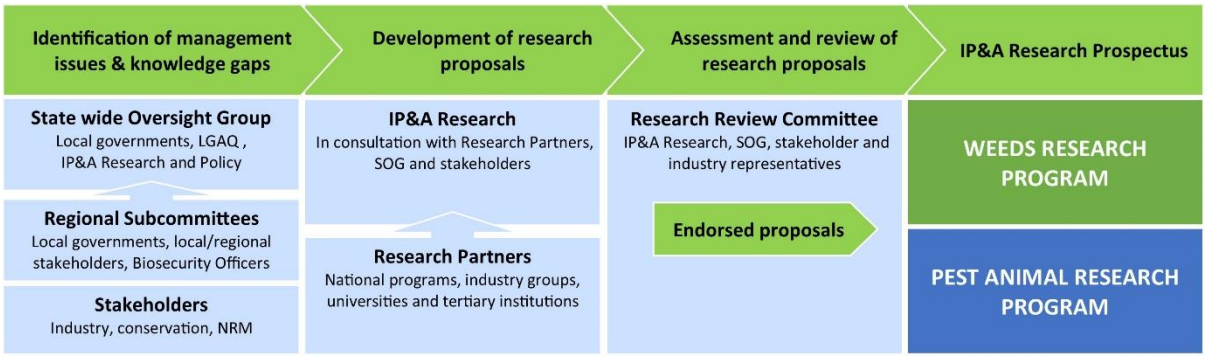

Figure 1. Pathway from management problem or knowledge gap to research project.

Timelines and process

The prospectus provides an outlook for the upcoming five years of investment. Projects are expected to have a timeline of ~2-5 years. Any extension of projects beyond that will require a submission for the revised timeline, particularly as extensions will often inhibit the ability to address new and emerging priorities. Longer-term projects, such as for biocontrol, should be undertaken in stages (e.g. exploration, host testing, release), each of which are distinct projects.

Summaries of new and emerging potential projects or recommended research targets will be provided annually to IP&A researchers by December-January via the prospectus to develop full proposals. Applications to external funding opportunities will often need to be made outside this timetable. The prospectus will be updated annually with a major review (and perhaps progress report) every 5 years.

Project proposals will be considered by May each year by the Research Review Committee. This is a stakeholder (rather than a technical) committee, overseeing the process and direction, and ensuring end-user needs are being met by the research program. IP&A Research may not have the capacity or expertise to undertake some of the proposed projects. These may be undertaken by others external to IP&A, if funding is available. This may particularly be the case where the project aims to address a planning and implementation need (e.g. marketing, social science).

Project reports will be provided biannually, with the mid-year report including the publication of Technical Highlights that provides a summary of the research in the past year. The Research Review Committee will consider those reports, suggesting any action.

2020-21 templates for project proposals are provided in Appendix 1.

Prioritisation of research

Progressing a research project is contingent on a range of internal and external factors which need to be considered in addition to identifying the research need and establishing the priority. The following three factors may influence the feasibility of a research proposal, as well the timing or scheduling of the project.

Technical capability – the required facilities, technical expertise in IP&A or skill sets in regional stakeholders may not be available for a research project. This may delay the proposed work, or the research may need to be undertaken by an external agency with the required capability.

Availability - the timing of a research project may be influenced by the current commitments of key research personnel; the availability of field sites, facilities or stakeholders supporting the project; or the budget required to initiate and complete the work.

Foundational work – sometimes work or supporting information will be required prior to research being undertaken. This foundational work may be a project in or of itself or might be delivered by research already underway. Examples might include taxonomy, herbicide development or life cycle research.

Within the prospectus, projects are not ranked; rather the current spread of agreed priorities are provided for consideration. Projects undertaken at any point in time will depend on availability of resources. Projects should be selected to achieve the greatest, cost-effective reduction in the impact of Queensland's pests. For example, money may be better spent on research on a pest with moderate impact with good prospects for control rather than a pest with high impact with little scope for further improving control. These key considerations and desired outcomes for research projects are outlined in Table 1. The criteria to be addressed to demonstrate these outcomes and assist IP&A Research and the RRC accept or reject research proposals are outlined in Table 2.

In addition to direct consultation and engagement with Regional Biosecurity Sub-committees and the SOG, there are four key influences on the research investment undertaken by IP&A Researchers and their partners.

