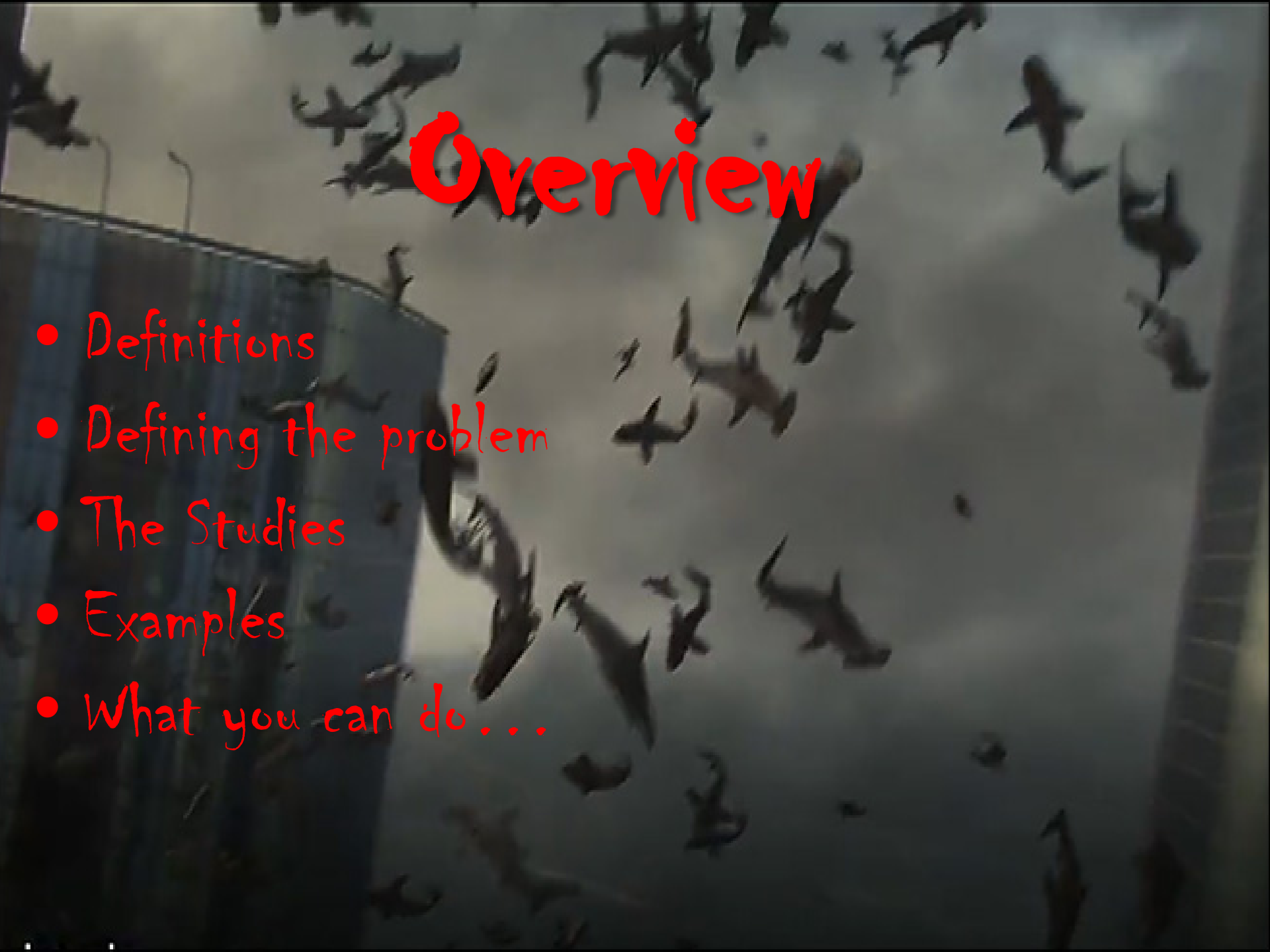
Invasive Species and Natural Disasters

Jon Lane
Chief, Invasive Species Management Branch
Jacksonville District

ISLT Webinar Series
January 21, 2015



Overview

- Definitions
- Defining the problem
- The Studies
- Examples
- What you can do…

What are we talking about?

Natural Disasters

- Hurricanes
- Floods
- Tornadoes
- Tsunamis
- Storms

Invasive Species

An invasive species is defined as an organism (plant, animal, fungus, or bacterium) that is not native and has negative effects on our economy, our environment, or our health.

