



GBIRD





Genetic Biocontrol of Invasive Rodents

# Gene Drives for Conservation: a transdisciplinary approach for effective and responsible innovation



ISLAND CONSERVATION

Preventing Extinctions

4th International Workshop on  
Regulatory Approaches for Agricultural  
Applications of Animal Biotechnologies

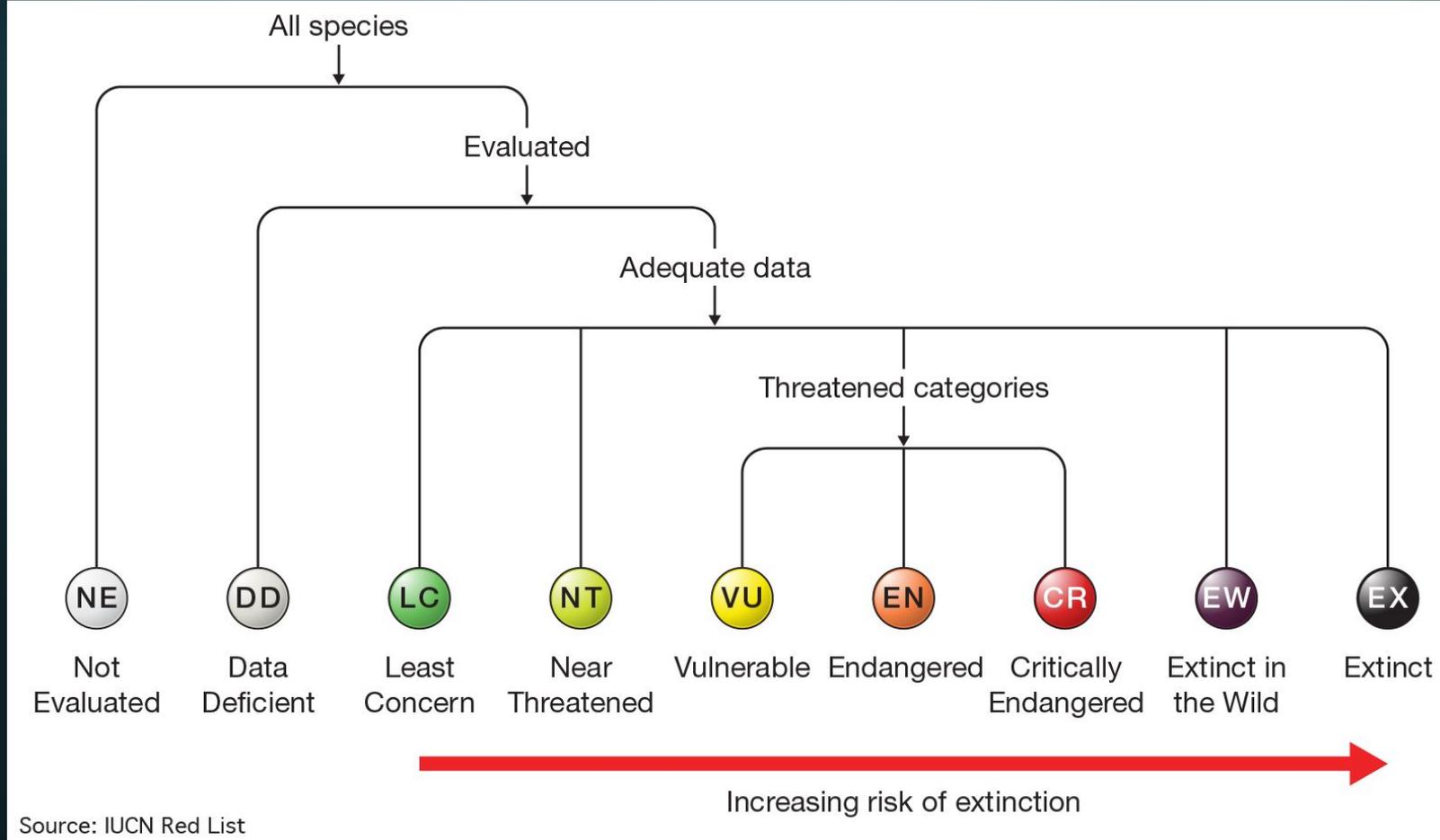
Sept 12, 2022

J. Royden Saah  
GBIRd Program Coordinator  
Island Conservation

# Acknowledgements and Gratitude

- I acknowledge that from where I sit in Raleigh, NC, I am speaking from the unceded, traditional homelands of the Tuscarora and Catawba people.
- I am grateful to the Planning Committee for the invitation
- I am grateful for Island Conservation and all the GBIRD partners

