NC STATE UNIVERSITY

GES CENTER

Genetic Biocontrol of Invasive Rodents (GBIRd) Partnership

Great Lakes Panel on Aquatic Nuisance Species Meeting
October 27, 2021

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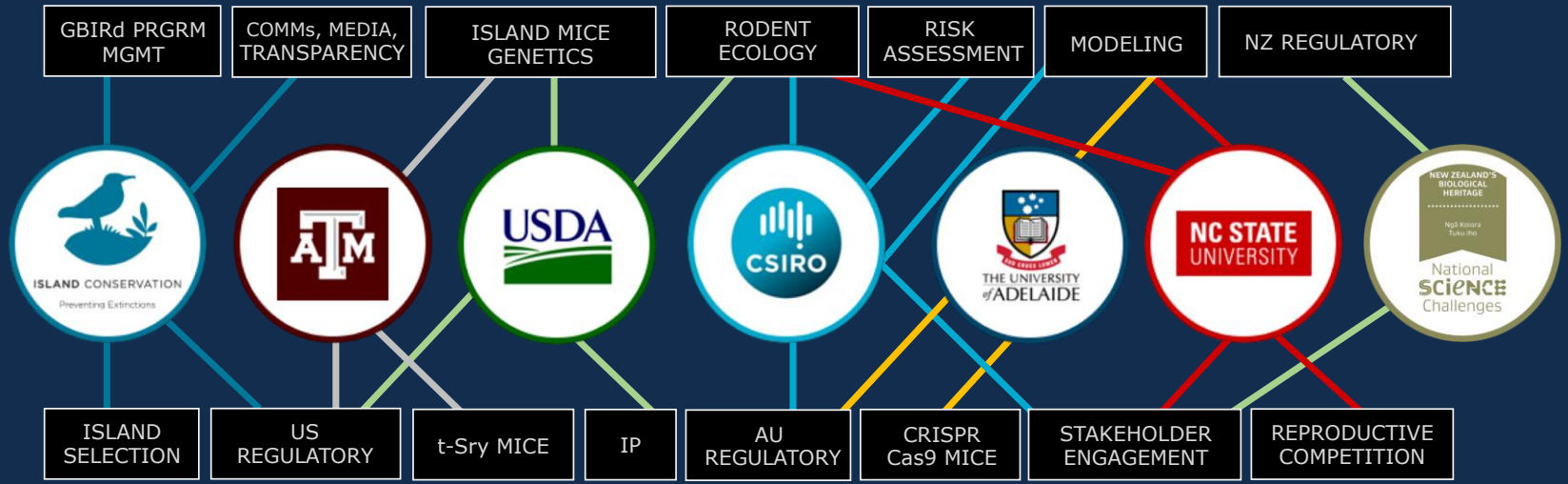
Genetic Engineering and Society Center