- Plants
- Animals
- Insects
- Aquatic
- Terrestrial

Why it matters

The Perfect Storm

What do natural disasters do?

- Disturb soils/environment
- Move things from one place to another (i.e. seeds)
- Connect unconnected water bodies
- Denudes trees allowing for light penetration

What makes invasives invasive?

- Grow faster than natives
- More temperature tolerance
- More seed production
- Reproduce faster
- Better means of seed dispersal

One way to look at it…

Natural disasters open wounds that invasives can exploit

Studies

PLOS ONE | Subject Areas | For Authors | About Us

Search

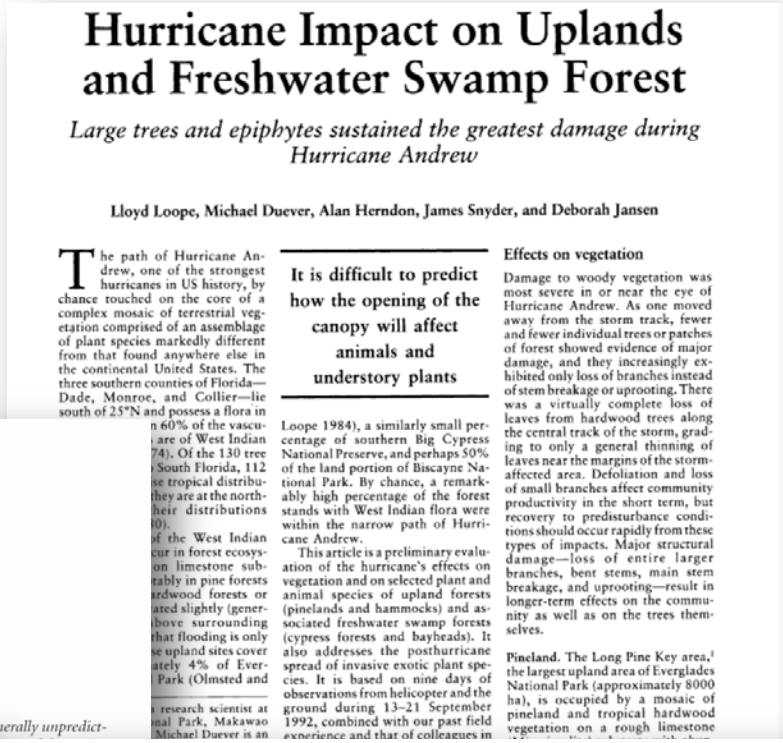
Hurricane Activity and the Large-Scale Pattern of Spread of an Invasive Plant Species

Ganesh P. Bhattarai, James T. Cronin

Published: May 30, 2014

Abstract

Disturbances are a primary facilitator of the growth and spread of invasive species. However, the effects of large-scale disturbances, such as hurricanes and tropical storms, on the broad geographic patterns of invasive species growth and spread have not been investigated. We used historical aerial imagery to determine the growth rate of invasive *Phragmites australis* patches in wetlands along the Atlantic and Gulf Coasts of the United States. These were relatively undisturbed wetlands where *P. australis* had room for unrestricted growth. Over the past several decades, invasive *P. australis* stands expanded in size by 6–36% per year. Based on tropical storm and hurricane activity over that same time period, we found that the frequency of hurricane-force winds explained 81% of the variation in *P. australis* growth over this broad geographic range. The expansion of *P. australis* stands was strongly and positively correlated with hurricane frequency. In light of the many climatic models that predict an increase in the frequency and intensity of hurricanes over the next century, these results suggest a strong link



Hurricane Impact on Uplands and Freshwater Swamp Forest

Large trees and epiphytes sustained the greatest damage during Hurricane Andrew

Lloyd Loope, Michael Duever, Alan Herndon, James Snyder, and Deborah Jansen

The path of Hurricane Andrew, one of the strongest hurricanes in US history, by chance touched on the core of a complex mosaic of terrestrial vegetation comprised of an assemblage of plant species markedly different from that found anywhere else in the continental United States. The three southern counties of Florida—Dade, Monroe, and Collier—lie south of 25°N and possess a flora in

It is difficult to predict how the opening of the canopy will affect animals and understory plants

Loope 1984), a similarly small percentage of southern Big Cypress National Preserve, and perhaps 50% of the land portion of Biscayne National Park. By chance, a remarkably high percentage of the forest stands with West Indian flora were within the narrow path of Hurricane Andrew.

