

# Subantarctic Auckland Island NEW ZEALAND

PREVENTING EXTINCTIONS  
&  
SAVING ECOSYSTEMS

Photo: Rachael Sagar



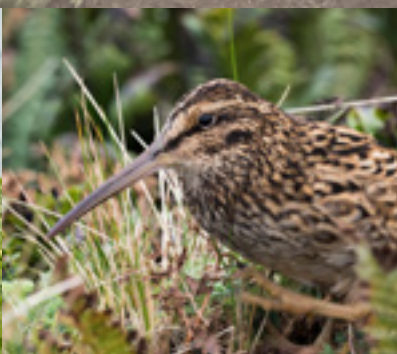
ZERØ MICE



ZERØ FERAL PIGS



ZERØ FERAL CATS



Department of  
Conservation  
*Te Papa Atawhai*



Te Rūnanga o NGAI TAHU



PEOPLE—NATURE  
TOGETHER WE FLOURISH  
TUIA TE TAIAO



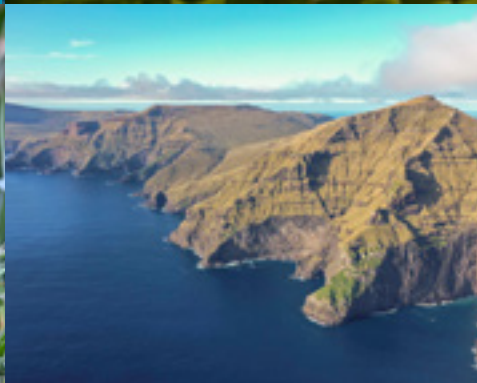
Te Kāwanatanga  
o Aotearoa  
New Zealand Government



...where in the world?



Comparison of scale  
to Auckland region



# A globally significant restoration project to restore a precious subantarctic Nature Reserve

Restoring Auckland Island (46,000 hectares) is the final step in over 30 years of investment, research, and innovation in restoring the New Zealand subantarctic UNESCO World Heritage area. Set to be one of the largest pest eradication projects in history, it is ground-breaking in scale and complexity. It represents a rare opportunity to make a tangible difference in a world facing a biodiversity crisis.

The project is co-led by New Zealand's government and indigenous tribe Ngāi Tahu, representing a unique partnership between world-leading technical restoration experts and indigenous peoples.

## A globally significant stronghold for unique wildlife

Deep in the Southern Ocean, Auckland Island is a biodiversity hotspot, home to 500+ species of plants and animals, over 100 of which are found nowhere else on Earth. It is comparable in importance to other World Heritage sites such as the Grand Canyon, Yellowstone National Park and the Great Barrier Reef.

It has exceptionally high seabird diversity, and is globally renowned as a seabird migration hub, with 25 rare seabird species breeding in the archipelago.





## Introduced predators threaten the future of unique wildlife

Sadly, we are rapidly losing these precious plants and animals. Populations of introduced feral pigs, feral cats, and mice have inflicted severe harm over the last 200 years. Predation and competition from all three of these introduced pests has lowered the abundance and diversity of native bird species and invertebrates. Of the 39 native bird species that were once on the island, 28 are either gone or remain in very small numbers. Iconic fields of megaherbs are now restricted to individual plants in the few places inaccessible to feral pigs. Large swaths of forests have disturbed soils and stunted understories due to feral pig rooting.



## Without deliberate action, plants, animals, and ocean health will continue to decline

Immediately to the south of Auckland Island lies pest-free Adams Island, one of the largest pristine islands in the world. This island time capsule has never suffered the ravages of pests, and gives us a glimpse into the pre-human past. It faces catastrophic consequences if feral pigs, feral cats or mice make their way across the narrow passage that separates the islands, a distance known to be swimmable by pigs and mice.





## This investment secures:

**x2**

More than doubling  
area available for native  
NZ subantarctic  
species to thrive



