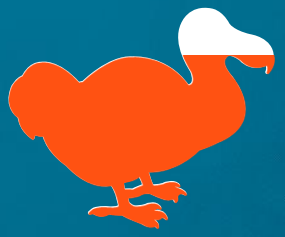
Mission: to prevent extinctions by removing invasive species from islands

Islands Represent

Less than 5% of land mass

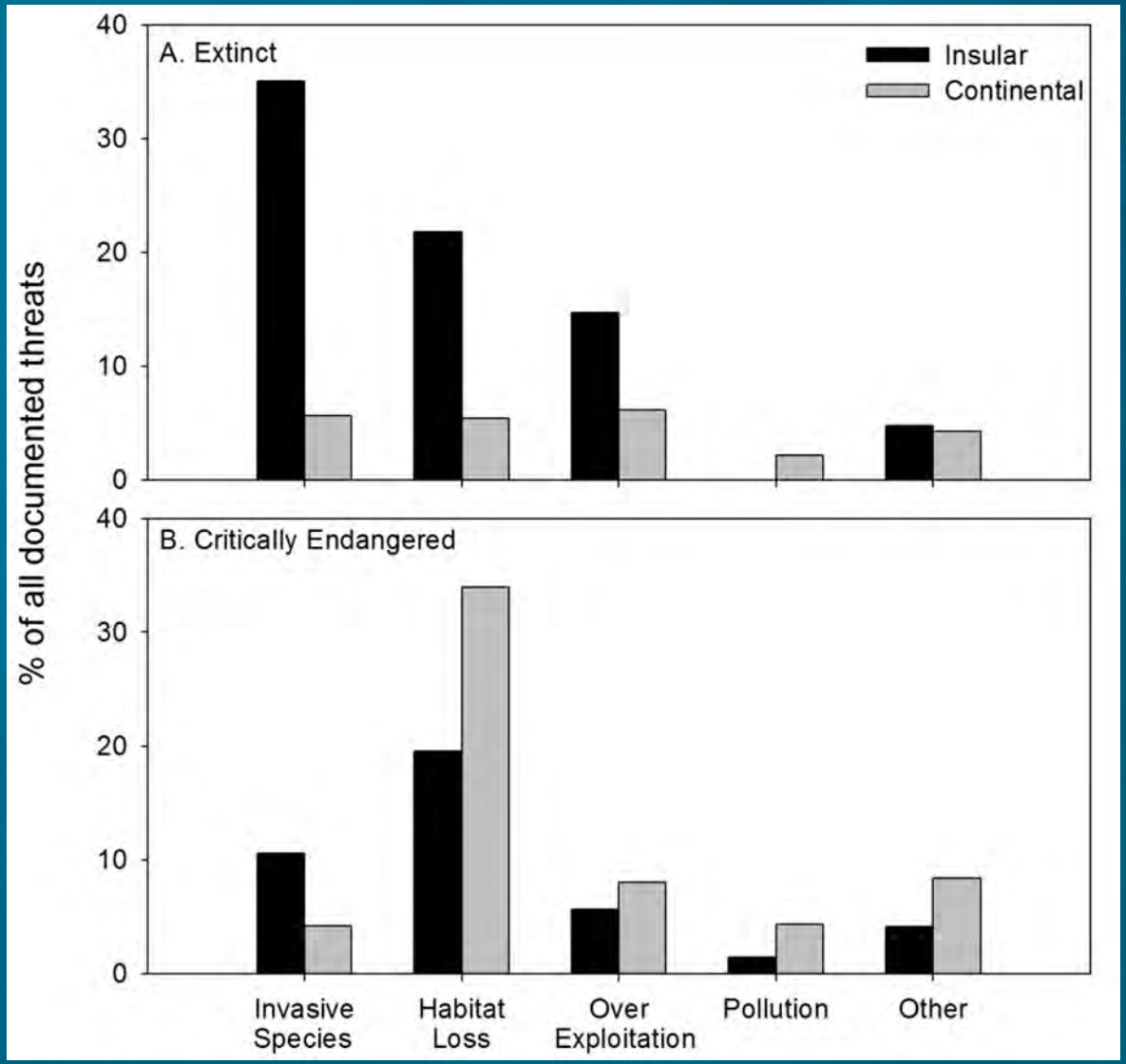
40% of endangered species



80% of extinctions since 1500

Islands as a special conservation need

- Invasive Alien Species (IAS) cause island extinctions
- Remain a key threat to today's CR plants and animals



Invasive Species

Predation

Competition

Disrupt ecological function

How do invasives impact island species?

Direct:

- Predation- Galapagos Tortoise (Galapagos Conservancy) and Laysan Albatross

How do invasives impact island species?

Direct:

- Predation-
- Grazing- Palm Forests - Hawaii (USFWS) and Rapa Nui (Hunt 2006)

How do invasives impact island species?

➢ Subsidize or Control predators (Kurle et al. 2008)

Introduced foxes

Predators
(Land birds, Spiders)

Herbivores
(Slugs)

Seabirds

Terrestrial Plants
(Elymus Grass)

Nutrients from Guano

Marine Productivity

Introduced foxes

Predators
(Land birds, Spiders)

Herbivores
(Slugs)

Seabirds

Terrestrial Plants
(Empetrum Shrub)

Nutrients from Guano

Marine Productivity

Invasive Alien Vertebrate Eradications

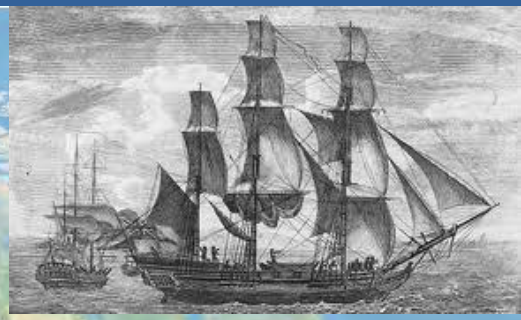
One of the most effective ways to:

Protect Threatened Species

Invasive Species on Islands - A Global Problem…

http://tib.islandconservation.org

Introduced Rodents: A Conservation Problem
(Atkinson 1985)