This article is a preliminary evaluation of the hurricane's effects on vegetation and on selected plant and animal species of upland forests (pinelands and hammocks) and associated freshwater swamp forests (cypress forests and bayheads). It also addresses the posthurricane spread of invasive exotic plant species. It is based on nine days of observations from helicopter and the ground during 13–21 September 1992, combined with our past field experience and that of colleagues in

Effects on vegetation

Damage to woody vegetation was most severe in or near the eye of Hurricane Andrew. As one moved away from the storm track, fewer and fewer individual trees or patches of forest showed evidence of major damage, and they increasingly exhibited only loss of branches instead of stem breakage or uprooting. There was a virtually complete loss of leaves from hardwood trees along the central track of the storm, grading to only a general thinning of leaves near the margins of the storm-affected area. Defoliation and loss of small branches affect community productivity in the short term, but recovery to predisturbance conditions should occur rapidly from these types of impacts. Major structural damage—loss of entire larger branches, bent stems, main stem breakage, and uprooting—result in longer-term effects on the community as well as on the trees themselves.

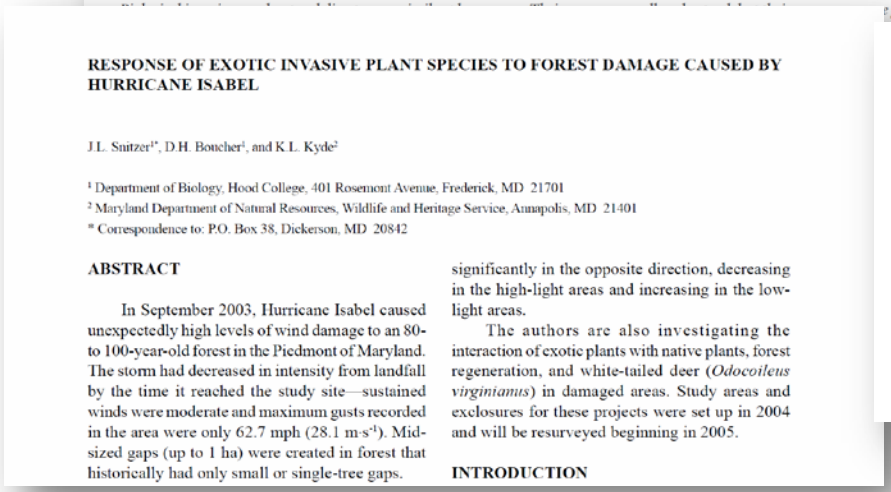
Pineland. The Long Pine Key area,[1] the largest upland area of Everglades National Park (approximately 8000 ha), is occupied by a mosaic of pineland and tropical hardwood vegetation on a rough limestone

Should Biological Invasions Be Managed as Natural Disasters?

ANTHONY RICCIARDI, MICHELLE E. PALMER, AND NORMAN D. YAN

generally unpredict-

research scientist at
nal Park, Makawao
Michael Duever is an



RESPONSE OF EXOTIC INVASIVE PLANT SPECIES TO FOREST DAMAGE CAUSED BY HURRICANE ISABEL

J.L. Snitzer[1*], D.H. Boucher[1], and K.L. Kyde[2]

[1] Department of Biology, Hood College, 401 Rosemont Avenue, Frederick, MD 21701
[2] Maryland Department of Natural Resources, Wildlife and Heritage Service, Annapolis, MD 21401
[*] Correspondence to: P.O. Box 38, Dickerson, MD 20842

ABSTRACT

In September 2003, Hurricane Isabel caused unexpectedly high levels of wind damage to an 80- to 100-year-old forest in the Piedmont of Maryland. The storm had decreased in intensity from landfall by the time it reached the study site—sustained winds were moderate and maximum gusts recorded in the area were only 62.7 mph (28.1 m·s^{-1}). Mid-sized gaps (up to 1 ha) were created in forest that historically had only small or single-tree gaps. significantly in the opposite direction, decreasing in the high-light areas and increasing in the low-light areas.

The authors are also investigating the interaction of exotic plants with native plants, forest regeneration, and white-tailed deer (*Odocoileus virginianus*) in damaged areas. Study areas and exclosures for these projects were set up in 2004 and will be resurveyed beginning in 2005.