GBIRd

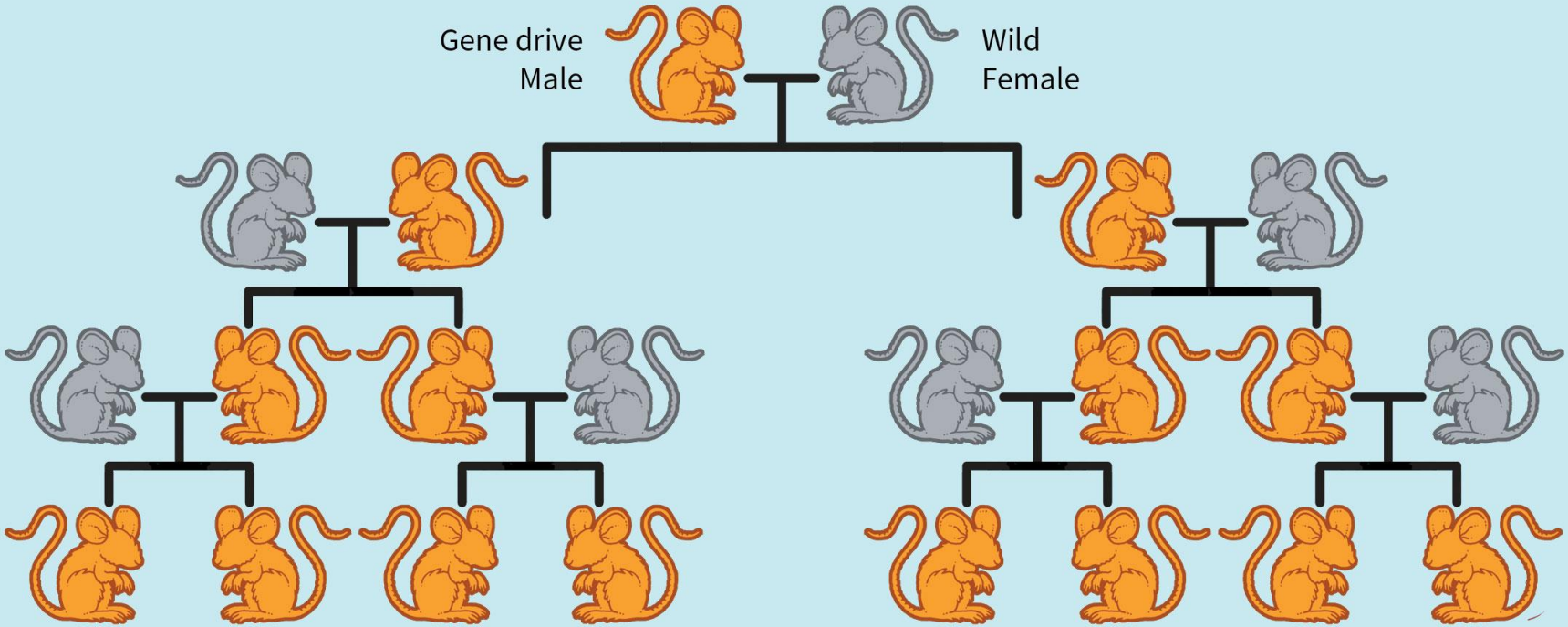
Genetic Biocontrol of Invasive Rodents



BIOSAFETY/CONTAINMENT/ LOCALIZATION

ETHICS ADVISORY COMMITTEE

SUSTAINABILITY/ FUNDRAISING



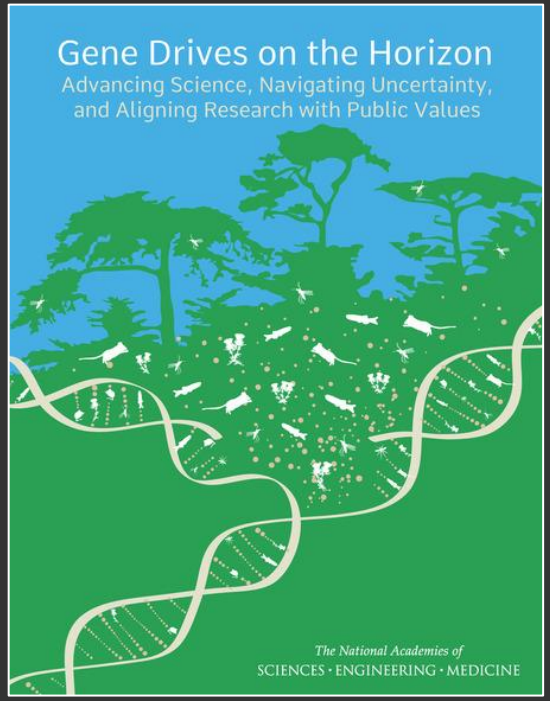
https://www.audubon.org/magazine/summer-2017/how-genetically-modified-mice-could-one-day-save


Farooque, M. (ecastnetwork.org)