>80%

Rattus rattus

Rattus norvegicus

Rattus exulans

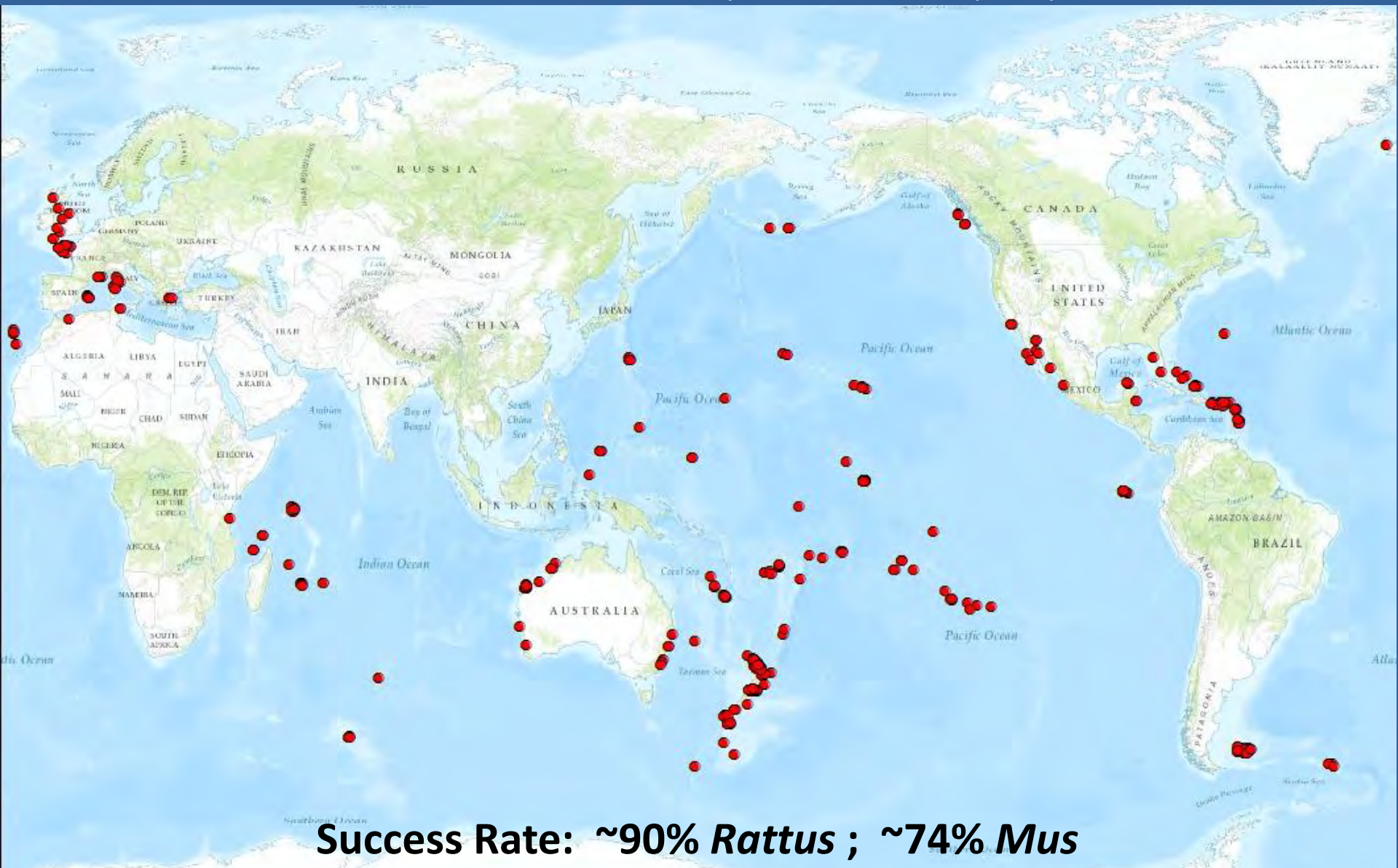
Mus musculus


Stop Rats!
Protect Alaska
Home
Rats and Wildlife
Rats on Boats
Rats in Town
Rat Law
Order Kit
Contact
News
WHERE THE RATS ARE
Legend
Cities, towns, and villages with known breeding populations of rats.
Large islands with rats
Attu Island
Shemya Island
Kiska Island
Unalaska/Dutch Harbor
Great Sitkin Island
City of Adak
Rat Island
Amchitka Island
Adak Island
Atka
Atka Island
Kagalaska Island
Unalaska Island
Amaknak Island
Akutan
Sedanka Island
Akutan Island
Fairbanks
Nome
Petersburg
Juneau
City of Kodiak
Sitka
Craig
Ketchikan
Biosecurity
Rats are Bad News for People and Wildlife
On ships, boats, planes, barges and trucks, rats have spread over much of the world. With them come disease, economic harm and wildlife destruction. We don't want this to happen in Alaska! Much of Alaska remains rat free, one of the last such places on earth. Our climate and remoteness won't keep Alaska and its wildlife safe forever. As travel, development and shipping increase, so to does the risk of spreading rats.
Rats Could Get on Your Boat
Ever tie up at Dutch, Kodiak, Ketchikan, or Seattle? These ports and many others have rats. Without you even knowing it, rats could have boarded your boat by scurrying up a line or jumping from the dock or another boat. Or you could have craned aboard a rats nest when you loaded cargo, trawl nets or pots. These stowaways can harm you, your boat and Alaska's wildlife. Don't let your boat be the one that accidentally unleashes this plague on our wildlife paradise or a rat-free town. Review the Rats on Boats page to find

SELENDANG AYU


Global Rodent Eradications
~500 Successful

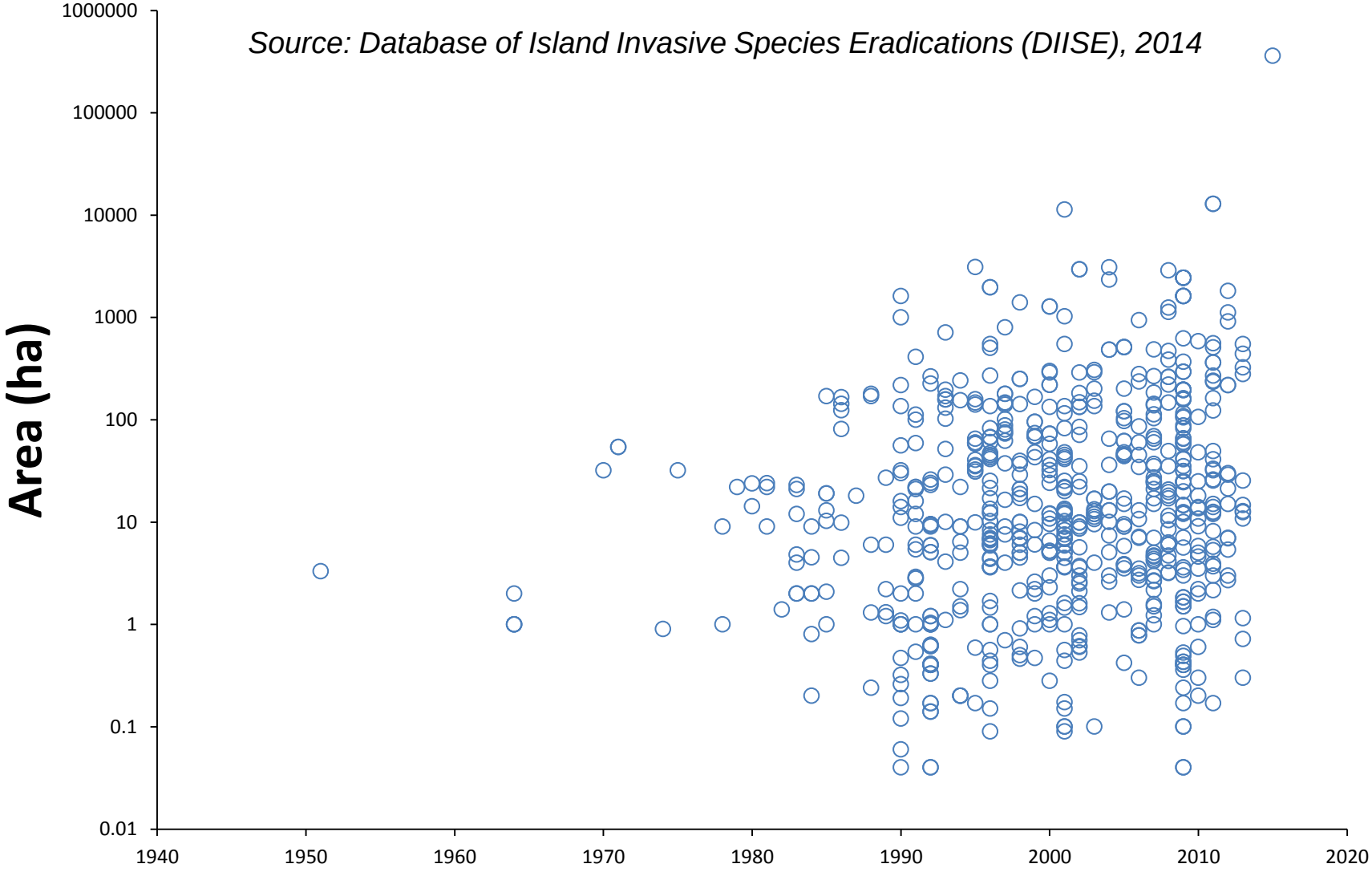
Source: Database of Island Invasive Species Eradications (DIISE), 2014