INTRODUCTION

ELSEVIER

Aquatic Botany

Volume 80, Issue 2, October 2004, Pages 89–102

Flood tolerance in wetland angiosperms: a comparison of invasive and noninvasive species

Suzanne M. Kercher, Joy B. Zedler

Received 10 April 2003, Revised 15 June 2004, Accepted 13 August 2004, Available online 18 October 2004

Hurricanes and tornados provide obstacles for invasive plant control as they provide opportunity for the establishment of new weed populations through wind and water movement of plant propagules, or by transport of propagules in and on vehicles that assist in recovery efforts (e.g., Hodkinson &Thompson 1997)

Light availability increased threefold in damaged plots and was twice as variable as in undisturbed forests (Carlton & Bazzaz 1998)

After Hurricane Fran struck North Carolina in 1996, Boutet & Weishampel (2003) found the height of forest canopies to be reduced considerably

In the News

Invasive species hitch ride on debris from Japan tsunami

AP By The Associated Press on June 10, 2012 at 12:00 AM

Print

When a floating dock the size of a boxcar washed up on a sandy beach in Oregon, beachcombers got excited because it was the largest piece of debris from last year's tsunami in Japan to show up on the West Coast.

But scientists worried it represented a whole new way for invasive species of seaweed, crabs and other marine organisms to break the earth's natural barriers and further muck up the West Coast's marine environments. And more invasive species could be hitching rides on tsunami debris expected to arrive in the weeks and months to come.

"We know extinctions occur with invasions," said John Chapman, assistant professor of fisheries and invasive species specialist at Oregon State University's Hatfield Marine Science Center. "This is like arrows shot into the dark. Some of them could hit a mark."

MONGABAY.COM

Environmental NEWS

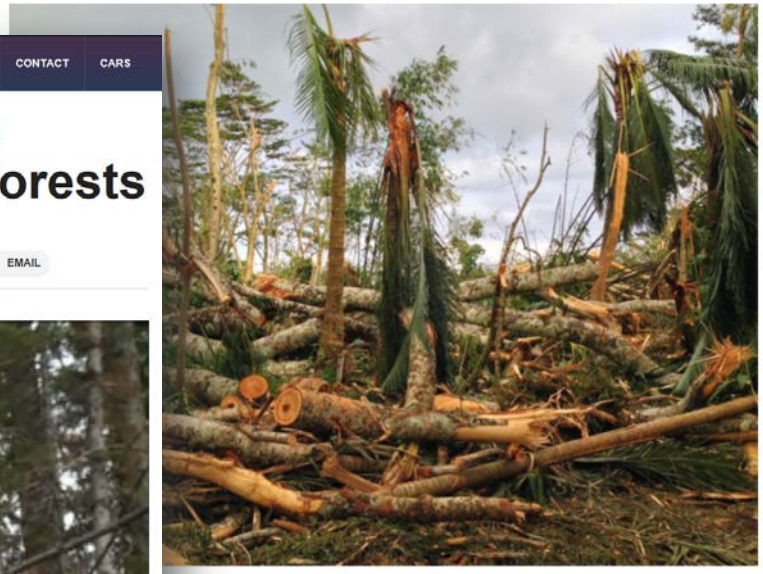
Environmental News | Rainforests | Tropical fish | For kids | Madagascar | Photos | Othe

Invasive species worsen damage from Hawaii's storms

Rhett A. Butler, mongabay.com

August 22, 2014

Like 176 Tweet 104 Share print



...aii. Photo by Greg Asner

August 7, 2014

HUFF POST GREEN

Flooding Spreads Invasive Species In Vermont, Iowa, Louisiana

...RATHKE Posted: 04/29/2012 12:01 pm Updated: 04/30/2012 8:51 am

136 17 57 159

GET GREEN NEWSLETTERS:

Enter email SUBSCRIBE

...eo, Asian Carp, AP, Flooding Invasive Species, Hurricane Katrina Invasive Species, Invasive ...sive Species Floods, Knotweed, Tropical Storm Irene Invasive Species, Green News

...Vt. (AP) — Last year's hurricanes and flooding not only engulfed homes and ...ay roads and bridges in hard-hit areas of the country, it dispersed ...invasive species as well.

