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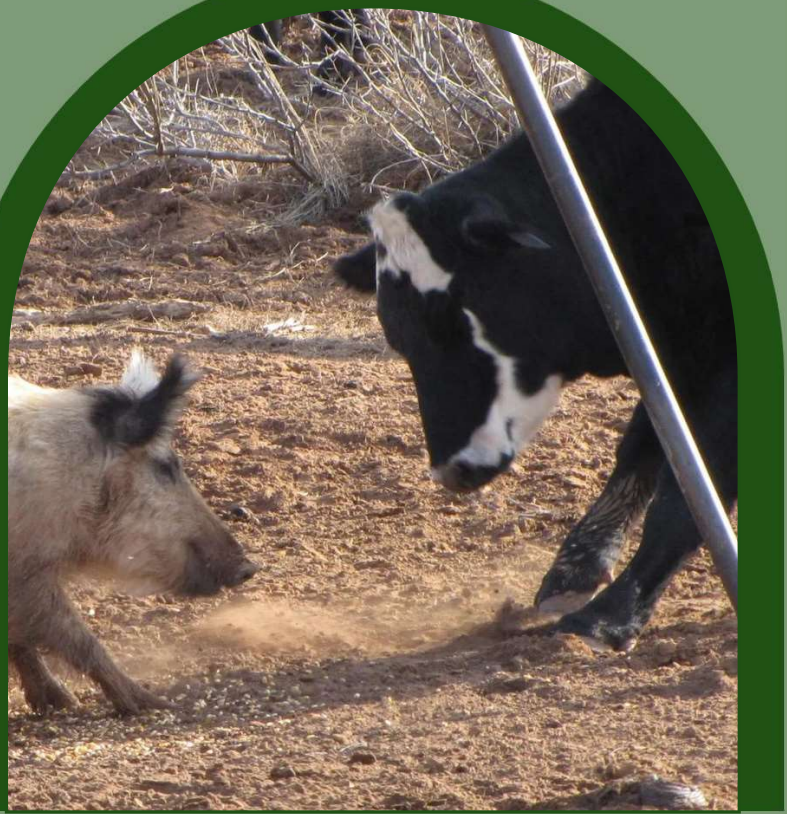
ECONOMIC IMPACT ESTIMATES FOR THE POTENTIAL INTRODUCTION OF

AFRICAN SWINE FEVER, CLASSICAL SWINE FEVER, AND FOOT-AND-MOUTH DISEASE IN THE UNITED STATES

Stephanie Shwiff, PhD.
United States Department of Agriculture
National Wildlife Research Center

Steven Shwiff, PhD. & Lirong Liu, PhD.
Texas A&M University - Commerce



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Collaborative research effort

Wildlife Services
NWRC
National Wildlife Research Center

Manage the Damage
Stop Feral Swine

At Commerce

VS
Veterinary Services

NATIONAL WILDLIFE RESEARCH CENTER

The NWRC is a federal institution devoted to:

- resolving problems caused by the interaction of wild animals and society.
- finding solutions to challenging wildlife damage management problems related to agriculture, natural resources, property, and human health and safety.

The Center applies scientific expertise to the development of practical methods to resolve these problems and to maintain the quality of the environments shared with wildlife.

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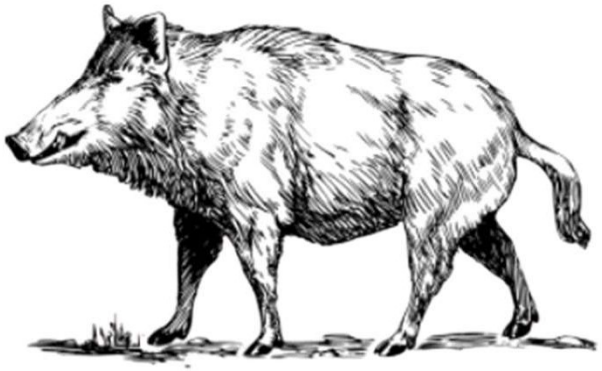
Wild Pigs (Feral Swine)



- First brought here in 1500s by early explorers and settlers as a source of food
- Feral swine are now a combination of escaped domestic pigs, Eurasian wild boars, and hybrids of the two.
- Have been able to spread due to adaptability to a variety of climates and conditions, translocation by humans, and a lack of natural predators.
- "Worst invasive animal" of our lifetimes….