# Conservation of What?





Science and Policy  
for People and Nature

---

## ONE MILLION SPECIES AT RISK OF EXTINCTION, UN REPORT WARNS



May 2019

---



ISLAND CONSERVATION

Preventing Extinctions

---

**WE PREVENT EXTINCTIONS BY  
REMOVING INVASIVE SPECIES FROM ISLANDS**



# ISLANDS REPRESENT



Preventing Extinctions



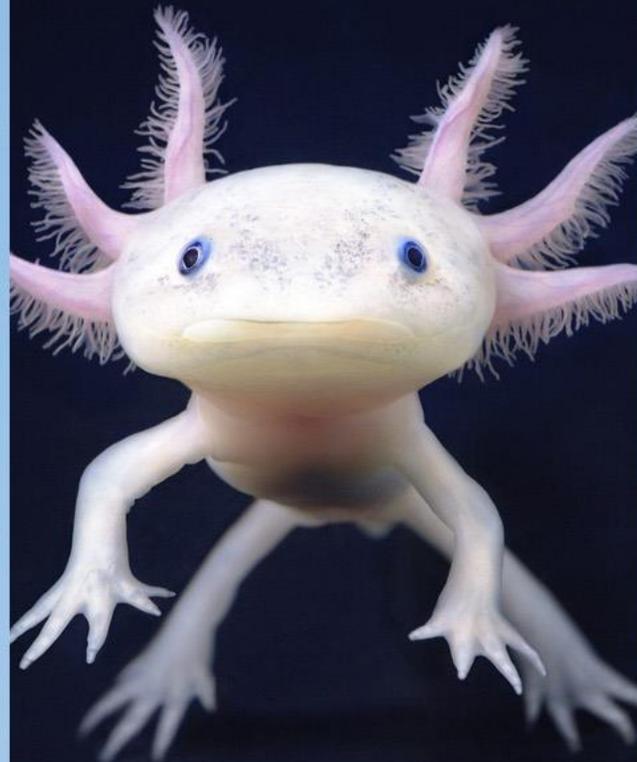
81%



95%



54%

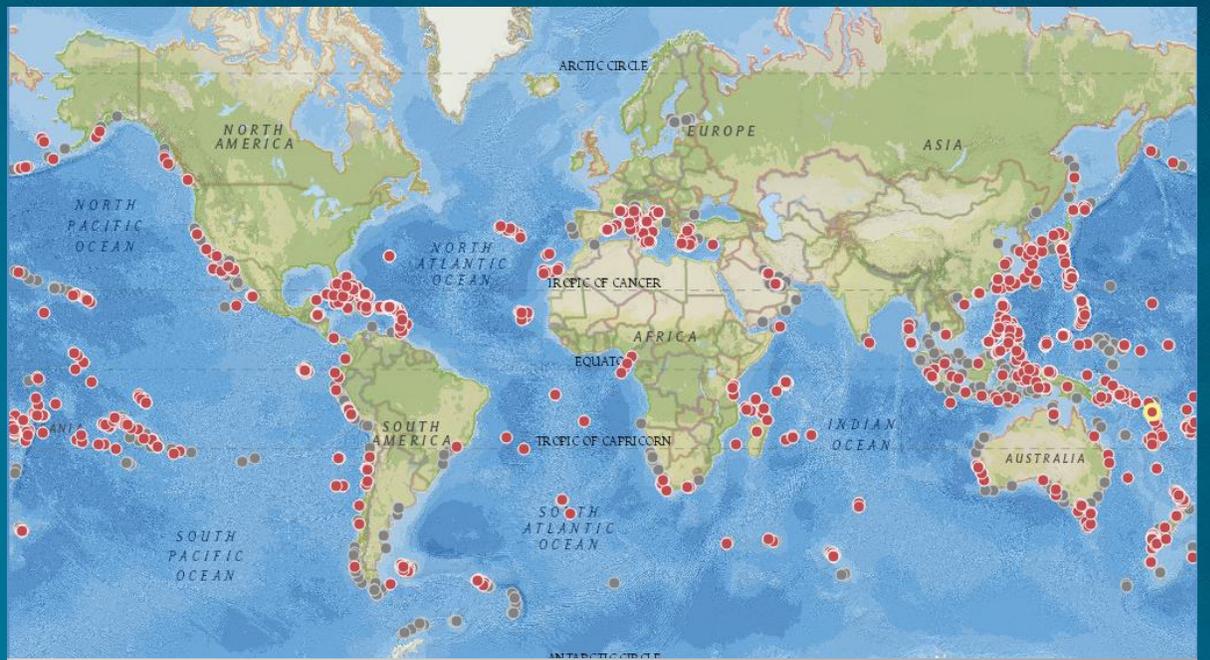


54%



Four invasive rodent species impact 88% of CR/EN vertebrates on islands

