Invasive species.
Dr. Zachary Long, Bio and Marine Bio, UNCW

Invasive species.

- What is an invasive species?
- What are the consequences of invasive species?
- Why have some species become invasive and why are they increasing?
- What can we do?

Executive Order 13112 - 1999

- "**Alien species**" means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.
- "**Invasive species**" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

4. *Of ſuch Plants as have ſprung up ſince the* Engliſh *Planted and kept Cattle in* New-England.[1]

Couch Graſs.[2]
Shepherds Purſe.[3]
Dandelion.[4]
Groundſel.[5]
Sow Thiſtle.[6]

[1] The importance of this list has been already spoken of. Its value depends on its having been drawn up by a person of familiarity with some of the botanical writers of his day, as part of a botanical treatise; and the (in this case) not unfair presumption that the names cited are *meant* to be accurate. Mr. A. De Candolle (*Geogr. Botanique*, vol. ii. p. 746) appears to be unacquainted with any authority for the naturalized plants of the Northern States earlier than the first edition of the *Florula* of Dr. Bigelow, in 1814. The treatise of Cutler extends this limit to 1785; and that of Josselyn, so far as it goes, to 1672.

[2] Doubtful. Gerard's couch-grass, p. 23, appears to be *Holcus mollis*, L., — "the true couch-grass of sandy soils" in England; and English agricultural writers reckon yet other grasses of this name, beside the well-known *Triticum repens*, L.

[3] Gerard, p. 276, — *Capsella Bursa Pastoris* (L.), Moench. "Cornfields, and about barns," — *Cutler* (1785), *l. c.* Naturalized.

[4] Gerard, p. 290, — *Taraxacum Dens Leonis*, Desf.; looked, to our author, like a new-comer. Dr. Gray (Man., p. 239; and comp. Torr. and Gray, Fl., vol. ii. p. 494) regards it as "probably indigenous in the north," but only naturalized in other regions. "Grass land," — *Cutler* (1785), *l. c.*

[5] Gerard, p. 278, — *Senecio vulgaris*, L.; one of the *adventive* naturalized plants, as defined by Mr. De Candolle (*l. c.*, vol. ii. p. 688; and Gray, Man. Bot., pref., p. viii.), according to the evidence of Dr. Darlington (Fl. Cestr., p. 152), and Gray, *l. c.* It has long been a common weed in eastern New England.

[6] *Sonchus*, L. *S. oleraceus*, L., as understood by Linnæus, was no doubt intended: but this is now taken to include two species, both recognized in this country (Gray, *l. c.*, p. 241); between which there is no evidence to authorize a decision.

Invasive species are not a recent issue.

Invasive species are not a recent issue.

This tree

- Can be used as either a windbreak or single specimen.
- Adapts to nearly all climates.
- Is widely used as a Christmas tree because of its excellent form and ability to hold its needles.
- Is a good choice for reclamation sites because of its reseeding capabilities.

NC Invasives

https://cnr.ncsu.edu/news/2020/02/invasive-species-how-exotic-plants-animals-and-insects-impact-north-carolina/

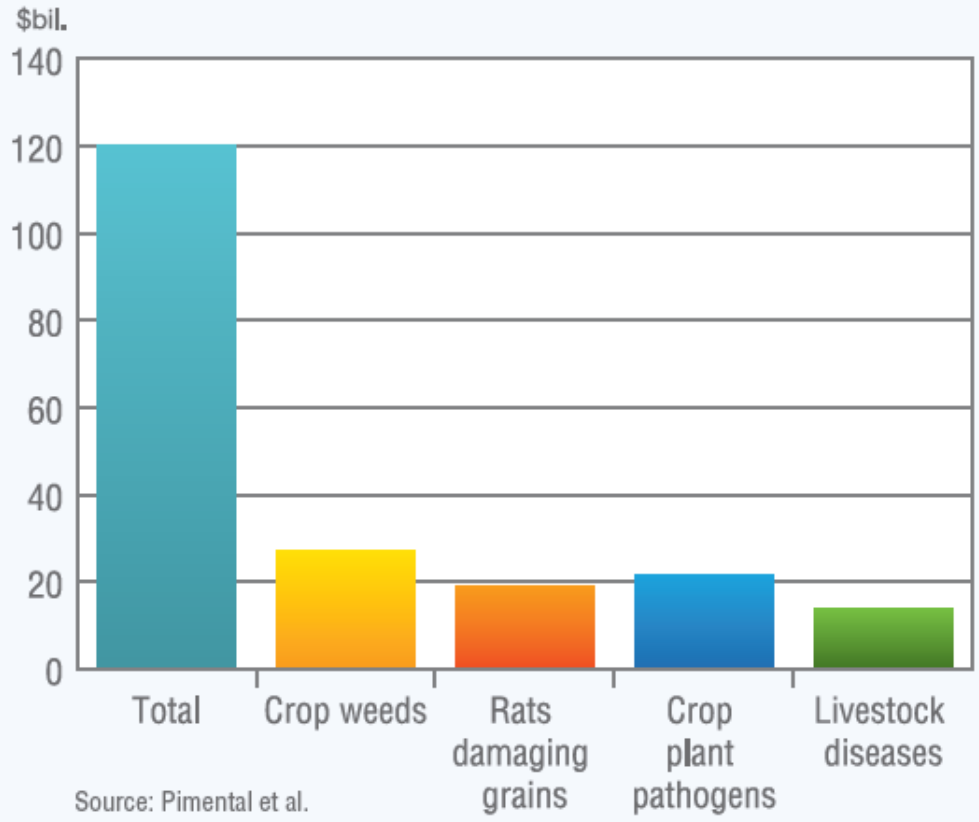
Invasive species.

- What is an invasive species?
- What are the consequences of invasive species?
- Why are or have some species become invasive?
- What can we do?

In the US, invasives cost $120 billion annually.

Estimated Annual Costs of Some Invasive Species to the U.S. Economy, with Key Agricultural Components

According to a 2005 study, the damage caused by key invasive species was at least $120 billion annually to the U.S. economy. Losses to the crop sector from invasive species of weeds, pathogens, and rodents account for more than 55 percent of the total.



