Aquatic Nuisance Species

Exotic Species

- **Nonindigenous species (NIS)**
- **Aquatic nuisance species (ANS)**

ANS Impacts

- **Threaten the diversity or abundance of native species**
- **Threaten activities dependent on these waters**

10% rule

- 10% of the species that are introduced will become established
- 10% of the species that become established will become nuisance species
- What makes an established species a nuisance species?

Costs

- wide-ranging and potent effects on species diversity, ecosystem services, food resources, water supplies and human health
- annual economic losses due to these invasions are estimated to exceed $137 billion

Legal Authorities

USDA

Department of Interior

EPA

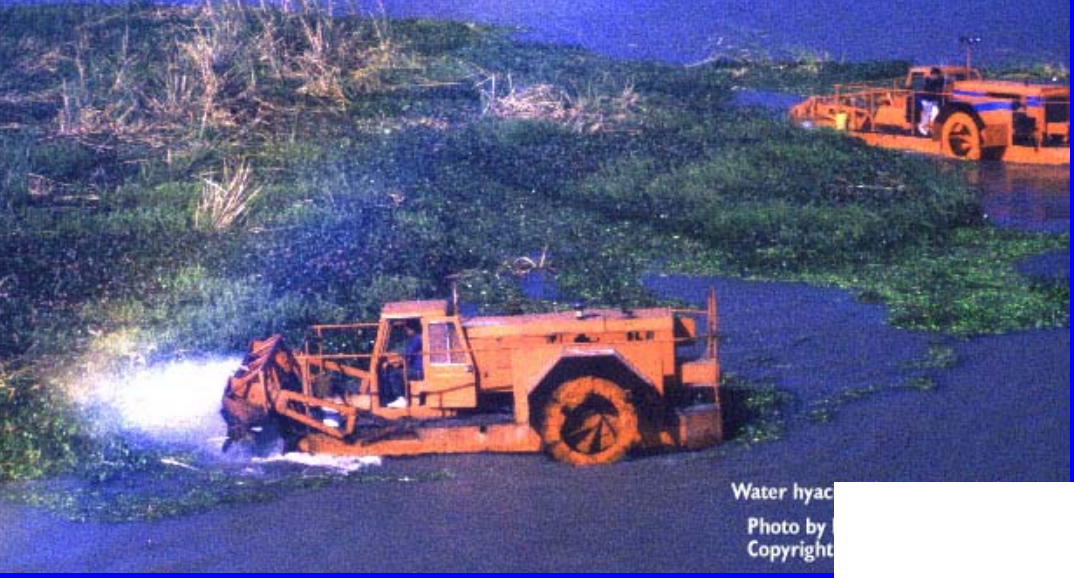
Nonindigenous Aquatic Nuisance Prevention and Control Act:

Section 1204

- **Creation, implementation and funding of state management plans.**

Control

- Mechanical
- Chemical
- Biological


Water hyac
Photo by
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Aquatic plant chopping machine


Fire helps melaleuca spread
by dispersing more seeds.
Photo by Randall Stocker
Copyright 1997 University of Florida

