Draft Predator Free 2050 Research Strategy 2020 – 2024

The purpose of this strategy is to inform on priority research and capability gaps that need addressing for Predator Free 2050 goal achievement, and to facilitate coordination and collaboration

High-Level Strategy

- ***Business-as-usual and incremental development alone is not going to enable Predator Free 2050's goals of national predator eradication***
- ***Through the 2016 – 2020 PF2050 strategy, the research and development to enable national possum eradication is well underway***
- ***Research support is now most needed to enable landscape-scale rat and mustelid eradication from New Zealand's backcountry***
- ***Capability building that enables trans-disciplinary approaches is needed for breakthroughs to overcome current barriers to scaling-up***
- ***This strategic focus will also help progress true alternatives to aerial 1080, currently the only fit-for-purpose tool for such management***
- ***Ongoing conversations on social, cultural, ethical and policy acceptability are essential to guide current and new tool application***

Strategy Background

The first Predator Free 2050 (PF2050) Research Strategy was prepared in 2017 to guide Predator Free 2050 Limited's $1m pa investment in breakthrough science up to 2020, focussed on the 2025 target of achieving a science solution capable of eradicating at least one small mammalian predator from the mainland. It was designed to complement work already ongoing in the New Zealand science system.

Through the first strategy, the research and development to enable national brushtail possum eradication is well underway. This second strategy, to guide funding investment through to 2024, is based on a more fundamental understanding of which predators in which contexts need the most research support, beyond incremental and business-as-usual development, to enable eradication.

This draft strategy is being made publicly available now to (1) invite co-funding requests from researchers submitting funding applications for projects that will initiate in the strategy timeframe, and (2) invite review of the strategy development process. All feedback received will be considered for a June 2020 revision of the strategy, alongside which responses to all comments will be published.

This draft is high-level, identifying the eradication goals needing the most support. The revision will draw on stakeholder consultation and review feedback to provide more detailed guidance, not only on priority goals but also on specific developments identified as desirable to achieve them. See www.pf2050.co.nz/research-projects/ for the review feedback and co-funding request forms.

Strategy Development

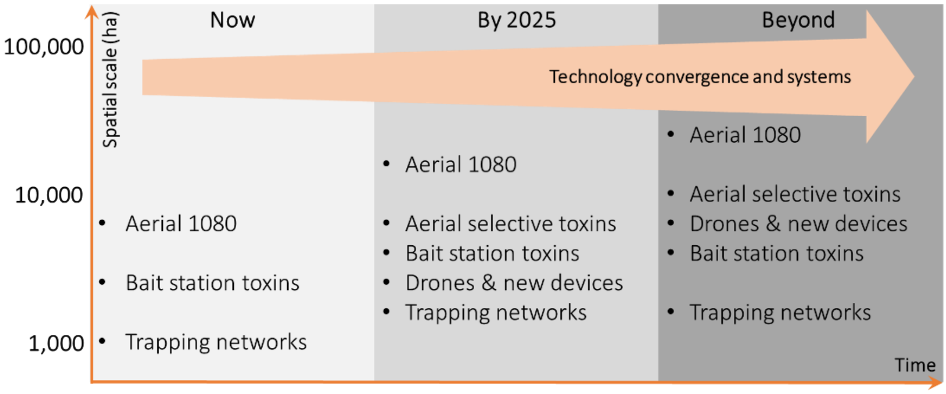
Strategy development is based on addressing the following three key questions for PF2050s' target predators (possums, rats and mustelids):

- For what spatial scale of achieving eradication is research support most needed?
- For what spatial scale of maintaining eradication is research support most needed?
- For which predators in which landscapes is research support most needed?

For what spatial scale of achieving eradication is research support most needed?
This question is informed through consideration of current and near-future predator management tools and approaches, the spatial scale at which they are applicable for the achievement of possum, stoat and rat eradication, and how this may increase over time through business-as-usual and incremental development, or targeted investment into underfunded avenues.

With the achievement of eradication at low-mid spatial scales likely to be provided with multiple options in the near-future through incremental and business-as-usual development, research support is most needed to give more options for achieving large (landscape) scale eradication.

Spatial-scale applicability of current and near-future tools and approaches for achieving eradication



Trapping networks are currently being employed for predator eradication at scales of low 1,000's ha, with expectation and early indications of success. Some scale increases are expected with reduced servicing costs through improved self-resetting and remote reporting capabilities.

