

# *Troubled Waters: Biological Invasion of Our Aquatic Resources*



Stop Aquatic Invasive Species Workshop

March 20, 2008. Stockton, CA



Louanne McMartin  
Jonathan Thompson  
Stockton Fish and Wildlife Office NISP  
4001 North Wilson Way



# Outline of the presentation

- The problem
- Pathways
- Examples of some invasive flora and fauna
- New invaders of concern
- What you can do



# The problem with non-natives invasive species

- Economic cost to U.S.
  - Damage to infrastructure
  - Loss of resources



- 2nd leading cause of native species' extinction/ endangerment (Wilcove et al)



- Loss of global biodiversity

- Human health risk
  - Asian lung fluke
  - West Nile virus



# Pathways of Introduction

- Aquaria
- Aquaculture
- Ballast
- Intentional Stocking
- Live bait
- Live Seafood
- Landscaping



Provided by The Nature Conservancy, Wildland Invasive Species Team



# Pathways of Introduction

How they are spread once there are here.

- Stowaways
- Boats & equipment
- On animals, pets
- Clothing
- Shipping crates
- Weed with seed
- Field crews



Find the pathways in this picture....



Ken A. Langeland, University of Florida, [www.forestryimages.org](http://www.forestryimages.org) UGA1624032

# Examples of Non-native Invasive Flora Species in California

- *Arundo donax*
- Water hyacinth
- Hydrilla
- Purple loosestrife
- Tamarisk



Purple loosestrife (Manitoba Purple Loosestrife Project)

# *Arundo donax* (giant cane)

- Originally from India, via Europe
- Extremely fast growth
- Forms massive stands, takes over
- Uses excessive amounts of water



- Provides no shade to streams
- Fire hazard
- Shallow root system = bank erosion
- Sheer mass of loose plants can damage bridges, etc.
- Controlled by cutting combined with chemical application

# *Eichornia crassipes*

- Water Hyacinth
- Native to Brazil
- Introduced to N. America at the Cotton Centennial Exposition in New Orleans in 1884 (Gopal 1987)



# Impacts

- Water hyacinth is so successful at reproduction that it can clog entire lakes of slow moving rivers
- Shades out many aquatic natives and may reduce food sources for aquatic animals
- Causes flooding, clogs water diversions and pumps and interferes with commercial and recreational water navigation
- Can increase sedimentation and lower dissolved oxygen of the water with consequent impacts to commercial and sport fisheries



# Control

- Not expected to be eradicated
- Herbicide
- Biological Control: Water Hyacinth Weevils (*Neochetina spp.*)
- Mechanical Removal



# Hydrilla (*H. verticillata*)



- Native to Asia
- Forms dense mats
- Clogs waterways
- Alters water quality, bottom substrate
- Control:
  - mechanical removal (by boat)
  - chemicals
  - grass carp



- Confused with Brazilian waterweed (*Egeria densa*) and Canadian waterweed (*Elodea canadensis*)
- Mechanical removal causes plants to multiply — new plants develop from plant fragments
- If you think you find it, take specimen to local County Agricultural Commission



# Control

- Identify
- Need both Herbicide & Mechanical
- Several years of treatment required



Wakulla Springs Hydrilla Infestation

Before and After  
After and Before

Photo by Vic Ramey  
Copyright 2002 Univ. Florida

# Purple Loosestrife (*Lythrum salicaria*)

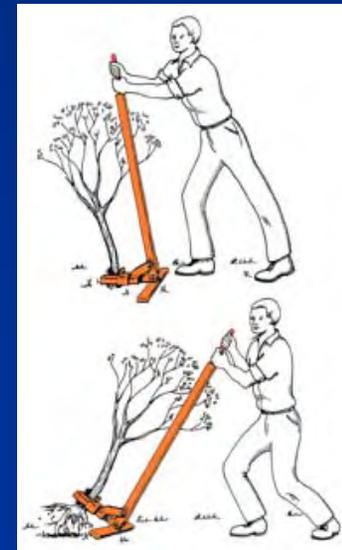


- Native to Eurasia
- Degrades wetlands - changes hydrology, soil conditions
- Grows aggressively on shores, displacing waterfowl habitat
- Disrupts irrigation systems
- Control:
  - mechanically
  - Chemicals
  - Limited success with biological agents