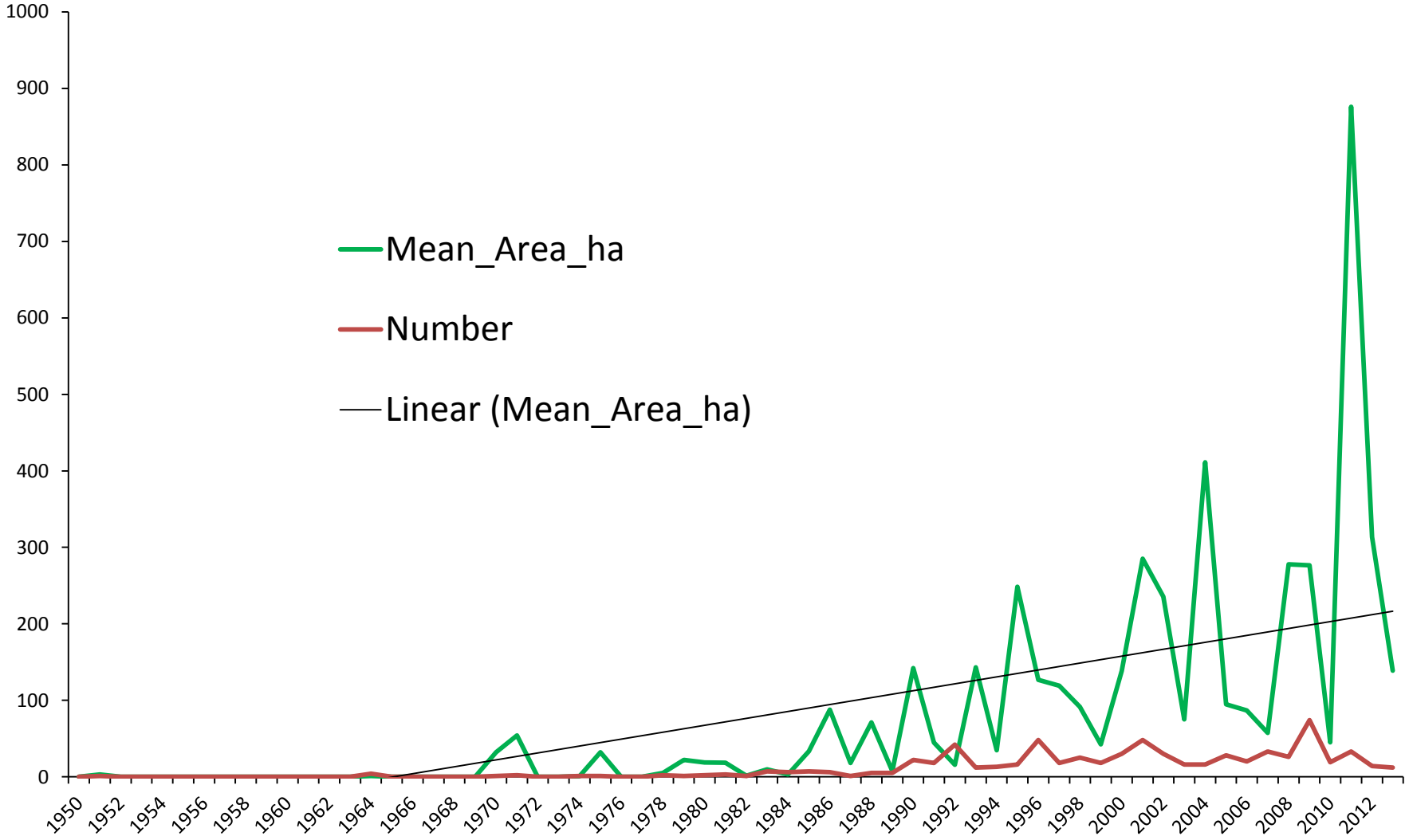
Success Rate: ~90% *Rattus* ; ~74% *Mus*

