

Invasive Species in Florida's Rangelands




Photo: Florida Fish & Wildlife Conservation Commission

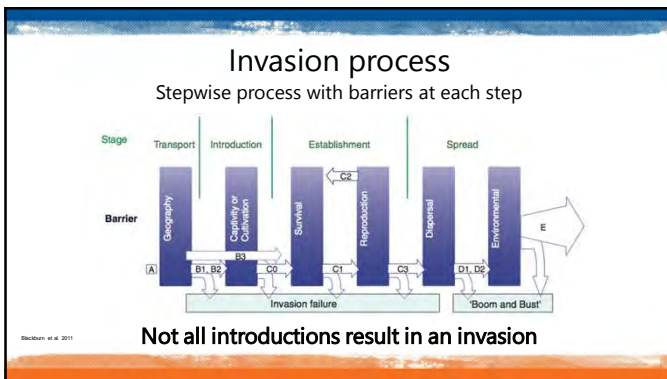
Hance Ellington
 UF/IFAS - Range Cattle Research and Education Center
 Rangeland Wildlife Ecology Lab
www.ufwildlifeontherange.com




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Term	Definition
Native	A species that occurs naturally in a specified geographic area.
Nonnative	A species that does not occur naturally in a specified geographic area.

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Transport



Global Flight Routes
<http://googlemapsmania.blogspot.com>



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Intentional introduction



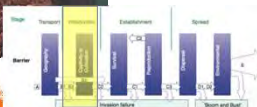
82-94% linked to the ornamental plant trade, forestry, & agriculture
 (Reichard 1997; Culley pers. comm.)



Term	Definition
Introduced	A species brought to a new geographic area intentionally or unintentionally by humans.

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Accidental introduction

Graphic courtesy of the International Maritime Organization

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Climate matching

Term	Definition
Established	A species having a self-sustaining and reproducing population in a specified geographic area without the need for human intervention. Applies both to native and nonnative species.

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Biological traits of invasive animals

- High growth rates
- Short time to reproduction
- High reproductive rate
- Generalists
- Efficient resource utilization

Term	Definition
Invasive	A species that (1) is nonnative to a specified geographic area, (2) was introduced by humans (intentionally or unintentionally), and (3) does or can cause environmental or economic harm or harm to humans.

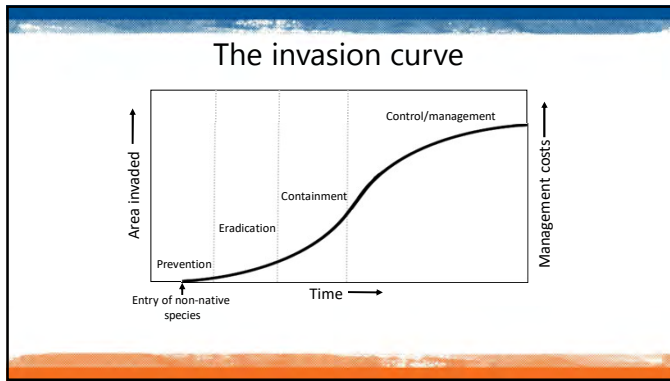
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Negative impacts of biological invasions

Environmental harm
Economic harm
Harm to human health

This invasive giant snail is spreading in Florida - and bringing nasty parasites with it

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Nuisance:
 An individual or group of individuals of a species that causes management issues or property damage, presents a threat to public safety, or is an annoyance.

Cannot apply to an entire species
 Applicable to *native* and *nonnative*
 Invasive species are nuisances
 Encapsulates *weed* and *pests*

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Range change: When a species' current/existing range grows, shrinks, or shifts over time

With and without help from humans

Not: nonnative, introduced, or invasive

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7 Terms

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Introduced	A species brought to a new geographic area intentionally or unintentionally by humans.
Established	A species having a self-sustaining and reproducing population in a specified geographic area without the need for human intervention. Applies both to native and nonnative species.
Invasive	A species that (1) is nonnative to a specified geographic area, (2) was introduced by humans (intentionally or unintentionally), and (3) does or can cause environmental or economic harm or harm to humans.
Nuisance	An individual or group of individuals of a species that causes management issues or property damage, presents a threat to public safety, or is an annoyance. Can apply to both native and nonnative species.
Range change	The circumstance of a species' current/existing range growing, shrinking, or shifting over time. This change can happen to native and nonnative species with or without human assistance.