Helicopter applying aquatic herbicides for submersed plants

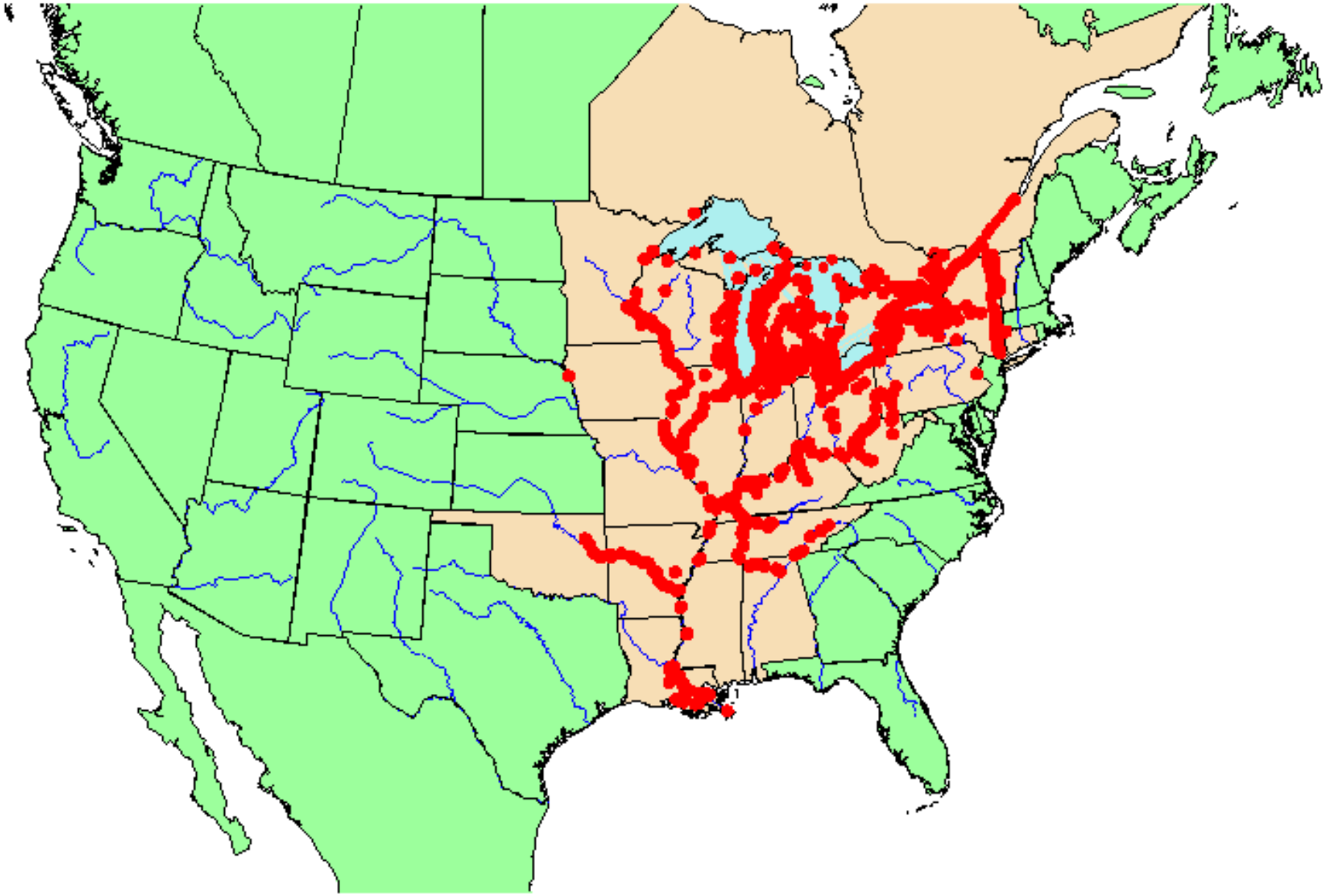

Copyright 2002 Univ. Florida
Photo by Vic Ramey
Oxyops


Photo Credit: USDA, Scott Bauer

The Poster Children

USGS
science for a changing world

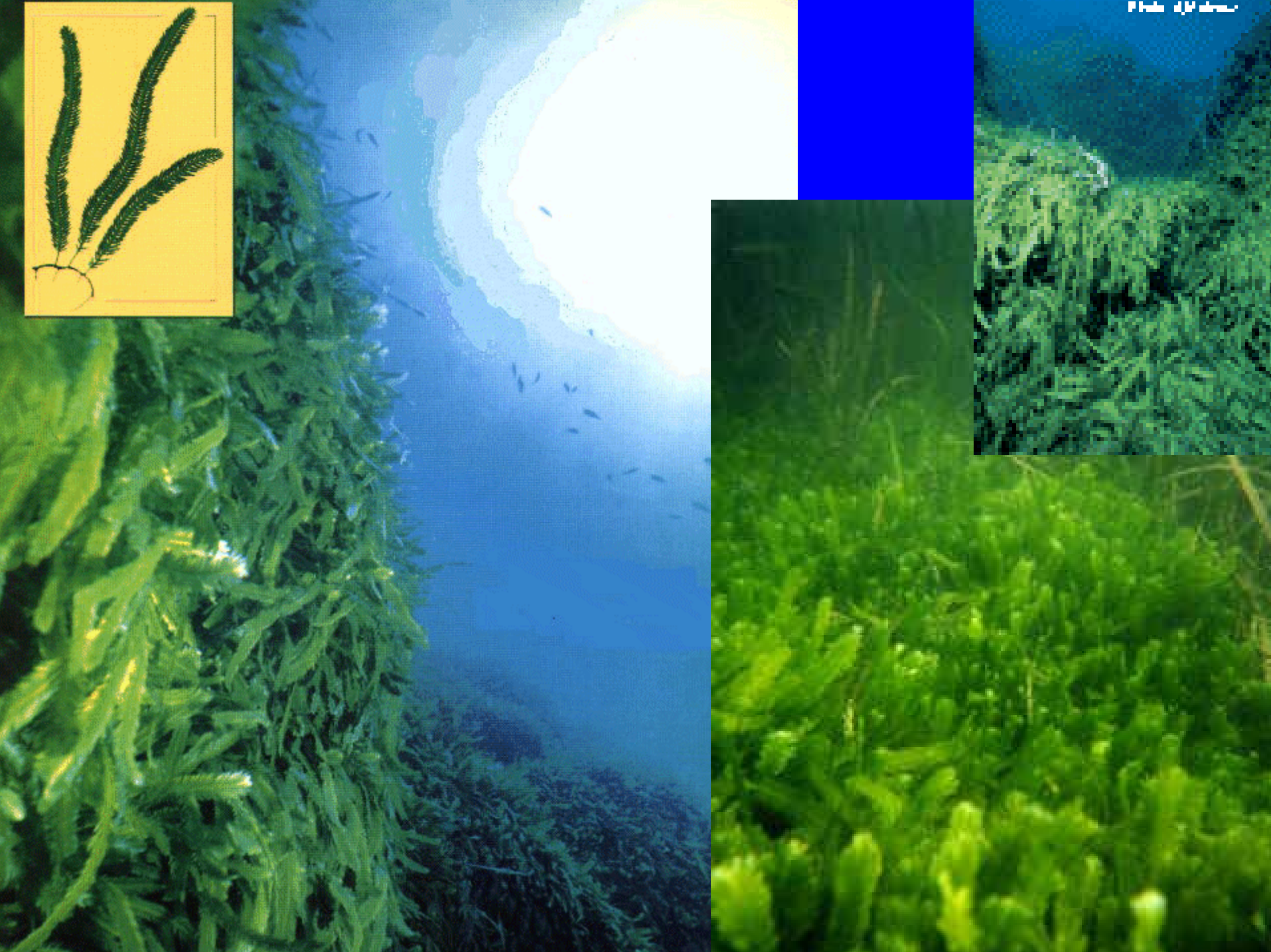
November 2000



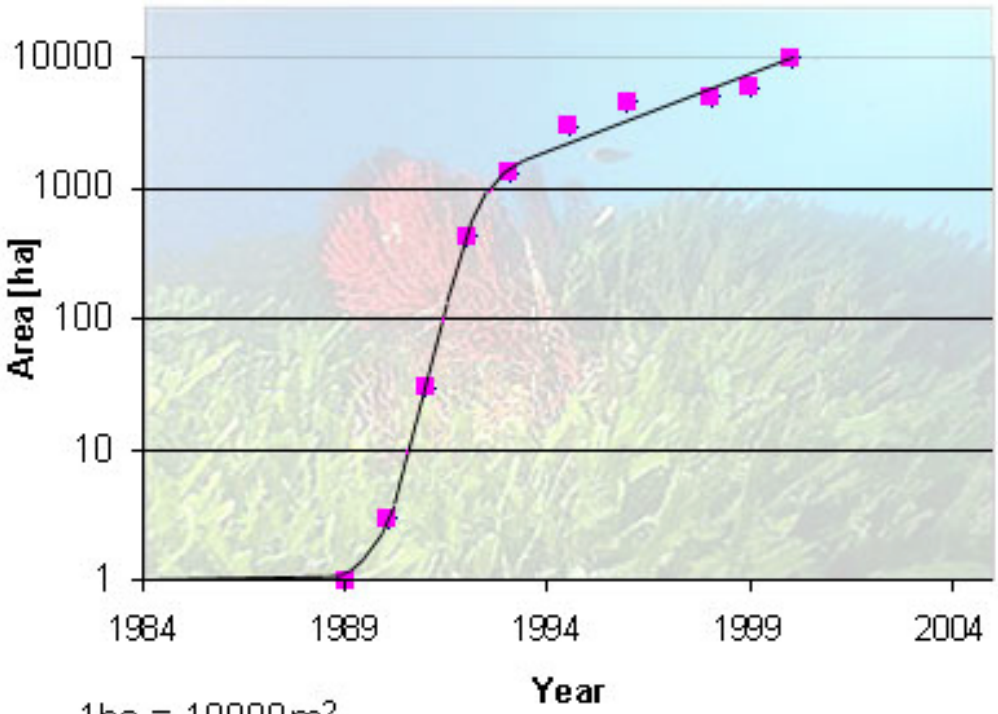
Additional Zebra Mussel Concerns

Caulerpa taxifolia

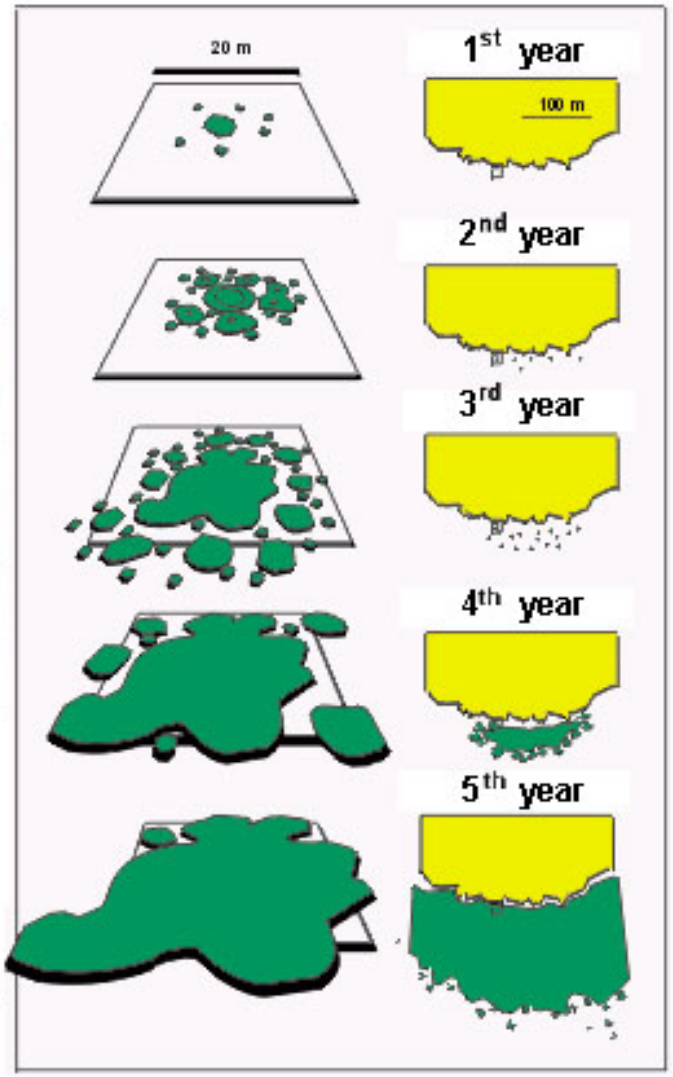
- marine green alga introduced into the Mediterranean Sea
- forms meadows to more than 30 m; up to 100 m
- reproduces by fragmentation
- at 10 m, up to 375 tons of wet biomass per acre
- produces toxins to the two main macro-herbivores, sea urchins and the fish *Sarpa salpa*