Successful and In Progress Rodent Eradications

Source: Database of Island Invasive Species Eradications (DIISE), 2014



Mean Area (ha) Cleared of Rodents Per Year



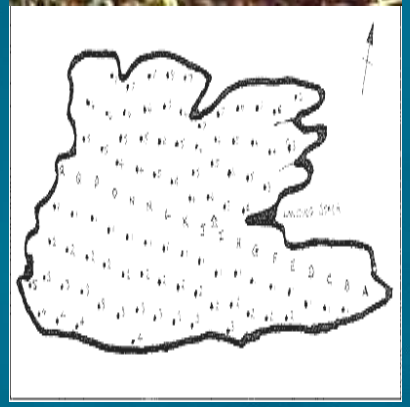
The Nature Conservancy

U.S. FISH & WILDLIFE SERVICE

ISLAND CONSERVATION
Preventing Extinctions

Palmyra Atoll

Rodent Eradication Methods: Rodenticides

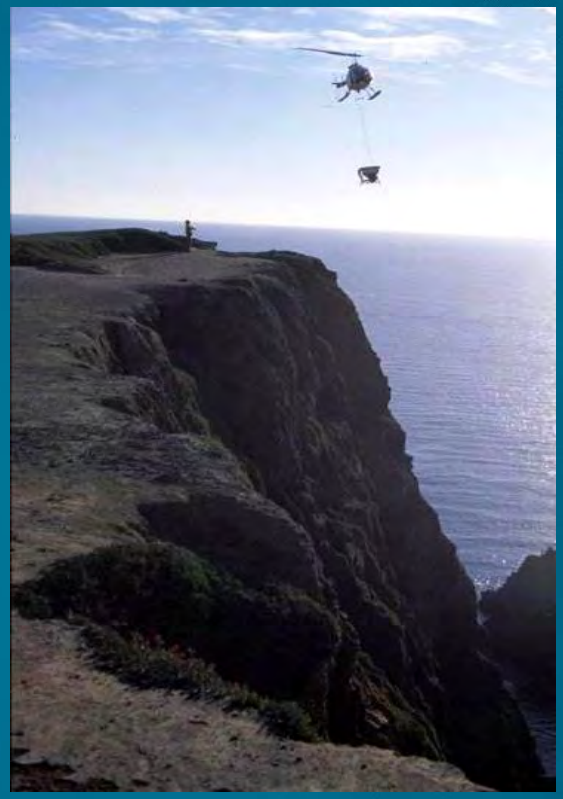


Bait station

34%

Hand broadcast

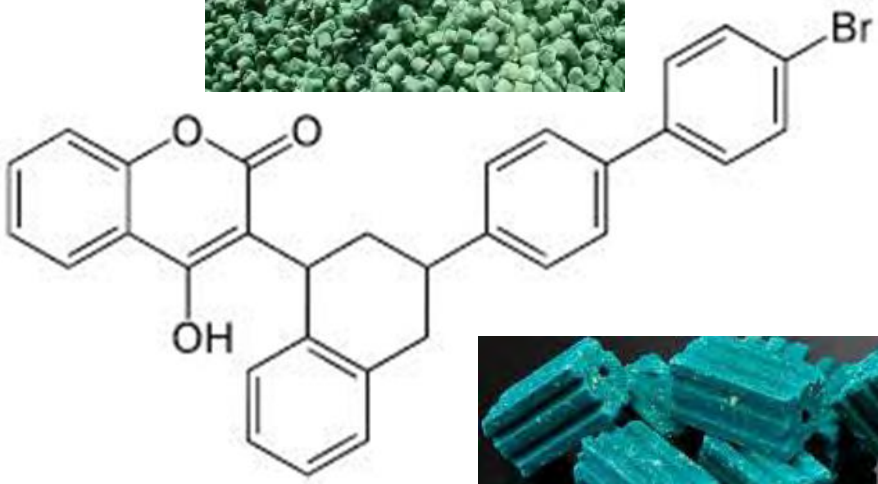
23%



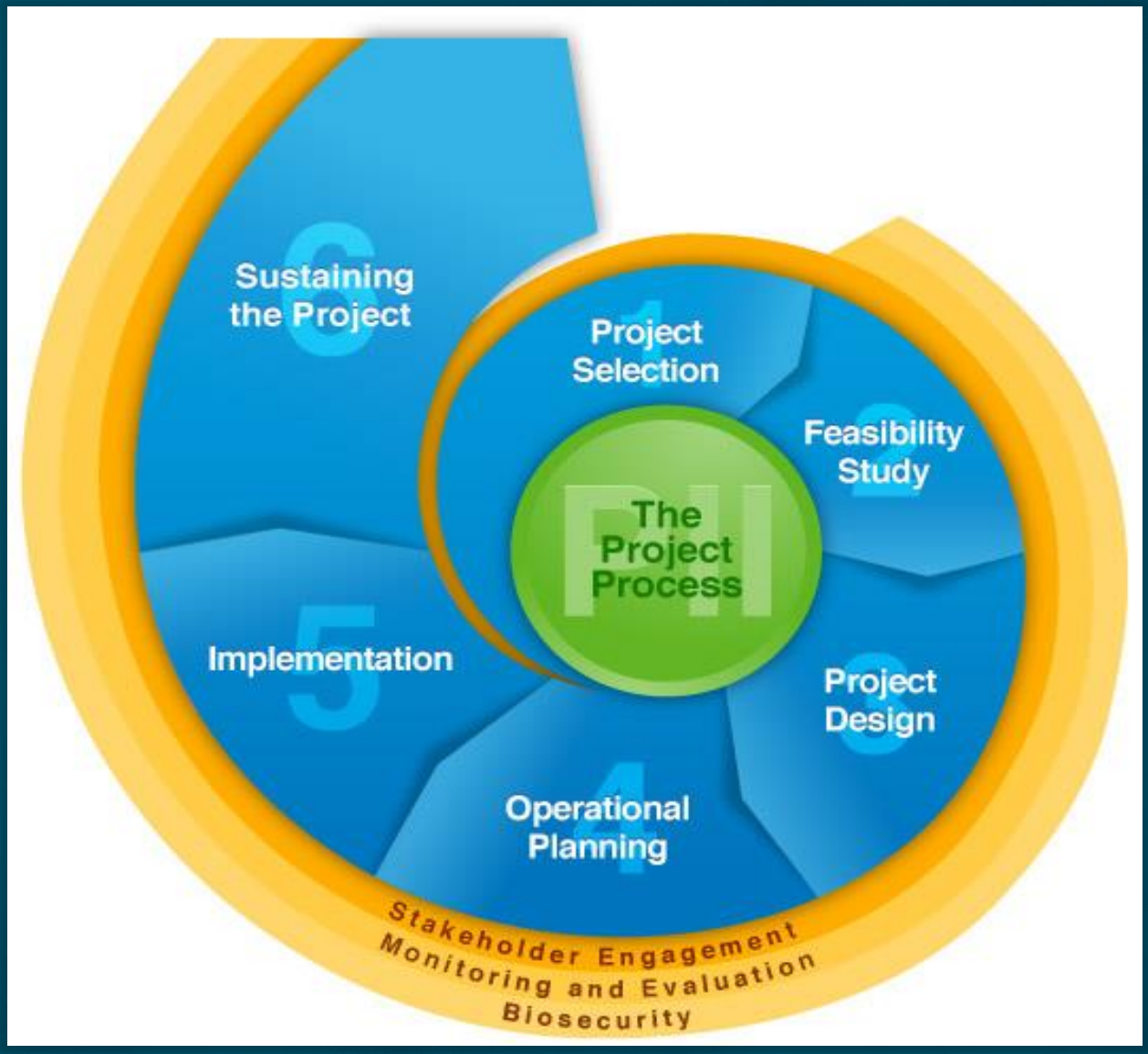
Aerial broadcast

43%

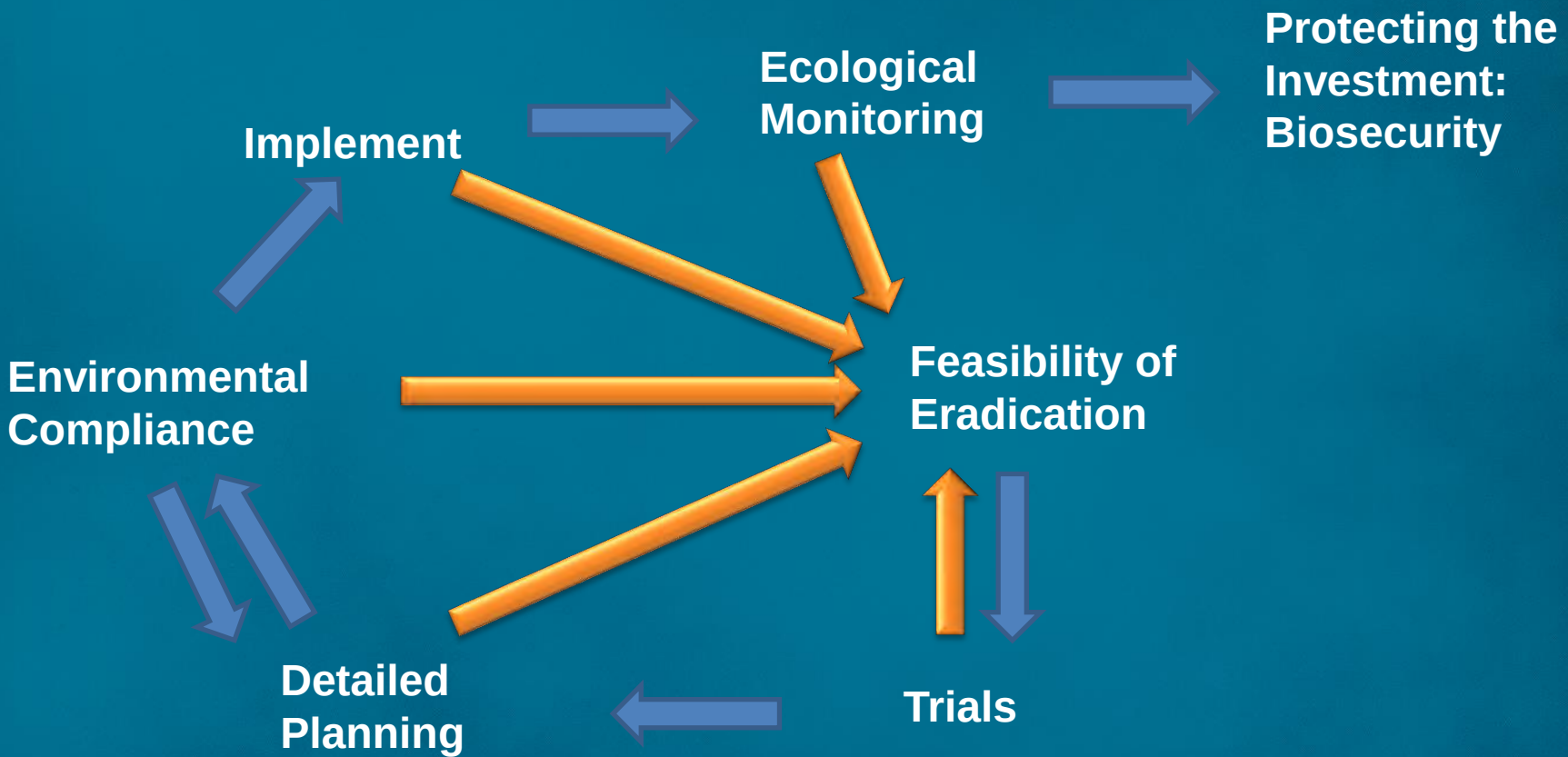
Rodenticide Choice: Balancing Efficacy vs. Risk
A Tradeoff