**38**

native bird  
species protected,  
including 25 that  
breed nowhere else

**9**

found nowhere  
else on Earth

Recovery of nearly

**2000**

native plants,  
including  
megaherb  
fields

Recovery of

**280+**

native insect  
species

**95+**

found nowhere  
else on Earth



Seabird  
populations  
restored



Surrounding islands  
secured from  
swimming feral pigs,  
feral cats & mice



Improved  
climate change  
resilience



Ground breaking  
new tools  
& techniques  
for use worldwide

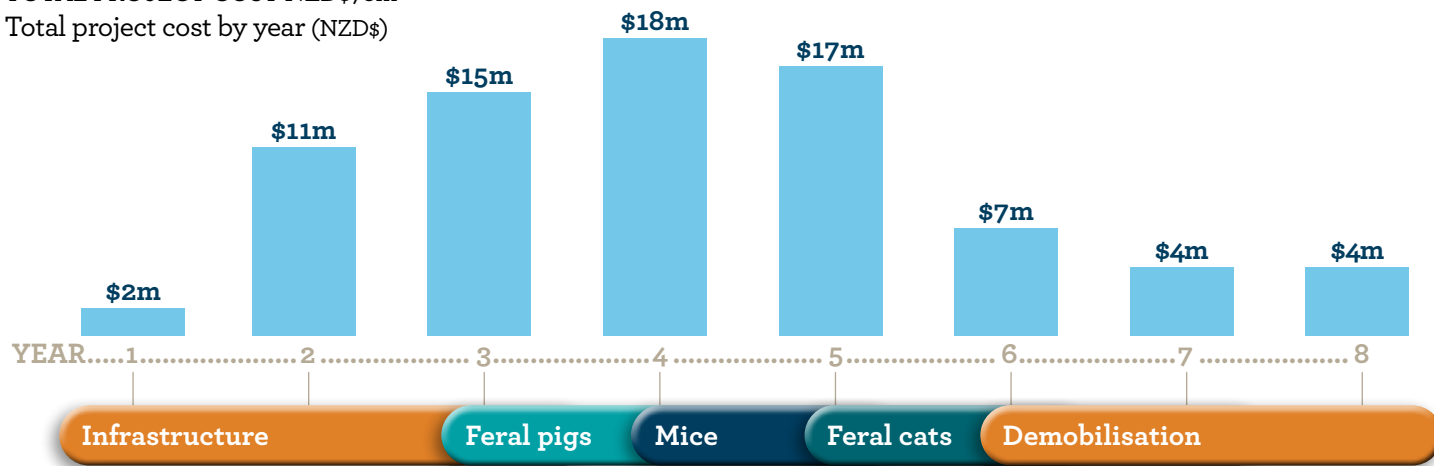


## Project overview:

ERADICATION OF ALL THREE SPECIES IN AN INTERWOVEN PROGRAM  
Three sequential operations in short succession are essential to success and to optimising cost and risk profiles. This approach retains capability and capacity for use across the program and extracts the most benefit from the investment in infrastructure and logistics.

TOTAL PROJECT COST NZD\$78m

Total project cost by year (NZD\$)



### Infrastructure

- 3 bases
- 16 field huts
- 5 helicopter hangars
- 3 boat sheds
- Fuel storage
  - 50,000L at 3 sites
- 800km tracks
- 28 bridges
- 9 bait loading sites
- 7km fencing - 2 fences



### Feral pigs

- 3 fenced management blocks
- Toxin
- Traps
- Thermal assisted aerial hunting
- Ground hunting with dogs
- Judas feral pig to aid validation



### Mice

- 2 aerial applications of rodent baits containing brodifacoum



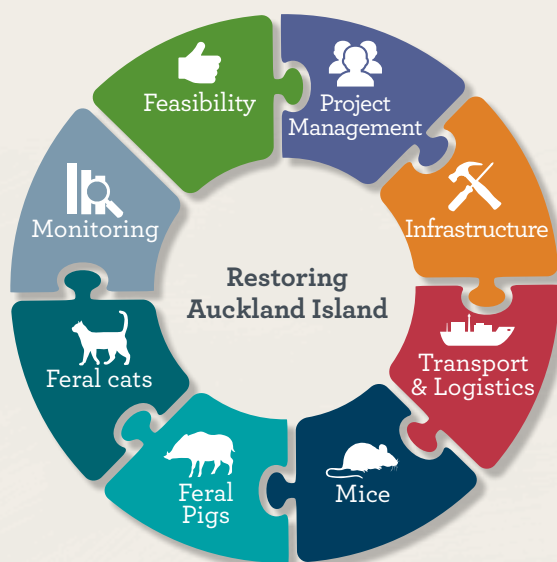
### Feral cats

- Knockdown by secondary poisoning from mice
- Aerial toxic sausage bait
- Cameras and dogs to detect cats and validate absence
- Traps, toxin, dogs to respond and mop up



### Demobilisation

- Remove infrastructure e.g., huts, hangars, fuel storage, fences
- Remove waste
- Dispose or sell assets



THE TIMING AND SEQUENCING OF THE WORK IS CRITICAL, AND HAS BEEN CAREFULLY PLANNED.

Feral pigs must be eradicated first as their presence would compromise an attempt to eradicate mice and feral cats. Mice should be eradicated second as baiting for mice will benefit the operation to eradicate feral cats via secondary poisoning and removing mice as a food source.

Feral pig operations will be managed to ensure optimisation of summertime daylight hours to reduce risk, but are likely to begin in winter, when feral pigs on Auckland Island are more likely to cue into feeders. The mouse program needs summer timing to ensure sufficient flyable hours, and should only start the summer after the feral pig program is completed. This allows time for required operational preparations, and avoids a clash in case the feral pig eradication takes longer than expected.

The feral cat program should begin eight weeks after the initial mouse baiting operation to capitalise on the knockdown of feral cats through secondary poisoning, and increase the likelihood of feral cats consuming toxic meat baits due to removing mice as a food source.



## Project status:



**NEW ZEALAND IS A WORLD LEADER IN ISLAND ERADICATIONS** with a history of innovation and capability development in this field. See this Story Map to learn more: [Standing on the Shoulders of Giants](#).



**FEASIBILITY AND EARLY STAGES OF PLANNING ARE COMPLETE** – Experts have already completed a 3-year, NZD\$3 million [feasibility study](#) on Auckland Island that found that eradicating feral pigs, feral cats and mice is achievable, worthwhile and necessary to halt the decline of native species and enable ecosystem recovery. The rigorous research used extensive field trials and an evidence-based approach that tested methods and assessed the costs, benefits, risks and technical challenges.



**OPERATIONAL PLANS HAVE BEEN DRAFTED** ensuring optimisation between programs, and enabling accurate costing and planning.



**R&D PROGRAMS ARE UNDERWAY** – Transport and infrastructure solutions, novel feral cat baits, and surveillance technology are all underway.



## Challenges and risks:

- ▶ Significant increase in scale from previous eradication.
- ▶ Requirement for funding and support security over the project's duration.
- ▶ Growth required in skilled personnel capacity.
- ▶ Expense of remote transport logistics given bespoke cargo/passenger requirements.
- ▶ Extreme weather and physical constraints of the site.
- ▶ Inherent safety risks of work at remote locations with challenging terrain.
- ▶ Need for acceptable fuel storage/transport solutions in a UNESCO World Heritage site.