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Don't use

Term	Usage	Reason to avoid
Native-invasive Nuisance	Used to describe an individual or group of individuals of a native species that act as nuisances	<ul style="list-style-type: none"> Creates confusion, as invasive species are not native Confounds: <i>biological invasions</i> caused by humans moving species over vast distances vs. a native species that create <i>management challenges</i>
Invasive-exotic Invasive	Used to describe an invasive species.	<ul style="list-style-type: none"> Redundant and confusing Invasive species are exotic. Confusion: Not all exotic species are invasive "Exotic" can also be interpreted in different contexts
Invasive-weed Invasive	Used to describe an invasive plant	<ul style="list-style-type: none"> "Weed" is a cultural term describing a plant (native or nonnative) not wanted in a given situation May lead people to believe that a weed is invasive
Alien/Foreign/ Nonindigenous Nonnative	All three terms are synonymous with "nonnative".	<ul style="list-style-type: none"> Evokes political ideals Based on political beliefs, may have negative connotations, despite most nonnative species not causing harm.

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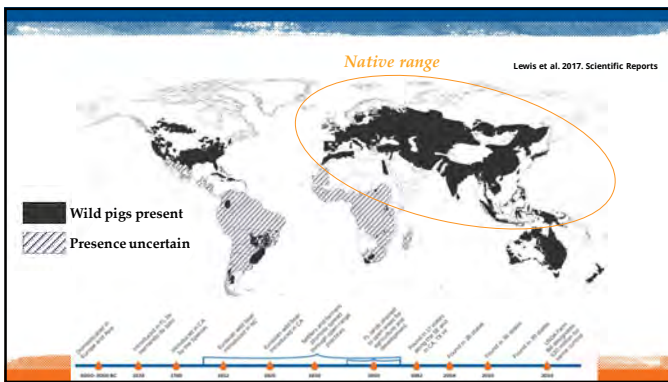


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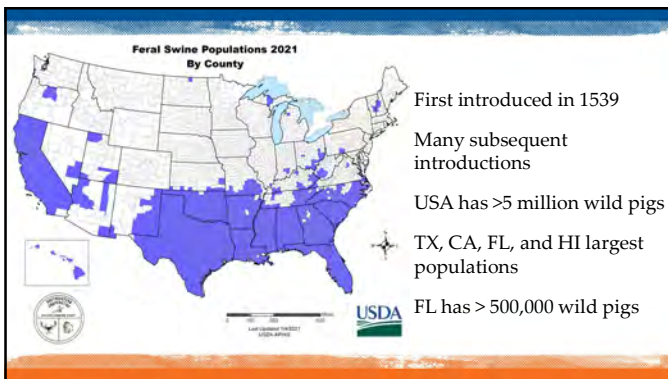


Wild Pig (*Sus scrofa*)
Synonyms: wild hog, feral hog, wild boar, feral swine
 Adults 75-250 lbs
 Sexually dimorphic
 Invasive species

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Wild pig ecology


High reproductive rate
(year-round in FL)

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Wild pig ecology

High reproductive rate
(year-round in FL)

One pregnant wild pig could result in 100 offspring in two years if all of her offspring all breed.



This assumes only 4-7 piglets per litter and one litter per year!

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Wild pig ecology

Social animals (sounders)
Diet and habitat generalist
but need access to water
but hard mast and roots and tubers are important



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Wild pig ecology

Home range size
 Sounder – 370 acres
 Solitary male – 740 acres

Variable based on:
 Landcover, food resources, sounder size

Impacts wild pig density

Schlichling, P. E., Boughdon, R. K., Anderson, W., Wirth, B., VinCauteren, K. C., Miller, R. B., & Lewis, J. S. (2022). Scientific reports, 12(1), 1-11.

