



Reducing the Introduction and Distribution of Non-native Aquatic Invasive Species through Outreach and Education

(RIDNIS Project)

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What Are Non-native Aquatic Invasive Species?

Non-native Aquatic Invasive Species (NIS) are introduced organisms -- fish, invertebrates, algae, vascular plants, pathogens, etc. -- that cause economic or environmental harm, or harm to human health. Impacts from NIS include:

- Reduced diversity and abundance of native plants and animals
- Degradation of water quality and wildlife habitat
- Impairment of recreational activities such as swimming, boating and fishing
- Impairment of infrastructure such as irrigation canals, levees and power plants
- Losses to fisheries and aquaculture production
- Diminished property values
- Increased threats to public health and safety



Hydrilla (*Hydrilla verticillata*) forms a dense mat that shades plants below it. Easily spread by fragmentation from boating activities. Interferes with recreation and degrades fish and wildlife habitat. Cultured and sold as an aquarium plant. Listed as a Federal Noxious Weed (© Regents of the University of California).



Chinese Mitten Crab (*Eriocheir sinensis*) clogs fish salvage facilities, creates losses for fisheries, and is a potential vector for the human lung fluke. Commercially valuable and may have been intentionally introduced to establish a fishery (© Bureau of Reclamation).



Water Chestnut (*Trapa natans*), though not found in CA yet, is easily purchased through online water garden catalogues. Once it spreads, control is expensive and its dense growth renders recreational activities all but impossible (Vermont DEC photo).

More Education is Needed

A simple and consistent message needs to be communicated to the public. If consumers are made aware that actions such as dumping the contents of their aquarium into a water body can result in severe economic and environmental damage, they are less likely to continue that activity. A **Do Not Release** message, and suggestions for alternative methods of disposal, will be more likely to lead to responsible consumer behavior that results in fewer harmful releases of aquatic invasive species.

Seasonal flooding of ornamental ponds can introduce non-native invasive species into new areas. Waterfowl and aquatic animals can also transport invasive plants from one water body to another. Nurseries, landscape contractors, garden designers and landscape architects can help customers make responsible plant choices for their water gardens.



Channeled apple snail (*Pomacea canaliculata*) in a tank. Poses a serious threat to wetlands around the world through potential habitat modification and competition with native species. Voracious appetite for plants such as taro and rice. May serve as a vector for diseases and parasites. Likely introduced through the dumping of unwanted aquarium specimens. © www.thelisa.per.sg.

Industry as a Part of the Solution

Accepted industry Best Practices or Codes of Conduct can help govern decisions made by groups and individuals whose actions affect the spread of aquatic invasive species. Collaborative efforts by industry, scientists, natural resource managers, regulatory officials and other interested stakeholders have been initiated in California and other states such as Florida, Massachusetts and Minnesota. The Draft Voluntary Codes of Conduct developed at the Missouri Botanical Garden (2001) are being used as a model for preventing new introductions of horticultural origin. The Pet Industry Joint Advisory Council (PIJAC) is working with the U. S. Fish and Wildlife Service, Minnesota Sea Grant, and others on a national "do not release" campaign which encourages aquarium and water gardening hobbyists to use alternative disposal methods rather than releasing unwanted ornamental plants and animals into the environment.

The Great Escape: Pathways of Introduction

There are many ways that non-native species enter the San Francisco Bay-Delta:

- Discharges in ships' ballast water
- Releases from home aquariums (marine and freshwater)
- Dumping of live bait containers and packing materials
- Attached to recreational boats, shipping crates or fishing gear
- Escapes from shipments of live seafood, soil or seeds
- Transfers of aquaculture products or fish stocks
- Intentional introductions to establish new fisheries
- Propagations from ornamental ponds, landscape plantings or restoration sites
- Intentional introductions to control other pests
- Escapes from educational or research institutions, or biological supply houses



A Rogue's Gallery of Aquatic Invasive Species

Of the nearly 250 species that have invaded the San Francisco Bay-Delta, many have already caused significant economic and ecological damage. Of the species shown below, only the zebra mussel has not yet been found in the Bay-Delta.