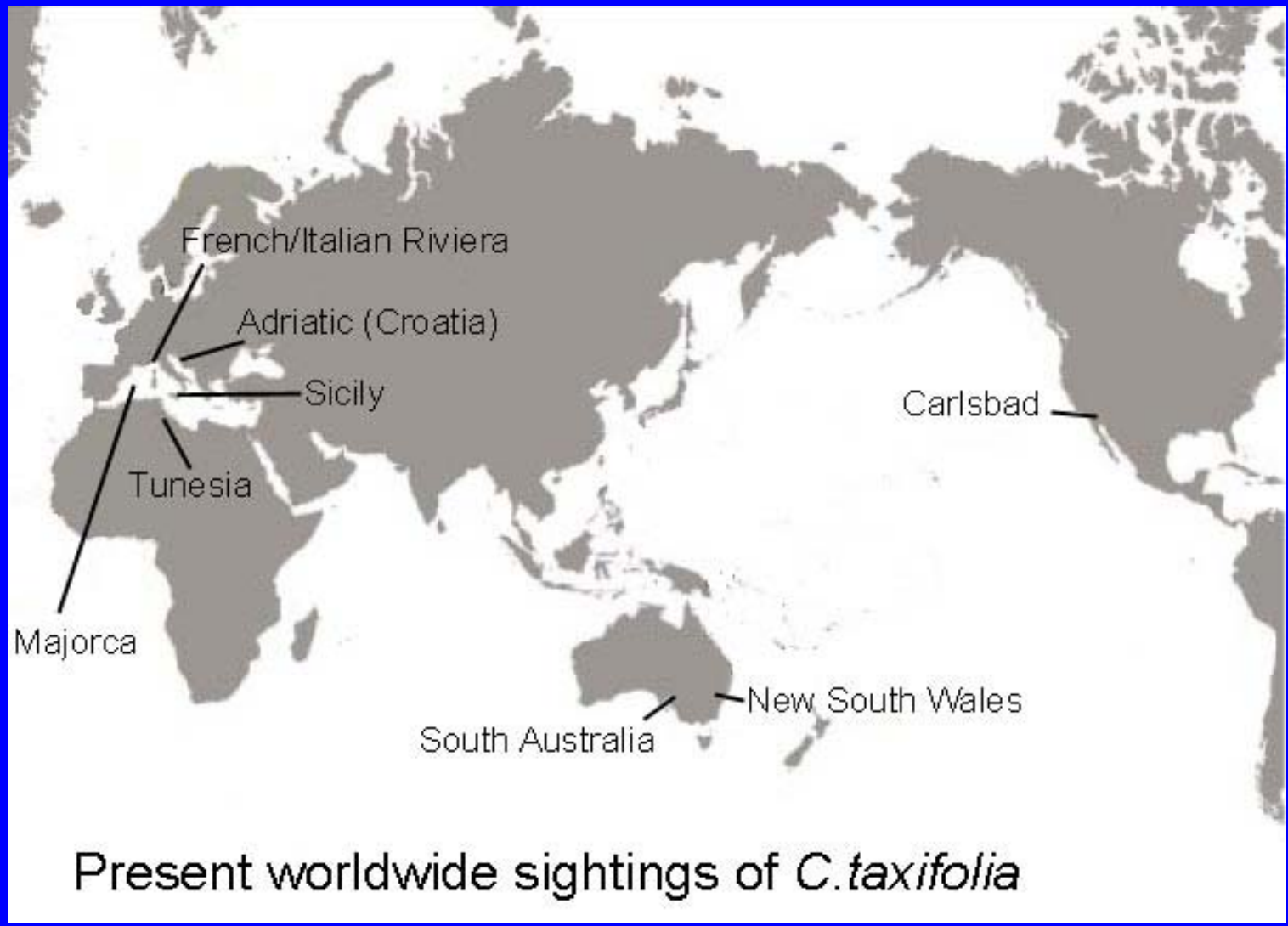
Sigmoidal growth of *C.taxifolia* (French Riviera)



1ha = 10000m^2



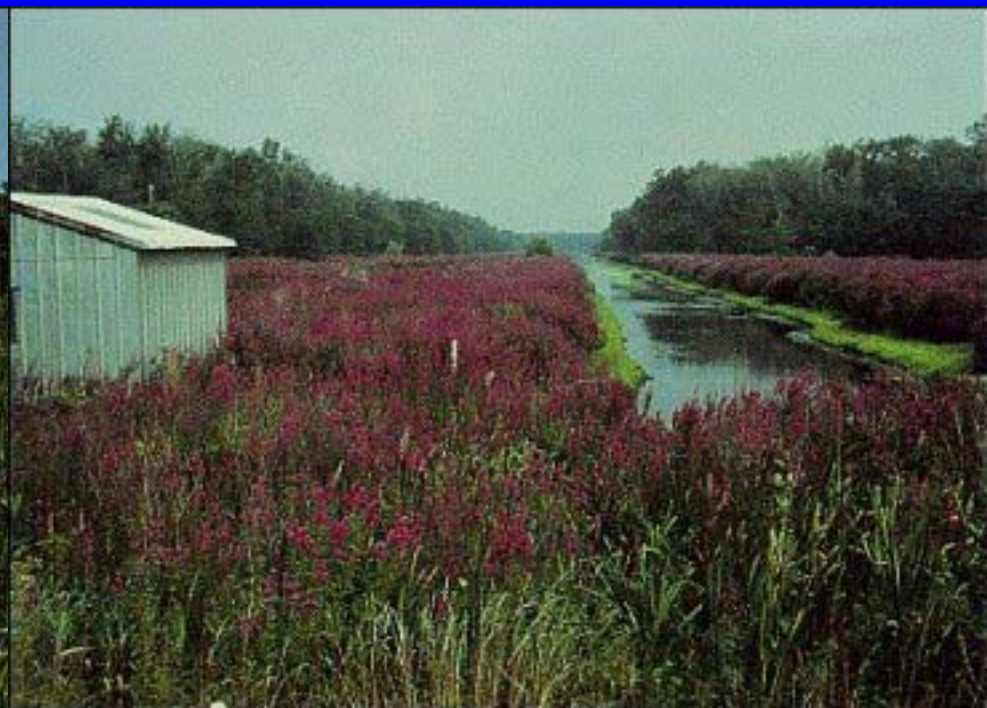
Expansion of an isolated patch of *C.taxifolia* at the French Riviera (Cap Martin)
Source: Dieval M.E.