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Why manage wild pigs?

Negative impacts

- Agricultural damage
- Ecosystem damage
- Disease transmission

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Agricultural damage


> \$1.5 billion a year in the US

Crop damage via consumption is a major issue

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Agricultural damage

> \$1.5 billion a year in the US



Crop damage via consumption is a major issue

Rooting damage can impact pastures and subsequently livestock production

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Rooting damage

Wild pigs turn over soil in search of food items




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The cost of rooting to livestock production (Bankovich et al. 2016)

Improved Pasture	Calf Production lbs/acre	Calf Value \$/acre	Cost of rooting \$/acre
Not Rooted	137.5	\$354.01	0
2% Rooted	136.3	\$350.89	\$3.12
10% Rooted	131.5	\$338.43	\$15.58
20% Rooted	125.4	\$322.85	\$31.15
Semi-native Pasture			
Not Rooted	16.5	\$42.48	0
13% Rooted	15.2	\$39.17	\$3.31
20% Rooted	14.5	\$37.38	\$5.10
30% Rooted	13.5	\$34.83	\$7.65

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Rooting damage

Also impacts native ecosystems



- Disturbing the soil modifies soil chemistry and nutrients
- Destroys native vegetation
- Alters species composition
Carolina red root
- Gateway for invasive plants

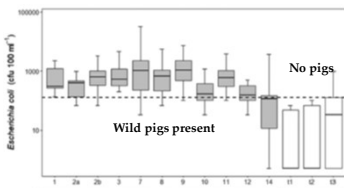
Boughton, E. H., & Boughton, R. K. (2014). *Biological Invasions*, 16, 2105-2114

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Wild pig presence impacts water quality

Organic N and C, SO₄, and Ca²⁺ were 2-11 times higher

E. coli concentrations were 40 times higher



Bolds, S. A., Lockaby, B. G., Ditchkof, S. S., Smith, M. D., & VerGauteren, K. C. (2021). *Journal of Environmental Quality* 50: 441-453

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Wild pig presence impacts water quality

Wallowing

- ↑ Erosion
- ↑ Nutrient concentration

Rooting

- ↑ Run-off
- ↑ Nutrient loading



Dykstra et al. in review: Effects of wild pigs on water quality: current knowledge and future directions

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Wild pig impact on soil carbon

Wild pigs uproot a median estimate of 9,500 km² land in North America per year
 This leads to the release of an estimated 1 million metric tonnes of CO₂ per year
 Equivalent to the emissions of 215,000 passenger vehicles

O'Bryan et al. (2022). Unrecognized threat to global soil carbon by a widespread invasive species. *Global change biology*, 28:877-882.

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Competition with native wildlife

Competition for hard mast
 white-tailed deer, turkey, squirrels
 could limit seedling establishment

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Competition with native wildlife

Competition for hard mast
 white-tailed deer, turkey, squirrels
 could limit seedling establishment

Competition at game feeders
 Destroy food plots

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Opportunistic predation on native wildlife

Invertebrates more commonly consumed than vertebrates

Sensitive species and habitats




reticulated flatwoods salamander

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Opportunistic predation on native wildlife

Invertebrates more commonly consumed than vertebrates

Sensitive species and habitats

Predation on eggs and young of ground nesting vertebrates

Turkey, Quail
Sea turtle









©2009 USFWS/Turkey

Figure 3. Feral pig consuming wild turkey egg (Trail camera photo by Dr. Steve Collins)

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Impacts: Disease Transmission

Bacterial diseases:
Brucellosis
Leptospirosis

Eckert et al. 2019. J Wildl Diseases

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Impacts: Disease Transmission



Bacterial diseases:
 Brucellosis
 Leptospirosis
 Pseudorabies

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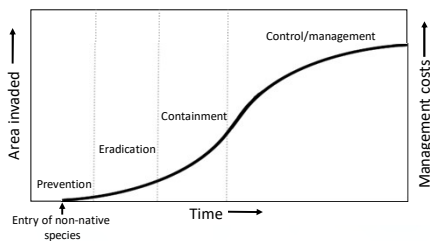
Impacts: Disease Transmission



Bacterial diseases:
 Brucellosis
 Leptospirosis
 Pseudorabies
 African Swine Fever

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The invasion curve



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How do we manage wild pigs?