Current methods 'feasible' for islands holding 15% of those CR/EN species



# GBIRD

Genetic Biocontrol of Invasive Rodents

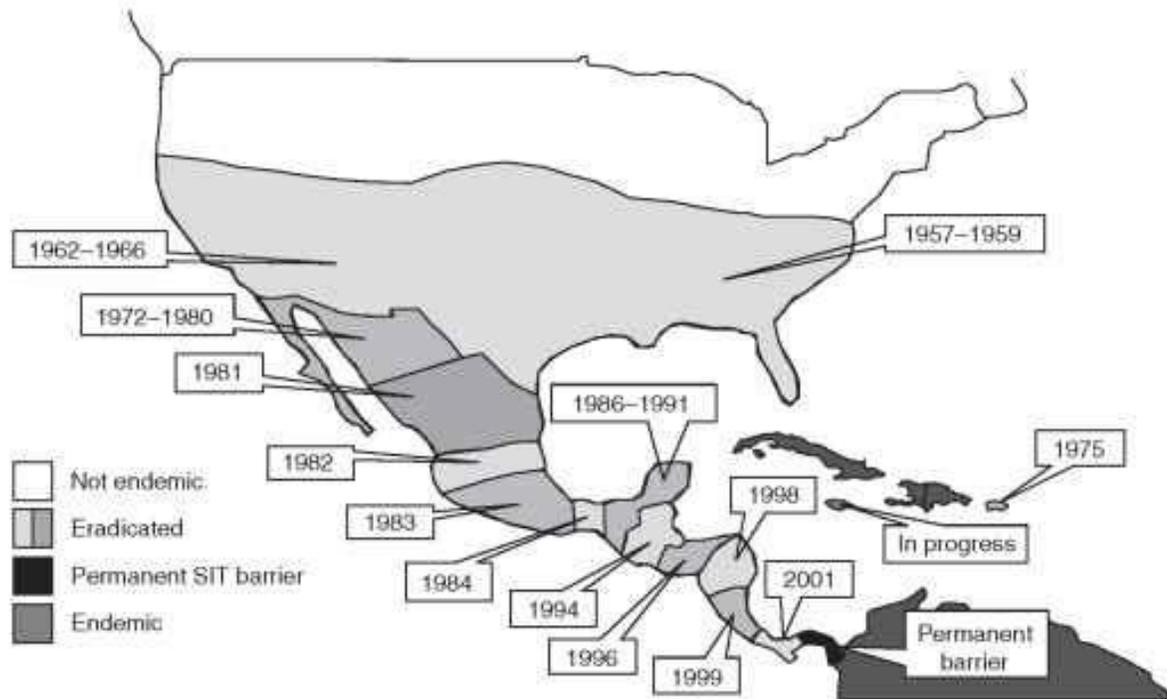


# HISTORY OF GENETIC BIOCONTROL

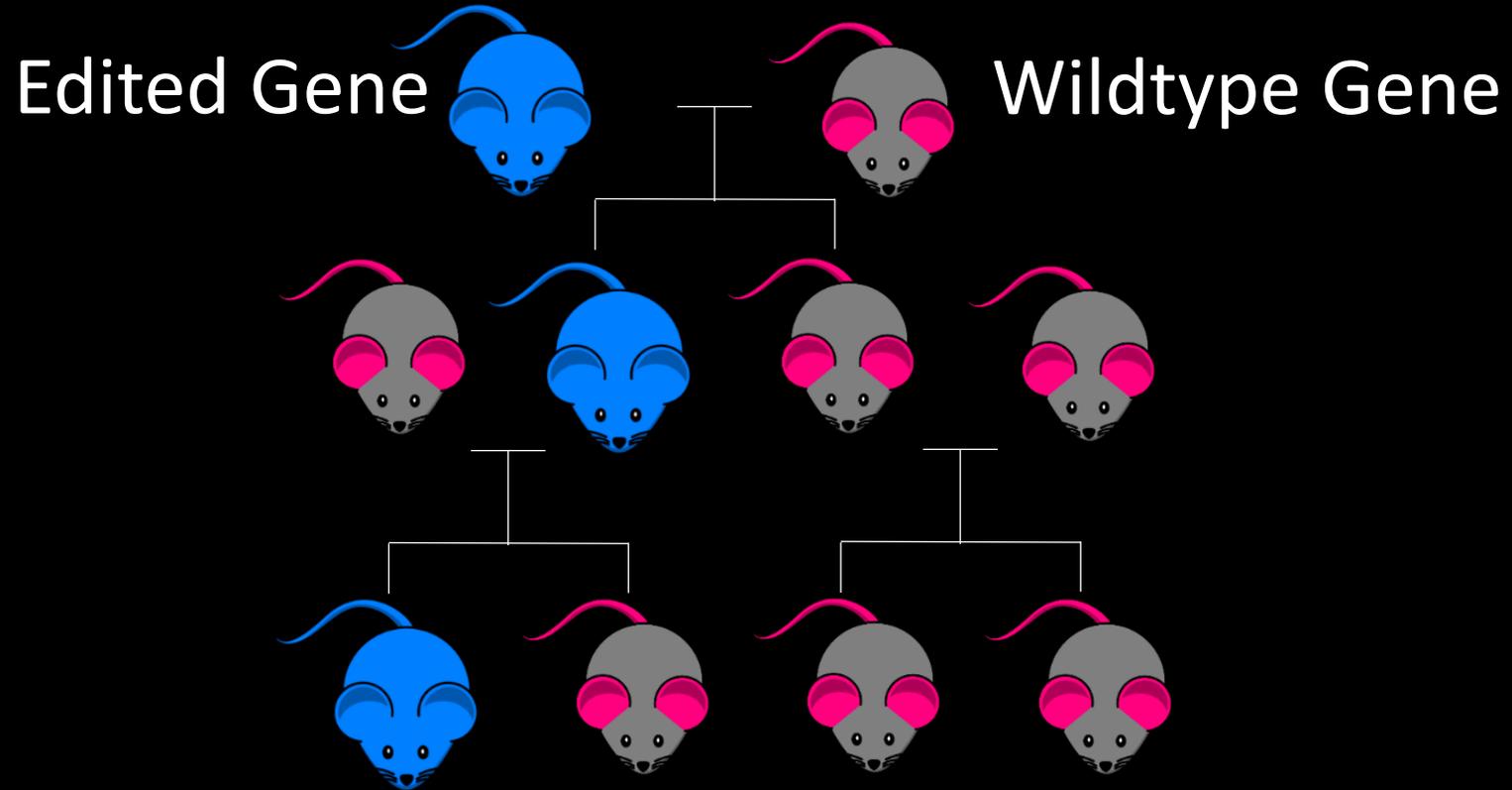
## Control of Screw-worm Fly by Atomic Radiation