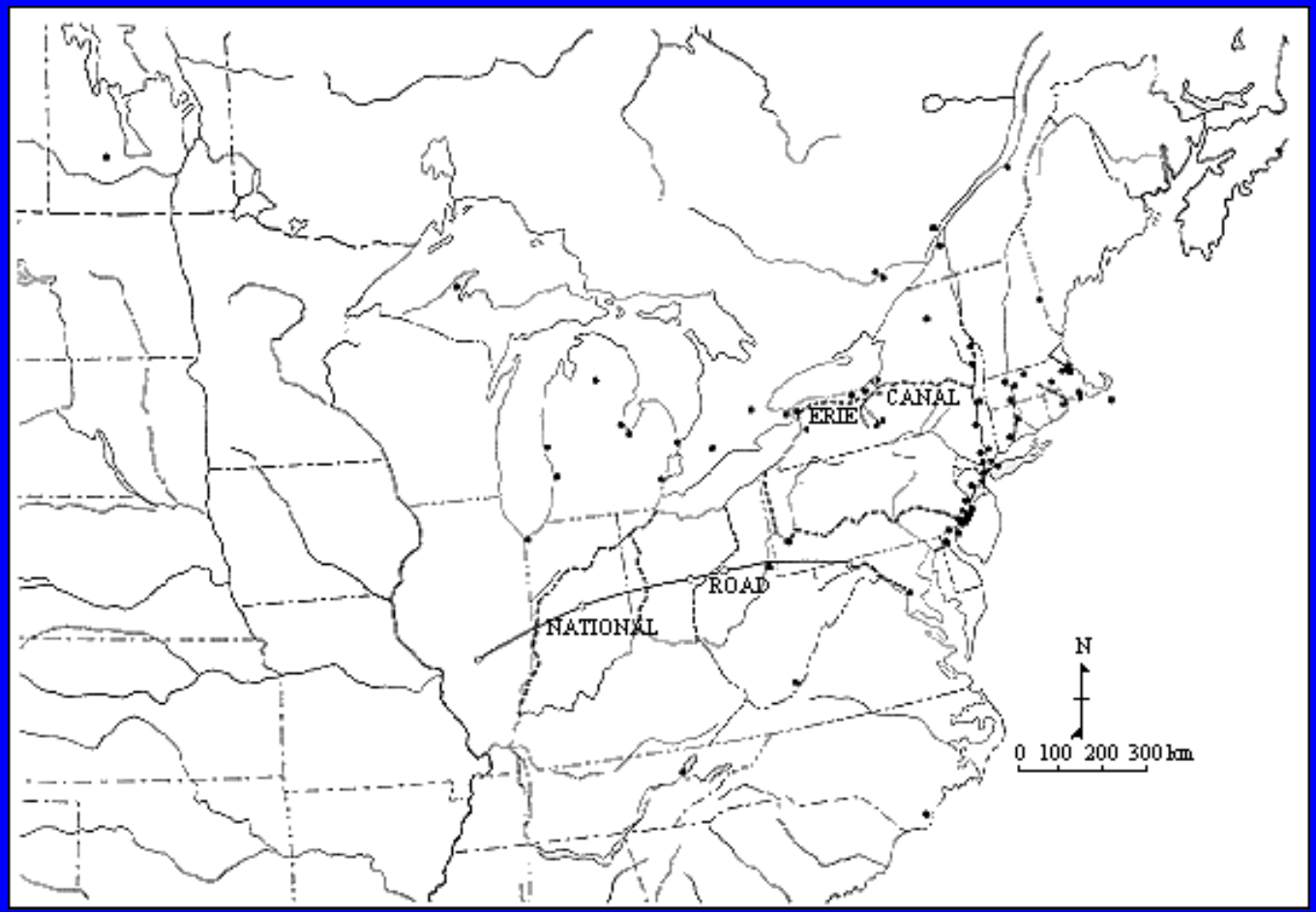
Present worldwide sightings of *C.taxifolia*