Economic impact of invasive species

Micro-organisms (20,000 species introduced into USA)	Losses and damage (US$ millions)	Cost of control (US$ millions)	Total (US$ millions)
Crop diseases	21,000	500	21,500
Diseases of ornamental, garden and golf course plants	–	2,000	2,000
Forest pathogens	2,100	–	2,100
Livestock diseases	9,000	–	9,000
Human diseases	–	6,500	6,500

Invasive species.

- What is an invasive species?
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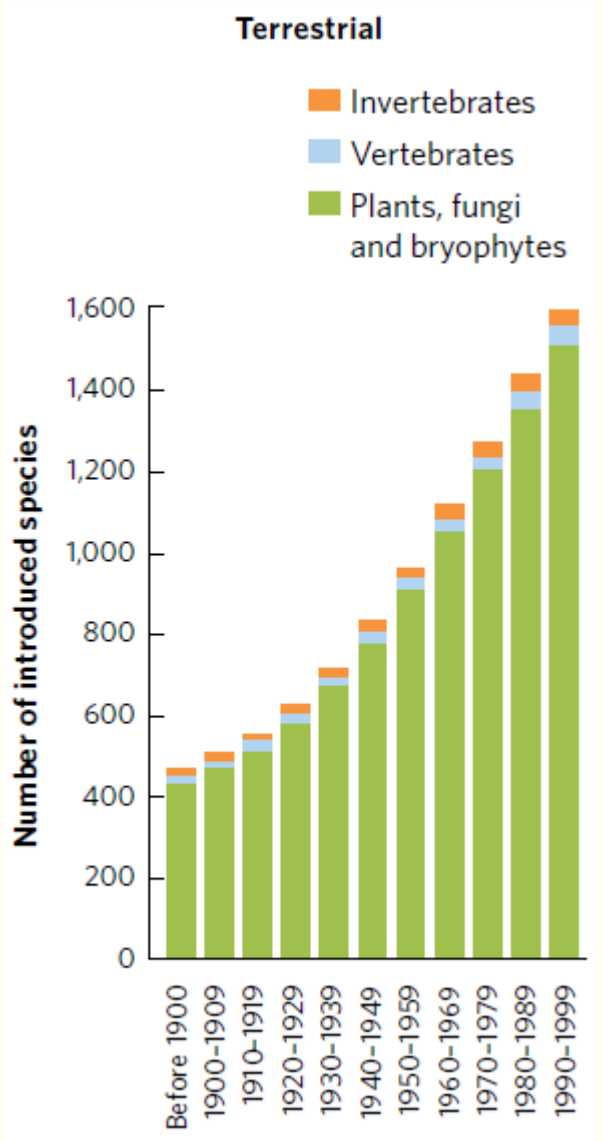
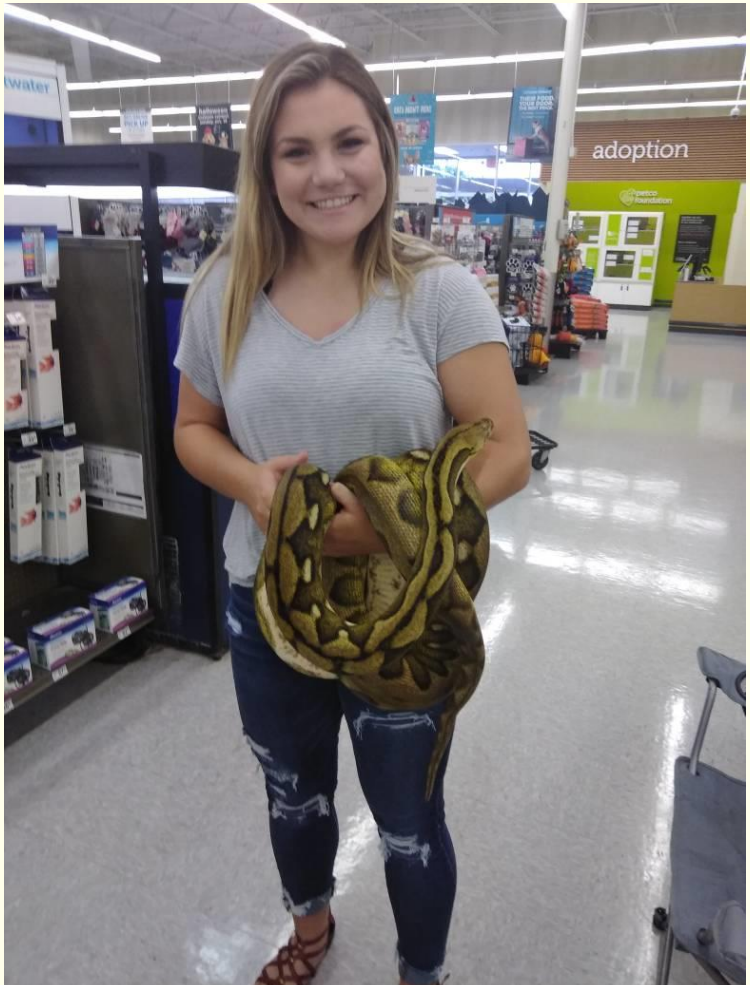
- Why have some species become invasive and why are they increasing?
- What can we do?

The number of invasive species is increasing.