# Tamarisk (*Tamarix spp.*)



- Eurasia
- Ornamental plant
- Deposits salt on ground underneath plant – other plants can't grow
- High water use
- Control:
  - mechanical
  - chemical
  - biocontrol



# Sponge Plant (*Limnobium laevigatum*)

Horseshoe Bend (Decker Island) near Brannan Island State Recreation Area. Plant scattered during Jan 4th storm

**Limnobium Rich.**  
Common names: Amazon frogbit, American frogbit  
Family: Hydrocharitaceae  
Could be confused with: *Eichornia*, *Waterhemp*, *Hydrocharis*, *Hydrocotyle*, *Limncharis*  
Native distribution: America  
Species commonly cultivated:  
*Limnobium laevigatum* (Willd.) Heine (Central and South America)  
*L. spongia* (Bosc) Bakuc. (North America)  
Adventive distribution: *Limnobium laevigatum* is introduced into the southern United States.  
Weed status: Sometimes considered troublesome. *Limnobium laevigatum* is a noxious weed in California (United States).  
Habit: Free-floating, stoloniferous rosette plant.  
Brief description: Perennial, viviparous. Leaves floating or emergent, arranged in basal rosettes along stolon; petiole short or elongate, leaf blade trifoliate-obovate to reniform, venation palmate, inconspicuous, base cordate to rounded; margin entire; epiphyllums on abaxial surface distinct; basal sheath present. Flowers unisexual, pedicels short, spathe of 1 or 2 free bracts; female flowers 1 to 3, hypanthium absent; males in cyathes of up to 11 flowers; sepals 2; petals 2, rudimentary or absent in female flowers. Dispersal by seed and stem fragments.  
Natural habitat: Still waters of lakes, rivers, ponds and swamps.  
Additional comments: *Limnobium* contains only two species, with *L. laevigatum* being more commonly cultivated for ponds and aquaria. *Limnobium spongia* is more likely to form emergent leaves than *L. laevigatum*, which produces emergent leaves only when it becomes crowded.



# Examples of Non-native Invasive Fauna Species

- Asian clam
- Chinese mitten crab
- New Zealand mudsnail
- Florida Watersnake (Nerodia)



# Asian clam

*Corbicula fluminea* (freshwater)



- Introduced in 1800s by immigrants, for human consumption
- High densities, out-competes native clams
- Impairs water delivery systems by clogging pipes, valves and sprinklers
- Traps sediment, forms bars in agriculture canals, alters flow
- Controlled mechanically and with chemicals

# Asian Clam *Corbula amurensis* (brackish)



Andy Cohen SFEI



Andy Cohen SFEI



Andy Cohen SFEI

- Other names  
Amur river clam, brackish water corbula, overbite clam
- Peak densities up to 48,000 clams per square meter
- Bioaccumulation of toxins
- Possible cause for pelagic fish decline in the delta



# Chinese mitten crab

(*Eriocheir sinensis*)

