Advancing our knowledge, innovation and improvement

Te mātauranga, te mahi auaha, te whakapai

Collaborative Pathway Action Plan 2020-2025

Strategic context

The overall strategic direction for biodiversity in Aotearoa New Zealand over the period 2020-2050 is provided by Te Mana o te Taiao (Aotearoa New Zealand Biodiversity Strategy). The strategy's intention is to guide all those who work with or have an impact on biodiversity. The Predator Free 2050 Strategy, Towards a Predator Free New Zealand, endorsed by Cabinet in 2020, sits under the umbrella of Te Mana o te Taiao as one of the core foundations. It comprises three areas – mobilise, innovate and accelerate, that describe how Aotearoa New Zealand will achieve the Predator Free 2050 goal to eradicate mustelids, rats and possums by 2050. Beneath the Predator Free 2050 (PF2050) Strategy sits He Māhere Rautaki Whakakore Konihi, PF2050 5 Year Action Plan 2020-2025. This overarching action plan organises delivery of the PF2050 strategy into six pathways to help rationalise and focus the work required to achieve PF2050. These pathways are:

- *Mā ngā whānau, mā ngā hapū, mā ngā iwi e whakatau tō rātou kaitiakitanga* – **Whānau, hapū and iwi expressing kaitiakitanga**
- *Te whakatinana i ngā ture me ngā momo kaupapa here e tika ana mō te kaupapa* – **Supporting the kaupapa through legislation and policy**
- *He aronui, he aromataiwai, he aromātai i te rerekētanga* – **Measuring and assessing the difference we make**
- *Me whakaohooho, me whakamana ngā hapori kia mahi i te mahi* – **Communities taking action**
- *Te mātauranga, te mahi auaha, te whakapai* – **Advancing our knowledge, innovation and improvement**
- *Te nuku atu i te pupuru i te maha o te kaikonihi kia iti, ki te ara haepapa pūmau* – **Moving from sustained predator control to eradication**

These six pathways each have a series of milestones and measures for achievement, and together they can be thought of as providing stepping stones to the ambitious PF2050 goal. In 2020, national collaborative groups composed of multiple agencies, organisations and iwi were formed and named for each of the six pathways. The purpose of these groups is to understand and allocate across those involved the actions within these pathways to ensure that the collective PF2050 goals are being achieved. Each group has a Collaborative Pathway Action Plan (2020-2025) that:

- drives the national achievement of the PF2050 Strategy milestones and Interim Goals;
- describes the measures being used to monitor progress and achievement;
- represents a joined-up approach to securing resources and facilitating partnerships in a collaborative, non-competitive way.

These plans are intended to be living documents and as such are a work in progress. Accountabilities for lead agencies and funding requirements are currently being explored by the collaborative groups and will be added to the plans once confirmed. It is important to note the impact that Covid-19 and subsequent lockdowns have had on planning and implementation timeframes. As such, many of the actions within the plans have had to be deferred. This is likely to continue to remain the case whilst the impacts of Covid-19 continue to be felt.

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This draft Advancing our knowledge, innovation and improvement Collaborative Pathway Action Plan was created by the collaborative group in July 2021, noting it is continually in development.

It aims to develop and drive a shared research agenda to deliver knowledge, innovation and improvements toward four key research outcomes:

1. We know what drives attitudes and actions to achieve PF2050.
2. PF2050 is built from multiple knowledge systems and world views.
3. A suite of tools and approaches are available (or in development) to eradicate predators and maintain gains in all ecological and social contexts.
4. Predator ecology and interactions are understood to inform eradication strategies.

Collaborative Pathway Action Plan 2020–2025

Advancing our knowledge, innovation and improvement

Te mātauranga, te mahi auaha, te whakapai

Context:
This plan outlines the work required to ensure we have a clear understanding of what research and technology needs to be invested in, in order to build our knowledge on, and effectively manage innovation towards achieving a PF2050. It outlines current knowledge (and gaps), and measures for success, as well as:

- What should happen
- Why it should happen.
- What is already happening in this space
- Milestones (and links)
- Dependencies
- Outcomes
- Measures

Priority research needs:
Identifies the priority knowledge gaps or questions needing to be answered in order to meet the milestones.