1. External funding body priorities
2. Expert reviews and workshops (e.g. grazing weed research, weed biocontrol)
3. Consultation with stakeholders, such as:
    i Centre for Invasive Species Solutions workshops
    ii Stakeholder survey, although operational management needs to be distinguished from research
    iii Regional local government workshops
4. Reference to strategic documents such as:
    i State and National management plans
    ii National Wild Dog Action Plan

Process to guide the development and selection of investment

A series of six selection criteria guide the development and selection of research proposals. The project templates (Appendix 1) provide the key questions for project proponents and researchers to address the criteria and desired outcomes below (Table 1).

Table 1. Assessment criteria for developing and selecting research proposals.

Assessment criteria	Should be able to demonstrate
1) Priority and scope	1) The research aligns with an agreed or established management priority at a regional, cross-regional, state-wide (or national level). 2) The research will address a regional, cross- regional or state-wide need. 3) The research outcomes could be applied at the scale or scope identified in #2.
2) Target impact/risk	1) The target species/issue is causing or could cause a significant impact/risk.
3) Outputs, impact and adoption	1) Why the research is required. 2) Research addresses a clearly identified knowledge or management capacity gap. 3) What the outputs or deliverables of the project will be.
4) Benefits/outcome	1) How the research will assist to reduce, mitigate, or manage the impact/risk. 2) Tangible outcomes
5) Methodology and timing	1) How the proposed research approach is the most effective means to deliver the outcome. 2) Why the project should be undertaken now. 3) Is the research project short term (1-2 years); or long term (2+ years)?
6) Funding and other support	1) Collaboration 2) Engagement with the relevant regional subcommittee/s 3) Co-contribution or leverage of funds/support?

For more information or assistance completing the project templates contact

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https://www.daf.qld.gov.au/plants/weeds-pest-animals-ants/invasive-plant-and-animal-science

Ecosciences Precinct, GPO Box 267, Brisbane Q 4001, Australia

Research portfolio

Projects fit into one of two programs, weeds or pest animal research. Within these programs, there are four themes with associated sub-themes:

1. **Incursion management and preparedness**
    a. Prevention
    b. Surveillance
    c. Eradication
2. **Control technology**
    a. Biocontrol
    b. Conventional control
3. **Integrated landscape management**
    a. Ecology
    b. Impact
    c. Strategy
4. **Planning and implementation**
    a. Communication and engagement
    b. Policy
    c. Planning
    d. Monitoring and evaluation

IP&A Research undertakes research under the first three themes, while planning and implementation is overseen by other sections of the IP&A program.

The portfolio below is presented as:

1. Potential projects for consideration

2. Current on-going projects.

Table 2. Weed research projects

WEEDS RESEARCH PROGRAM – POTENTIAL PROJECTS				
Theme	**Sub-theme**	**Project area**	**Project target**	**Project**
Incursion management	Prevention	Techniques & approaches		
	Surveillance	Techniques, detection probability		
	Eradication	Control, monitoring, strategy, feasibility	Local government prevention and control programs	Monitoring progress to eradication toolkit
Control technology	Biocontrol	Prioritisation (start of pipeline)		
		Host-specificity testing		
		Agent distribution & evaluation		
	Conventional control	Tool development	Leucaena	Foliar herbicides
		Tool evaluation		
Integrated landscape management	Ecology	Life history		
		Distribution		
		Population dynamics		
	Impact	Assessment		
		Cost-benefit analyses		
	Strategy	Field trials		
		Modelling		
Planning & implementation	Communication & engagement	Surveys & workshops	Face-to-face & online delivery of information	Communications officer providing detailed, up-to-date information on weed management
			Optimise community engagement for pest management and compliance with General Biosecurity Obligation (GBO).	Focus groups and surveys of community on pest management. Includes pest animals.
		Demonstration sites		
		Best-practice manuals, fact sheets	Siam weed	Management guide
	Policy	Legislation, regulation, compliance		
	Planning	Biosecurity planning tools		
	Monitoring & evaluation	Data collection & management		