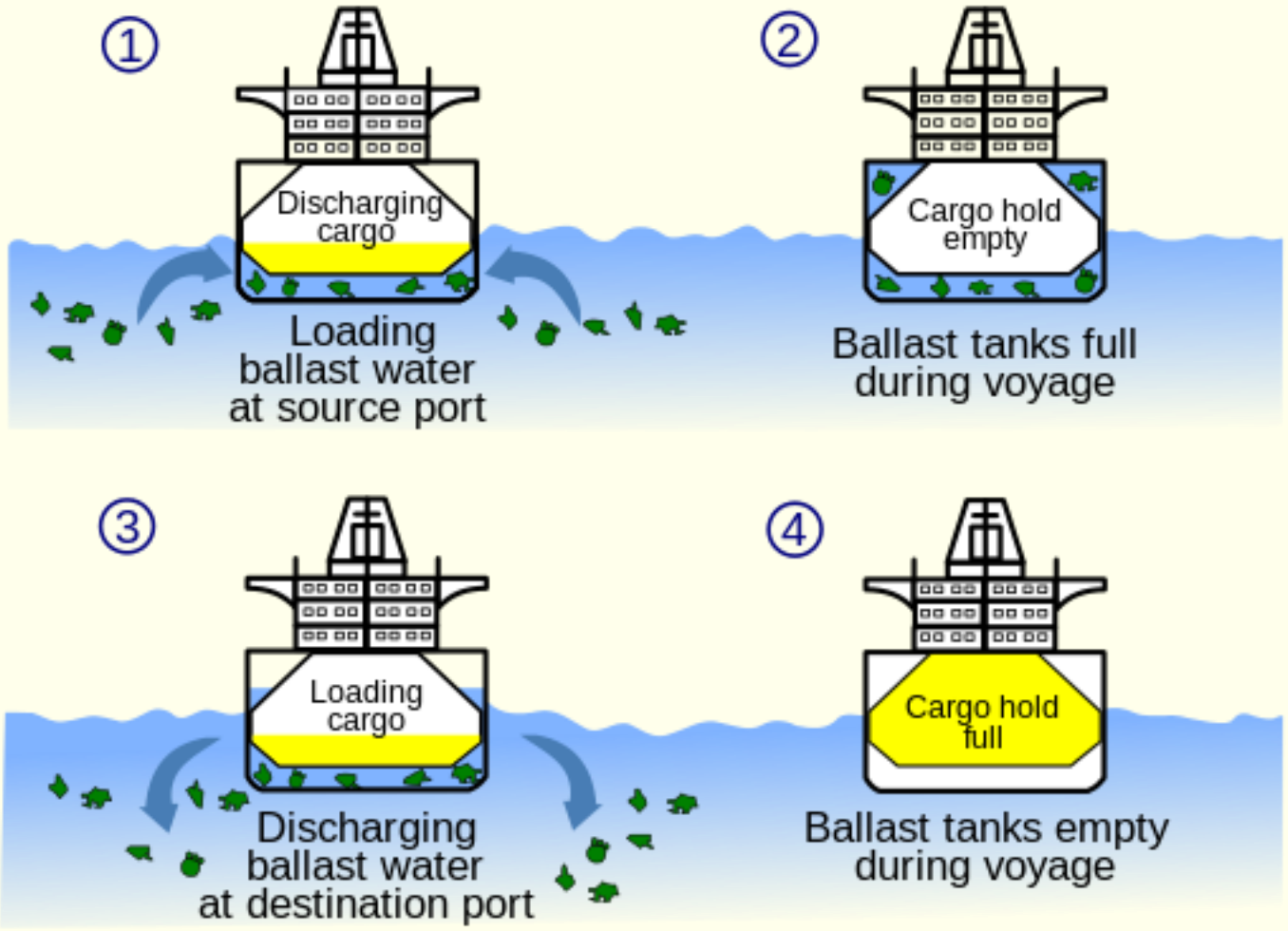


3. Why?

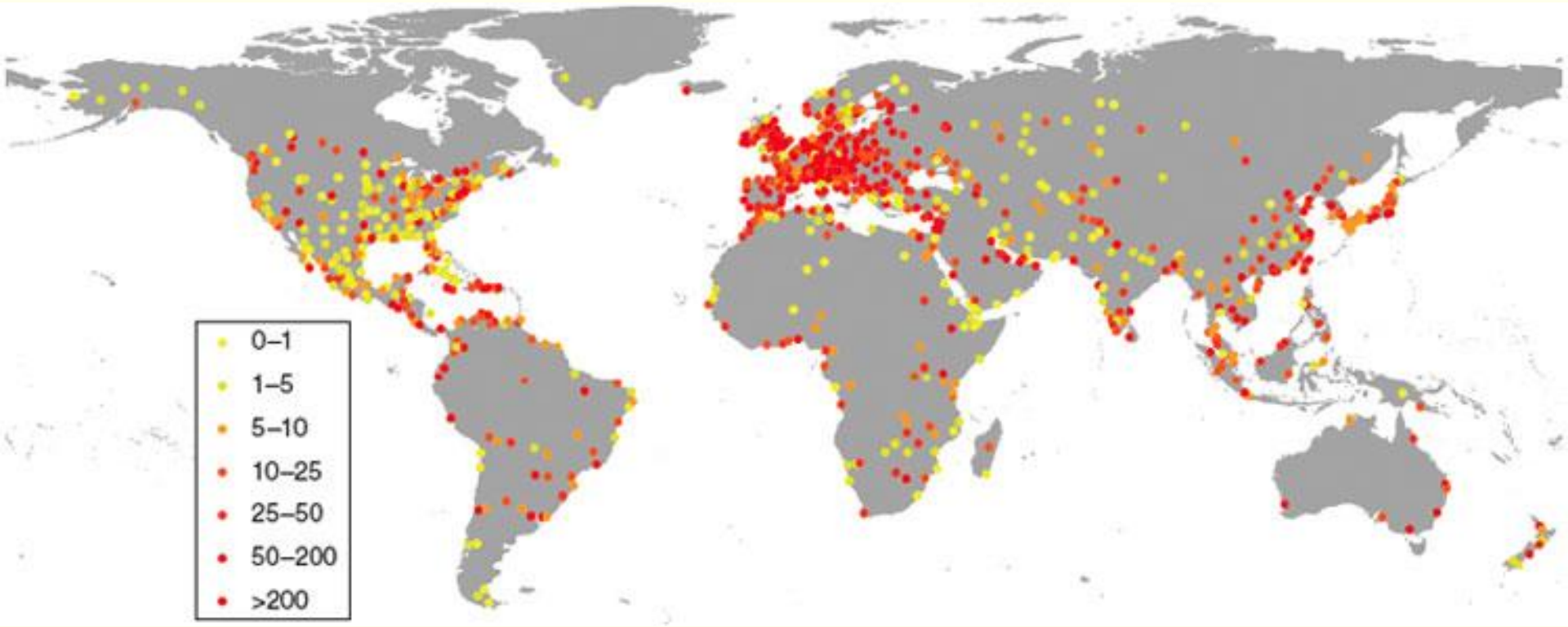
Accidental and intentional introductions