## Opportunities:

- ▶ **Legacy:** Once this island is pest-free, its remoteness and strict visitor protocols already in place will protect it in perpetuity for no extra cost.
- ▶ **Resilience:** Securing this island will bolster the ability of species to persist in the face of several other serious environmental threats including climate change and fisheries pressure.
- ▶ **Collaboration:** Development of solutions to complex logistical and operational challenges will come about through people and organisations working in partnership.
- ▶ **Knowledge:** Wisdom gained during this project will pave the way for ever more ambitious island eradication e.g., freeing Rakiura, New Zealand's third-largest island, of predators.
- ▶ **Awareness:** Media and outreach initiatives during this project will enable a wide tranche of society to connect with a world region that few get to otherwise experience.





# INFRASTRUCTURE

## Key design features:

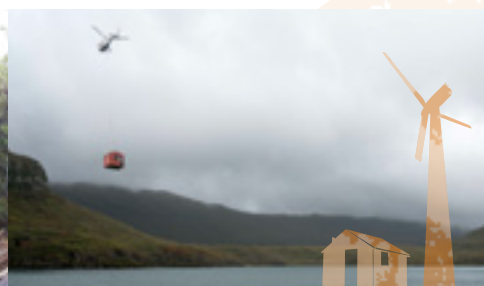
The project requires large-scale infrastructure development.

- ▶ **Limited existing infrastructure** exists at present.
- ▶ **Adaptive Management:** Continuous assessment of infrastructure needs based on operational experience.
- ▶ **Most of the project assets will need to be removed** on completion of the project – reflecting the Nature Reserve status of the island.
- 🏠 **Accommodation and support for teams of 25+ at a time:**  
3 bases / 16 field huts
- ▶ **Support for aerial operations:**
  - ⊕ 5 helicopter hangars / ⊕ 3 mass fuel storage sites /
  - ⊕ 9 bait loading sites
- ▶ **Tracks and small boats for access and egress:**  
800km track / 28 bridges / 3 boat sheds and boats
- **Fences to make management blocks for feral pigs:**  
7km over two fences
- ▶ **Significant mainland support infrastructure:**  
storage / biosecurity / workshop
- ▶ **Communications:** internet / repeaters for VHF radio coverage
- ▶ **Biosecurity:** Managing throughout the supply chain to avoid introducing other pests.



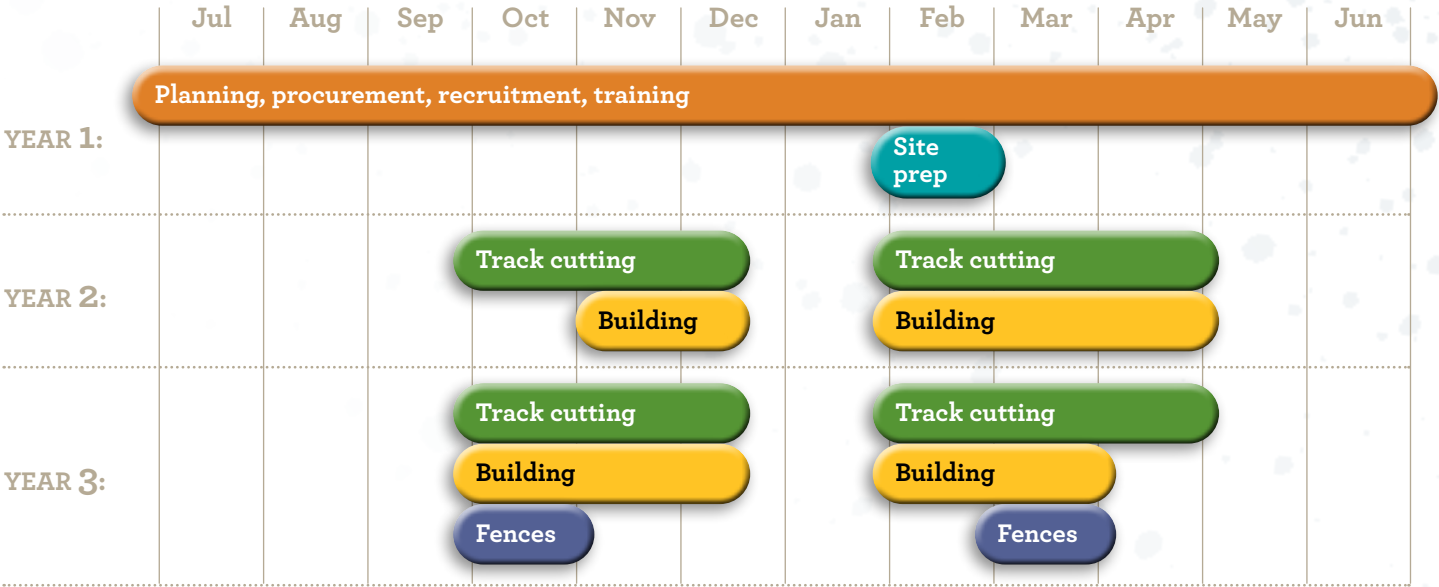
## Challenges:

- ▶ Complex transport and installation logistics.
- ▶ Limitations on access to cost-effective shipping.
- ▶ Large area and difficult terrain over which a track network must be constructed.
- ▶ High degree of synchrony required between mainland pre-fabrication and island installation, to maximise staging, storage and transport efficiency.
- ▶ Archaeologically significant land features in areas otherwise ideal for infrastructure.
- ▶ Need for practical solutions to meet legal requirements for fuel storage.
- ▶ Balance required in structure design between being fit for purpose and being temporary.





Timeline:



Demobilisation:

- ▶ Tactical asset removal throughout operational phases as soon as assets become redundant optimises helicopter and cargo utilisation.
- ▶ Bulk of remaining assets will be removed the summer after completion of cat eradication.
- ▶ Some assets are likely to be retained for future island management, science, and research.