National Feral Swine Damage Management Program

- APHIS created a collaborative, national feral swine damage management program in 2014.
- Overarching goal of National Feral Swine Damage Management Program is:

to protect agricultural and natural resources, property, animal health, and human health and safety by managing damage caused by feral swine in the United States and its territories.

Manage the Damage
Stop Feral Swine

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MOTIVATING QUESTION

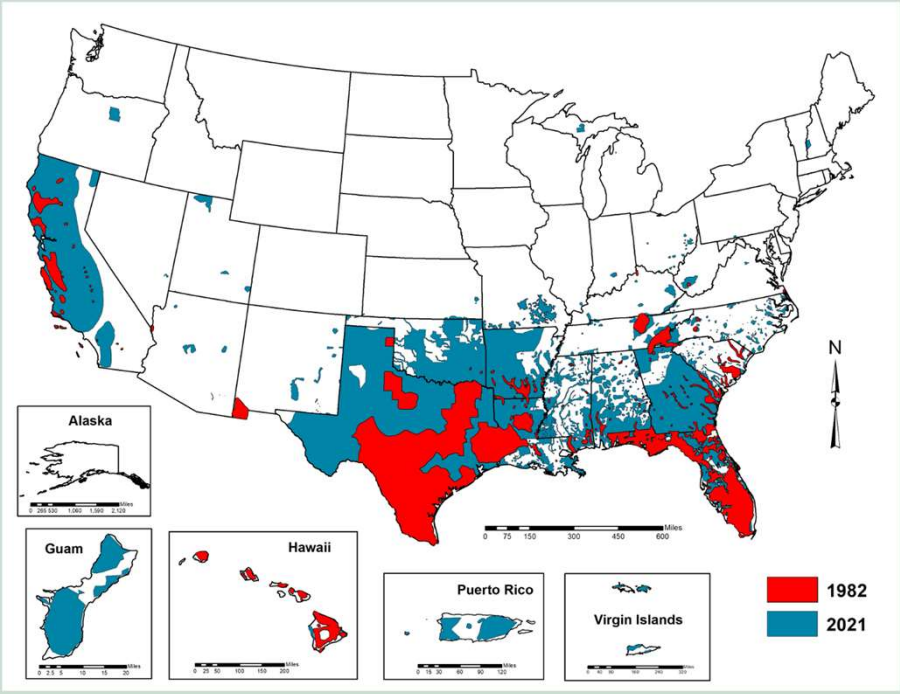
What would happen if a foreign animal disease (FAD) was introduced in the United States and got into wild pigs*?

3 FADs to consider:

- Classical Swine Fever (CSF)
- African Swine Fever (ASF)
- Foot-and-Mouth Disease (FMD)

**McKee et. al. 2023. Areas within the United States at the risk for ASF, CSF, and FMD introduction. TBED.*

**McKee et. al. in review. Economic impact estimates of African Swine Fever, Classical Swine fever, and Foot-and-Mouth Disease: a comparison between most probable sites of introduction and worst-case locations*



To answer this question, we first had to model what might would happen in domestics:

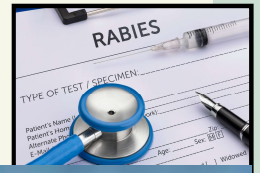
- Most likely locations of introduction and worst-case scenario for introduction were determined through literature reviews, illegal entry of swine products, density of operations of host species, and contamination risk.
- An epidemiological disease spread model was used to predict potential spread from these diseases.
- Spread results were then analyzed using REMI PI+ to estimate the relative economic impacts to U.S. domestic and export markets

Where are FADs now and where are they most likely to be introduced in the US?