Lethal Removal

To slow population growth, you need to remove most of the population annually

You should aim to remove an entire sounder

Techniques that focus on single individuals are ineffective and potentially counterproductive

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Whole Sounder Trapping



- 1) Identify areas of high use
- 2) Appropriate timing
- 3) Pre-bait
- 4) Effective trap design
- 5) Bait within trap
- 6) Monitor traps
- 7) Patience and persistence

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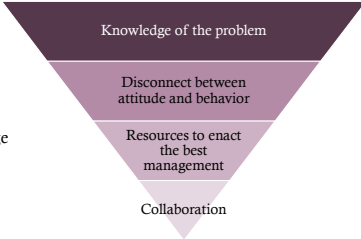
Successful management must include private lands

Most of Florida is privately owned

Wild pigs use large areas

Management in one location does not guarantee a reduction in damage

Yet most private landowners do not appear to be using the best management practices for wild pigs

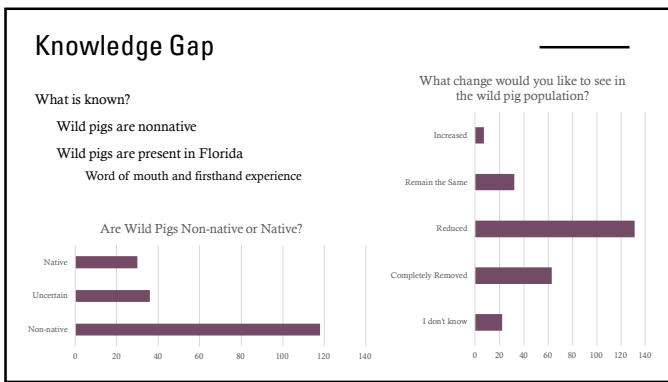


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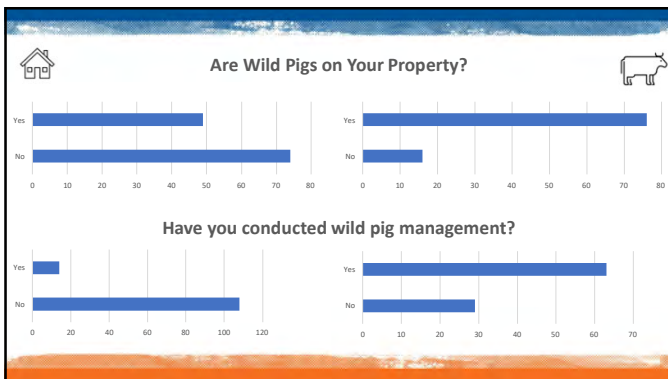
The survey

<p>Landowners targeted</p> <p>308 Florida landowners</p> <p>131 rural residents</p> <p>103 livestock producers</p>	<p>Questions asked</p> <p>Opinions and knowledge of wild pigs</p> <p>Current management practices and damage experienced</p> <p>Hunting practices</p> <p>Willingness to collaborate and learn</p>
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Methods used to remove and trap wild pigs