Prototype flat pack structures in use on Chalky Island, Fiordland





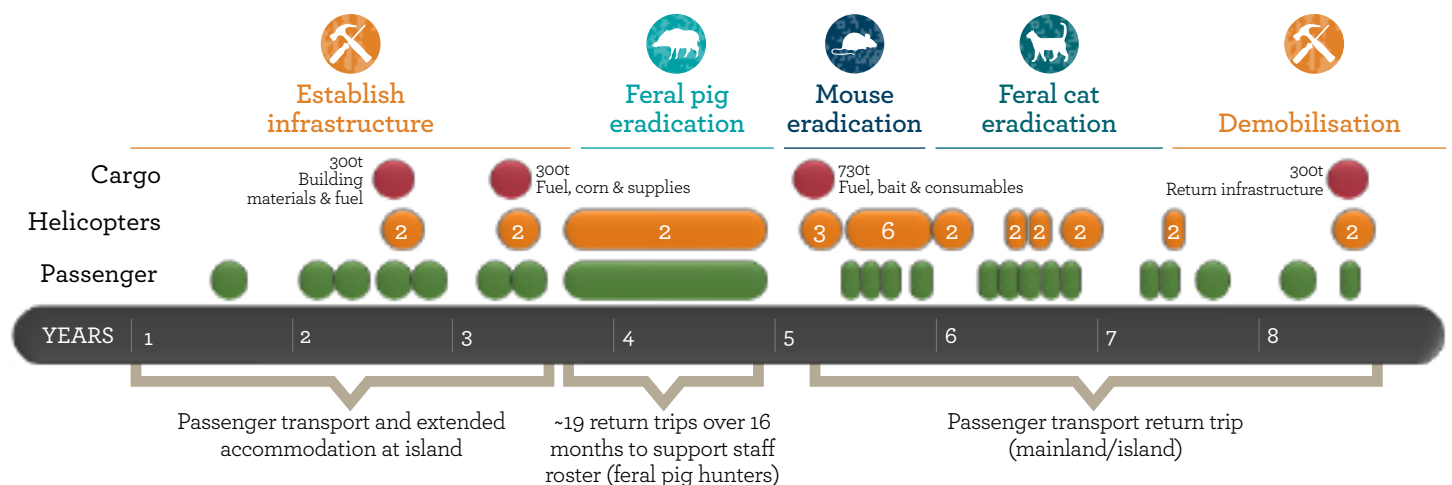


# TRANSPORT & LOGISTICS

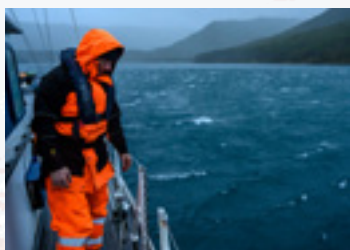
## Key design features:

- **Comprehensive shipping strategy:** Shipping needs are generally infrequent and bespoke. The project requires occasional use of a large vessel for major operations, more frequent use of a mid-sized vessel for passenger transfer and resupply (including helicopter fuel), and use of a smaller vessel for passenger transfer, and some accommodation (especially during the start and end of the project when on island facilities are limited).
- **Emergency preparedness:** Ensuring robust on-site emergency response capabilities to manage unforeseen situations effectively.
- **Biosecurity and environmental standards:** Compliance with strict biosecurity measures is crucial due to high-risk organisms present in major New Zealand ports. The project also adheres to environmental standards, restricting vessels to diesel fuel and avoiding heavy fuel oil.
- **Cargo shipping requirements include:**
  - host helicopter operations
  - transport significant cargo (e.g., 550t bait)
  - bulk supply of fuel (not essential but would provide significant benefits).

## Timeline:



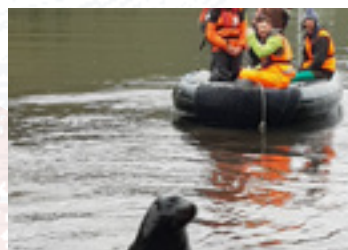
## Opportunities:



Reliable and efficient passenger transport option could allow effective rostering of staff and allow better teams to be built



Procurement models: own, lease, charter, to optimise whole of life cost and availability.



Partnership or philanthropy



Optimisation by working with industry

## Challenges:

- **Supply chain:** Auckland Island is remote. The significant distance of shipping operations from home ports presents unique challenges and costs in maintaining regular supply lines. Securing vessel services will be a key factor towards the project's success.
- **Resource availability:** The limited availability of New Zealand based shipping and helicopter services necessitates careful planning to ensure operations are not put at risk.
- **Passenger transport limitations:** Passenger transfer is currently limited to a 36-hour trip, in good weather, by boat (with seasickness affecting personnel and dogs) or flight with a twin-engine helicopter (limited payload).
- **Adverse environmental conditions:** The harsh conditions of the Southern Ocean pose constant challenges to safe and efficient transport operations. There are no deep water harbours.
- **Extended project duration:** With teams expected to spend approximately 4.4 years in total on the island, sustainable and robust logistics support is critical.
- **Financial Constraints:** There is large variation in charter rates and running costs depending on the vessel. As the largest cost component, transport logistics requires careful financial planning.



## Project will require:



4 cargo voyages  
1,400t



40 passenger  
voyages  
423 passenger  
transfers



3,600  
helicopter hours



550,000L  
jet A1 fuel



Strict  
biosecurity







## ZERØ FERAL PIGS

### Impacts:

Feral pigs were introduced to Auckland Island in 1807 as a food source. Their population can fluctuate rapidly with food availability and seasonal conditions.

- ▶ Feral pigs disrupt and prey upon ground-nesting birds. Most small seabirds are no longer able to breed on the main island because of predation.
- ▶ They consume invertebrates and destroy habitat. Eight of the ten species of earthworm preyed on by feral pigs on Auckland Island are endemic.
- ▶ They have devastated soil, invertebrate, intertidal and floral communities, including iconic megaherbs.
- ▶ They restrict regeneration of understorey vegetation.
- ▶ They have devastated burrowing seabird colonies by rooting up to 1m deep, eating adults and chicks and trampling breeding areas.