Bait station toxins are currently being employed for possum eradication at scales of mid 1,000's ha, with expectation of success. Some further scale increases are expected as initial trials prove successful. Greater potential scale (due to lower cost) but lower social licence than trapping.

Aerial 1080 is currently being researched for predator eradication. Combined with survivor mop-up, there are early indications of success around 10,000 ha. Further research and strategy including more accurate delivery may scale up, although with social licence challenges.

Drones and new devices are being researched and developed for predator eradication. Greater efficacies, reduced costs, more precise targeting, longer field-life, and faster, cheaper and more agile deployment are expected to scale beyond what conventional ground control can achieve.

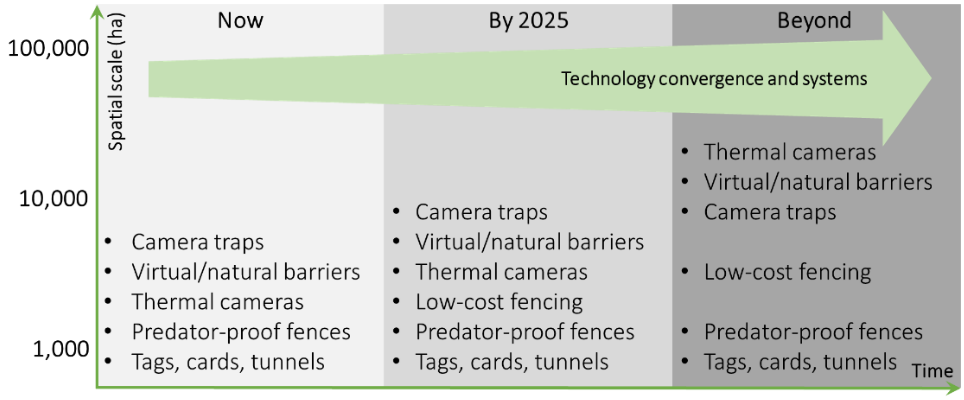
Aerial selective toxins with reduced non-target effects are being researched for rats and mustelids. Should developmental barriers be overcome, application for eradication may achieve mid-spatial scale (likely cost limited). Significant regulatory time frames and hurdles to be navigated.

Positive and timely identification of target species using artificial intelligence (AI) will lower the cost of controlling individuals and responding to incursions, and help build social confidence around risk to non-targets across all habitats.

For what spatial scale of maintaining eradication is research support most needed?
This question is informed through consideration of current and near-future predator management tools and approaches, the spatial scale at which they are applicable for the maintenance of possum, stoat and rat eradication, and how this may increase over time through business-as-usual and incremental development, or targeted investment into underfunded avenues.

With the maintenance of eradication at low-mid spatial scales likely to be provided with multiple options in the near-future through incremental and business-as-usual development, research support is most needed to give more options for maintaining large (landscape) scale eradication.

Spatial-scale applicability of current and near-future tools and approaches for maintaining eradication



Wax tags, chew-cards & tracking tunnels are conventional approaches for monitoring predator suppression that provide crude indices of abundance. They are too insensitive for predator eradication purposes and may not even be appropriate for informing eradication at low spatial scales.

Predator-proof fences have played a critical role in providing mainland predator-free sanctuaries for native biodiversity benefit. However, the cost of their installation and upkeep means that they are, and will remain, limited to applicability for low spatial scale predator eradication.

Low-cost fencing is currently being researched for use in 'rolling-front' approaches to predator eradication. Not intended to prevent re-invasion, but to sufficiently reduce re-invasion rates for management to be able to control re-invading individuals and grow eradication areas.

Camera traps are in use at low-mid scale for demonstrating eradication achievement and for detecting survivors of control or re-invading individuals (in contrast to abundance monitoring in predator suppression regimes). Cost-efficiency increases are occurring with AI image recognition.

Virtual barriers (multiple parallel lines of predator control/detection devices) are being trialled in the field, for their ability to (similarly to low-cost fencing) sufficiently reduce re-invasion rates for management to be able to control re-invading predators and grow eradication areas.

Natural barriers (e.g. rivers/mountains) are also being research for their role in reducing re-invasion rates for management to be able to control re-invading predators and grow eradication areas. Application at mid-spatial-scale and beyond may be possible in combination with virtual barriers.

Thermal cameras (with AI image recognition) are more sensitive than trail cameras by 3x and up to 50x for possum and rodent detection respectively. Reducing costs, ongoing improvements in battery life and remote communications, and use with drones will scale up application.