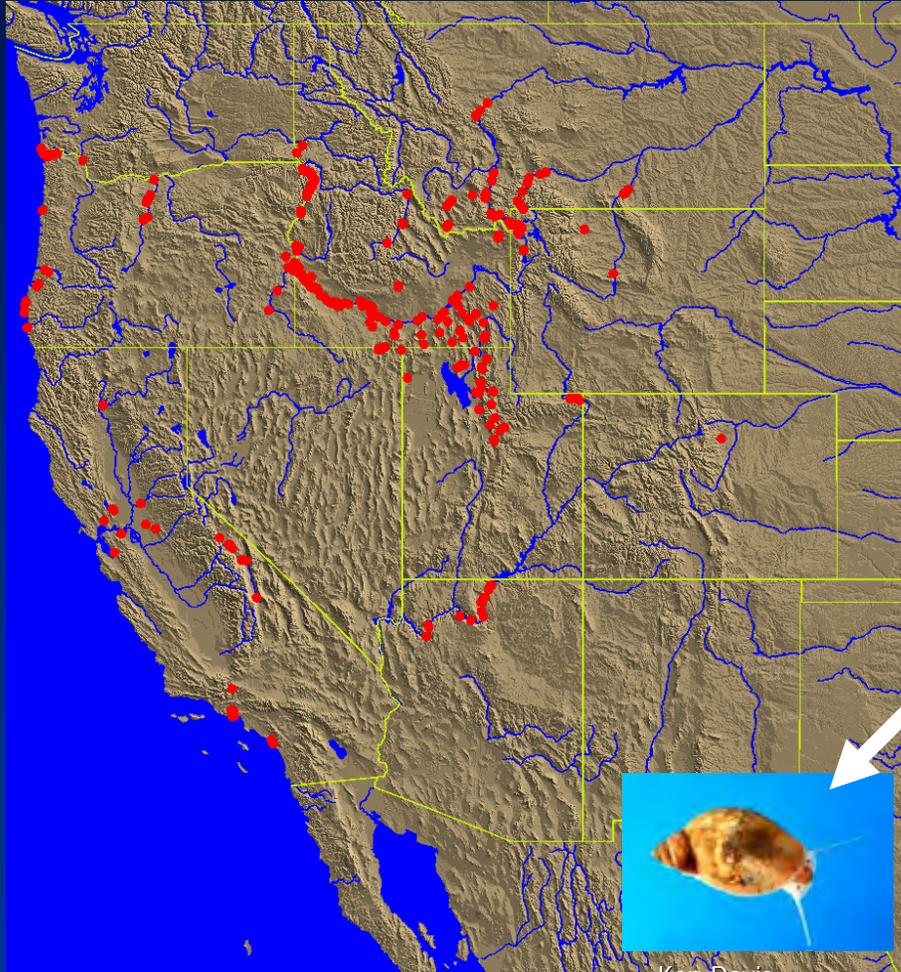


- Intentional releases for human consumption and/or via ballast water
- Clogs fish salvage facilities
- Creates losses for fisheries
  - Reduced catch
  - Damages fishing nets
- Threatens levee stability
- Potential host for human lung fluke

# New Zealand mudsnail

(*Potamopyrgus antipodarum*)

- From New Zealand
- 750,000 NZMS per square meter recorded
- Competes for space and food
- Ties up nutrients – not digestible by most fish or birds, and the shell takes a long time to decompose
- Shells will block pipes, filters and grates



Distribution of the New Zealand mudsnail in the Western U.S.



Ken Davis

These are **not** New Zealand mudsnails!



Ken Davis

These are



Photo credit: Mike Gangloff

# Confirming Identification

- Springsnails (*Pyrgulopsis* spp.) morphologically similar
- Micro-dissection performed to confirm ID
- Max size 5mm
- 5-6 Whorls



nzms

*Pyrgulopsis*

[www.esg.montana.edu/aim/mollusca/nzms/id.html](http://www.esg.montana.edu/aim/mollusca/nzms/id.html)

# Southern watersnake (*Nerodia fasciata*)

- Native to southeastern US
- Threat to CA native and federally listed giant gartersnake (*Thamnophis gigas*)