Removing feral pigs from Auckland Island would be one of the largest feral pig-removal projects, in terms of scale and complexity, in the world.

Estimated population:

7500 to 22,000



Feral pig forages amongst nesting albatross

Photo: Paul Sagar



### Auckland Islands

Aerial hunting across the open tussock tops

Haskell Bay

Fence

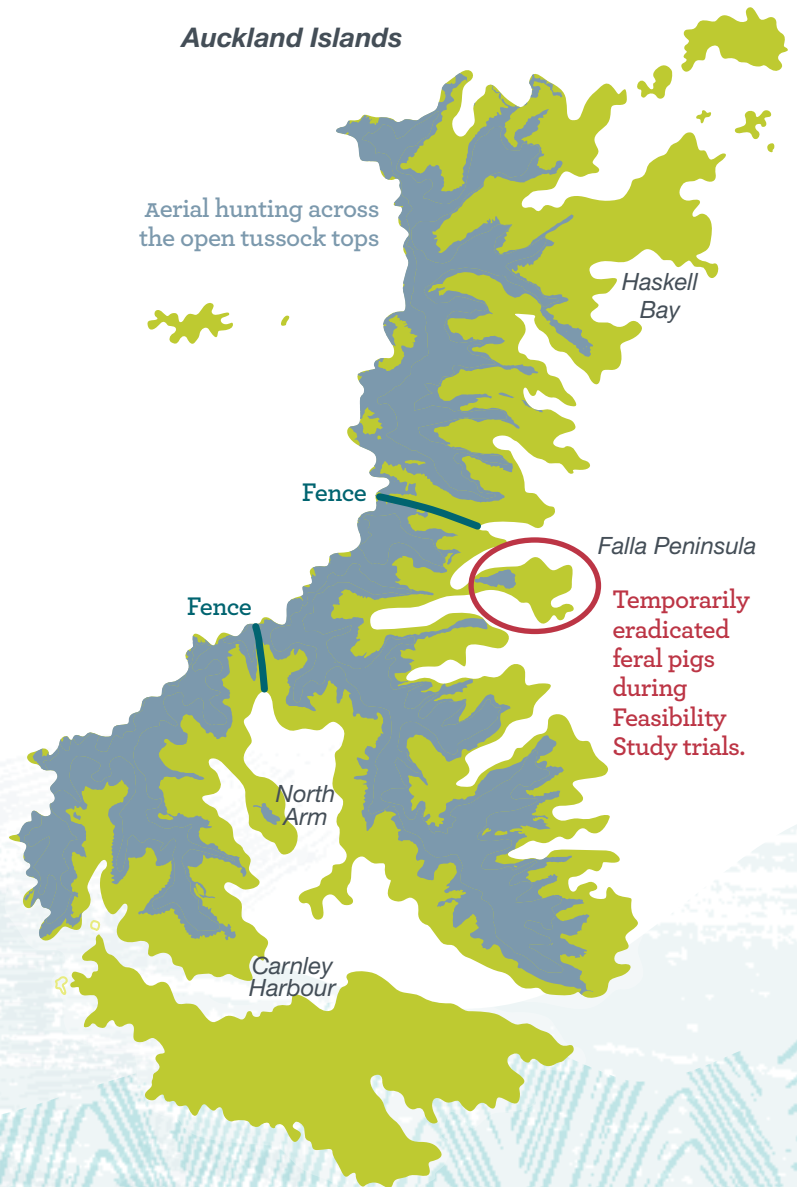
Falla Peninsula

Fence

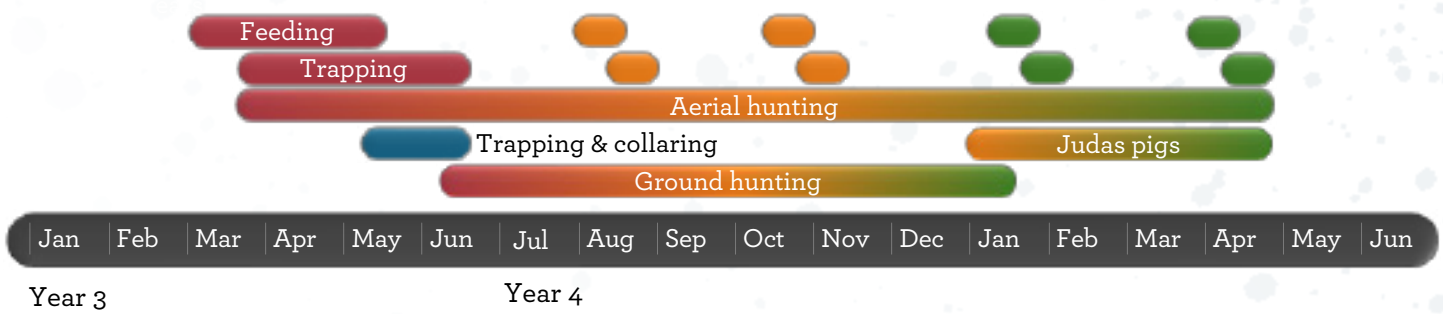
Temporarily eradicated feral pigs during Feasibility Study trials.

North Arm

Carnley Harbour



## Key design features:



Proposed sequence of operations and techniques to eradicate feral pigs from Auckland Island. Red to green = knockdown to validation.

- ▶ The island will be divided into 3 fenced management blocks to enable eradication in stages.
- ▶ A suite of overlapping techniques with increasing aggressiveness will be used to minimise educating animals and ensure every interaction is lethal.
- ▶ Corral style traps with automated corn feeders will be used as the first tool to catch family groups.
- ▶ Aerial hunting aided by thermal camera technology will then efficiently target individuals in the open tussock tops.
- ▶ Once initial knockdown has been achieved ground hunting teams with dogs will systematically sweep each block ensuring no individual feral pigs remain.
- ▶ Judas feral pigs (fitting an animal with a GPS transmitter and releasing it expecting it to attract any other remaining animals) will be released in cleared blocks to validate that no feral pigs remain, alongside opportunistic aerial hunting throughout.
- ▶ This process will be repeated in each of the three blocks.