Removal Method

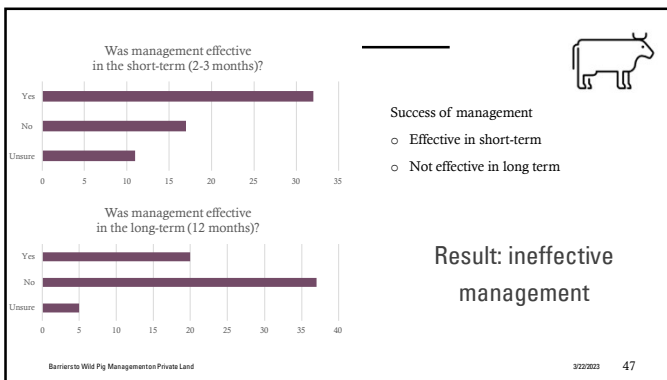
- Shot with firearm or archery (51)
- Trapped and shot (45)
- Hunted with/without dogs (27/28)
- Trapped and moved from property (12)
- Trapped and sold (7)

Ensuring Trapping Success

- Scouting trap location (34)
- Checking traps daily (32)
- Pre-baiting site and trap (30/31)
- Setting traps along travel routes (30)
- Monitoring with game cameras (18)
- Whole sounder removal (8)

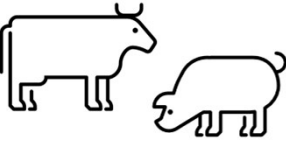
*Respondents selected all that apply


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NEXT STEPS






Wild Pig Management Focus Group!
For livestock producers (owners, lessees, managers)

A guided discussion:

- Wild pig damage experienced
- Wild pig management tactics used
- what is working, what is not working
- How UF/IFAS can help



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ABW Tegu Features

- Young, < 1 month old, have bright green heads and necks
- Body is browner than adults
- Hatchlings 10-12 in. long



Photo: D. Smith, North Carolina Zoo

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Similar Looking Species

- Don't confuse with Nile Monitor or small alligators
 - Monitors are brownish-yellow, rows of round spots on back
 - Alligators with osteoderms, "rough" tail



Photo: T. Campbell, Univ. of Tampa



Photo: S.A. Johnson, Univ. of Florida

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Biology and Habitat

- Highly adaptable and do well in natural & human-modified landscapes (agricultural settings, suburban subdivisions)
- Inhabit scrub, pinelands, habitat edges, shrubby habitats, grasslands; like open habitats & tend to avoid dense forests
- Use roadsides, powerlines, canal levees to forage and disperse
- Mainly terrestrial, but strong swimmers
- Diurnal, seek shelter in burrows and rock crevices at night
- Become dormant in burrows/shelters from Sep.-Feb. (brumation)

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Diet and Reproduction

- Broadly omnivorous—plants (fruits/berries), invertebrates, vertebrates, will scavenge carrion
- Diet includes reptile (turtles, snake, alligators) & bird eggs
- Active foragers that move about over a defined home range
- Reach sexual maturity at body length of 9.25 in. (M) and 10.5 in. (F), at approximately 2-3 years old
- Lay an average of 29 eggs (17-43) a year in a single clutch during spring, eggs hatch in summer; females will guard nest/eggs
- May live 20 years

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Negative environmental impacts

- Predation at numerous trophic levels—herbivores, insectivores, carnivores
- Imperiled species—known predators of gopher tortoises; potential for impacts on shorebirds, sea turtles, American crocodiles, indigo snakes, etc.
- Competition w/natives for food or burrows
- Potentially disperse invasive plants



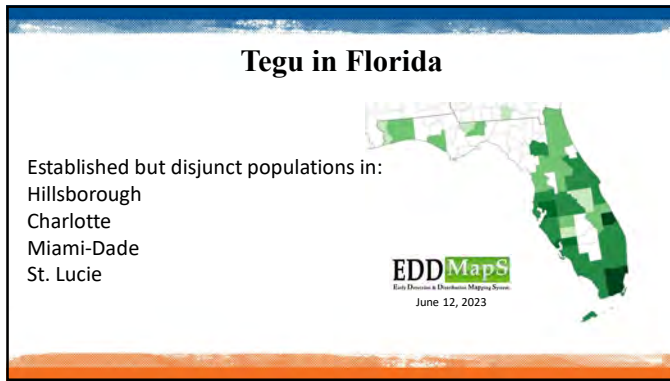
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Other potential negative impacts