Photo: H. Evereth

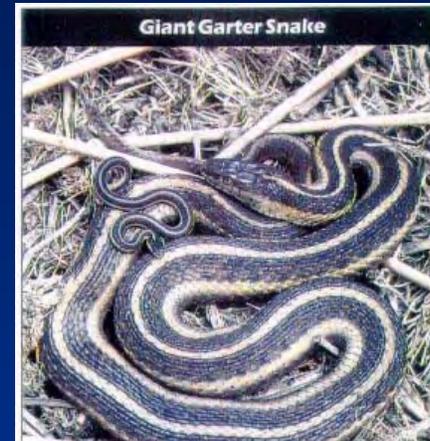


Photo: George E. Hansen



Photo: D. Childers

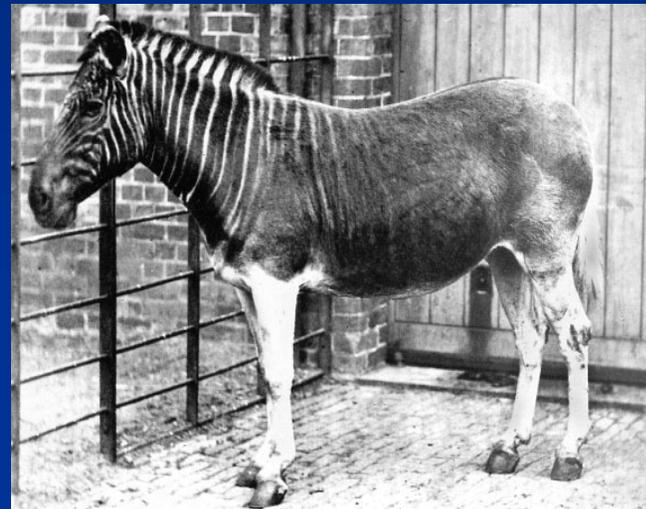
# New Invaders to California

- Zebra mussel  
(*Dreissena polymorpha*)
- Quagga mussel  
(*Dreissena bugensis*)



# Quagga and Zebra

- striped shells
- ability to attach to objects with byssal threads



# Impacts from zebra/quagga mussel: *Economic*

- Clog water intakes and pipes
- Damage pumps
- Decrease power production
- Increase maintenance costs
- Harm commercial fisheries
- Range of cost estimates:  
up to \$100 million/year



# Impacts from zebra/quagga mussel : *Ecological*

- Compete for food and space
- Alter aquatic food webs
- Shift nutrient flow (blue-greens)
- Bioaccumulation of toxins
- Disrupt fish screen/passage facilities



# Impacts from zebra/quagga mussel: *Recreation and Safety*

- Damage boat engines
- Increase watercraft maintenance
- Sharp shells hurt!
- Foul odor from die-offs



# Invasion History: NV and CA

## Quagga mussel

- January 2007: Las Vegas Boat Harbor, Lake Mead National Rec Area
- 2007: Throughout Colorado River Aqueduct, San Diego County, and Riverside County