## Key challenges:

- ▶ Achieving 100% detectability of feral pigs in targeted area.
- ▶ There are areas of the steep western coast that are inaccessible to ground hunting but which feral pigs can access.
- ▶ The steep coastline and bluffs in the bush add challenges for ground hunting and add risks for dogs.
- ▶ Helicopter and boat support is essential.
- ▶ High-resolution thermal camera capability and capacity is essential.
- ▶ Development of a humane toxin offers potential to reduce risk and cost.
- ▶ Further development of thermal camera technology and associated capacity is required.
- ▶ Recruiting disciplined hunters and dogs – the objective of eradication work achieving and proving absence is a different mindset from standard hunting.
- ▶ Collection of specimens for research purposes before operation begins.

## Project will require:



**75** feeders  
& **15t**  
of kibbled corn



**2** helicopters,  
**1,200** hours &  
**200,000L** fuel



**2** thermal hunting  
teams & cameras



**18** hunters  
& **36** dogs



**50**  
judas feral pigs





# ZERØ MICE

## Impacts:

Mice arrived on Auckland Island as stowaways on ships in the 1820s.

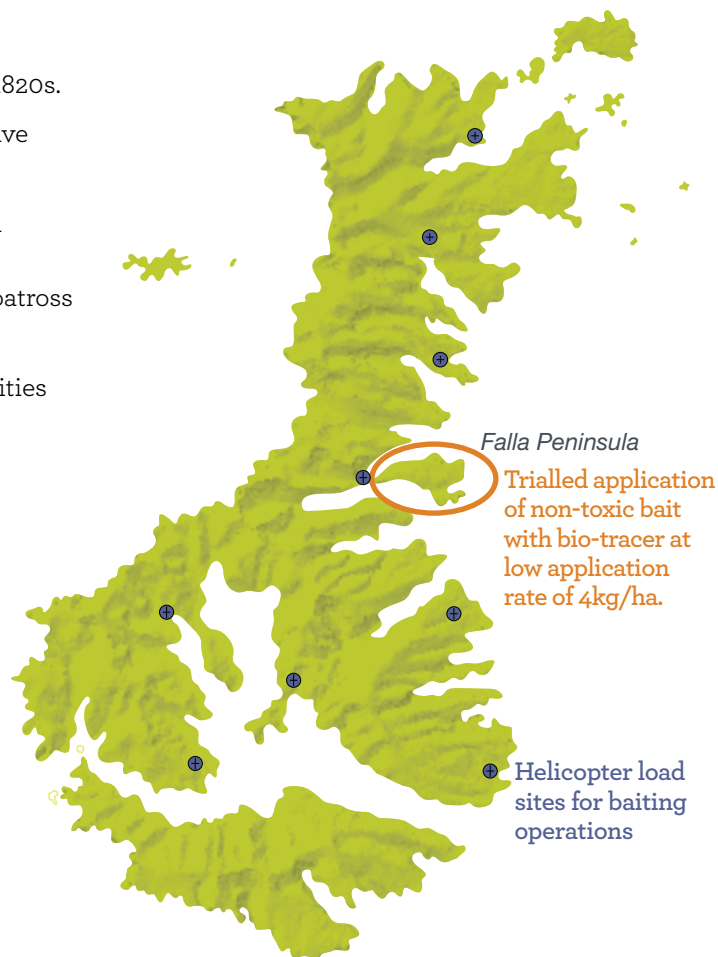
- ▶ Mice destroy native insect populations and compete with native birds for food.
- ▶ They are also known to prey on small and large seabirds, both chicks and adults, when they are the only predator, as seen on Marion and Gough Islands and Midway Atoll, where some albatross species have no successful breeding.
- ▶ Population fluctuates wildly between seasons and years; densities vary by habitat and site.



## Key design features:

Aerial spread of cereal baits containing rodenticide over two applications is currently the only technique capable of eradicating mice from Auckland Island, and has a proven track record globally. Trials have shown the proposed method can eradicate mice from Auckland Island, despite some deviation from current best practice required to make the logistics feasible.

- ▶ 4kg/ha application rate over 46,000 hectares.
- ▶ Most mouse operations are carried out in winter, which in the subantarctic means limited daylight hours. A summer operation would improve the logistical feasibility of spreading an estimated 500t of bait over longer daylight hours and more favourable weather. 650 hours of flying are estimated, requiring 6 helicopters up to 5 months.
- ▶ Likely to begin at the start of the fifth year. There is a planned gap after the end of the feral pig eradication to mitigate risk of that operation taking longer than planned, and impacting mouse operations.
- ▶ The sheer numbers of mice and size of the island make this a huge undertaking. It will be the largest attempted removal of mice in the world.



View into bait bucket from helicopter Photo: Finlay Cox



# Timeline:



## Key challenges:

- ▶ Safe achievement of comprehensive bait coverage across all mouse habitat, including 375km of coastline and formidable cliffs up to 400m high, in the notoriously windy and wet subantarctic climate.
- ▶ Delivery of complete bait coverage not once but twice, to account for young mice emerging from the nest after the first bait on the ground has lost palatability or potency.
- ▶ Procurement of sufficient skilled operators, including experienced baiting pilots who are routinely in demand for other aerial baiting projects in New Zealand.
- ▶ Fine-tuning of bait bucket technology to ensure consistent flow and to address bait bridging (blocking the small opening) at low application rates.
- ▶ Provision and maintenance of necessary helicopter infrastructure and support.
- ▶ Understanding of local tussock masting predictability for well-informed baiting timing.