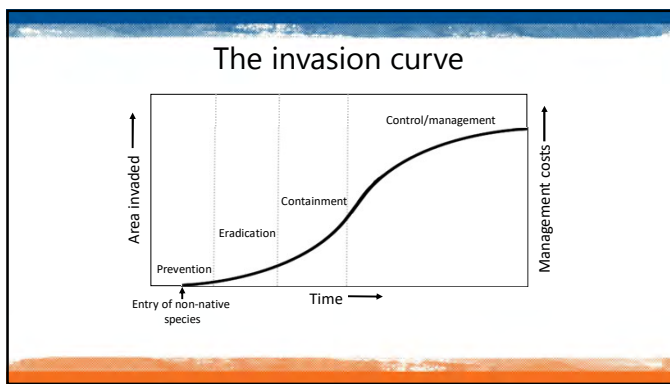
- Potential impacts on agriculture
 - Strawberries unlikely, tomatoes?, blueberries?, other
 - Transfer pathogens to crops?
- Potential homeowner impacts
 - Raid chicken coops
 - Dig under structures
- Costs of management \$\$\$



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Florida Regulatory Status



- Illegal to release w/o a permit
- Not protected—legal to capture and euthanize
- Tegus are a Prohibited nonnative species in FL
- No import, sale, possession, or transport w/o FWC permit

Final rule language expands possession allowances for the purposes of eradication and control, allows for current tegu and green iguana pet owners to keep their pet with a no-cost permit, allows for some limited continued commercial sales of tegus and green iguanas, and provides reporting and biosecurity measures to prevent escape of these species.

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Management Strategies


- Prevent new invasions: ensure cages are secure, do not release unwanted pet ABWTs
- FWC Pet Amnesty Program
- Report ABWT sightings at EDDMapS
- Report ABWT sightings to FWC via IveGot1.org (get smartphone app) and call the Exotic Species Hotline 888-Ive-Got1





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Management Strategies

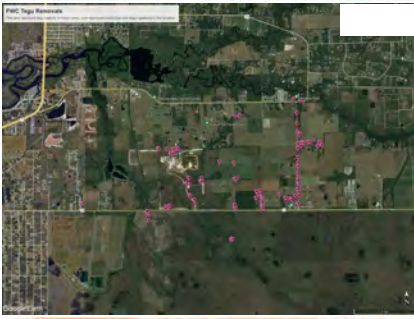
- Homeowners can live trap or shoot on private property—must be in area where legal to safely discharge firearms
- Homeowners should seek assistance from FWC
- Traps baited with eggs, opened during daylight
- Illegal to release trapped tegus, euthanasia required







Photos: Croc Docs, Univ. of Florida

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EDDMapS
Early Detection & Exclusion Mapping System
June 12, 2023




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Charlotte County Tegu Project


Goals:

- 1) How many tegu are present on the landscape
- 2) How far have tegu spread across the landscape
- 3) Are current eradication efforts effective




Tasks:

- Population estimate from trapping grid in core range
- Population spread from camera grid in periphery



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Tegu trapping grid



40 captures

hot spots of captures west of previous years

Lack of access is restricting research and control efforts



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Tegu camera grid – 36 cameras rotated









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Thank you!

MSc students - Bri Ryver, Alex Furst
RWELab members

Co-PIs - Dr. Martin Main, Dr. Samantha Wisely,
Dr. Nia Morales, Dr. Steve Johnson,
Dr. Christina Romagosa

Invasive Species Council members –
Dr. Deah Lieurance, Dr. Basil Iannone

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RANGE CATTLE
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WILDLIFE BIOLOGY AND CONSERVATION
UNIVERSITY OF FLORIDA

FLORIDA FISH AND WILDLIFE
CONSERVATION COMMISSION

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**INVASIVE
SPECIES
COUNCIL**

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