E. F. KNIPLING

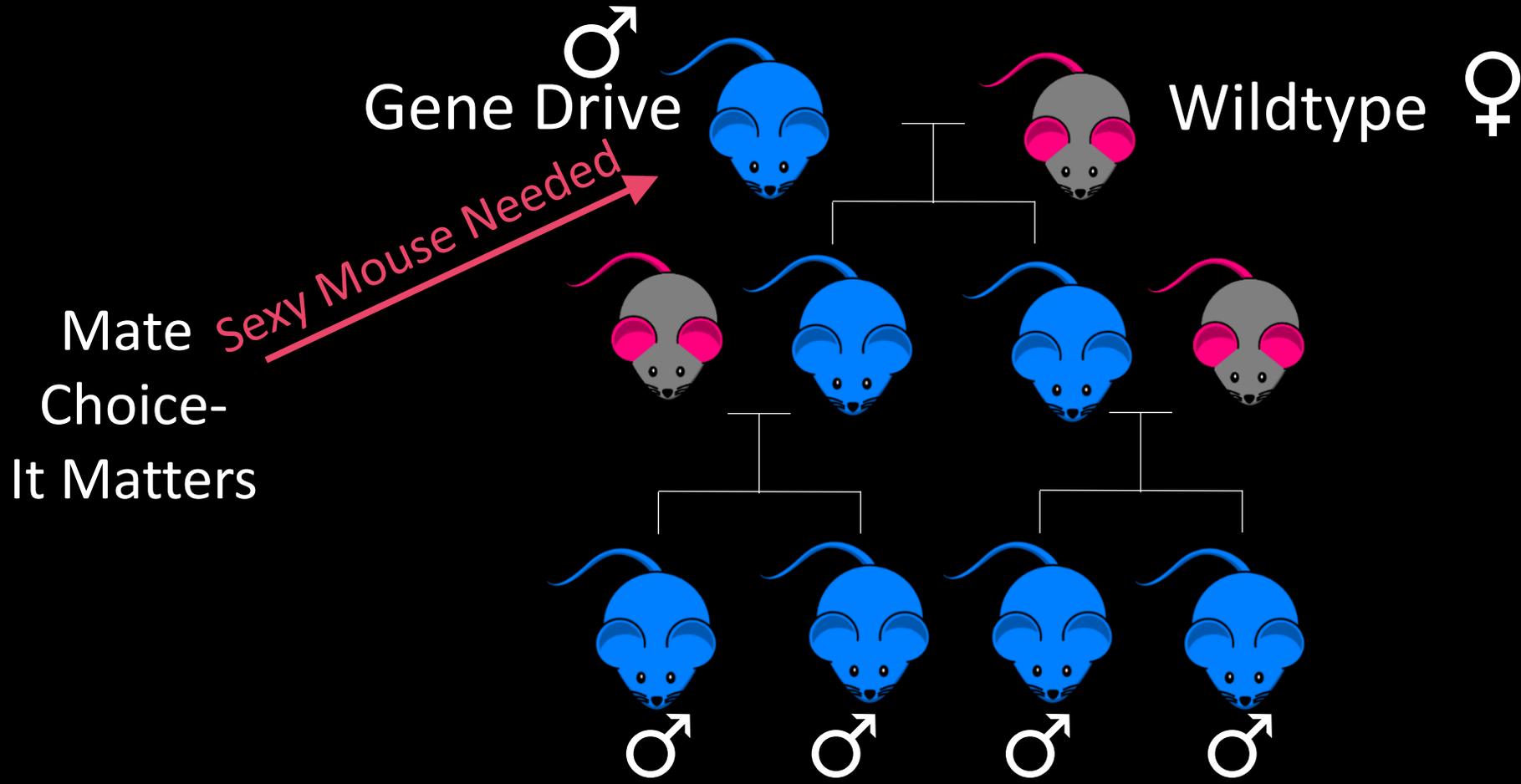
*is director of the Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture, Plant Industry Station, Beltsville, Md. He received his B.S. degree in entomology at Texas A and M University in 1930 and his M.S. and Ph.D. degrees at Iowa State College, obtained in 1947. He has conducted and directed entomology research in the Department of Agriculture since 1931, particularly in the field of medical and agricultural entomology. During World War II he was in charge of research, under Office of Scientific Research and Development contracts, on the control of insects of military importance.*