Distributing bait during summer trials Photo: Finlay Cox



## Project will require:



500t  
of bait



6  
helicopters



5  
helicopter hangars



200,000L  
fuel



29  
field personnel





# ZERO FERAL CATS

## Impacts:

Cats were brought to Auckland Island by settlers in the 1820s.

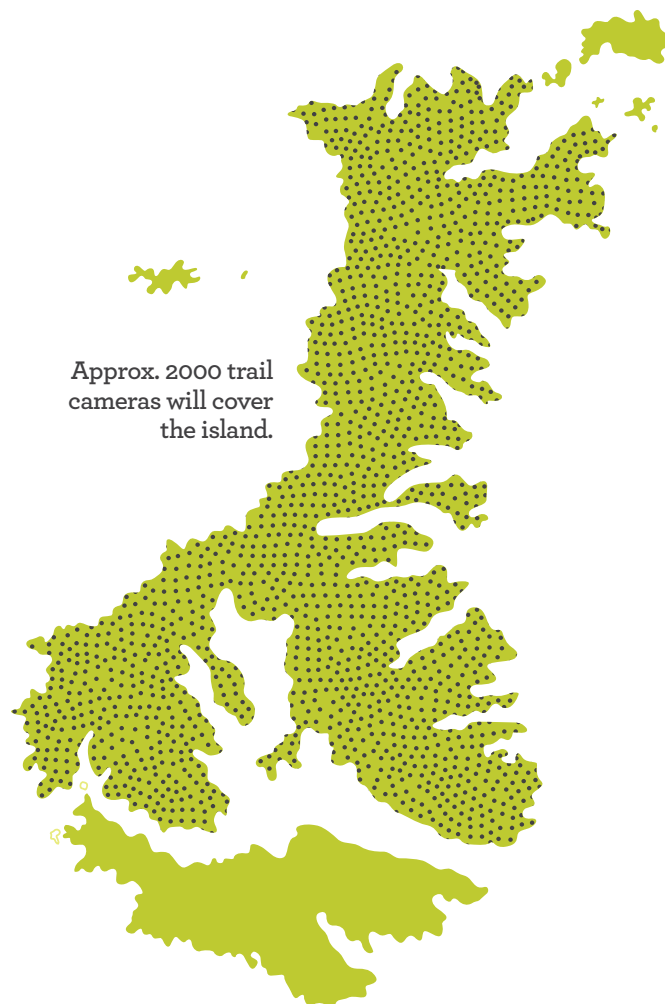
- ▶ Feral cats prey on native land birds, seabirds and invertebrates.
- ▶ They compete with birds for food.
- ▶ They inhibit ground-nesting birds from breeding or recolonising.

Estimated population:

500 to 1,500

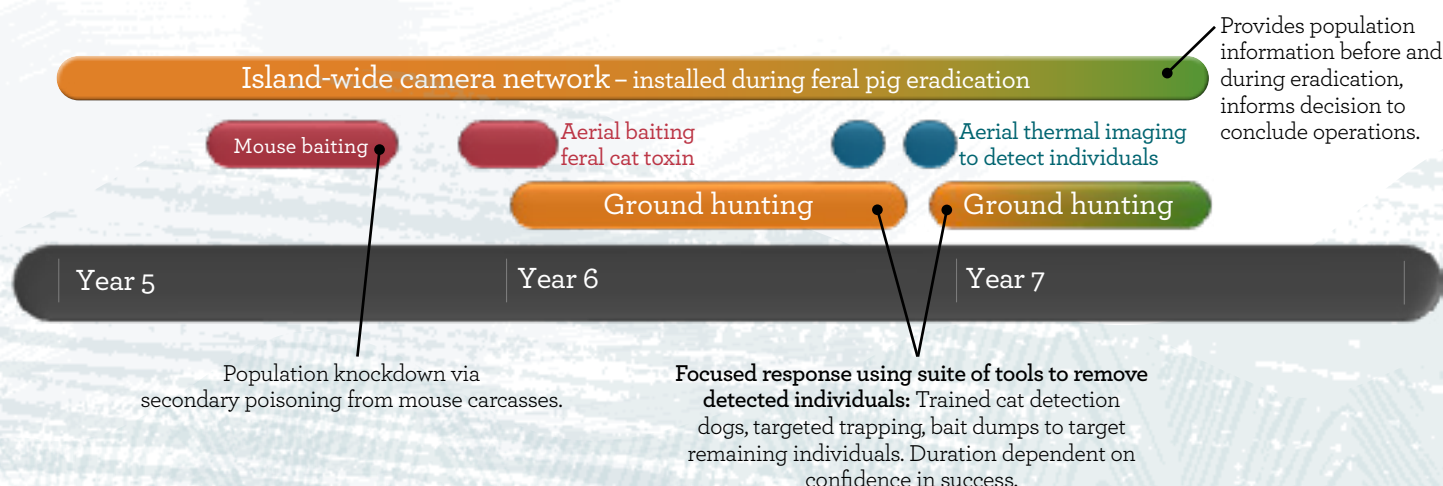


Cats prey extensively on seabirds Photo: Paul Jacques



## Key design features:

A suite of tools will be employed over time and space combined with intensive monitoring throughout.



## Key challenges:

- ▶ Developing an aerially-distributed toxic bait targeting feral cats that is effective and proven.
- ▶ Availability of fit for purpose camera technology (field durability, battery life, price) and on site automated process to classify images and remotely notify users of target species detections.
- ▶ Recruiting and developing enough highly skilled staff for mop-up and validation (~24 people).
- ▶ Running a ground-based operation given topography, vegetation, scale and climate of island.
- ▶ How to know when feral cat removal has been achieved and operations can conclude.