FOX 13 SALT LAKE CITY

NEWS ON-AIR GOOD DAY UTAH TRAFFIC CONTESTS CONTACT CARS

Drought helps invasive species thrive in Utah forests

POSTED 7:02 PM, AUGUST 30, 2014, BY ASHTON GOODELL, *UPDATED AT 09:55PM, AUGUST 30, 2014*

FACEBOOK 117 TWITTER 0 PINTEREST LINKEDIN GOOGLE EMAIL

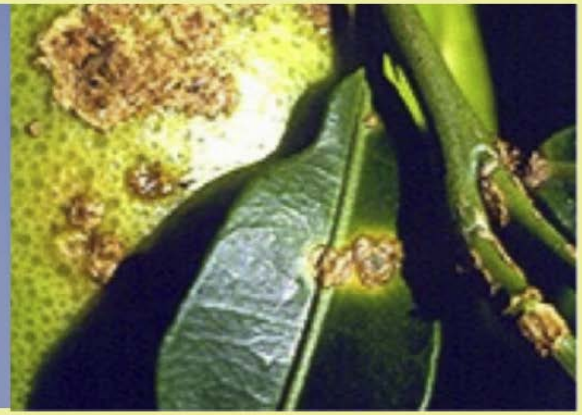
Citrus Canker

Movement of viruses & bacteria
Major impacts on agriculture

Obvious hurricane damage
But the spread of disease may be more costly

Effects of Citrus Canker

Fruit symptoms of Citrus Canker on sweet orange



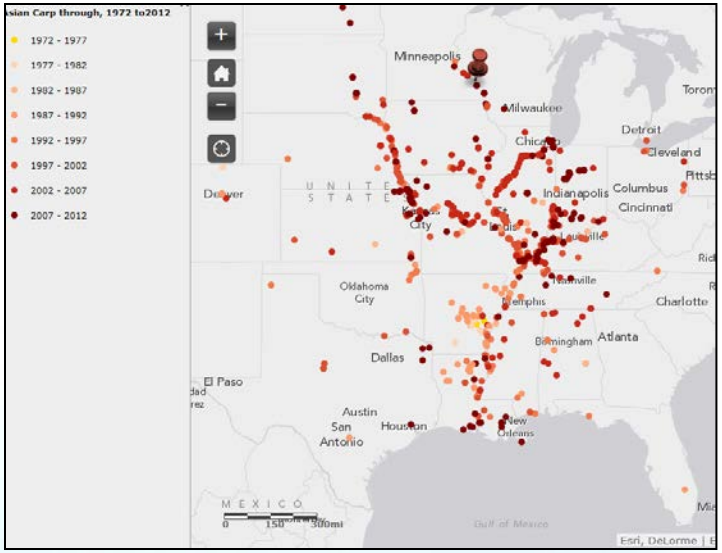
Lesions on orange leaves and twigs

Hurricane's Wilma, Francis, Jean and Charlie

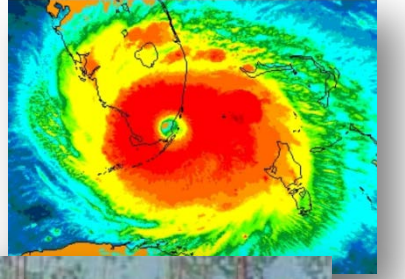

Lygodium
(Old World Climbing Fern)
spreads by spores
Hurricane's Wilma,
Francis, Jean and
Charlie