Purple Loosestrife

- mean number of seeds produced per plant was estimated at 2,700,000



1900



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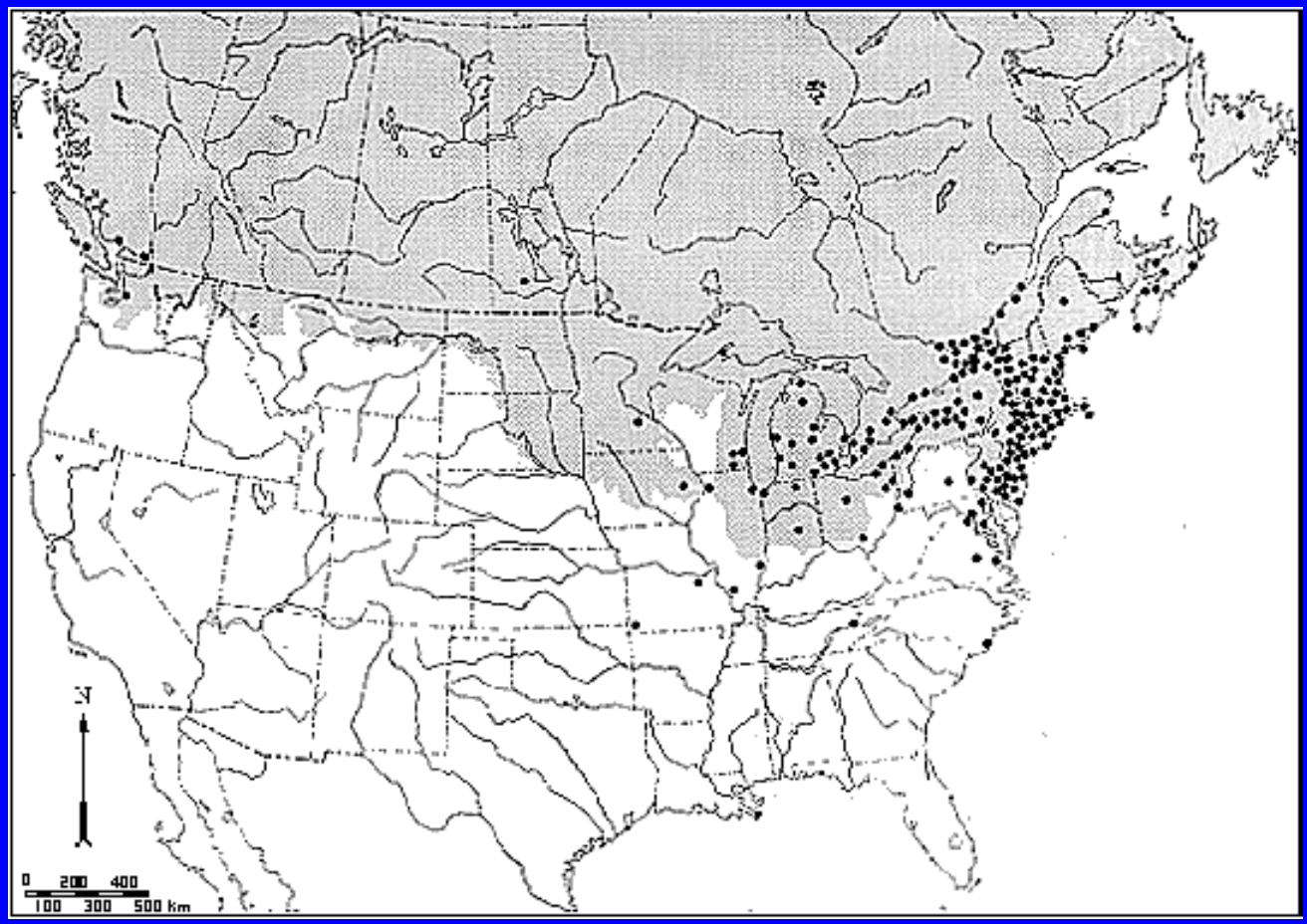
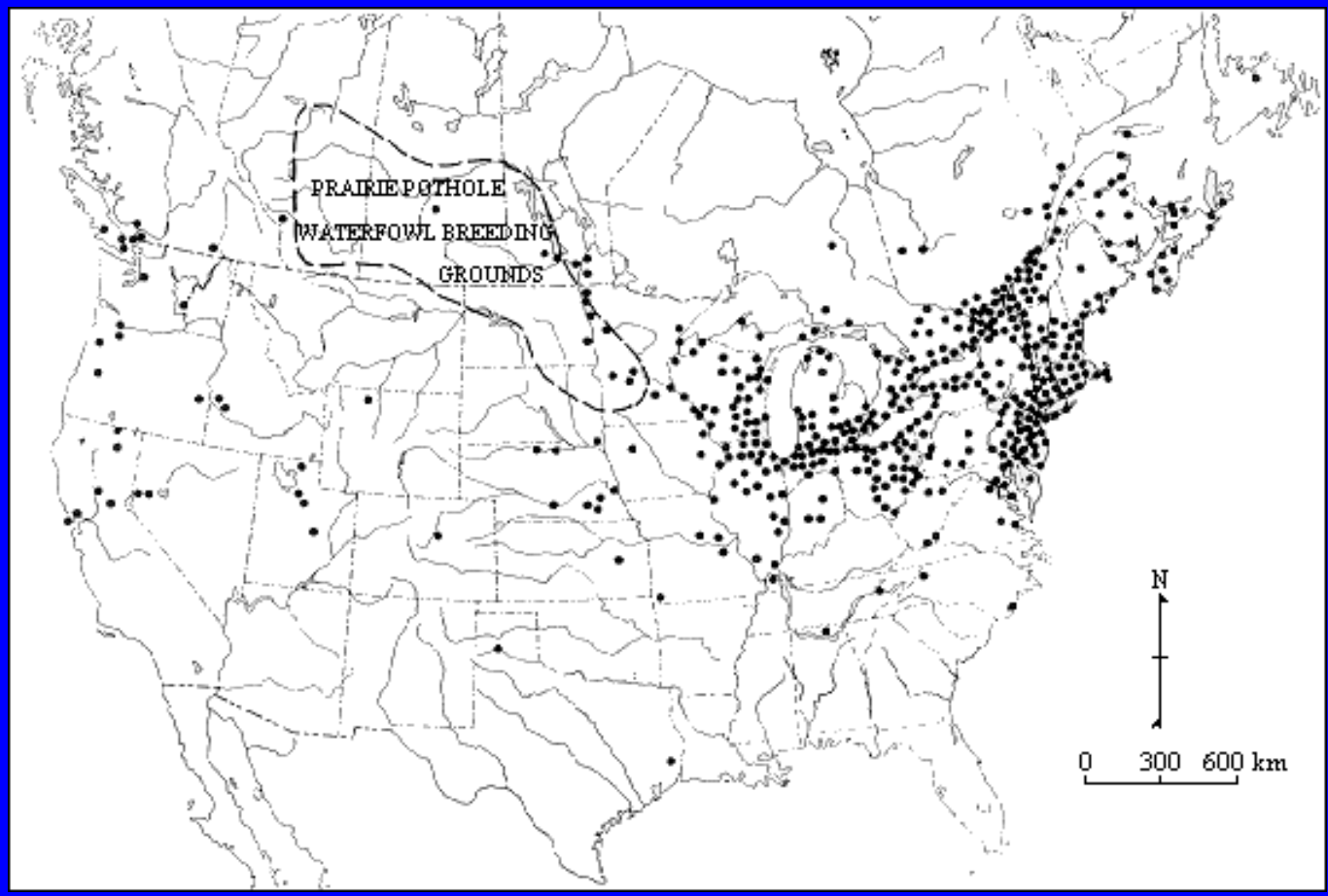


1985



Hydrilla verticillata

- submerged, "obligate" (requiring a wet habitat)
- forms dense stands of very long stems (25 ft.) in the water
- reproduces by regrowth of stem fragments
- also reproduces by and subterranean tubers; tubers can remain viable for more than 4 years
- a single tuber can grow to produce more than 6,000 new tubers per m^2

More Hydrilla

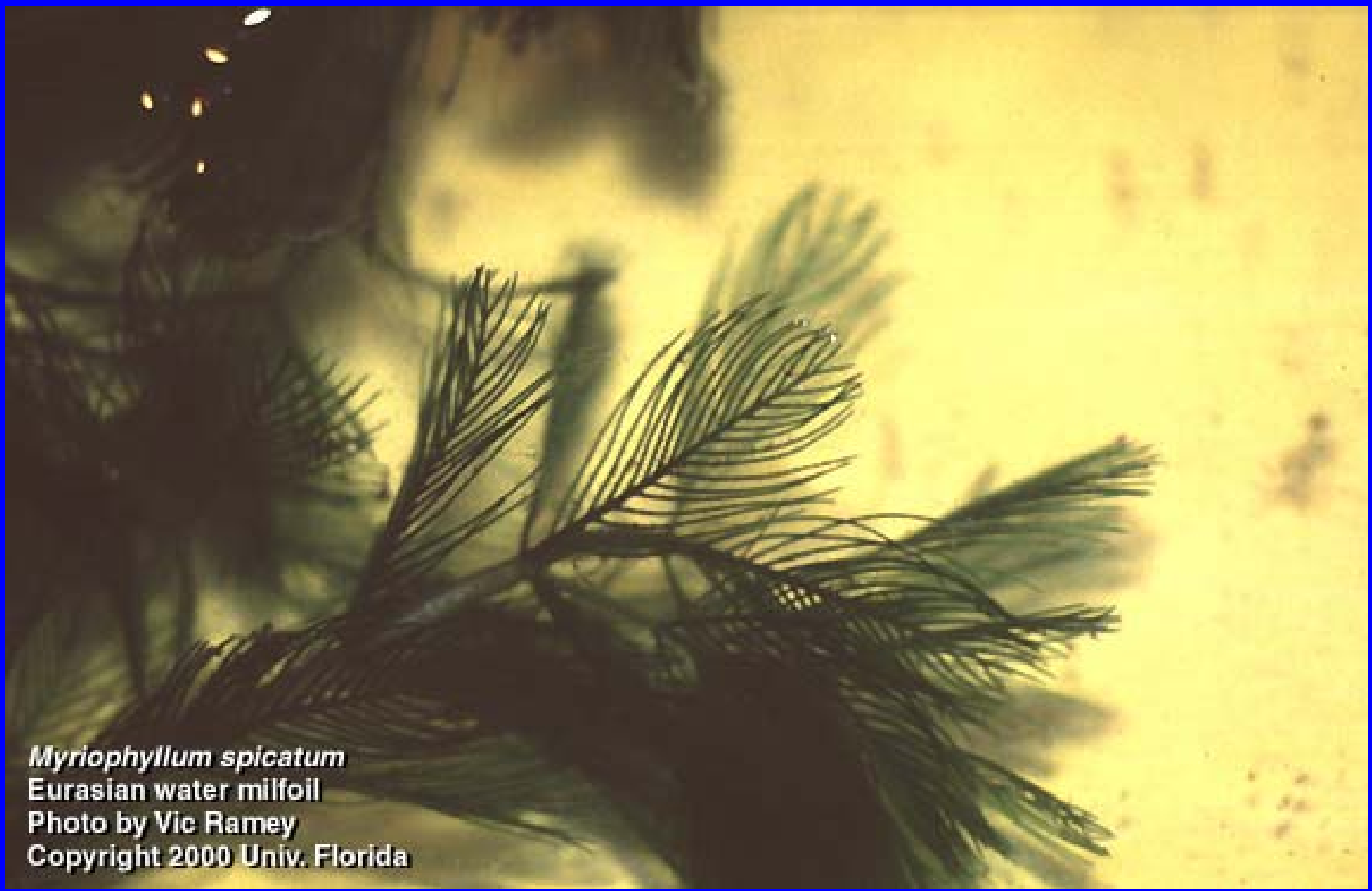
- can grow in only a few inches of water, or in water more than 20 feet deep
- can grow in oligotrophic to eutrophic conditions
- can grow in 7% salinity of seawater
- southern populations overwinter as perennials; northern populations overwinter and regrow from tubers
- can grow in only 1% of full sunlight