Actions:
Actions describe the work required in order to fulfil a milestone. No actions are optional. Actions are predominantly scheduled until 2025, except those that are necessary to continue long term groundwork for post-2025 technology. This reflects the increasing uncertainty in assigning timeframes beyond 5 years and the need to review progress for all actions by 2023.

Prioritisation:
Work has been prioritised using the following system:
Maintain = ongoing work needed
Progressing = additional work required to meet goals
Accelerating = new/expanded/increased work needed over the next 5 yrs.

Context/justification: Why it is necessary that the work needs to be done?

Current status: Outlines if any work been done previously into this research question.

Milestones:

Advancing our knowledge, innovation and improvement milestones (and corresponding number)	
(1)	We know what drives attitudes and actions to achieve PF2050
(2)	PF2050 is built from multiple knowledge systems and world views
(3)	A suite of tools and approaches are available (or in development) to eradicate predators and maintain gains in all ecological and social contexts
(4)	Predator ecology and interactions are understood to inform eradication strategies

Dependencies:
Outlines if something need to happen in another workstream first for this action to be worked on? An appendix will show actions which need to be happening in parallel.

Timeframe:
Whilst the milestones aren't timebound, their measures of success are. Actions should be displayed in chronological order. Nearly all actions occur simultaneously rather than sequentially, but their prioritisation/relative effort will vary over the 5 year timescale. We suggest that all priority research needs and actions will occur throughout the initial 5 years (2020-2025) covered in this action plan, but that the scale of effort and priority of actions will change over this period. Please note: Some of these plans were developed prior to the Covid-19 pandemic, thus timeframes for these plans do not take into account the impacts Covid-19 have had (and continue to have) on ability to achieve some of the actions outlined. Timeframes should therefore be held with this in mind. Additionally, as one plans actions are often dependent on actions/activities of other collaborative action plans, a need to defer in one plan can have a ripple effect on actions across plans.

Priority research need	Actions	Prioritisation	Context/justification	Current status	Milestone(s)	Dependencies	Outcome (= 5-yr AP 'Milestones')	Measures/timelines
Identify barriers to support of and engagement with PF2050	Investigate the links between people's predator control values, attitudes, motivations, and participation Create a baseline picture of public understanding, interpretation and support of PF2050 including: (i) how this associate with diverse world views and conservation behaviours; (ii) understanding co-benefits; (iii) investigating public concerns for the future.	Progressing	There is not enough understanding of people's values and perspectives on predator control to enable PF2050 practitioners to skilfully support active engagement in PF2050 activities across different communities, although we do know that 85% of New Zealanders agree that investment in pest control is beneficial for future generations. We need to understand the full range of reasons why people engage in this work, as well as the many differences in attitudes that will exist between different segments of the population (e.g., between urban and rural populations).	Initial work by Biological Heritage National Science Challenges, OSPRI, Manaaki Whenua Landcare Research and Predator Free exemplar sites. Needs integrating and expanding to national levels	1, 2	Link to Communities Taking Action and Whānau, Hapū and Iwi Expressing Kaitiakitanga Collaborative Groups.	Social science is improving understanding of the diversity of beliefs and values associated with predator control and the methods used	By 2025 social science research has helped agencies understand what motivates people to act

Priority research need	Actions	Prioritisation	Context/justification	Current status	Milestone(s)	Dependencies	Outcome (= 5-yr AP 'Milestones')	Measures
Understanding how Te Ao Māori framework and values and Mātauranga Māori are championed (by the right people) and given effect to, to support predator freedom	Specialist subgroup is recruited to visualising Mātauranga Māori at PF2050 programme level to ensure the system gives effect to Mātauranga Māori including focus on: (i) Resourcing for Māori to participate (i) Safe places/spaces for Māori to engage	Accelerating	We need to ensure centuries of knowledge and history gained by whānau, hapū and iwi in their rohe is captured within the knowledge system we are building for achieving a Predator Free Aotearoa.	This work is essential but requires support and rapid development. Current work requires co-ordination, and application to PF2050	2	Requires close engagement with Whānau, Hapū and Iwi Expressing Kaitiakitanga Collaborative Group to differentiate between knowledge/research needs and supporting kaitiakitanga.	Mātauranga and community-based science enhance relationships between people and the natural environment Mātauranga Māori is funded and a core part of Predator Free projects	By 2023, pilots of mātauranga centred research to inform regional planning commence By 2025, locally driven and owned mātauranga has informed development of regional plans By 2025, whānau, hapū and iwi will have identified sites of importance for predator eradication and at least five eradication projects led by whānau, hapū and iwi will be underway across the country.
	Increase understanding of Mātauranga Māori relevant to PF2050	Progressing						
	Understand what Māori communities are taking action and what their aspirations are	Accelerating						
	Pilots of matauranga-centred research linked to regional planning	Accelerating						