# Mendelian Genetics



# Gene Drive Genetics



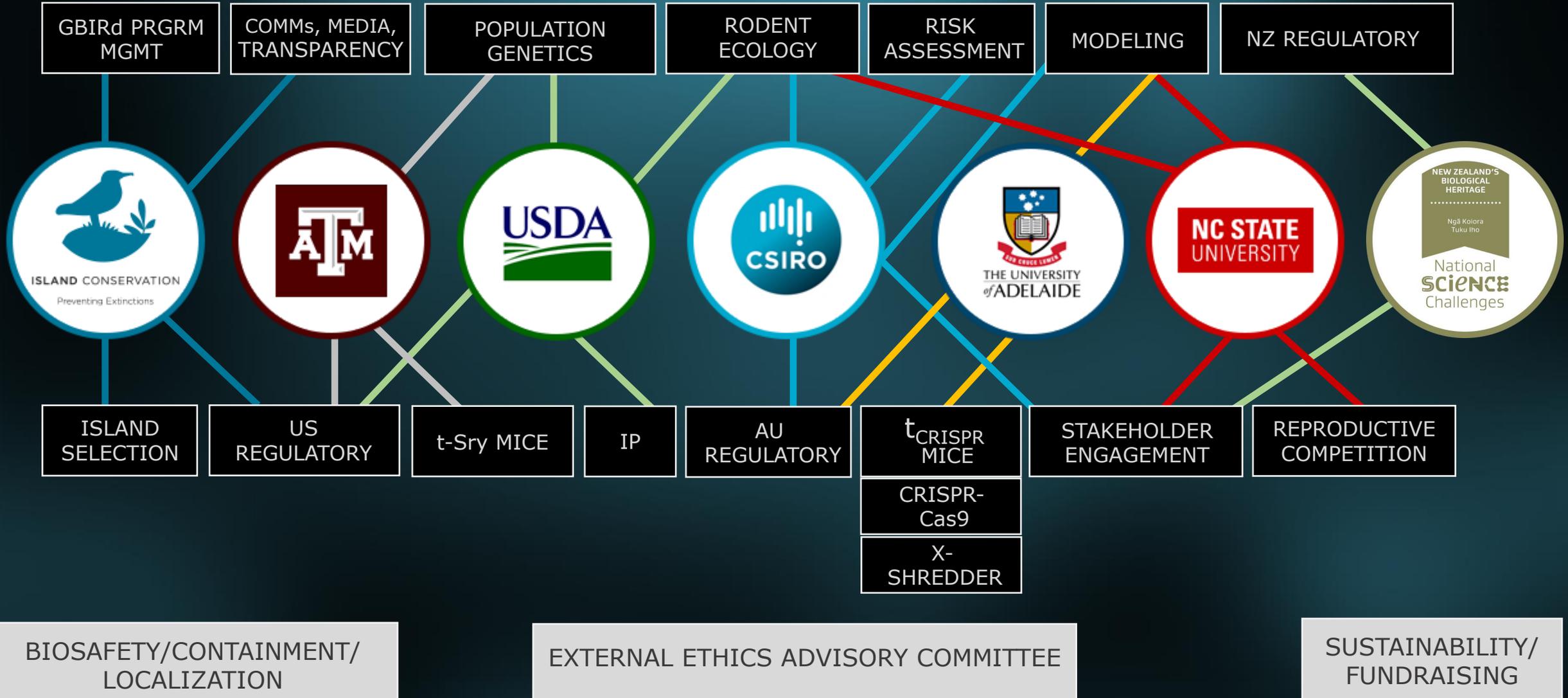
Cisgenic and Transgenic Approaches

# Guiding Principles

- Proceed cautiously, with deliberate step-wise methods and measurable outcomes;
- Engage early and often with the research community, regulators, communities and other stakeholders;
- Maintain an uncompromising commitment to biosafety, existing regulations, and protocols as minimum standards (e.g. NASEM, 2016; AAS, 2017);
- Use, and participate in developing best practices;
- Only operate in countries with appropriate regulatory capacity; and
- Be transparent with research, assessments, findings, and conclusions.