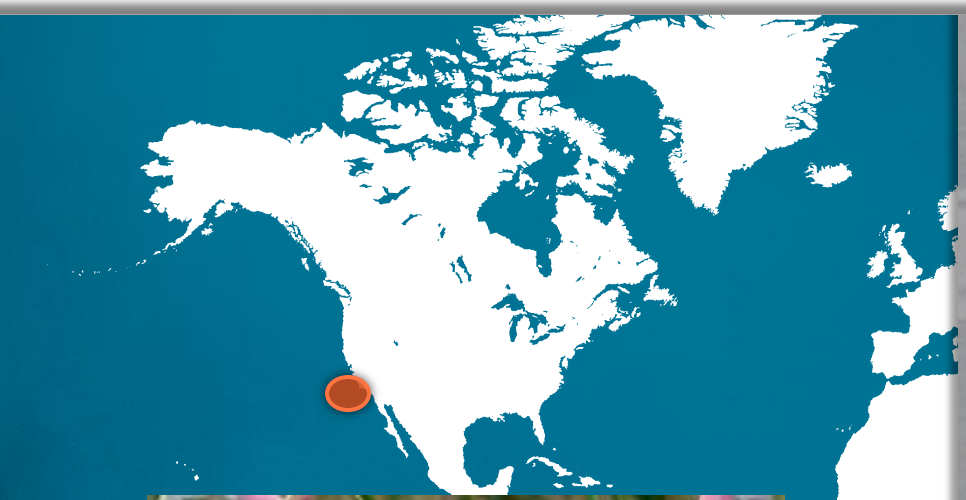
Basic Eradication Project Cycle

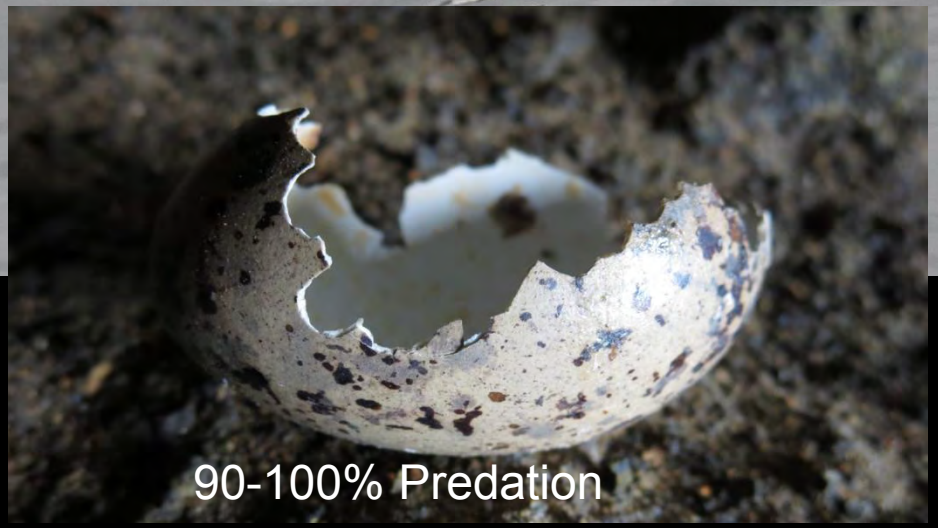


Managing Risk: Adaptive Management



American Trader Trustee Council





Anacapa Island, California

Per Annum Increase: ln Annual Number of Occupied Nests

Whitworth and Carter, 2014

ln Number of Nests

5.0
4.5
4.0
3.5
3.0
2.5
2.0

y = 0.147x - 292

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

The Nature Conservancy

ISLAND CONSERVATION

Preventing Extinctions

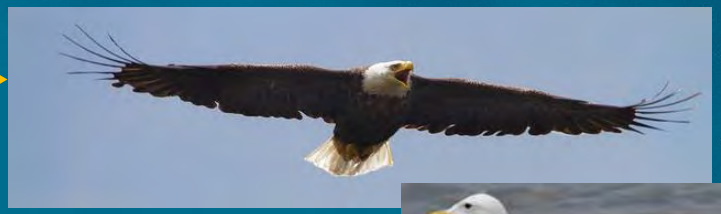
U.S. FISH & WILDLIFE SERVICE

Hawadax (Rat) Island, Alaska

Timing: Balancing efficacy vs. risk

ion size

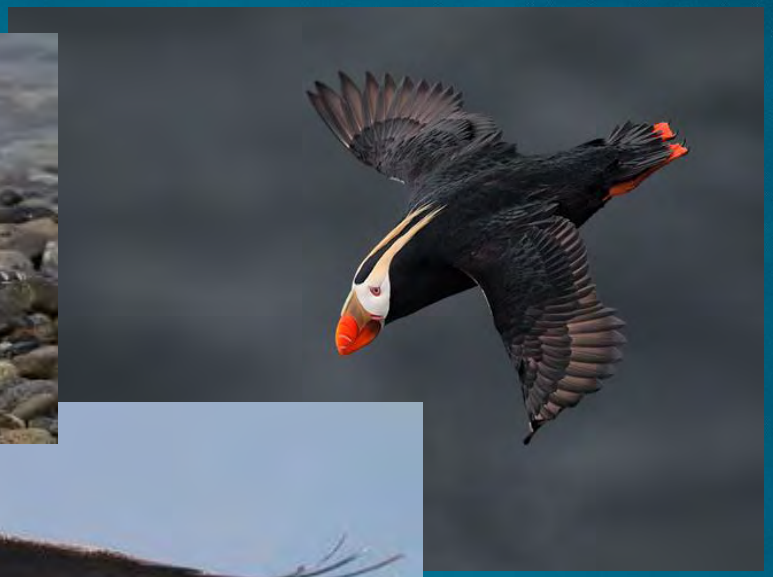
Non-target Risks

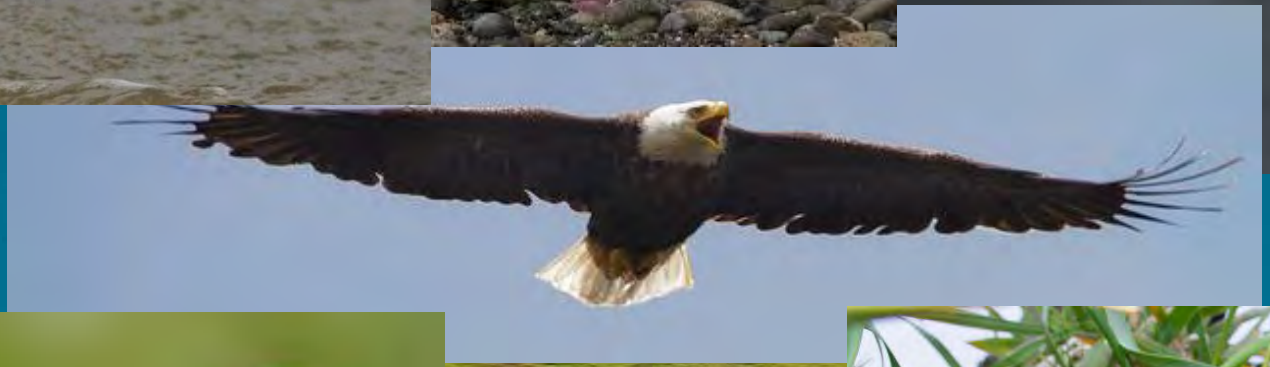


Bait

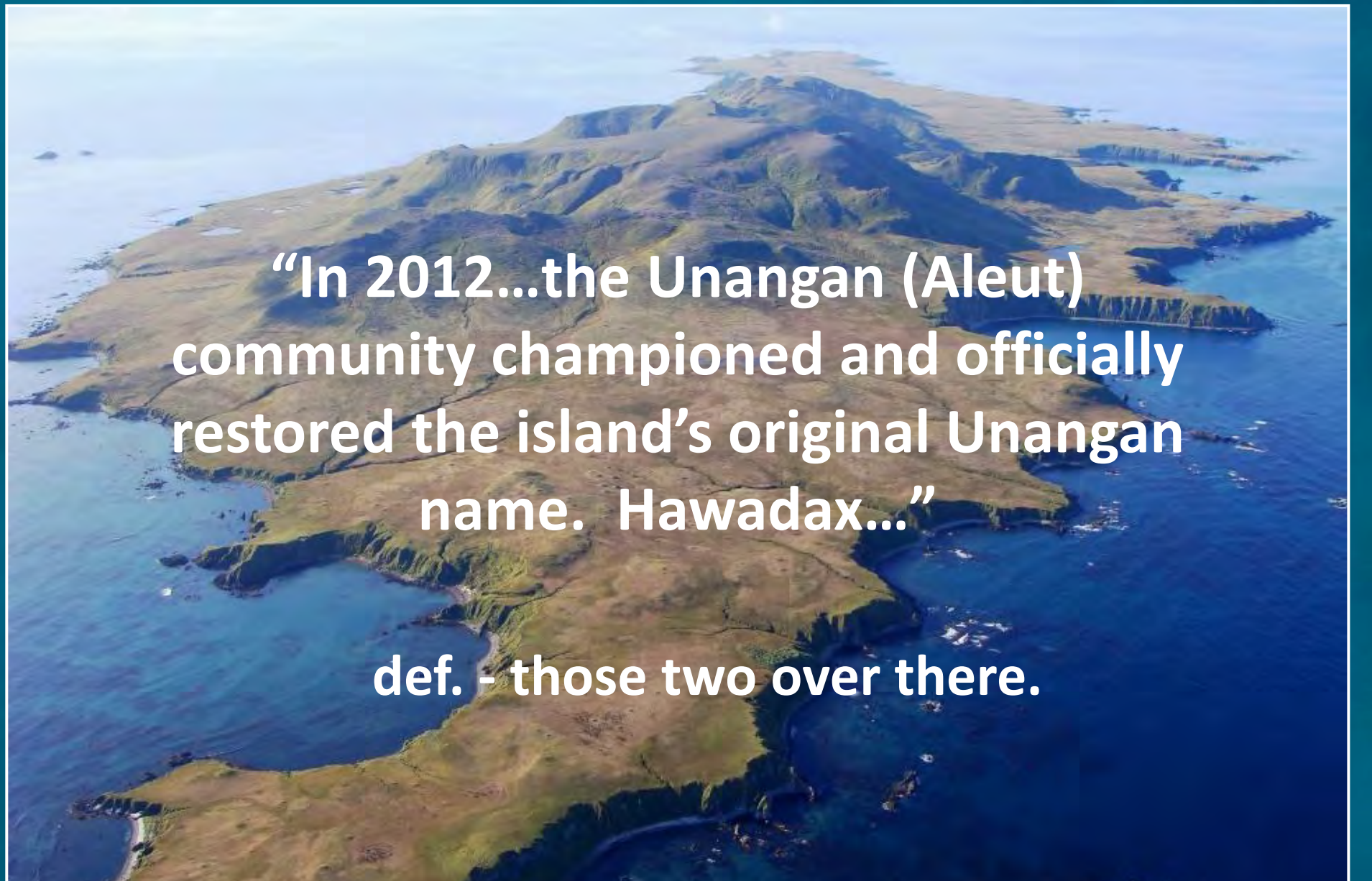
Rats

Cost vs. Benefit: Is it Worth It?