Why? Ship ballast

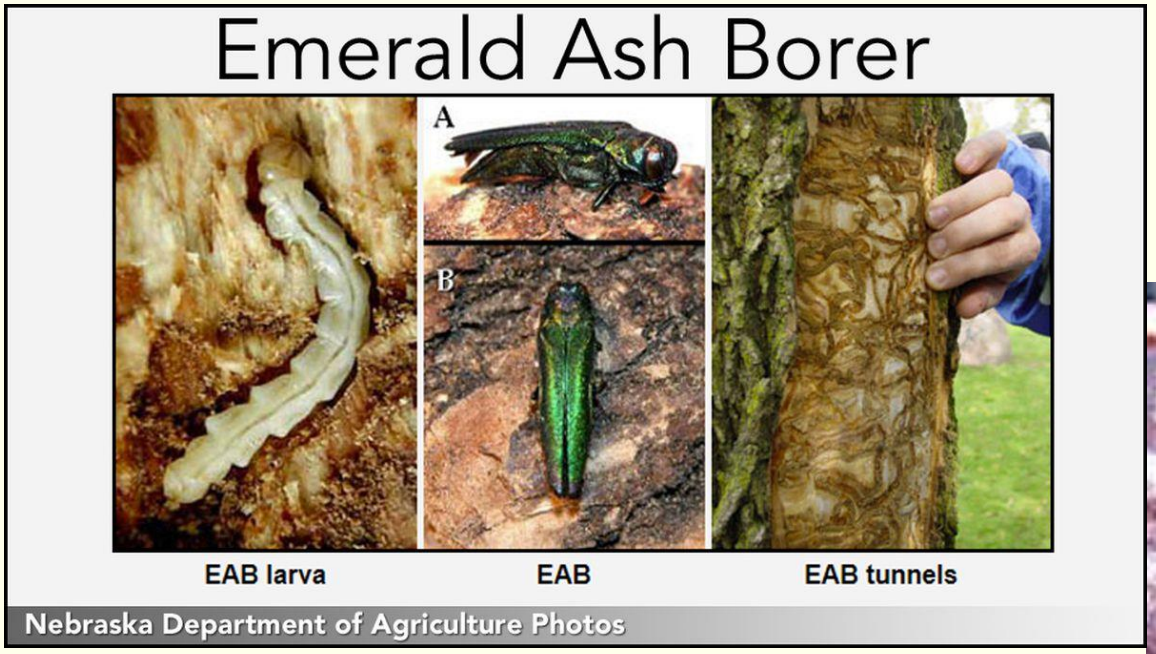


Air travel:



Snakes on a plane:

Unintentional dispersal



Pests:

Asian Gypsy Moth
Asian Longhorned Beetle
Balsam Woolly Adelgid
Banded Elm Bark Beetle
Bromeliad Weevil
Brown Spruce Longhorned Beetle
Cactus Moth
Chestnut Gall Wasp
Citrus Longhorned Beetle
Common Pine Shoot Beetle
Cycad Aulacaspis Scale
Emerald Ash Borer
Erythrina Gall Wasp
Eurasian Nun Moth
European Gypsy Moth
European Oak Bark Beetle
European Spruce Beetle
Golden Haired Pine Bark Beetle
Goldspotted oak borer
Harrisia cactus mealybug
Hemlock Woolly Adelgid
Kuroshio Shot Hole Borer

Intentional introductions.

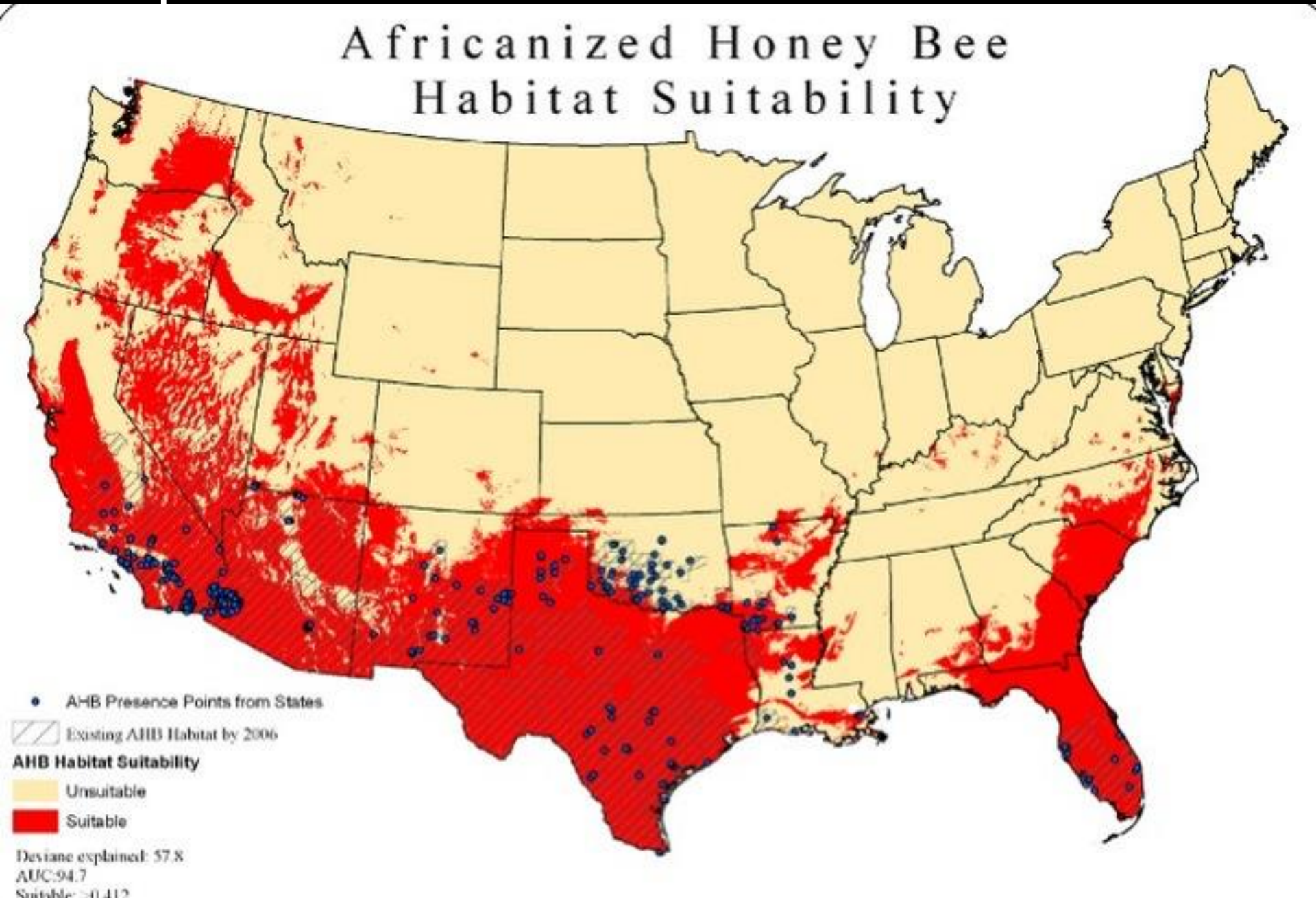
http://cambree.wordpress.com/2008/12/04/kudzus-good-side/