## Zebra mussel

- January 2008: San Justo Reservoir, San Benito County



● - Red markers indicate presence of quagga mussels

● - Green markers indicate the presence of zebra mussels

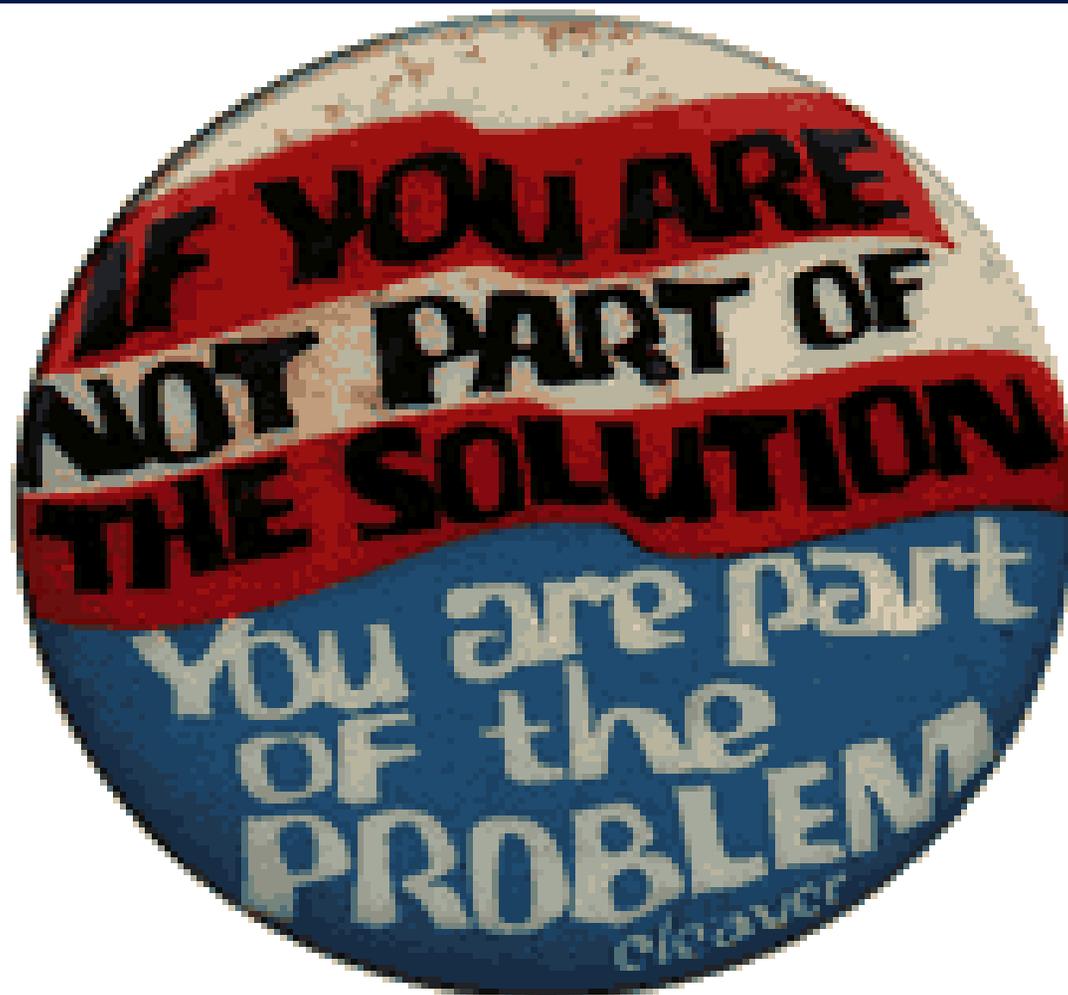


# What Can You Do? Clean Your Boat! Spread the Message!



Water Hyacinth

USFWS, Stockton Sept  
2005



# Thank You!

- *A special thanks to the California Department of Boating and Waterways for providing many of the slides and technical information.*
- *For further information please contact:*
- *Paul Ryan: [pryan@dbw.ca.gov](mailto:pryan@dbw.ca.gov) (209-263-8142)*
- *Marcia Carlock [mcarlock@dbw.ca.gov](mailto:mcarlock@dbw.ca.gov) (209-263-8143)*
- *<http://www.dbw.ca.gov/aquatic.asp>*





<http://100thmeridian.org/>

On-Line Certificate:



If you are a boater, angler, or aquatic recreational user, then you can benefit from our short, on-line educational training designed to teach you four simple steps that you can follow to **Stop Aquatic Hitchhikers!** This training will only take a few minutes and at the end you will get a certificate that you can show authorities to demonstrate that you are doing your part.

[On-line training starts here.](http://100thmeridian.org/)



Catherine Mandella  
Environmental Scientist  
Quagga & Zebra Mussel Specialist  
California Dept. Fish & Game  
Aquatic Nuisance Species  
(209)942-6107  
cmandella@dfg.ca.gov



# Conducting Vessel and Equipment Inspections

- Where do we start looking?
  - Lower Unit – Cavitation Plates



W Baldwin 8-07



STOP AQUATIC  
HITCHHIKERS!™

# Conducting Vessel and Equipment Inspections

- V
- 



**STOP AQUATIC  
HITCHHIKERS!™**

# Lake Mead Marina

## 40' Baja 8-8-07



**STOP AQUATIC  
HITCHHIKERS!**

# Decontaminating Process

How do we decontaminate vessels?