Beyond the Biodiversity: Rat Island



"In 2012…the Unangan (Aleut) community championed and officially restored the island's original Unangan name. Hawadax…"

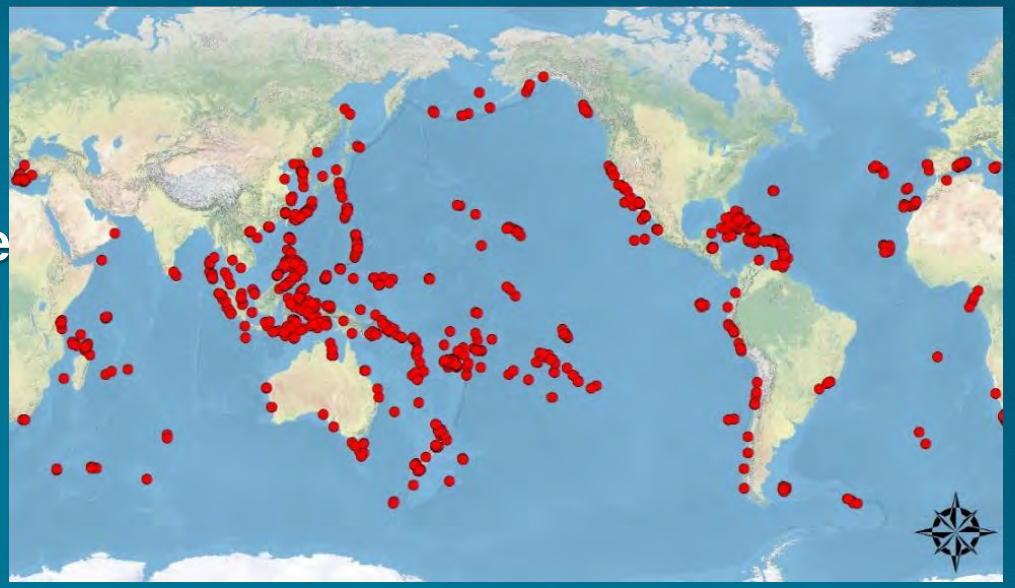
def. - those two over there.

Challenges for the Future

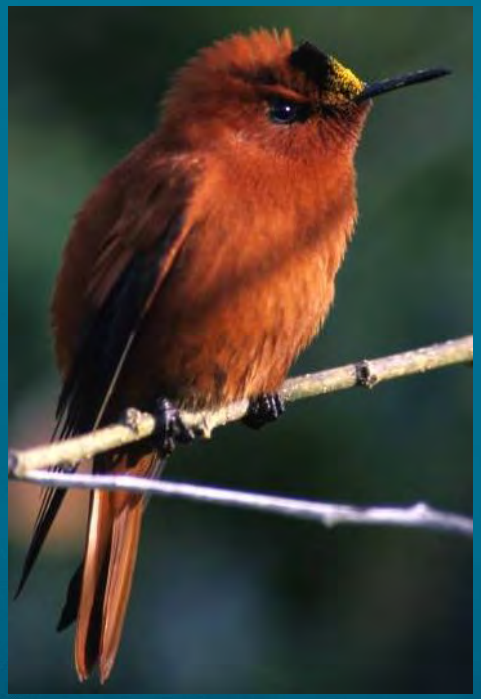
- Reliant on application to every rodent territory
- Not Species Specific
- Humane issues
- Inhabited islands
- Perception of poisons

Innovation Strategy

Incremental vs. Transformative



- Eliminate Pesticide Use or Reduce
- Applicable for Large Scale
- How might we catalyze?



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journal homepage: www.elsevier.com/locate/biocon

Special Issue Article: Tropical rat eradication

The next generation of rodent eradications: Innovative technologies and tools to improve species specificity and increase their feasibility on islands

Karl J. Campbell [a,b,*], Joe Beek [c], Charles T. Eason [c,d], Alistair S. Glen [e], John Godwin [f], Fred Gould [g], Nick D. Holmes [a], Gregg R. Howald [a], Francine M. Madden [h], Julia B. Ponder [i], David W. Threadgill [j,k], Alexander S. Wegmann [a], Greg S. Baxter [l]

ARTICLE INFO

ABSTRACT

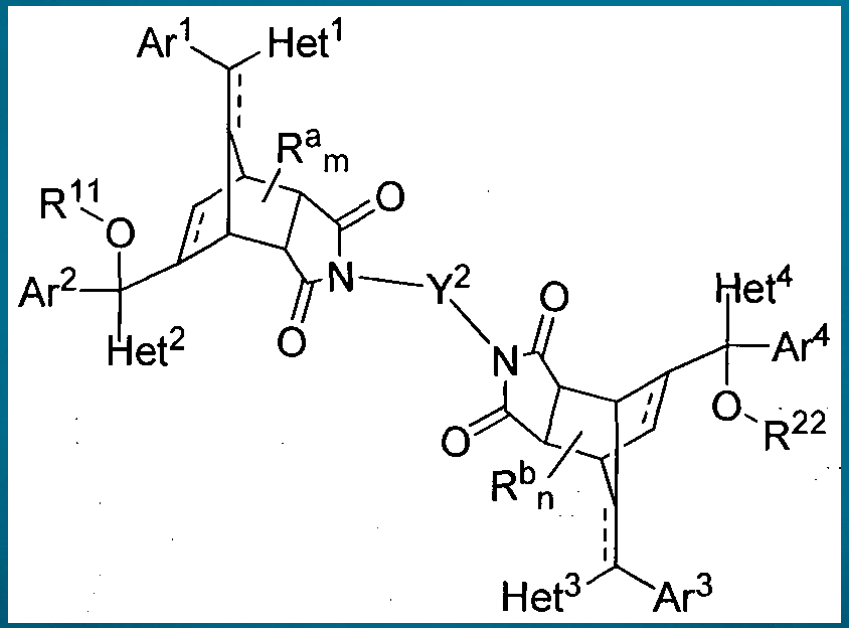
Rodents remain one of the most widespread and damaging invasive alien species on islands globally. The current toolbox for insular rodent eradications is reliant on the application of sufficient anticoagulant toxicant into every potential rodent territory across an island. Despite significant advances in the use of these toxicants over recent decades, numerous situations remain where eradication is challenging or not yet feasible. These include islands with significant human populations, unreceptive stakeholder communities, co-occurrence of livestock and domestic animals, or vulnerability of native species. Developments in diverse branches of science, particularly the medical, pharmaceutical, invertebrate pest control, social science, technology and defense fields offer potential insights into the next generation of tools to eradicate rodents from islands. Horizon scanning is a structured process whereby current problems are assessed against potential future solutions. We undertook such an exercise to identify the most promising technologies, techniques and approaches that might be applied to rodent eradications from islands. We highlight a Rattus-specific toxicant, RNA interference as species-specific toxicants, rodenticide research, crab deterrent in baits, prophylactic treatment for protection of non-target species, transgenic rodents, virus vectored immunocontraception, drones, self-resetting traps and toxicant applicators, detection probability models and improved stakeholder community engagement methods. We present a brief description of each method, and discuss its application to rodent eradication on islands, knowledge gaps, challenges, whether it is incremental or transformative in nature and provide a potential timeline for availability. We outline how a combination of new tools may render previously intractable rodent eradication problems feasible.