## Project will require:



**2,047**  
trail cameras



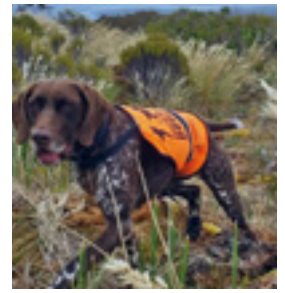
**1,200km**  
camera hand  
baiting trail



**1,500kg**  
frozen cat bait



**15t**  
device lure



**10 +**  
detection dogs  
& handlers

Cat scavenging mollymawk fledgling Photo: Stephen Bradley



Setting up trail camera Photo: Paul Jacques







## MONITORING to track success

### Key design features:

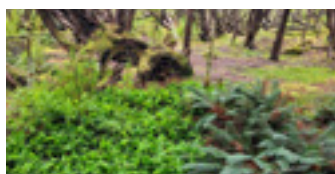
Ridding the island of mammalian pests requires a targeted monitoring plan to measure the impacts of eradication activities – both positive and negative – and to help inform other similar projects.

- ▶ Regular qualitative and quantitative data from formal surveys, opportunistic observations and citizen science.
- ▶ Relative abundance indices for key bird, plant and insect species; changes in succession and population structures.
- ▶ Predictive habitat and population modelling for whole-island responses.
- ▶ Photo point surveys.
- ▶ Surveys to take place approximately annually, prior to, during and following eradication operations, at three key sites that are representative of key ecotypes, indicator species and climatic ranges, as well as comparative control sites.

### Challenges:

- ▶ Need strictly timed, repeated measures for before, during and after operations for monitoring data to be of value.
- ▶ Long-term commitment to monitoring is necessary.
- ▶ Well trained observers are required to ensure consistent measures.
- ▶ Ability to respond to unexpected consequences of eradication in a timely manner (e.g., release or introduction of weed plants).
- ▶ How to measure carbon sequestration potential of peat systems once feral pigs are removed.

### Work already completed:



**23**

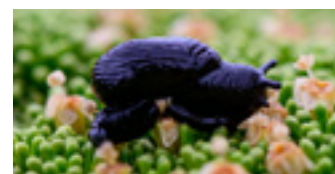
**feral pig enclosure plots** installed to investigate likely recovery rates following feral pig removal.



**Preliminary baseline surveys** of indicator species including burrowing seabirds, snipe, teal, falcon and insects on Auckland Island and pest free Adams Island.



**Surveys and GPS tracking** to inform falcon population density and distribution, genetic analysis to resolve taxonomy.



**Baseline monitoring of invertebrates** at Deas Head & Adams Island.

### Key findings:

- ▶ Native species abundance and diversity differs across Auckland Island, likely due to proximity to pest-free islands in the group, but as a whole is severely depleted across Auckland Island.
- ▶ More than 70% of native bird species that were once on the island are either gone or remain only in very small numbers.
- ▶ Falcon are behaviourally, though not genetically, distinct from mainland New Zealand populations. Healthy (though small) reservoir populations on the pest free islands mean captive management is likely not necessary.
- ▶ Endangered yellow eyed penguin still breed on Auckland Island in reasonable numbers but the impact of feral pig disturbance on breeding success needs further investigation.
- ▶ Existing feral pig enclosure plots show that both feral pigs and mice inhibit the recovery of key plant communities such as megaherbs and other ground cover plants.
- ▶ Initial pitfall trapping results show that invertebrate diversity and abundance is very restricted on Auckland Island compared with neighbouring pest-free islands.

## Further information:

### ► [www.doc.govt.nz/maukahuka](http://www.doc.govt.nz/maukahuka)

- Project promotional video  
<https://vimeo.com/336216293>
- Feasibility report:
  - Full feasibility report  
[www.doc.govt.nz/globalassets/documents/our-work/maukahuka-project/maukahuka-technical-feasibility-report.pdf](http://www.doc.govt.nz/globalassets/documents/our-work/maukahuka-project/maukahuka-technical-feasibility-report.pdf)
  - Summary feasibility report PDF  
[www.doc.govt.nz/globalassets/documents/our-work/maukahuka-project/maukahuka-technical-feasibility-report-summary.pdf](http://www.doc.govt.nz/globalassets/documents/our-work/maukahuka-project/maukahuka-technical-feasibility-report-summary.pdf)
- NZ Journal of Ecology editorial – The next frontier: assessing the feasibility of eradicating mammalian pests from Auckland Island  
<https://newzealandecology.org/nzje/3500.pdf>
- Birds New Zealand and Te Papa special edition – Birds of the Auckland Islands  
[www.birdsnz.org.nz/wp-content/uploads/2021/12/2\\_Birds\\_of\\_the\\_Auckland\\_Islands\\_Notornis\\_67\\_1\\_59-2.pdf](http://www.birdsnz.org.nz/wp-content/uploads/2021/12/2_Birds_of_the_Auckland_Islands_Notornis_67_1_59-2.pdf)
- Online Story Maps:
  - Standing on the shoulders of giants, history of eradications  
<http://bit.ly/2GLIT1J>
  - Future proofing the furious fifties – benefits of project  
<http://bit.ly/36XIQtg>
  - Masked Island, demonstration of cats swimming ability and risk to Adams Island  
<https://arcg.is/1rniDi>
  - Preventing extinctions and saving entire ecosystems – Subantarctic Auckland Island, New Zealand, Feb 2024  
<https://storymaps.arcgis.com/stories/bd3f2a996eca4f559051b9dfd8bbcf4>

Historic finger post pointing to provision depot



New Zealand Nature Fund is a charitable trust responsible for funds donated to this project

- To donate go to [www.nznaturefund.org/auckland-island](http://www.nznaturefund.org/auckland-island) or email us at [maukahuka@doc.govt.nz](mailto:maukahuka@doc.govt.nz)