Priority research need	Actions	Prioritisation	Context/justification	Current status	Milestone(s)	Dependencies	Outcome (= 5-yr AP 'Milestones')	Measures
Achieving, demonstrating and maintaining eradication at scale *This research need covers most research, innovation and operational applications. As a consequence, we have identified context and status for individual actions (rather than at the priority research need level).	Develop new long-lasting lures for mustelids	Progressing	Mustelids exist at low natural densities and may encounter control devices in their range only infrequently. This means that lures need to last until an animal encounters them. Current lures deteriorate rapidly in most environments	Some initial work funded under Tools to Market and Products to Projects; also work on lures by Manaaki Whenua Landcare Research and Canterbury and Lincoln Universities	3	Essential to link with Moving from Sustained Control to Eradication Collaborative Group	New humane approaches and technologies are developed to broaden the suite of predator management tools available New technology and highly sensitive, accurate and reliable remotely operated, automatic presence/surveillance methods are developed New technologies and tools to enable eradication are developed and trialled for use on a range of land tenures The tools and approaches to effectively prevent predator reinvasion (barriers) are developed	By 2025, technology capable of eradicating at least one small mammal predator species is available By 2025, highly sensitive, reliable, quick and accurate devices are being used across NZ to alert land managers when breaches into areas where predators have been controlled occurs Ongoing, developers and users seek improvement in surveillance and/or detections of predators (e.g. by thermal imaging, camera traps, acoustic recorders) Ongoing, technologies and tools for suppression are invested in By 2035, the technology needed to find and eradicate the last 1% of predators in targeted populations exists
	Develop tools for '1080 to zero'	Accelerating	1080 is currently the most-effective tool for eradication at large scales in the backcountry but refinement of methods is required to minimise the likelihood of leaving survivors	Zero Invasive Predators have progressed this but work still needs refinement	3	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Application of artificial intelligence in traps and monitoring devices	Accelerating	Use of AI can lead to significant time and cost savings in identifying images from camera traps and can also be used to drive 'smart' traps and devices to both improve kill rates and minimise maintenance costs.	Multiple current research streams but work needs coordination and refining to produce operational tools	3	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Optimising and refining trapping networks	Progressing	Predator species vary in their ranging behaviour which is also affected by season and local factors. This effects the design and effort required in trapping networks. More research into optimising networks to improve cost-effectiveness is essential.	Initial work by Manaaki Whenua Landcare Research and Zero Invasive Predators alongside eradication sites but requires further refinement. Cost-effectiveness analyses planned by Biological Heritage National Science Challenges	3, 4	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Investigate the use of drones for sensing (and delivery)	Progressing	Drones have great potential for both detecting survivors from initial control and delivering toxins with great precision, but this requires fundamental research and innovations to ensure cost-effectiveness.	This is new tech. Some initial work by OSPRI; Manaaki Whenua Landcare Research and tertiary institutions but needs significant refinement/development and assessment of cost-effectiveness vs existing methods.	3	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Predator interactions with devices are	Progressing	This will improve the effectiveness of toxins, bait stations and traps both in initial control	Multiple current streams incl. consultancies, and tertiary providers but still needing significant	4	Link with Moving from Sustained Control to Eradication Collaborative Group		