1. Introduction

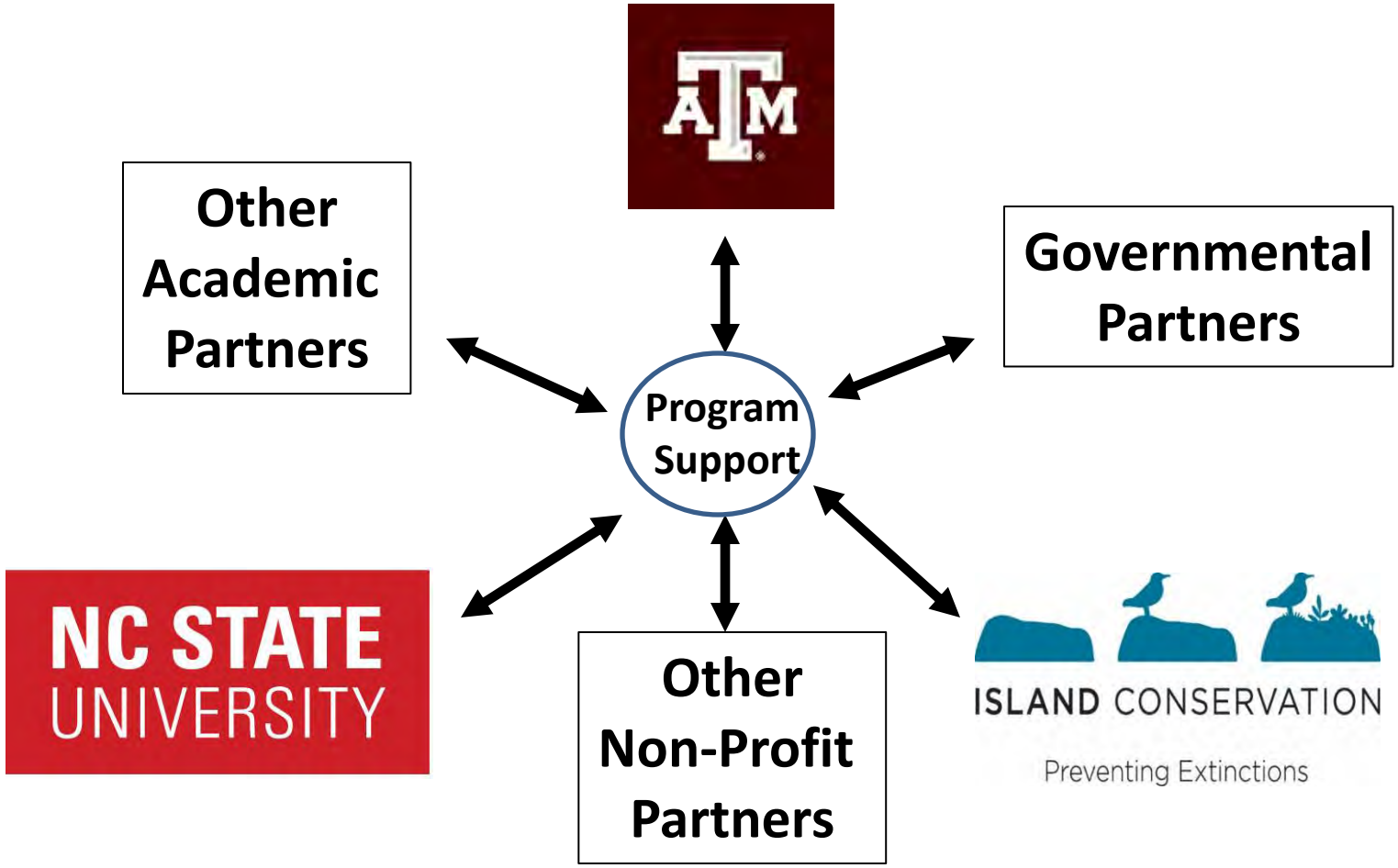
Innovations

Crab Deterrents

Rattus Specific Toxicant (RST)

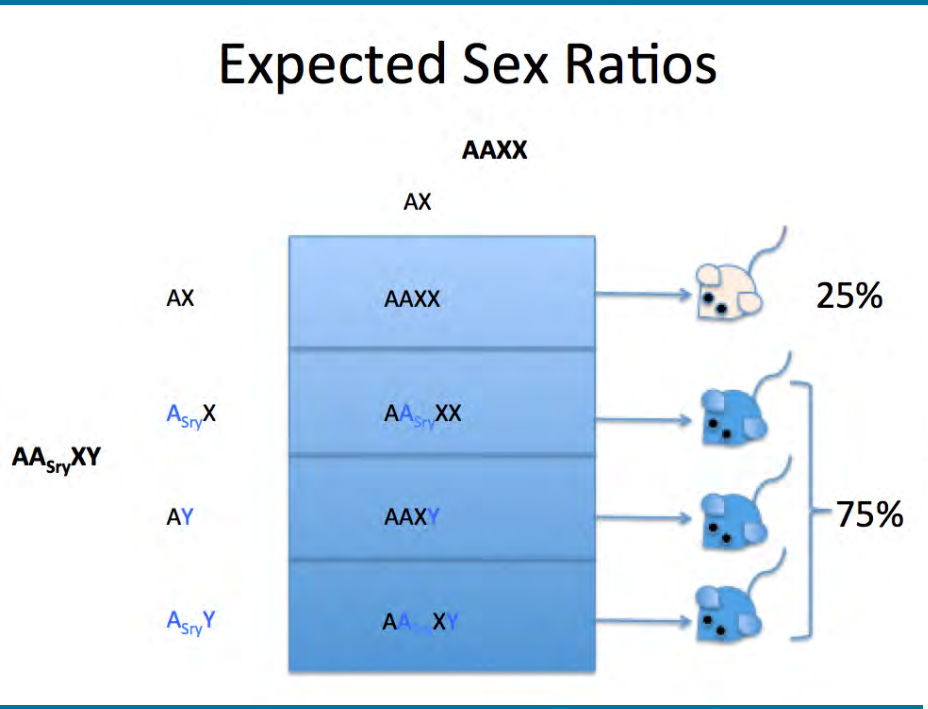


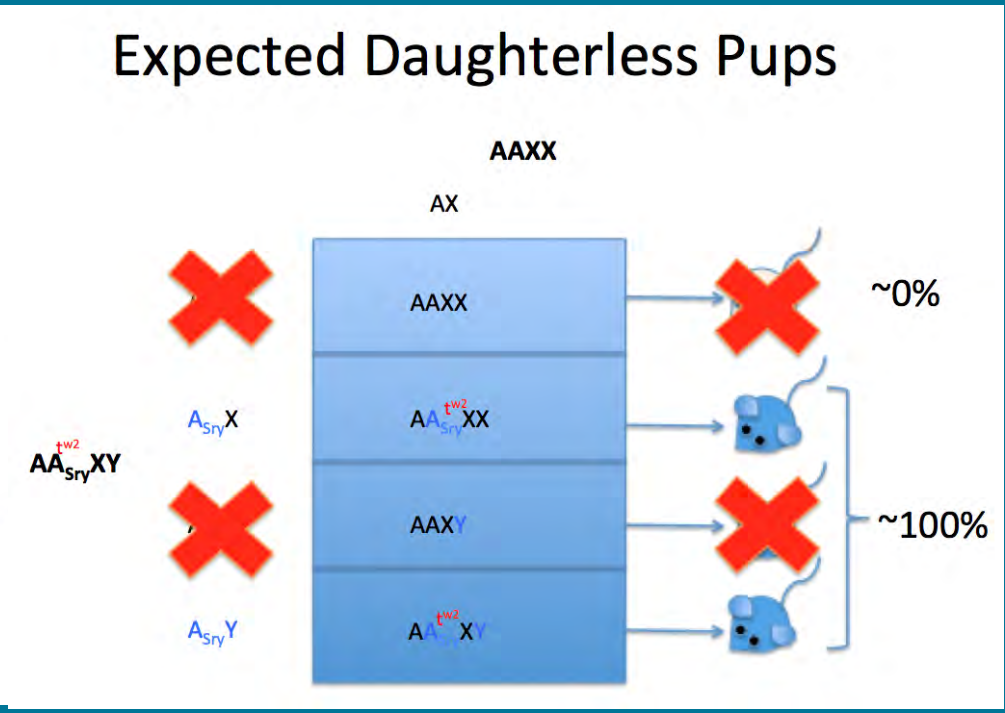
Genetic Biocontrol of Invasive Rodents Program



Mouse Genetics
that may contribute to conservation

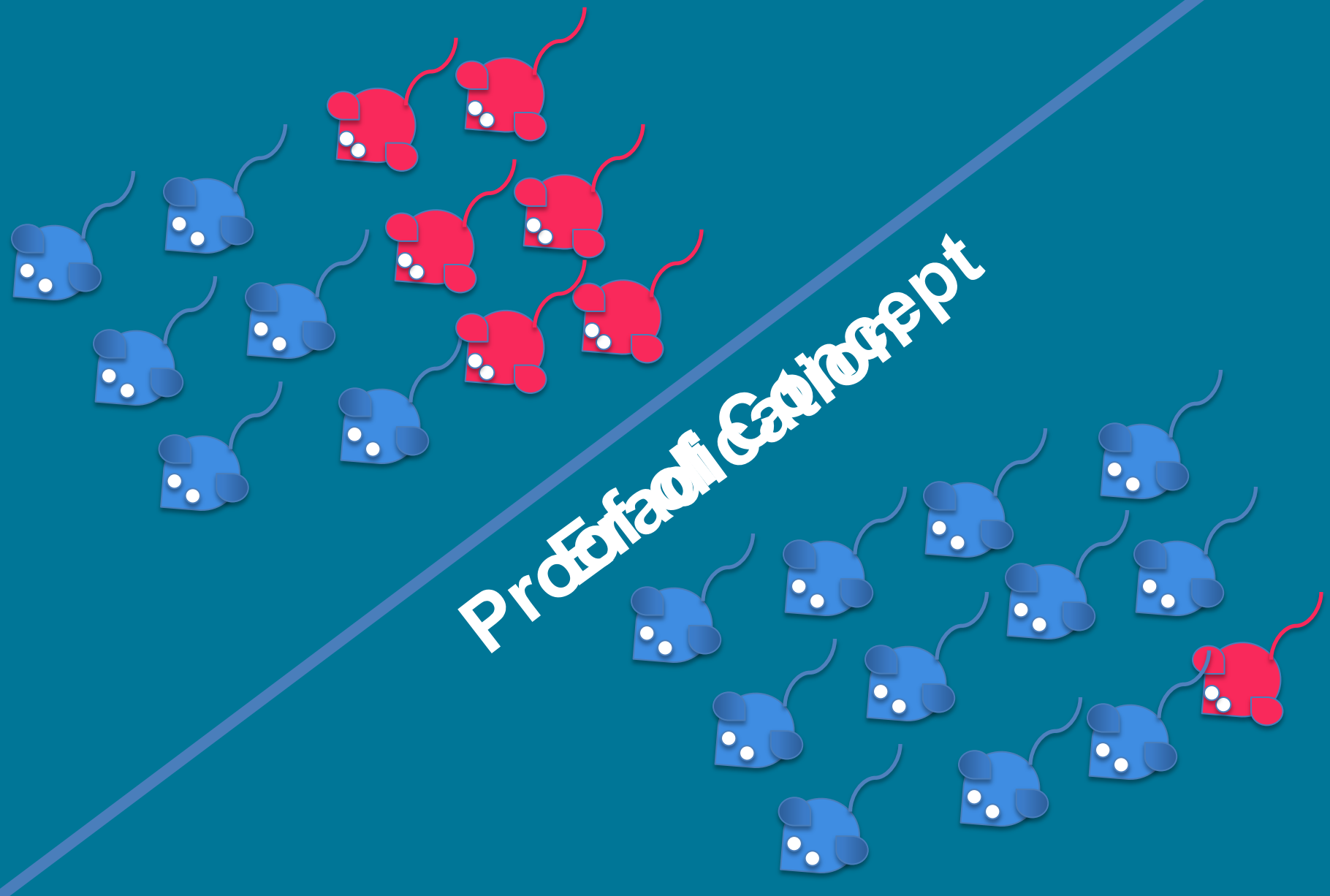
- **SRY** – Sex Determining Region in the Y-chromosome
- **T-complex** – naturally occurring meiotic drive in *Mus*