# GBIRd

## Genetic Biocontrol of Invasive Rodents



GBIRD

Genetic Biocontrol of Invasive Rodents

# Mouse Genetics



bioRxiv

THE PREPRINT SERVER FOR BIOLOGY

bioRxiv posts many COVID19-related papers. A reminder: they have not been formally peer-reviewed and should not guide health-related behavior or be reported in the press as conclusive.

New Results

[View current version of this article](#)

[Follow this preprint](#)

### Leveraging a natural murine meiotic drive to suppress invasive populations

[ID](#) Luke Gierus, [ID](#) Aysegul Birand, Mark D. Bunting, Gelshan I. Godahewa, Sandra G. Piltz, [ID](#) Kevin P. Oh, Antoinette J. Piaggio, [ID](#) David W. Threadgill, John Godwin, Owain Edwards, [ID](#) Phillip Cassey, Joshua V. Ross, Thomas A.A. Prowse, [ID](#) Paul Q. Thomas

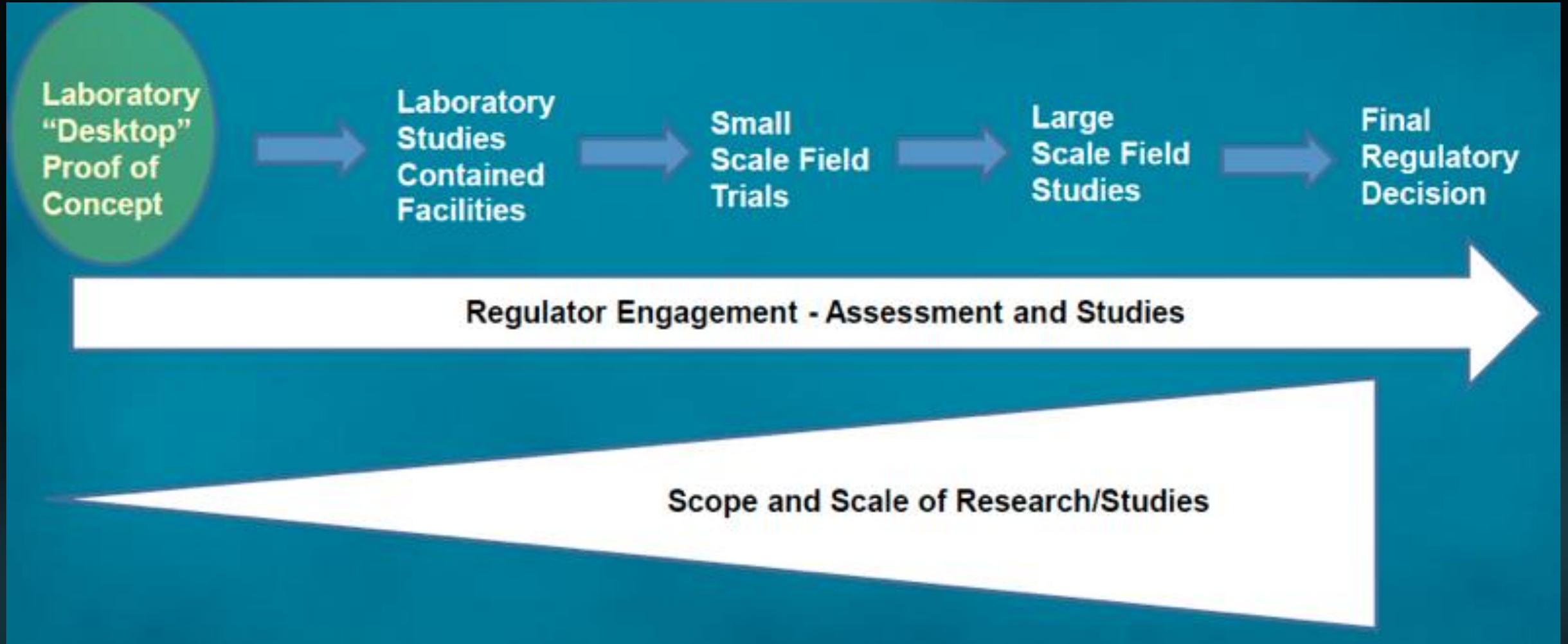
doi: <https://doi.org/10.1101/2022.05.31.494104>