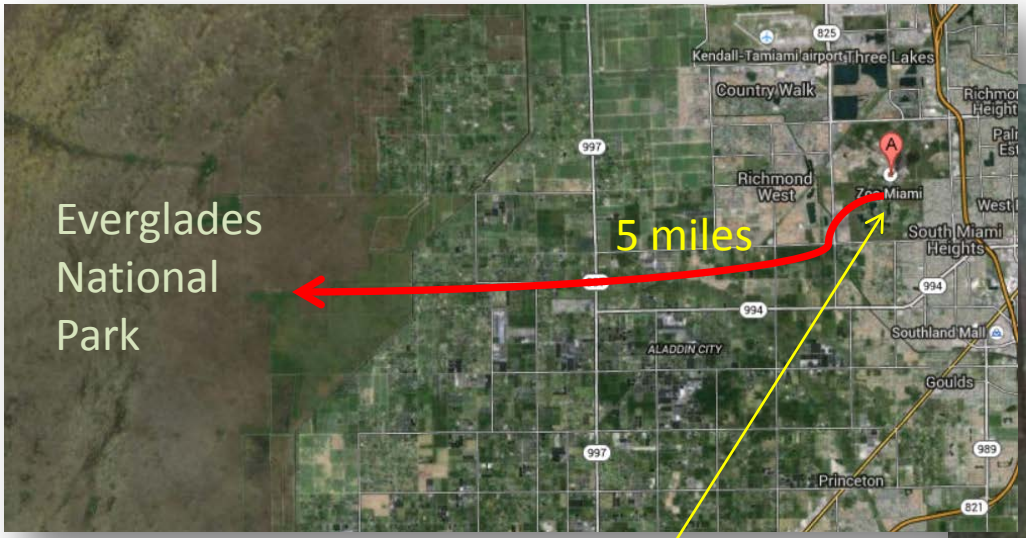
Asian Carp

Escaped from farm ponds during floods



Hurricane Andrew 1992





The Everglades

Hurricane Andrew

Miami Zoo

Burmese Pythons

Sacred Ibis

Pet Stores
&
Breeders

2011 Japanese Tsunami

Debris washing on shore in Washington, Oregon, California and Hawaii with living organisms

Organisms found on Japanese floating dock on Agate Beach, Oregon, June 2012

–Pelagic species –
expected on marine debris

– Coastal species –
not typically transported on marine debris

Pelagic gooseneck barnacle
Lepas anatifera

Northern Pacific seastar
Asterias amurensis

Japanese shore crab
Hemigrapsus sanguineus

Megabalanus rosa

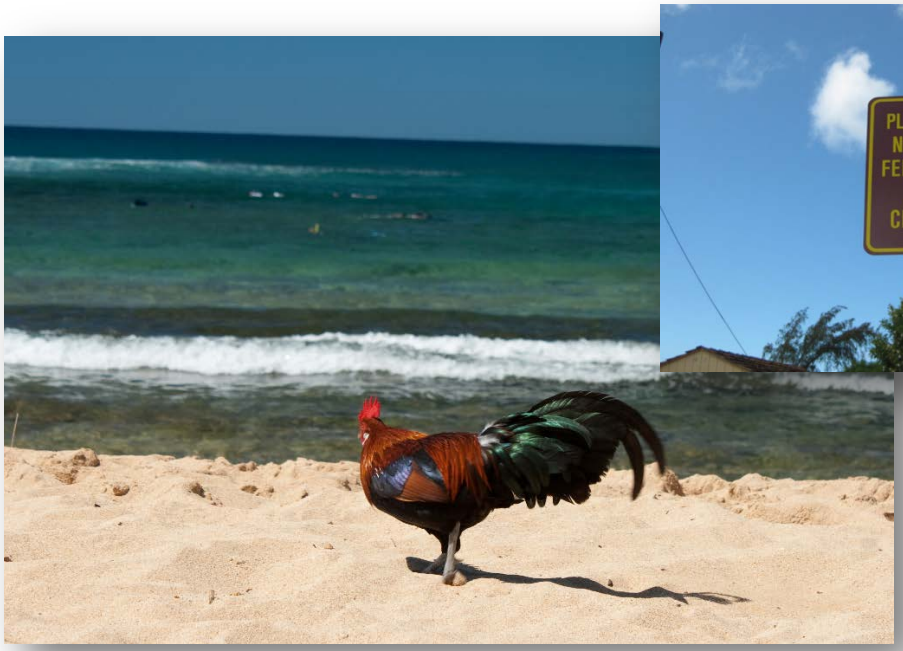
Mytilus galloprovincialis

Whale barnacle
Conchoderma auritum

Crassostrea gigas

Undaria pinnatifida

Hurricane Iniki 1992



After the last hurricane hit Kauai over 20 years ago there has been an enormous increase in the number of wild chickens on the island as they escaped during the storm and survived. Ironically it is the only island without Mongooses so there is not the same level of predation as there is on other islands, thus they have become a huge nuisance.