Supporting Spartina: Interdisciplinary perspective shows Spartina as a distinct solid genus

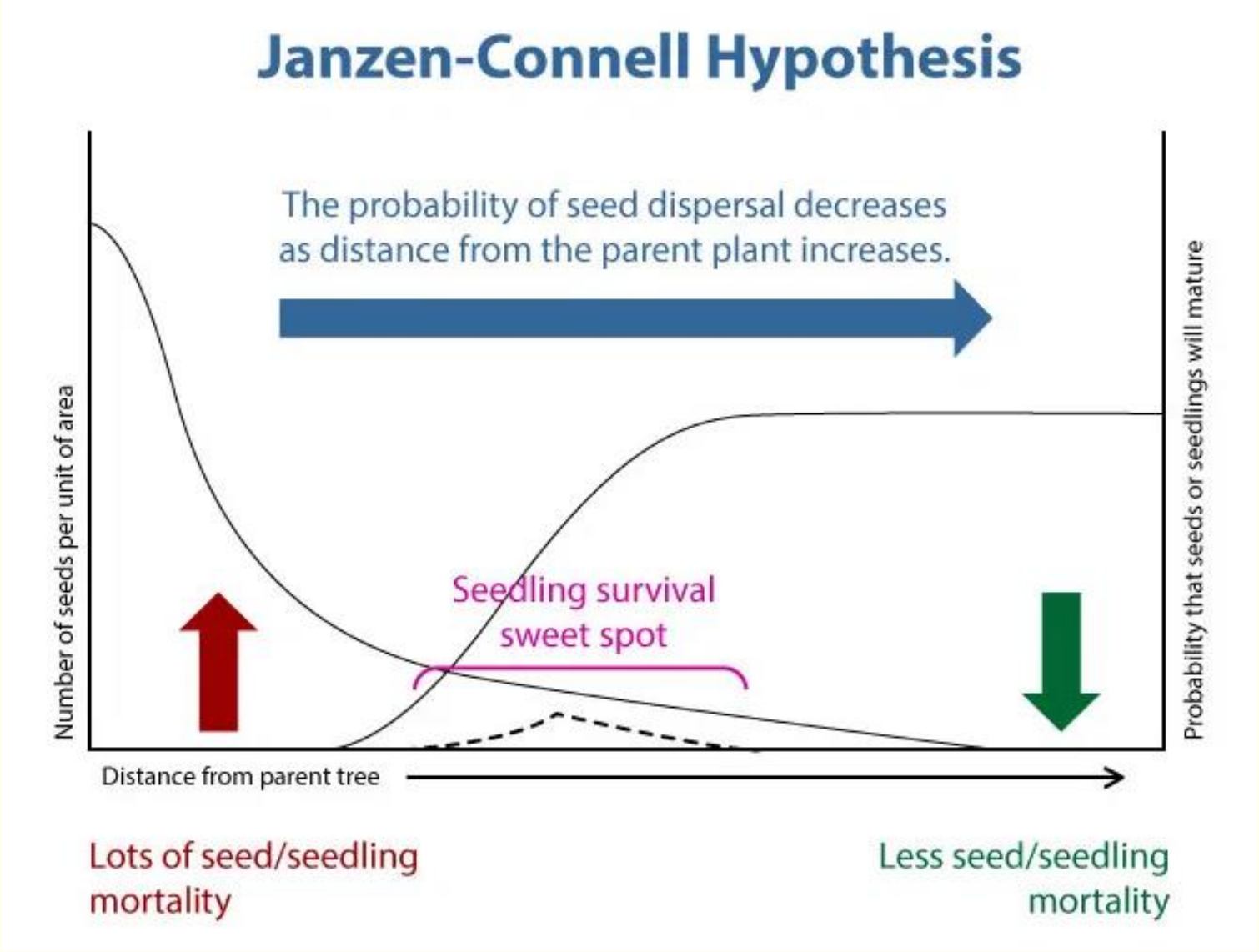
ALEJANDRO BORTOLUS, 1,39 PAUL ADAM, 2 JANINE B. ADAMS, 3 MALIKA L. AINOUCHE, 4 DEBRA AYRES, 5 MARK D. BERTNESS, 6 TJEERD J. BOUMA, 7,8 JOHN F. BRUNO, 9 ISABEL CACADOR, 10 JAMES T. CARLTON, 11 JESUS M. CASTILLO, 12 CESAR S. B. COSTA, 13 ANTHONY J. DAVY, 14 LINDA DEEGAN, 15 BERNARDO DUARTE, 10 ENRIQUE FIGUEROA, 12 JOEL GERWEIN, 16 ALAN J. GRAY, 17 EDWIN D. GROSHOLZ, 18 SALLY D. HACKER, 19 A. RANDALL HUGHES, 20 ENRIQUE MATEOS-NARANJO, 12 IRVING A. MENDELSSOHN, 21 JAMES T. MORRIS, 22 ADOLFO F. MUNOZ ~ -RODRIGUEZ, 23 FRANCISCO J. J. NIEVA, 24 LISA A. LEVIN, 24 BO LI, 25 WENWEN LIU, 26 STEVEN C. PENNINGS, 27 ANDREA PICKART, 28 SUSANA REDONDO-GOMEZ , 12 DAVID M. RICHARDSON, 29 ARMEL SALMON, 4 EVANGELINA SCHWINDT, 30 BRIAN R. SILLIMAN, 31 ERIK E. SOTKA, 32 CLIVE STACE, 33 MARK SYTSMA, 34 STIJN TEMMERMAN, 35 R. EUGENE TURNER, 21 IVAN VALIELA, 36 MICHAEL P. WEINSTEIN, 37 AND JUDITH S. WEIS38