GBIRD

Genetic Biocontrol of Invasive Rodents

Biosafety/Containment/Localization

# Regulatory Planning





Genetic Biocontrol of Invasive Rodents

Transparency/Communications/Media

# Target 17

1. Should Target 17 focus on 'biotechnology' or on 'living modified organisms resulting from biotechnology'?
2. Should Target 17 also address the positive impacts of biotechnology? If so, how should they be reflected in target?
3. Should the target be moved to the section 'meeting people's needs through sustainable use and benefit-sharing' (T13)?

## Draft Target 6

I

[[Ensure that the]/[Identify[, prioritize]] and manage]/[Address the drivers and, where possible, manage all] [the] pathways for the introduction of [invasive] alien species [are identified and managed], preventing, [or]/[and] [significantly] reducing their[the [[rate of] [introduction [by at least 50 per cent] and] establishment [by at least 50 per cent], and [detect and] [eradicate] /effectively manage] or control [priority] invasive alien species to eliminate[, minimize] or [reduce] /mitigate] their [coverage and] impacts [by at least by 75%], [focusing on [those that pose significant risk for threatened species or ecosystem services] /nationally identified priority [invasive] alien species[, in particular those with a higher invasive potential.] and priority [sites [for biodiversity]] /ecosystems]]].

### Alt

[Eliminate or reduce the impacts caused by invasive alien species on native biodiversity, by managing pathways for the introduction of alien species, preventing the introduction and establishment of all priority invasive species, reducing the rate of introduction of other known or potential invasive species by at least 50% and eradicating or controlling invasive alien species]





Genetic Biocontrol of Invasive Rodents

# Stakeholder and Community Engagement

# Stakeholder Workshops

- Diverse participants
- “Upstream” engagement
- Discussions across scales of research
- Scenarios for island identification
  - Integrate facts and values
  - Encourage tradeoff discussions
- Moving from stakeholder to community engagement

Farooque, M., Barnhill-Dilling, S. K., Shapiro, J., & Delborne, J. (2019). Genetic Engineering & Society Center. <http://go.ncsu.edu/ges-gene-drive-landscape>

## Exploring Stakeholder Perspectives on the Development of a Gene Drive Mouse for Biodiversity Protection on Islands

Workshop Report  
June 2019



# CERTIFICATE OF REGISTRATION & INSPECTION

LARRY HOGAN, Governor

BOYD K. RUTHERFORD, Lt. Governor



STATE OF MARYLAND

DEPARTMENT OF LABOR, LICENSING AND REGULATION

Gaylord National Resort & Convention Center #16

201 Waterfront St

National Harbor, MD 20745-1135

ELEVATOR UNIT

REGISTRATION NO: PG3427

CLASS: Passenger (P)

CAPACITY: 4000 Lbs.

VALID UNTIL: 04/09/2020

In case of emergency, press  located on elevator panel.

In accordance with Public Safety Article §12-811, this certificate is issued by:

A handwritten signature in black ink that reads 'R. Kaese Dillman'.

R. Kaese Dillman, Chief Elevator Inspector

To report accidents, contact:  
Division of Labor and Industry  
Safety Inspection Unit  
410-767-2990

[www.dllr.maryland.gov/labor/safety](http://www.dllr.maryland.gov/labor/safety)



ISLAND CONSERVATION

Preventing Extinctions

GBIRD

#5





ISLAND CONSERVATION

Preventing Extinctions



**Past Support:**

**Current Support:**



ISLAND CONSERVATION



**Defense Advance Research  
Projects Agency**

**National Science  
Foundation**



**New Zealand National Science Challenges**

**Seaver Institute**



**Australian Government**

**Australian Research Council**

**Australian Research Council (to Thomas)**

**OUTREACH NETWORK FOR  
GENE DRIVE RESEARCH**



**HOPE**

# WE PREVENT EXTINCTIONS

- [ISLANDCONSERVATION.ORG](https://islandconservation.org)
- [GENETICBIOCONTROL.ORG](https://geneticbiocontrol.org)