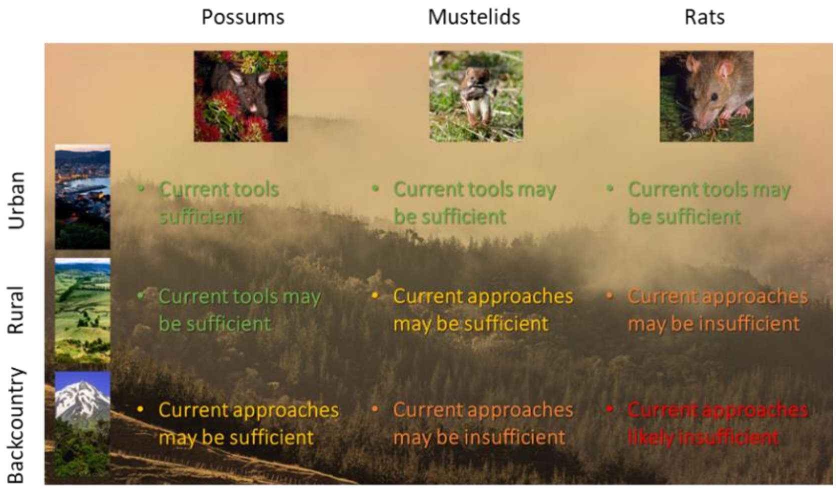
Technology convergence and systems thinking will be particularly important for effectively and efficiently maintaining increasing landscape areas of predator eradication, drawing on data capture, processing, AI and improved ease of use.

For which predators in which landscapes is research support most needed?

This question is informed through consideration of the different life-history characteristics of the PF2050 target predators, which have consequences for the effort, tools and approaches that will be required for their eradication at large spatial scales, and the current and predicted near-future state of play of projects attempting their eradication in urban versus rural versus backcountry landscapes.

The research and development to enable national possum eradication is well underway, although research to develop true alternatives to aerial 1080 is still lacking. New research focus is now most needed on enabling landscape-scale rat and mustelid eradication in New Zealand's backcountry.

How applicable are current and near-future tools and approaches for PF2050 target predators?



Possums have variable home ranges (~1–50 ha), can occur at variable densities (~0.5–10 ha^{-1}), can live for > 10 years in the wild, and can have 0–2 offspring per year. Hence, devices or actions to eradicate possum populations or detect surviving or re-invading possum individuals can be effective at relatively moderate intensities. Relative low rates of population growth will further assist the maintenance of population eradication even in the face of survivors of control or re-invaders.

Possum eradication in an urban area has already been achieved on the Miramar Peninsula. In rural and backcountry landscapes, possum suppression for the purpose of TB eradication can already achieve very low densities. Current research is focussing on achieving eradication is such landscapes with promising early results. However, the only currently fit-for-purpose approach with promise for backcountry builds on aerial 1080 use, with associated social licence challenges.

Mustelids have larger home ranges (~50–500 ha), generally occur at lower densities (~0.01–0.1 ha^{-1}), have shorter lifespans (4–6 years) and faster reproduction (6–12 hits yr^{-1}) than possums. Hence, devices or actions to eradicate mustelid populations or detect surviving or re-invading individuals may be effective at relatively low intensities. However, mustelids tend to be very wary of interacting with devices, and their numbers can rapidly increase from single pregnant females.

Urban areas generally do not support mustelid populations, and any exceptions should be eradicated through sufficient public involvement in trapping. Current approaches may be sufficient to eradicate rural and backcountry populations, so long as interaction/detection rates between individuals and devices can be increased. However, the larger scale and lower accessibility of backcountry likely makes conventional device-based approaches (e.g. trapping) insufficient for the task.

Rats have smaller home ranges (~0.02–2 ha) and generally occur at higher densities (~1–50 ha^{-1}) than possums, have very short lifespans (up to 2 years) and very fast reproduction (up to 5 litters yr^{-1}). Hence, devices or actions to eradicate rat populations or detect surviving or re-invading individuals need to be more intense than for either possums or mustelids, generating issues of affordability (for device-based approaches) and social licence (for toxin-based approaches).

The first urban rat eradication is currently being attempted on the Miramar Peninsula, with indications that success will soon be achieved. With sufficient public support, rat-free status will likely be maintained. Public support may also enable rat eradication in the rural landscape, through sufficient control and detection device use. However, the ability of current approaches to achieve landscape-scale rat eradication in backcountry at acceptable cost has yet to be demonstrated.