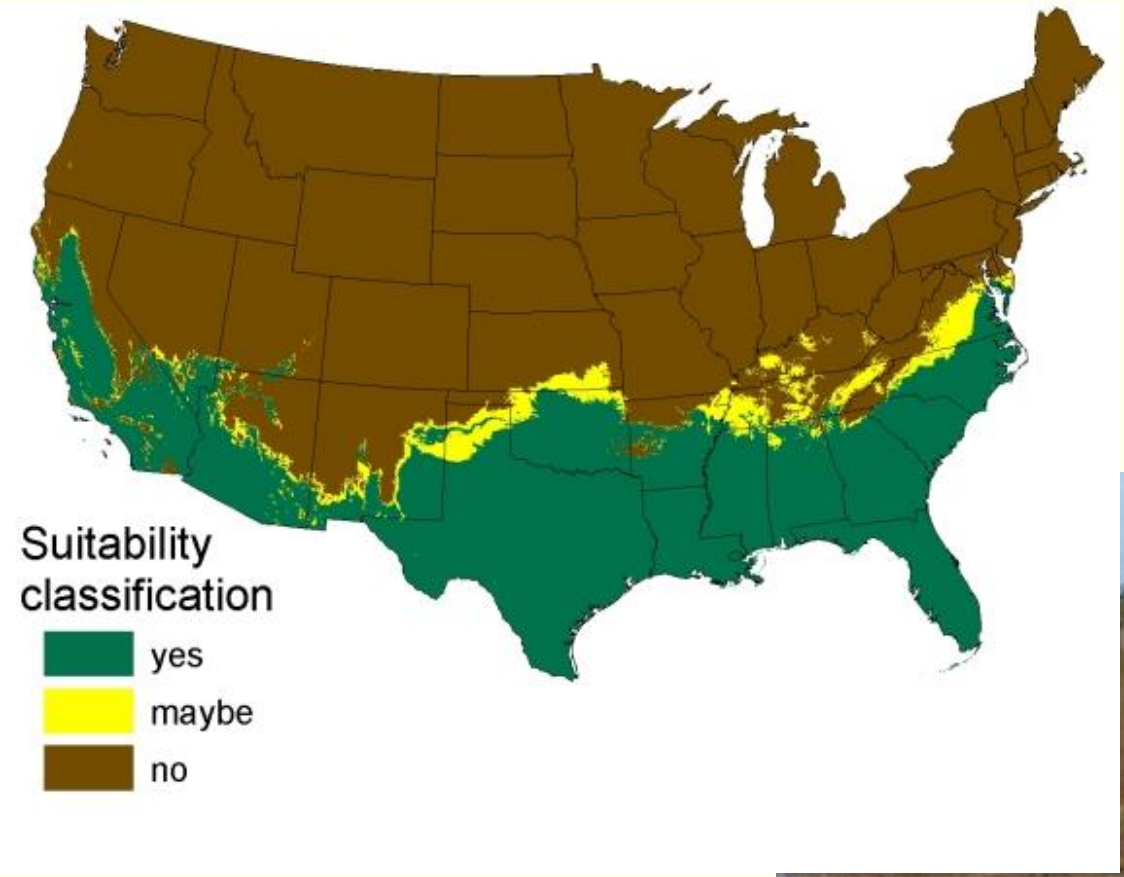
Escape from ”captivity”

Escape


Africanized Honey Bee
Habitat Suitability
AHB Presence Points from States
Existing AHB Habitat by 2006
AHB Habitat Suitability
Unsuitable
Suitable
Deviance explained: 57.8
AUC:94.7

Escape from disease and predators can help invasive plants





Why?
Climate change.

http://bp0.blogger.com/_JaDVFdQMdwc/R8ON3m3JxmI/AAAAAAAAFzQ/bbGYE_1l2ks/s400/burmese-python-florida.jpg

Range expansions

Invasive species.

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Biodiversity influences ecosystem functioning

Biodiversity and ecosystem stability in a decade-long grassland experiment

David Tilman[1], Peter B. Reich[2] & Johannes M. H. Knops[3]

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More plants = less invasives

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More plants = less problems


More plants = less problems

Unless it’s the wrong plant.