The National Academies of SCIENCES ENGINEERING MEDICINE

nas-sites.org/gene-drives

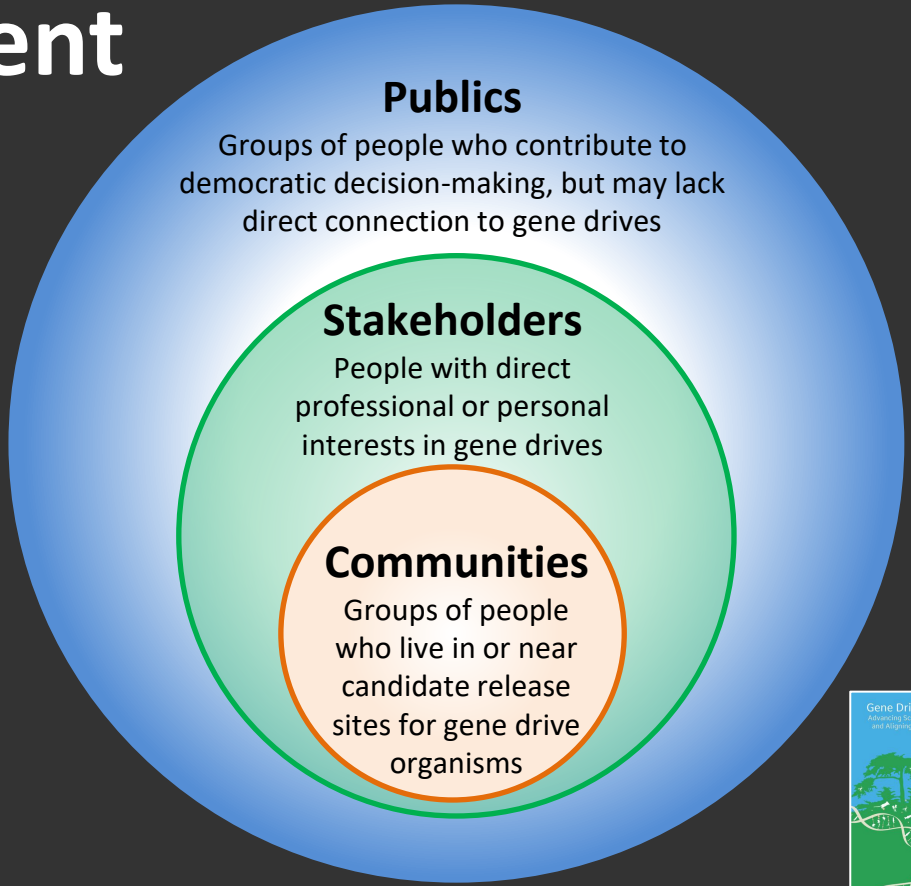
"Public engagement cannot be an afterthought."

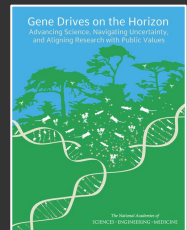


"The outcomes of engagement may be **as crucial as the scientific outcomes** to decisions about whether to release a gene-drive modified organism into the environment."

Defining Engagement

"Seeking and facilitating the sharing and exchange of knowledge, perspectives, and preferences between or among groups who often have differences in expertise, power, and values"





https://research.ncsu.edu/ges/2019/02/report-gene-drive-landscape/

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

Summary Report of Stakeholder Interviews

GES CENTER | NC STATE UNIVERSITY | KEYSTONE POLICY CENTER | Consortium for Science, Policy & Outcomes at Arizona State University

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DARPA DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Defense Advanced Research Projects Agency › Program Information

Safe Genes

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

Stakeholder Workshop | March 7-8, 2019

North Carolina State University | Hunt Library | Raleigh, NC

DARPA DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Defense Advanced Research Projects Agency > Program Information

Safe Genes

CSPO Consortium for Science, Policy & Outcomes at Arizona State University

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Participants

- Evolutionary biologists
- Invasive species experts
- Ethicists
- Mouse biologists
- Conservation NGOs
- Animal welfare experts
- Wildlife biologists
- Biotech policy experts
- Population geneticists
- Population modelers

Discussions across scales of research

- Laboratory
  - Gene drive mechanisms
  - Control methods
- Simulated natural environments
- Field trial risk assessment
- Island selection
- Community engagement

Island Selection Criteria	Island A	Island B	Island C	Island D
Size	5 ha	10 ha	100 ha	400 ha
Distance from mainland	10 km	1000 km	1 km	100 km
Presence of native mice	No	Yes	No	Yes
Human activity on island	Small-scale Eco-tourism	Lighthouse	Research Station	Indigenous agriculture
Geography	Sandy beaches		Steep Cliffs	
Accessibility - Public	Yes	Yes	No	No
Accessibility - Research team	1 hr boat ride	flight to landing strip	10 min boat ride, with crane access	1 day boat ride
Regulatory Oversight	U.S.	AU	US	AU
Number of land managers involved	Wealthy Conservationist	Petrochemical Company	Government (Fish & Wildlife)	Tribal government, Federal government
Knowledge of invasive mouse population (behavior, genetics, ecology)	N/A	1 sampling event	20 years of studies	1 year of study
Livestock & other animals	None	feral goats	None	llamas, pigs, chickens
Prior eradication efforts	Succeeded in 2009	historical baiting around barracks	None	None
Non-targets of concern	None	native mouse	endangered raptor	None
Presence of mus musculus	No, would be introduced	Yes	Yes	Yes
Feasibility of eradication with toxicants	Highly feasible	Feasible	Unclear	Difficult
Organisms threatened by mice	bat spp that is rebounding	an extirpated lizard that could be reintroduced	several endangered birds	Mice spread human disease as a vector for tick-borne illness