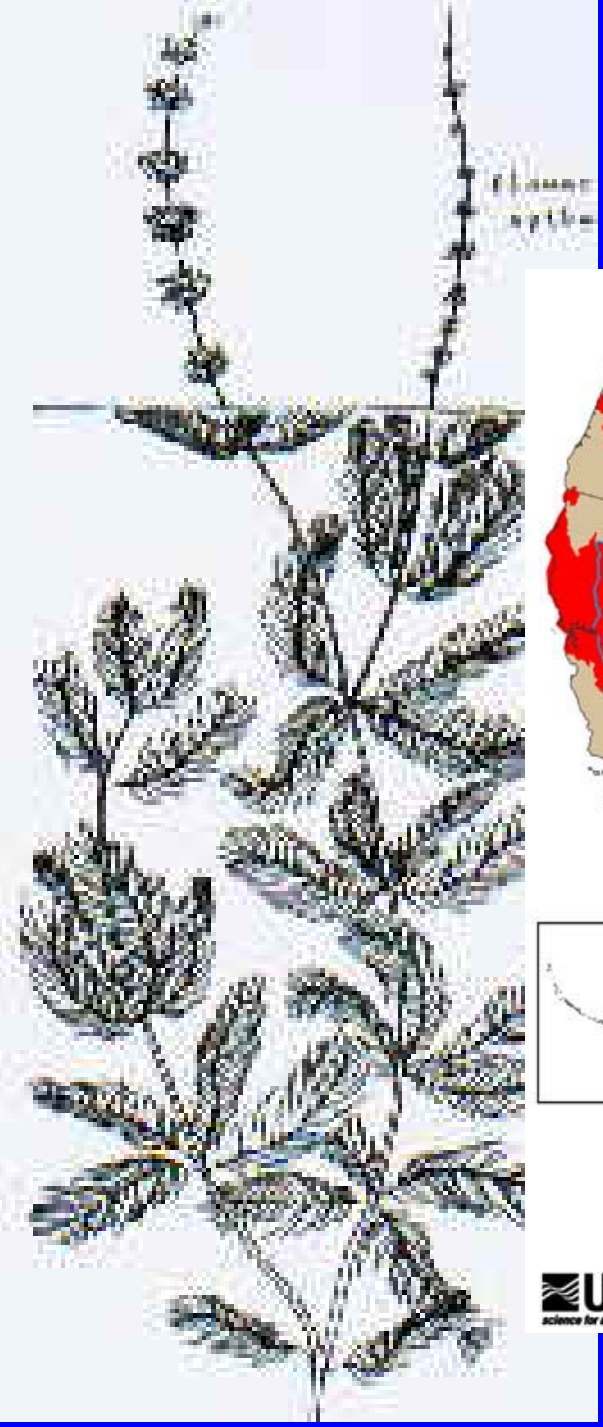

Hydrilla infestation
Withlacoochee River, Florida
Photo by Brian Nelson
Copyright 1997 Southwest Florida Water Management District

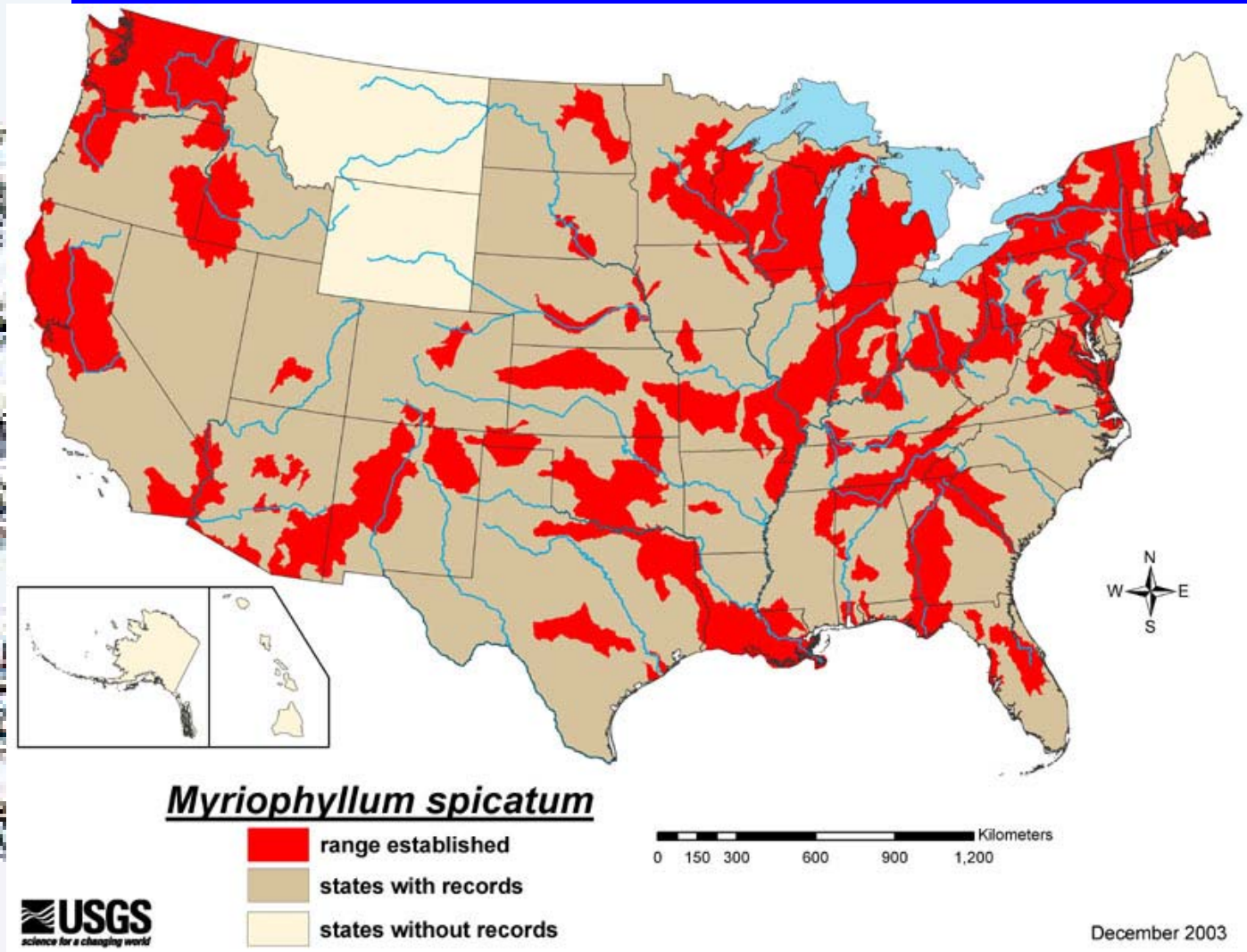

Hydrilla
Hydrilla verticillata
Photo by Vic Ramey
Copyright 2000 Univ. Florida

Myriophyllum spicatum
Eurasian Watermilfoil

- a submersed, rooted, perennial
- stems can "top out" in 20 feet of water, most often found in water 0.5 to 3.5 m deep
- spreads and reproduces mainly by regrowth of plant fragments; spreads locally by stolons
- will halt boat traffic on rivers; will fill a lake surface from shore to shore