Biodiversity hotspots

Biodiversity and ecosystem stability in a decade-long grassland experiment

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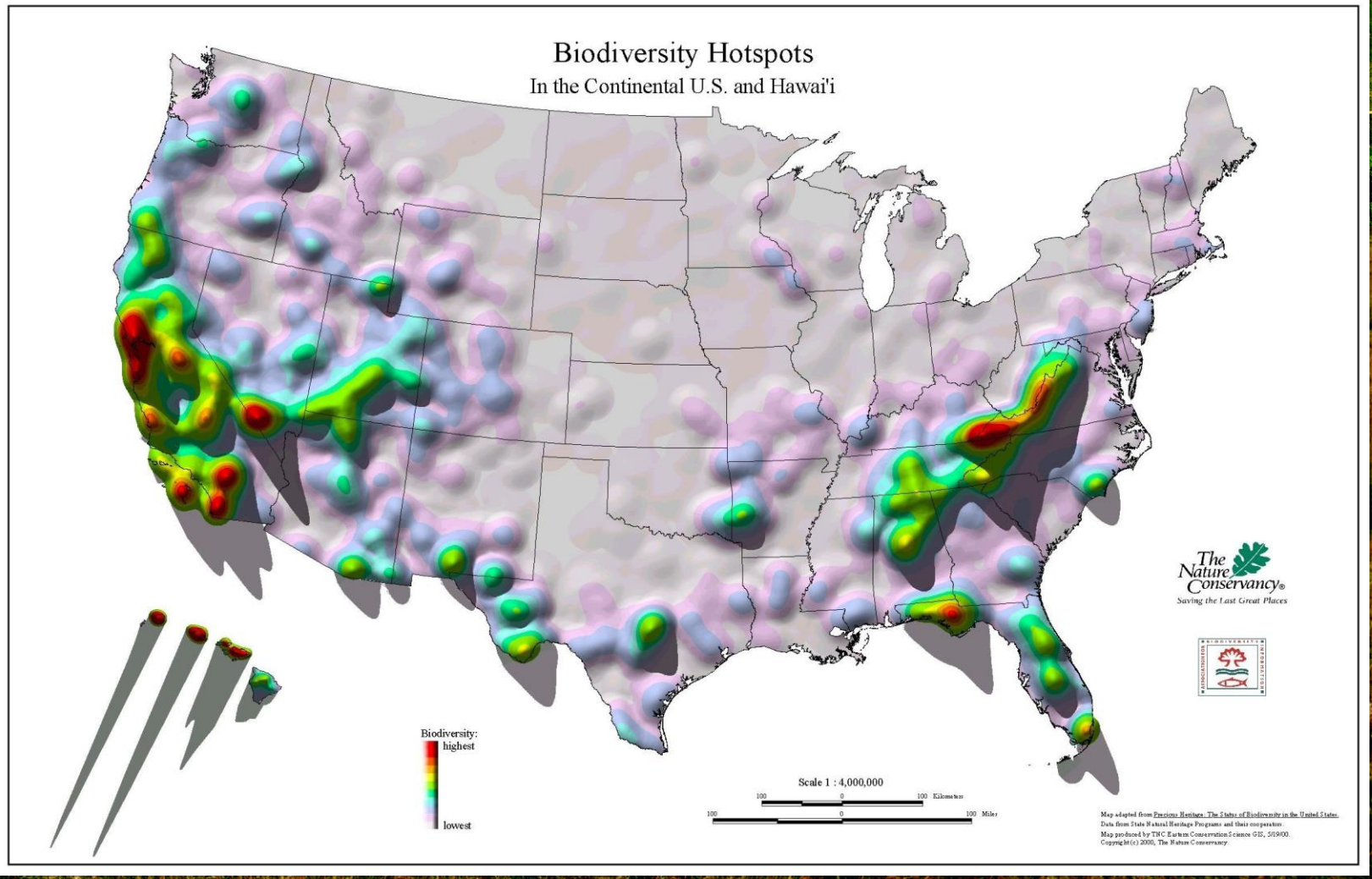


Evolutionary inevitability?

Invasive plant species have a greater probability of originating from areas with high diversity

<u>Inevitable that natives will be “beaten and supplanted by the naturalized productions from another land”</u>

F. LANTING/NAT. GEOGR.

A forester engages in efforts to eradicate the velvet tree *Miconia calvescens* in Hawaii.

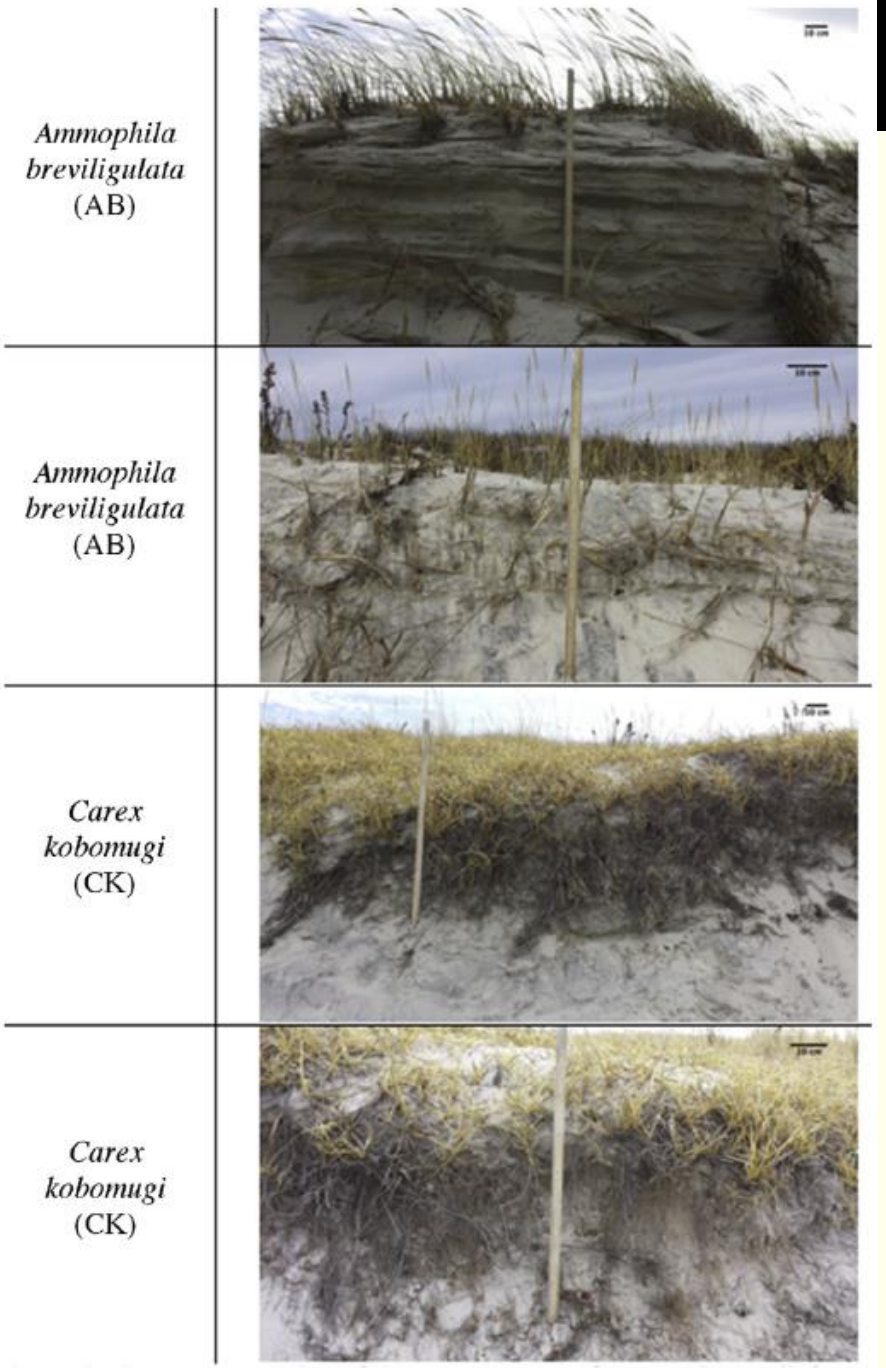
Don't judge species on their origins

Conservationists should assess organisms on environmental impact rather than on whether they are natives, argue **Mark Davis** and 18 other ecologists.