WEEDS RESEARCH PROGRAM – CURRENT PROJECTS			
Theme	**Sub-theme**	**Project area**	**Project**
Incursion management	Prevention	Techniques & approaches	
	Surveillance	Techniques, detection probability	
	Eradication	Control, monitoring, strategy, feasibility	Ecology and methods for eradication of weeds in north Qld
			Red witchweed seed depletion
Control technology	Biocontrol	Prioritisation (start of pipeline)	
		Host-specificity testing	Bellyache bush biocontrol
			Prickly acacia biocontrol
			Cat's claw creeper biocontrol
			Parthenium biocontrol
			Navua sedge biocontrol
			Control of giant rat's tail grass using endemic pathogens
			Giant rat's tail grass biocontrol
			Clidemia biocontrol
			Biocontrol of pasture weeds in Vanuatu
			Integrated control of *Cylindropuntia* spp.
			Weed management in the Pacific (African tulip tree, Singapore daisy)
		Agent distribution & evaluation	Rearing and release of weed biocontrol agents in north Qld
			Parkinsonia biological control (UU2)
			Harrisia cactus
			Mikania
			Non-target risk
	Conventional control	Tool development	Integrated control of aquatic weeds
			Foliar herbicides for Aleman grass
		Tool evaluation	Tolerance of Gamba grass and native and exotic plant species to pre-emergent herbicides
			Sicklepod ecology and control
			Giant rat's tail grass management
			Flupropanate control of giant rat's tail grass
			Integrated control of parthenium in southern Qld
			Minor & emergency use permit applications for pesticides
			Encapsulated herbicide control of woody weeds
			Management of high biomass grasses

WEEDS RESEARCH PROGRAM – CURRENT PROJECTS (continued)			
Theme	**Sub-theme**	**Project area**	**Project**
Integrated landscape management	Ecology	Life history	Weed seed dynamics
			Aquatic weeds of northern Australia – ecology and control
		Distribution	Spatial and temporal dynamics of Qld pests (includes pest animals)
		Population dynamics	
	Impact	Assessment	Impact and management of Navua sedge
		Cost-benefit analyses	
	Strategy	Field trials	Fireweed management
		Modelling	Prioritising pest management at multiple scales
Planning & implementation	Communication & engagement	Surveys & workshops	
		Demonstration sites	
		Best-practice manuals, fact sheets	Best practice management of pests on peri-urban properties. Includes pest animals
	Policy	Legislation, regulation, compliance	
	Planning	Biosecurity planning tools	
	Monitoring & evaluation	Data collection & management	

Table 3. Pest animal research projects

PEST ANIMAL RESEARCH PROGRAM POTENTIAL PROJECTS				
Theme	**Sub-theme**	**Project area**	**Project target**	**Project**
Incursion management	Prevention	Techniques & approaches		
	Surveillance	Techniques, detection probability		
	Eradication	Control, monitoring, strategy, feasibility		
Control technology	Biocontrol	Prioritisation (start of pipeline)		
		Host-specificity testing		
		Agent distribution & evaluation		
	Conventional control	Tool development		
		Tool evaluation		
Integrated landscape management	Ecology	Life history		
		Distribution		
		Population dynamics		
	Impact	Assessment		
		Cost-benefit analyses		
	Strategy	Field trials		
		Modelling		
Planning & implementation	Communication & engagement	Surveys & workshops		
		Demonstration sites		
		Best-practice manuals, fact sheets		
	Policy	Legislation, regulation, compliance		
	Planning	Biosecurity planning tools		
	Monitoring & evaluation	Data collection & management		

PEST ANIMAL RESEARCH PROGRAM - CURRENT PROJECTS			
Theme	**Sub-theme**	**Project area**	**Project**
Incursion management	Prevention	Techniques & approaches	
	Surveillance	Techniques, detection probability	Optimising surveillance of Asian black-spined toads
	Eradication	Control, monitoring, strategy, feasibility	Detection and control of red-eared slider turtle
Control technology	Biocontrol	Prioritisation (start of pipeline)	
		Host-specificity testing	
		Agent distribution & evaluation	
	Conventional control	Tool development	
		Tool evaluation	Peri-urban wild dog management
			Peri-urban wild deer management
			Assessment of the biodiversity, economic and productivity gains from exclusion fencing
			Feral cat ecology and management
			Non-target impact of 1080 pig baits
Integrated landscape management	Ecology	Life history	
		Distribution	
		Population dynamics	Ecology and management of chital deer in north Qld
	Impact	Assessment	Wild dog predation on cattle and wild herbivores in the Qld dry tropics
		Cost-benefit analyses	Improved rabbit management in horticulture and northern Qld
	Strategy	Field trials	
		Modelling	
Planning & implementation	Communication & engagement	Surveys & workshops	
		Demonstration sites	
		Best-practice manuals, fact sheets	
	Policy	Legislation, regulation, compliance	
	Planning	Biosecurity planning tools	
	Monitoring & evaluation	Data collection & management	

Appendix 1. Project proposal templates and more detailed assessment criteria.