Myriophyllum spicatum
Eurasian water milfoil
Photo by Vic Ramey
Copyright 2000 Univ. Florida




N
W
E
S
Myriophyllum spicatum
range established
states with records
states without records
Kilometers
0 150 300 600 900 1,200
USGS
science for a changing world
December 2003

Melaleuca quinquenervia

- Large tree, up to 80 feet
- Moving into the Florida Everglades
- Creating a “Sea of Trees” in the “Sea of Grass”
- Biological control (insects)


Person w/ single melaleuca tree
Melaleuca quinquenervia
Photo by A. Murray
Copyright 2000 Univ. Florida


Melaleuca trees
Melaleuca quinquenervia
Photo by A. Murray
Copyright 2001 Univ. Florida


Fire helps melaleuca spread
by dispersing more seeds.
Photo by Randall Stocker
Copyright 1997 University of Florida


Copyright 2002 Univ. Florida
Photo by Vic Ramey
Oxyops

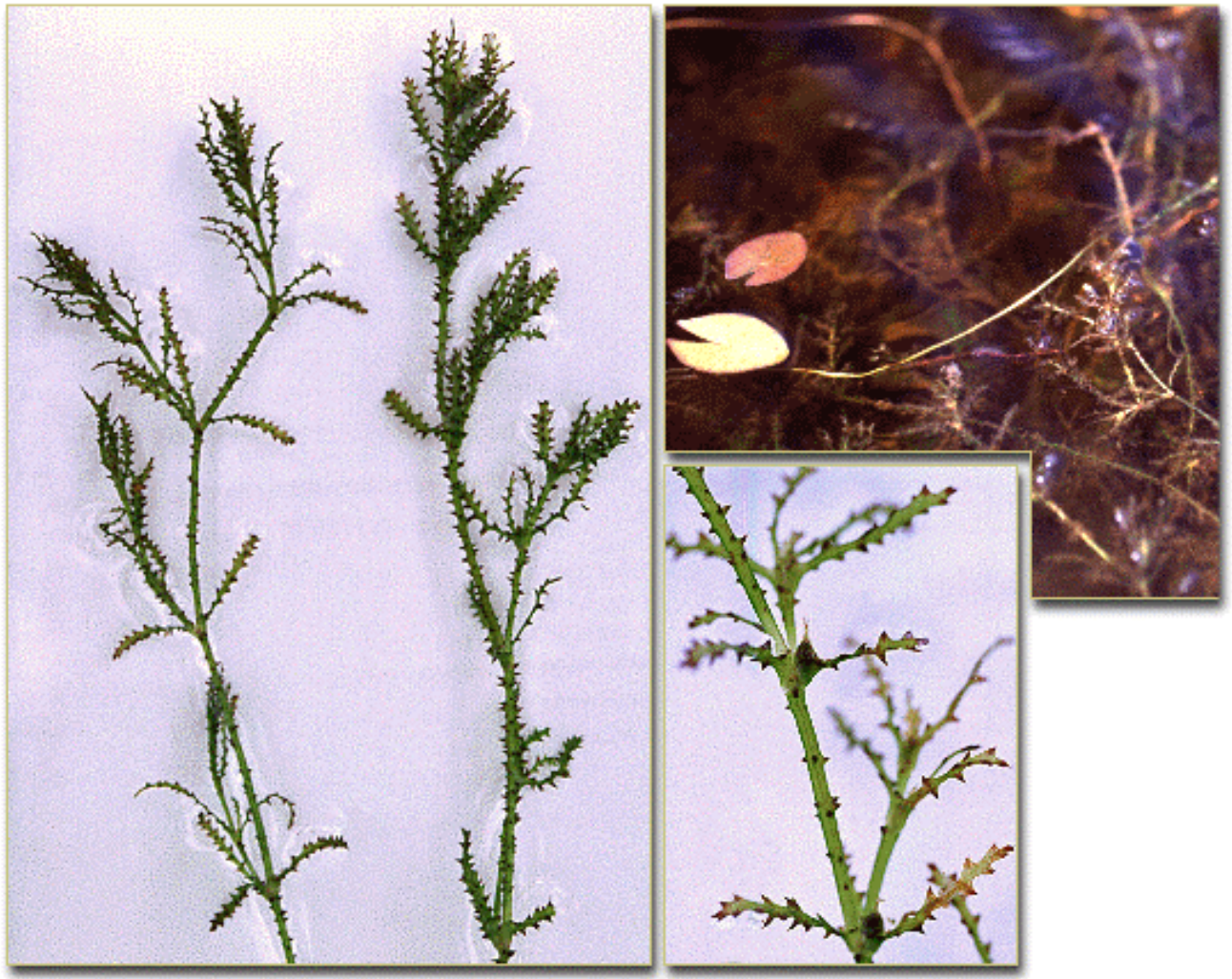
Myocastor coypus (Nutria)

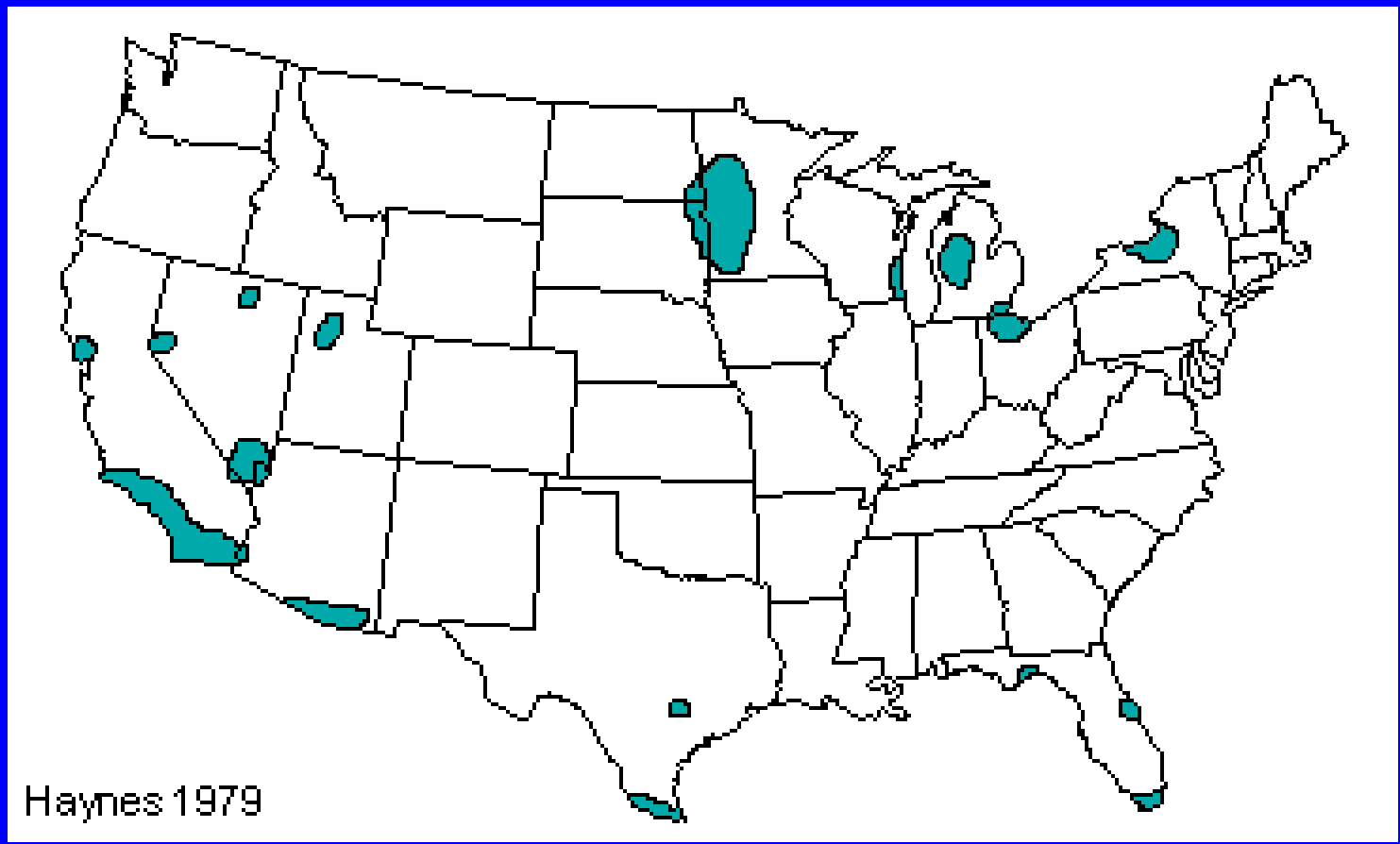
- Brought into the country for the fur trade
- Population established
- Impact to marshes, salt-water and fresh-water, reduce vegetation
- Increase erosion