Hurricane Iniki 1992

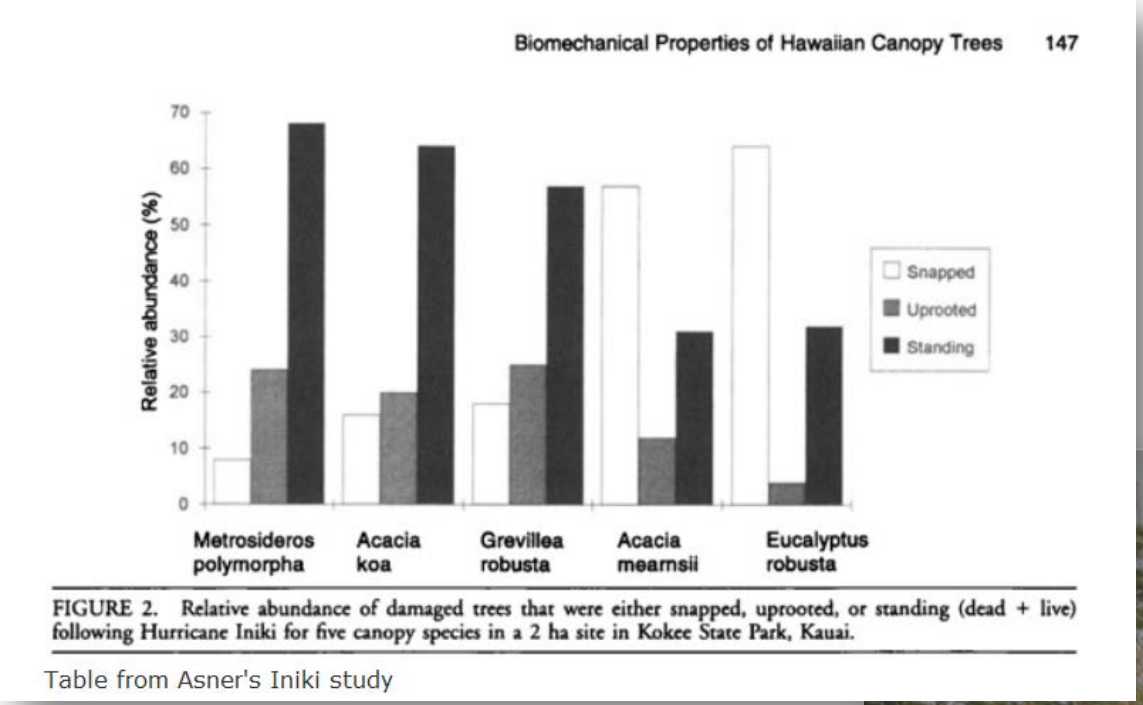


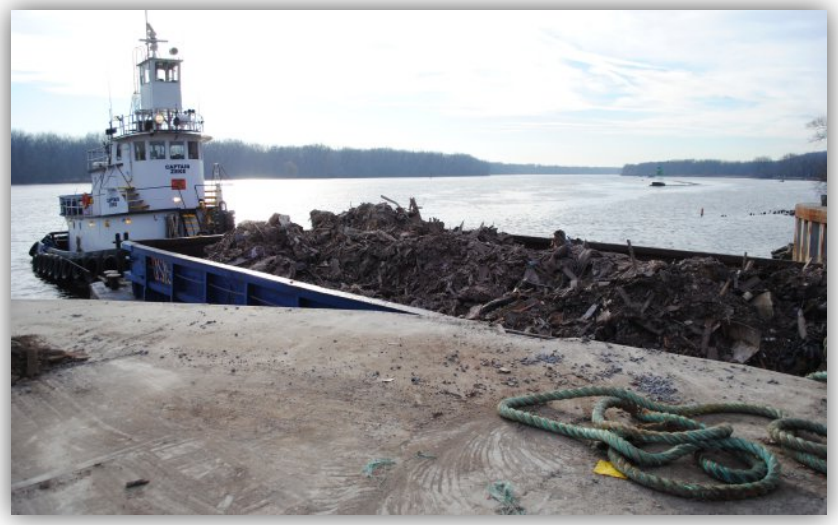
Table from Asner's Iniki study

Native trees remained standing while invasive trees fell.

- Increased damage to structures and cost to rebuild
- Opened canopy for more invasion

Debris

What's in it?



Where is it going?

What can you do?

EM community

- Know what is in the Debris and where it is going and how it is being disposed. Educate debris removal experts.
- Equipment coming into the area could bring unwanted species. Include contract language that equipment needs to be cleaned before coming to the disaster area and before returning home.

Natural Resource Community

- Be extra aware and increase monitoring the year following an event for new unwanted species and remove them.

Sometimes natural disasters help…

Dead Nutria along the gulf coast after Hurricane Katrina in Louisiana


Questions