	understood and maximised		operations and in removal of the few survivors of that control.	research and development.				
	Improved camera trap monitoring for eradication	Accelerating	Initial evidence suggests that camera traps are an effective monitoring method but their use and the analysis of output images needs further refinement to ensure effectiveness and consistency in use.	Fairly advanced (Department of Conservation, Manaaki Whenua Landcare Research, Zero Invasive Predators and others) but requires further work on reliability and cost-effectiveness	3	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Improve confidence in proof of eradication	Progressing	All monitoring methods have a detection probability of <1 meaning that some survivor animals may be missed. Integration of multiple methods along with the co-development of statistical models will maximise confidence that eradication has been achieved.	Underlying statistical models require refinement but this needs estimates of vital parameters from multiple devices for all species. Demonstration of eradication is a PF2050 Ltd requirement for funded eradication projects	3	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Understanding predator behaviour and ecology at low density	Progressing	Animals are likely to behave differently following large reductions in density from initial control. This means that their ranging behaviours and responses to lures will change. Better understanding of these responses will allow targeted control of survivors	Theoretical framework developed but needs field data to confirm predictions.	4	Link with Moving from Sustained Control to Eradication Collaborative Group		
	Understanding predator dispersal pathways and distances	Progressing	Following eradication, predators are likely to reinvade sites. Understanding the pathways and habitats that they use will allow targeted control to minimise reinvasion.	Some work initiated (Predator Free Taranaki/Manaaki Whenua Landcare Research), Waikato Uni. But our knowledge is limited.	4	Would be a fundamental component of proposed Farms as Barriers programme (DOC; BHNSC) Also link with Moving from Sustained Control to Eradication Collaborative Group		
	Determine and maximise effectiveness of barriers to dispersal (man-made and natural)	Accelerating	Predators disperse across landscapes, significantly increasing reinvasion pressures at eradication sites. It is essential to understand how to incorporate control networks and natural barriers to block reinvaders	Initial work by Zero Invasive Predators (virtual barriers) alongside eradication sites but needs further refinement for multiple land-uses, incl. urban	3, 4	Would be a fundamental component of proposed Farms as Barriers programme (DOC; BHNSC) Also link with Moving from Sustained Control to Eradication Collaborative Group		

	Optimise rapid detection and removal of re-invading predators	Progressing	With increasing scale of eradication sites boundaries also increase. This increases the need to detect and remove reinvading predators using a combination of ecological knowledge and new/improved technology.	Initial work by Zero Invasive Predators (virtual barriers) alongside eradication sites but needs further refinement for multiple land-uses, incl. urban. Can be informed by island eradication experiences. Farms as barriers work being scoped.	3, 4	Link with Moving from Sustained Control to Eradication Collaborative Group		

Priority research need	Actions	Prioritisation	Context/justification	Current status	Milestone(s)	Dependencies	Outcome (= 5-yr AP 'Milestones')	Measures
Long-term groundwork for post-2025 technology	Foundation research into improved selective toxins (including functional gene targets)	Accelerating	New species-specific toxins will limit non-target impacts, may limit environmental effects and may reduce public concerns over non-target effects.	Fundamental work on genome-mining is at an early stage (Manaaki Whenua Landcare Research + collaborators) but needs investment to progress.	3	Link with Moving from Sustained Control to Eradication Collaborative Group	New humane approaches and technologies are developed to broaden the suite of predator management tools available	By 2022 research into at least two novel technologies is funded and initiated.
	Evaluate the feasibility of new biocontrol and genetic control mechanisms	Progressing	The use of non-chemical control methods (e.g., species-specific parasites/diseases, biocontrol) has been proposed but we know little about the effectiveness of these tools. There is likely to be a long lead-in time to potential application so early research is essential in informing decisions.	Modelling and theoretical studies only to date. Needs further work on social licence to operate and applicability in NZ context (Department of Conservation; Biological Heritage National Science Challenge)	3	Link to Communities Taking Action and Whānau, Hapū and Iwi Expressing Kaitiakitanga Collaborative Groups Also link with Moving from Sustained Control to Eradication Collaborative Group		

BHNSC – Biological Heritage National Science Challenge

OSPRI - Operational Solutions for Primary Industries

Manaaki Whenua Landcare Research

Tools to Market

PF2050 Products to Projects

Zero Invasive Predators (ZIP)