Water hyacinth (*Eichhornia crassipes*) is a popular ornamental pond plant. It clogs waterways, limiting boating, swimming, and fishing. Shades out other aquatic plants (© Kerry Dressler/Center for Aquatic and Invasive Plants).



Smooth cordgrass (*Spartina alterniflora*) and its hybrid (*S. alterniflora* x *S. foliosa*) are invading the intertidal zone of the San Francisco Bay estuary. Cordgrass was intentionally introduced during a 1970s marsh restoration project (© Regents of the University of California).



Zebra Mussel (*Dreissena polymorpha*) fouls water supply and power plant pipes, and industrial facilities. Inhabits fresh and brackish water and negatively affects native mussels and fish. Has not established in the Bay-Delta but during border inspections has been found on boats and trailers entering California (© Sea Grant Nonindigenous Species Website).



Purple loosestrife (*Lythrum salicaria*) spreads through marsh habitats and out-competes native plants. As native plant communities are reduced, so are wildlife species that depend on them. May reduce spawning habitat for fish (© Western Aquatic Plant Management Society website).



Egeria (*Egeria densa*) forms dense beds that hinder navigation, disrupt recreational activities, clog irrigation intakes, slow water conveyance, and displace native vegetation. Cultured and sold as an aquarium plant (© Barry Meyers-Rice/The Nature Conservancy).



Asian freshwater clam (*Corbicula fluminea*) competes with native species and may have already displaced native mussels (© Noel Burkhead/USGS website).

The RIDNIS Project

GOAL: to prevent introductions of non-native aquatic invasive species into the San Francisco Bay and the Sacramento/San Joaquin Delta in California.



NIS represent a serious obstacle to successful ecosystem restoration -- a top priority for the California Bay-Delta Authority, a collaborative of state and federal agencies working with local communities to improve water quality and restore the Bay-Delta ecosystem.

The RIDNIS Project goal will be accomplished through two main approaches:

- **Educate industry** representatives involved in the importation, sale and distribution of live plants and animals about NIS issues and coordinate with them to address concerns.
- **Educate consumers** about the risks posed by NIS if they are released into the environment and the important role the public can play in preventing new introductions.



The following tasks will be completed under the RIDNIS project during 2004 and 2005: **1)** hold workshops with nursery and aquarium industry representatives to develop "Best Practices" or Codes of Conduct, **2)** create and distribute "Best Practice" Manuals, **3)** create educational materials in English, Spanish and Chinese, **4)** publish articles in industry trade magazines, **5)** create a short video about aquatic invasive species for commercial airlines and cable television, and **6)** maintain a RIDNIS project website.

What You Can Do To Help

- 🦀 Learn to identify species that are regionally and federally prohibited or restricted and don't purchase them
- 🦀 Verify the name of what you are buying (Genus and species) since common names frequently cause confusion as to the organism's real identity
- 🦀 Check live plant and animal shipments to make sure they are not contaminated with other species
- 🦀 NEVER release unwanted aquatic plants or animals into storm drains or any water body (lake, river, stream, ocean, lagoon, drainage ditch, etc.)!
- 🦀 Be part of the solution! Educate yourself and others in ways to prevent the spread of invasive aquatic species. Visit the RIDNIS website (address below).

For more information, please visit our website at <http://www.ridnis.ucdavis.edu> or contact:

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This work is funded by CBDA -- the California Bay-Delta Authority in cooperation with the University of California, Division of Agriculture and Natural Resources, Davis, California.



Caulerpa taxifolia is popular with home aquarists. Its introduction in CA is likely due to a tank dumping, via a storm drain or directly into the water body (© San Diego Regional Water Quality Control Board).



Caulerpa taxifolia in southern California. The Mediterranean strain of *C. taxifolia* was designated in 1999 as a prohibited species under the U.S. Federal Noxious Weed Act (© Merkel & Associates).