Lessons for engagement

- Enthusiasm for “upstream” engagement (before mouse exists)
- Appreciation for dialogue with “uncommitted developers”
- Scenarios: integration of facts and values, tradeoffs, priorities
- Difficult to discuss technical options without safety data
- Tension between seeking public acceptance and being an “honest broker”


M. Farooque

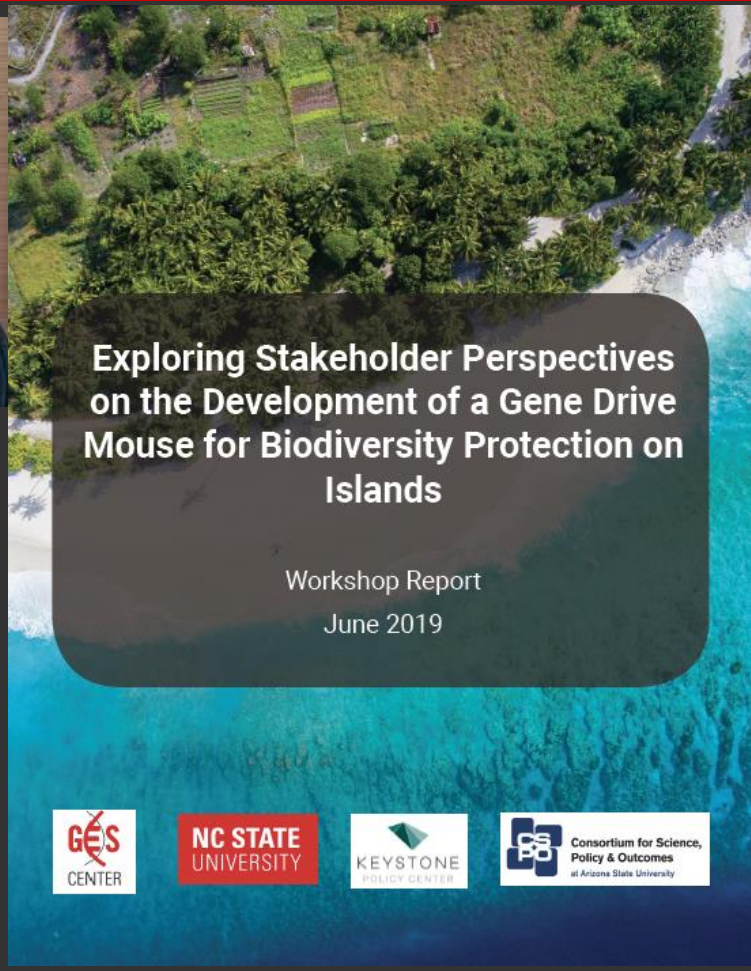

S.K. Barnhill-Dilling


J. Shapiro


J. Delborne

Report available at the GES Center Website

https://research.ncsu.edu/ges/research/biodiversity-and-gene-drive-mice/



GBIRd Engagement - Next Steps

- Expand and diversify stakeholder engagement
- Identify candidate islands for first field trial
  - Ecological, regulatory, social, and cultural criteria
- Seek partnerships to design context-specific engagement of local communities and Indigenous Peoples

Minnesota Aquatic Invasive Species Research Center (MAISRC)

COLLEGE OF FOOD, AGRICULTURAL AND NATURAL RESOURCE SCIENCES

Genetic control of invasive fish species

This project focuses on a novel method of biocontrol for common carp which will complement existing technologies by introducing a synthetic species-like barrier to reproduction. Researchers will use programmable transcription activators to drive lethal embryonic overexpression of endogenous genes in hybrid embryos. Applications for this synthetic incompatibility could include

Phase II

Project manager: Michael Smanski

Funded by: Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources

Start date: 2018

Estimated end date: 2020

Phase I

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