IP&A Research new project proposal 2020-21 (template)	
Title:	
Dates: mm/yyyy- mm/yyyy *Not on-going. 3-5 years, followed by review then restart*	
Project summary including brief methods (up to 300 words)	
Project justification (up to 300 words) Proposal needs to address the six assessment criteria in Table 4. e.g. National, state or local government priority Pest impact X feasibility Collaboration (outside IP&A) Other funding and in-kind support	
Budget	Staff name & FTE, consultant (in the case of planning, M&E projects) Operating budget External $? (internal = Qld state govt and LPF) (e.g. Vogler 0.5 FTE, operating $35k)

Table 4. Detailed assessment criteria for developing and selecting research proposals.

Assessment criteria	Should be able to demonstrate	Examples
1) Priority and scope	1) The research aligns with an agreed or established management priority at a regional, cross-regional, state-wide (or national level). 2) The research will address a regional, cross- regional or state-wide need. 3) The research outcomes could be applied at the scale or scope identified in #2.	PRIORITY a. Highlight the plans in which the species/issue is a management priority. Eg. FNQROC Natural Asset Management Strategy SCOPE b. Outline the geographic scope of the research project. c. Outline the (anticipated) geographic scope of the application of the research outcome.
2) Target impact/risk	1) The target species/issue is causing or could cause a significant impact/risk.	IMPACT/RISK → ACTUAL/POTENTIAL a. Economic b. Environmental c. Social
3) Output, impacts and adoption	1) Why the research is required. 2) Research addresses a clearly identified knowledge or management capacity gap. 3) What the outputs or deliverables of the project will be.	RESEARCH OUTPUTS, IMPACT & UPTAKE Short and medium-term outcomes a. How will the uptake or adoption of the research take place? b. How will the adoption or uptake of the research address management need and knowledge gaps? c. Who will benefit from or use the research outcome? d. Identity the products/tools/knowledge which will result from the research
4) Benefits/outcomes	1) How the research will assist to reduce, mitigate, or manage the impact/risk. 2) Tangible outcomes	IMPACT/RISK ⟶ ACTUAL/POTENTIAL (avoided/reduced/mitigated) Long term outcomes a. Economic b. Environmental c. Social
5) Methodology and timing	1) How the proposed research approach is the most effective means to deliver the outcome. 2) Why the project should be undertaken now. 3) Is the research project short term (1-2 years); or long term (2+ years)?	a. Is the project new or an extension of existing work? b. Is there precedent to the proposed approach (i.e. is it adapting established tools/approaches or is it developing new tools/approaches)? c. Are there other steps which are required prior to this project commencing? d. For long term projects, outline the steps or stages and any decision points related to the project delivery. Particularly the points at which further research does not generate significant benefits.
6) Funding and other support	1) Collaboration 2) Engagement with the relevant regional subcommittee/s 3) Co-contribution or leverage of funds/support?	a. Identify proposed and potential collaboration? b. Identify regional biosecurity subcommittee/s engaged in the project? c. Identify co-contributions; financial; in-kind; other d. Is the project value for money?

IP&A Research full project proposal 2020-21 (template)

Title:

Dates: mm/yyyy- mm/yyyy
Not on-going. 3-5 years, followed by review then restart

Project summary: (up to 200 words)

Aims: (criterion 4)

Methods: (up to 300 words) (criterion 5)

Collaborators: (criterion 6)
(outside IP&A)

Project justification (up to 300 words) (criteria 1, 2 & 4)
Proposal needs to address the six assessment criteria in Table 4..
e.g. National, state or local government priority
Pest impact X feasibility
Collaboration (outside IP&A)
Other funding and in-kind support

Outputs (criterion 3) Products (papers, manuals, fact sheets) Ideally should identify pathway to adoption. Outputs (e.g. reports) are immediate & tangible and lead to longer-term 'outcomes' or benefits (e.g. reduced weed impact or herbicide use).	•

Milestones:
9/20
-
12/20
-
3/21
-
6/21
-

Budget	Staff name & FTE Operating budget External $? (internal = Qld state govt and LPF) (e.g. Vogler 0.5 FTE, operating $35k) Full budget in DAF PARIS coster.