- most likely country of origin: China
- California, Texas, Florida- connection to wild pigs
- Outputs from the epi model were used as REMI inputs

Translation Issues
(making the connections to the model)

- Exogenous versus Endogenous
- Static or dynamic?
- Periodicity (monthly, quarterly, annual) When does the impact occur? It matters and REMI is annual.
- Policy Variable Choice(How, where and when do wildlife issues impact in REMI?) We are NOT building a new plant or factory
  - –Examples
    - Racoon Rabies – health sector multipliers and the new urban economics
    - Brown Tree snakes – tourism
    - FMD – where in the supply chain is the impact?
    - Feral hog damage to golf courses and cemeteries



Modeling Assumptions and Settings

General assumptions

- 1.Outbreak lasts one year
- 2. No indemnity payment to cattle and pork farmers from the government
- 3. Total export ban on US beef and pork for one year
- 4. Animal culling costs paid from emergency USDA fund

Cost	REMI input
Euthanasia	Vet services
Disposal	Waste management and remediation services
Cleaning and disinfecting	Services to building and dwellings

Modeling Assumptions and Settings

Worse case

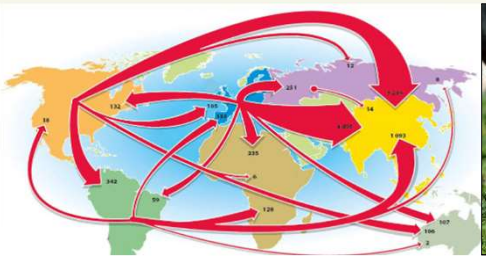
1. Animal herd decrease by 20% in the second year due to animal culling in the first year
2. Animal stamped out exceeds animal exported
3. Beef and pork removed from the economy based on its domestic value:
   - *Beef cattle ranching and farming*
   - *Dairy cattle and milk production*
4. Add-on value: value difference between beef/port exported and sold domestically

- Reduce industry sales by the add on value: *Animal (except poultry) slaughtering, rendering, and processing*

Modeling Assumptions and Settings

Most likely case

- Beef and pork removed from the economy based on its domestic value:
  - *Beef cattle ranching and farming*
  - *Dairy cattle and milk production*
- Export ban: *Food manufacturing (International Exports)*
- Re-use: export-bounded products re-routed to domestic market.
- To Capture re-use value: increase *Animal (except poultry) slaughtering, rendering, and processing* by domestic value


Economic impact in the worse case scenarios

Scenario	Disease	Year	Total Employment	Private Non-Farm Employment	Gross Domestic Product	Real Disposable Personal Income
			Thousands (Jobs)	Thousands (Jobs)	Billions of 2021 Dollars	Billions of 2021 Dollars
Worst Case Scenario	FMD Cattle and Swine	Year 1	-483.44	-338.34	-65.05	-22.50
		Year 2	-67.16	-34.59	-8.35	4.40
	FMD Cattle	Year 1	-466.85	-357.01	-60.75	-22.03
		Year 2	-59.03	-33.22	-7.23	4.36
	FMD swine	Year 1	-16.59	18.66	-4.31	-0.47
		Year 2	-8.15	-1.39	-1.12	0.05
	ASF	Year 1	-14.15	13.69	-3.61	-0.46
		Year 2	-6.46	-1.11	-0.90	0.05
	CSF	Year 1	-15.70	17.20	-4.15	-0.49
		Year 2	-7.75	-1.43	-1.08	0.04

Economic impact in the most likely scenarios

Scenario	Disease	Year	Total Employment	Private Non-Farm Employment	Gross Domestic Product	Real Disposable Personal Income
			Thousands (Jobs)	Thousands (Jobs)	Billions of 2021 Dollars	Billions of 2021 Dollars
Most Likely Case Scenario	FMD Cattle	Year 1	-34.88	-32.78	-4.34	-1.76
	FMD Swine	Year 1	-20.68	-20.14	-2.75	-1.11
	ASF	Year 1	-20.68	-20.14	-2.75	-1.11
	CSF	Year 1	-20.68	-20.14	-2.75	-1.11

Discussion

Unique application of REMI

- 30,000-foot view of the project
- Modeling wildlife damage and damage management in a way that is nonstandard for REMI but crucial for translation to a broader audience.
- What are the economic implications FAD spread into wild pigs and what is the value of management?
- What economic sectors are most/least impacted?
- What would be the value of regionalization?
- Next steps

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THANK YOU!

ANY QUESTIONS?