## Decontamination kit



### WARNING

- Chemical Vapors inside
- Open in Well ventilated area
- Stay upwind when opening
- Keep face away from bucket opening



STOP AQUATIC  
HITCHHIKERS!™

# Decontaminating Process

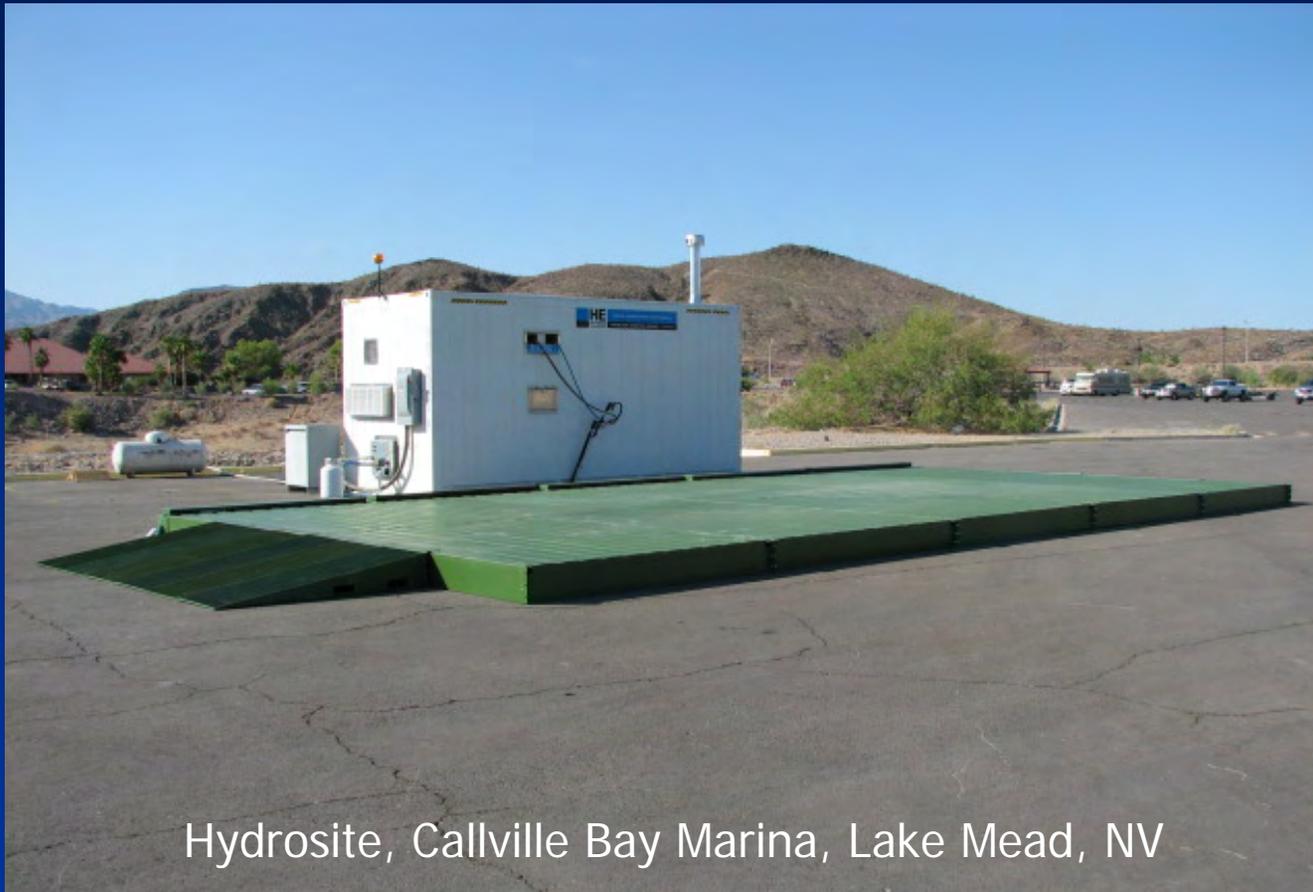


Hydro Engineering, Salt Lake City, UT



**STOP AQUATIC  
HITCHHIKERS!**

# Decontaminating Process



HydroSite, Callville Bay Marina, Lake Mead, NV



**STOP AQUATIC  
HITCHHIKERS!**