Closeup of Severely Damaged Brackish Marsh


Normal Marsh
Denuded Marsh
Exclosure

Najas marina L.
(Spiny Naiad)

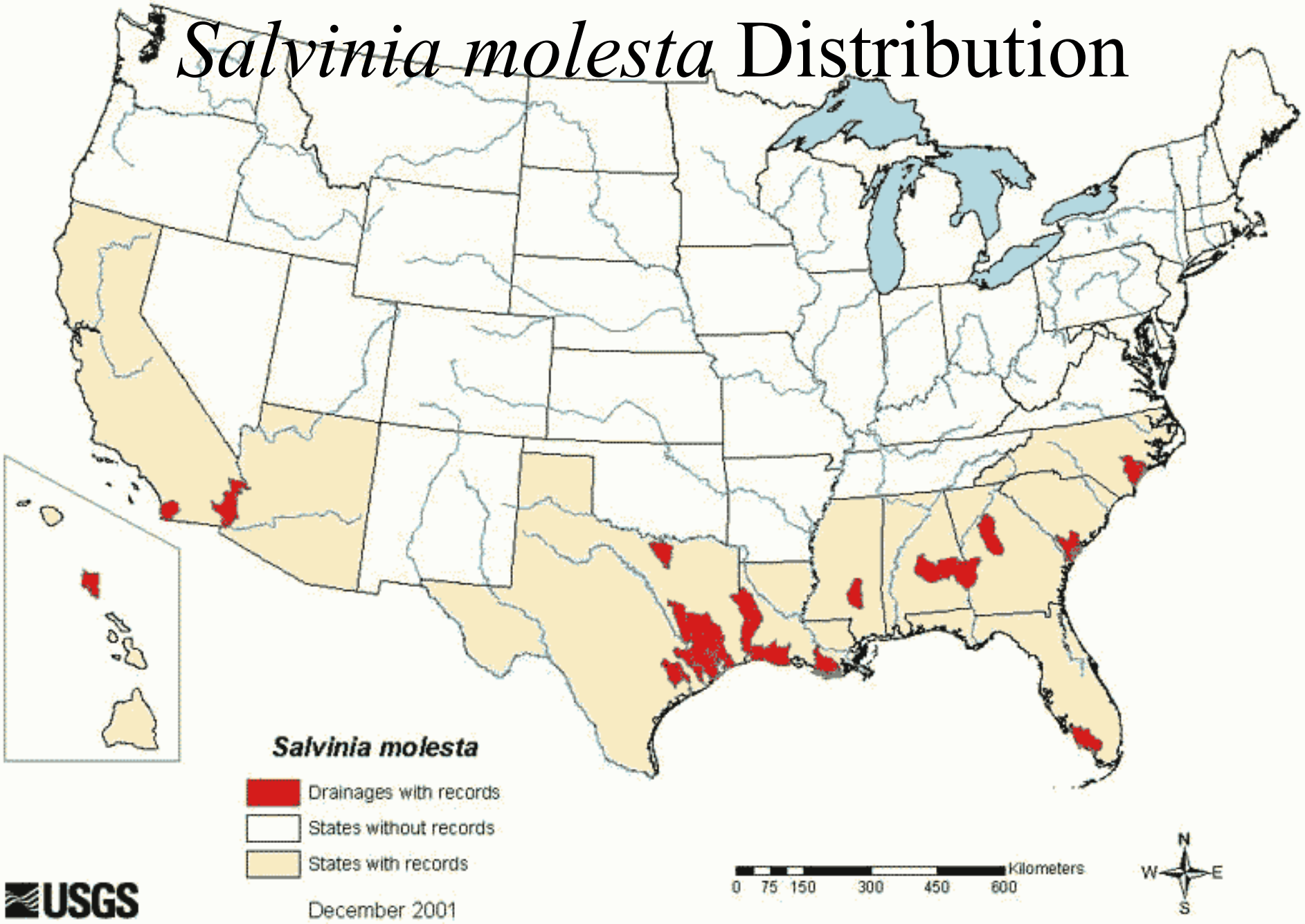



Haynes 1979

Salvinia molesta
Giant Salvinia

- Native to Brazil
- Aquatic fern
- Outbreaks have occurred in Sri Lanka, Africa, India, Southeast Asia, Indonesia, Malaysia, Papua New Guinea, Australia, New Zealand and Borneo

Salvinia molesta Distribution

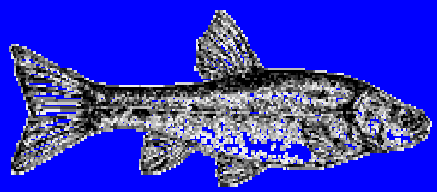


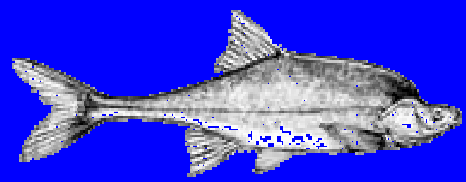
Dangers of *Salvinia*

Photo Credit: Charles Dugas, LA Dept. of Wildlife and Fisheries

The Arizona Problem

- Water as a precious resource
- High potential for transfer
- 81% of native fish are classified or proposed to be threatened or endangered





Species of Concern

- Virile crayfish
- Bullfrog
- Bullhead catfish
- Salt cedar
- *Salvinia molesta*
- Purple loosestrife
- Hydrilla

Closing Questions

- What are the costs associated with ANS?
- What are the costs associated with the treatment of ANS?
- What can be done to stop/slow the spread of ANS?
- How do we decide between attempting eradication and calling an ANS naturalized?