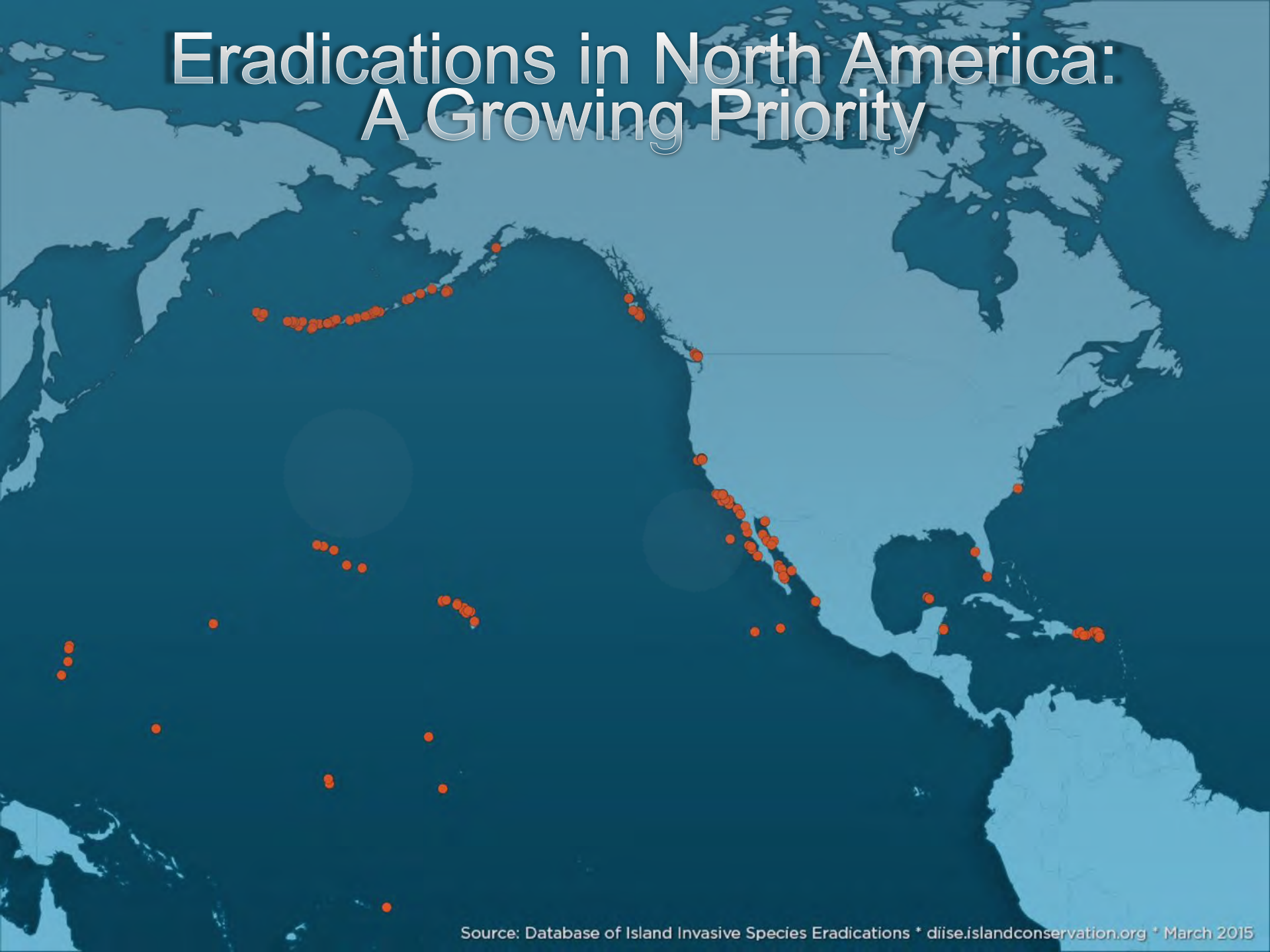


Figures compliments of Dona Kanavy, TA

Mendelian inheritance



Eradications in North America: A Growing Priority



Source: Database of Island Invasive Species Eradications * diise.islandconservation.org * March 2015

Letter of Intent

- Signed at 2014 Trilateral Meeting
- Seeks to strengthen collaboration between Canada, Mexico, and the United States on the conservation and restoration of islands

Parks Canada Parcs Canada
U.S. FISH & WILDLIFE SERVICE
NATIONAL PARK SERVICE
NOAA
U.S. DEPARTMENT OF THE INTERIOR
SEMARNAT
CONABIO
CONANP
Comisión Nacional de Áreas Naturales Protegidas
INECC
Conservación de Islas
MÉXICO
COASTAL CONSERVATION
ISLAND CONSERVATION
Preventing Extinctions
National Fish and Wildlife Foundation

MEMORANDUM OF UNDERSTANDING U.S. FISH AND WILDLIFE SERVICE

".. jointly promote an integrated and coordinated approach to these efforts through project implementation, information exchange, education and training, coordination, inventorying and monitoring, and sharing of resources whenever appropriate."

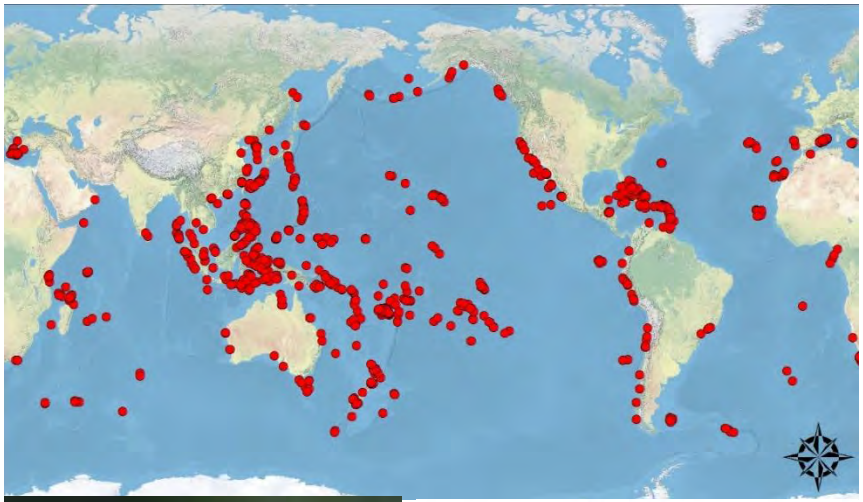
AMERICAN BIRD CONSERVANCY

ISLAND CONSERVATION
Preventing Extinctions

USDA

Innovation Strategy

- Identify point of greatest impact
  - Invasive rodents
- Match technology to the need
  - Horizon scanning
- Select investment targets
  - Incremental
  - Transformative
- How might we catalyze?



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The next generation of rodent eradications: Innovative technologies and tools to improve species specificity and increase their feasibility on islands

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Successful Eradication Attempts Over Time

Source: Database of Island Invasive Species Eradications (DIISE), 2014