Nature, 2011

If the bee disappears from the surface of the earth, man would have no more than four years to live.
-Einstein (well, probably not Einstein).

Asiatic sand sedge



National Invasive Species Council Management Plan

1. Prevention (keep invasive species from entering a new ecosystem);

https://www.doi.gov/sites/doi.gov/files/uploads/pre-release_copy_niscmanagement_plan_adopted11july2016.pdf

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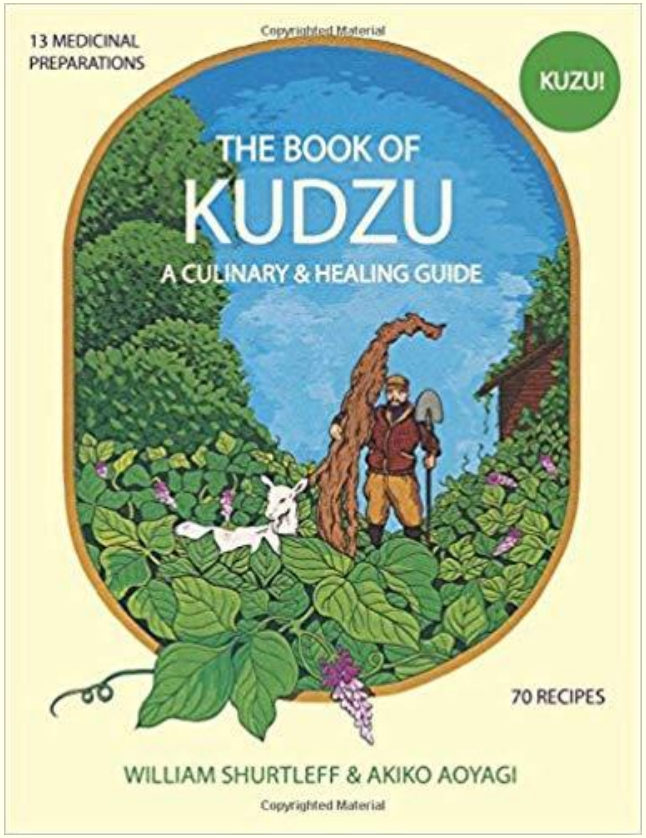
National Invasive Species Council Management Plan

1. Prevention (keep invasive species from entering a new ecosystem);
2. Eradication (remove the entire population of a non-native species);
3. Control (contain or otherwise manage the population of an invasive species so as to minimize spread and impacts);

Exotic pet trade

http://www.amnh.org/education/resources/rfl/web/oceanguide/images/lionfish_lg.jpg


13 MEDICINAL PREPARATIONS
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THE BOOK OF
KUDZU
A CULINARY & HEALING GUIDE
70 RECIPES
WILLIAM SHURTLEFF & AKIKO AOYAGI
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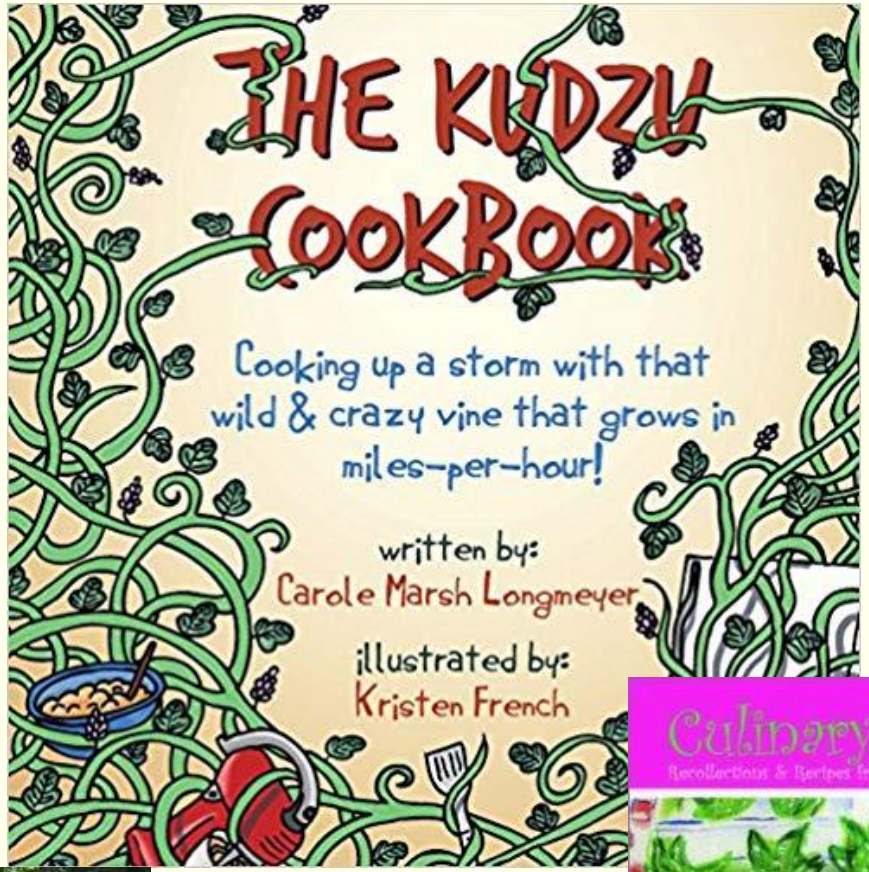
THE KUDZU COOKBOOK
Cooking up a storm with that wild & crazy vine that grows in miles-per-hour!
written by:
Carole Marsh Longmeyer
illustrated by:
Kristen French


Culinary Kudzu:
Recollections & Recipes from Growing Up Southern
Keetha DePriest Reed

National Invasive Species Council Management Plan

1. Prevention (keep invasive species from entering a new ecosystem);
2. Eradication (remove the entire population of a non-native species);
3. Control (contain or otherwise manage the population of an invasive species so as to minimize spread and impacts);
4. Ecosystem restoration (recovering native species and ecosystems post-removal of invasive species in order to build resistance and resilience to future introductions of non-native species).

Questions?

- Thank you!