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Aquatic Gardens, Not Aquatic Pests: How to Practice Responsible Water Gardening

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Water gardening is popular in California, and many Californians enjoy growing aquatic plants in backyard ponds or home aquaria. Most of the plants used in gardens and landscaping do not invade or harm wildlands and waterways. But a few vigorous non-native species can, and do, escape from cultivation into natural landscapes where they cause a variety of ecological problems. These introductions occur when people dump unwanted plants into local storm drains, streams, or ponds, or when floods or wildlife transport them. Once released, invasive aquatic plants cause serious ecological and economic problems for California's water bodies. They can

- form dense stands along the shore or thick mats in open water. (Sometimes so much of the water surface is covered that migrating water birds cannot land.)
- crowd out native plants while providing little benefit to wildlife
- reduce light and oxygen levels underwater, killing fish and other aquatic life
- clog intake valves of irrigation systems and power plants
- reduce access to waterways for recreational and commercial boats
- use significantly more water than native species. For example, a 10,000-acre infestation of giant reed (Arundo donax) on the Santa Ana River in Orange County is estimated to use 57,000 acre-feet more water per year than native vegetation. (For equivalents between U.S. and metric systems of measurement, a conversion table is provided at the end of this publication.)

Because so many waterways are interconnected, one plant dumped in a local storm drain can travel for miles. Federal, state, and local agencies spend millions of dollars each year to remove invasive aquatic plants. Preventing their spread costs much less than removing the plants once they have escaped.

How You Can Help

It is vital to follow safe gardening practices:

- Build your water garden away from natural waterways.
- Plant non-invasive alternatives.
- Become familiar with the plants discussed in the brochure *Don't Plant a Pest!* It includes photos of invasive species and suggests alternative plants. Ask your local Master Gardener for a copy or contact the California Invasive Plant Council (510-843-3902 or http://www.cal-ipc.org). Consult your local aquatic gardening specialist to determine which plants are best for your setting.
- Grow plants in containers to reduce the likelihood that they will spread. This also simplifies pond maintenance.
- Dispose of unwanted pond plants by composting or sealing in plastic bags and placing in a trash container.
- Prevent introductions—do not purchase plants restricted by California law, especially when shopping on the Internet.

Avoid Using Invasive Species

To lessen the risk of environmental hazards, do not plant the following:

Brazilian Waterweed, Anacharis *(Egeria densa)*
Infests 7,000 acres in the Sacramento-San Joaquin Delta. Aggressively invades natural waterways, forming dense mats that impede water flow.

Eurasian Watermilfoil *(Myriophyllum spicatum)*
The most widespread submerged invasive aquatic plant in California and a serious problem in Lake Tahoe. Stems break easily, starting new infestations when spread by boats or birds.

Giant Reed *(Arundo donax)*
A serious problem along rivers and streams. Dense growth damages habitat while creating a fire and flood hazard. Variegated varieties may also be problematic and are not recommended.

Giant Salvinia *(Salvinia molesta)*
Illegal to sell in the United States. Floating mats up to 3 feet thick reduce light and dissolved oxygen in the water so that few living things can survive. Common salvinia *(Salvinia minima)* may be sold, but species are difficult to tell apart.

Hydrilla *(Hydrilla verticillata)*
Illegal to sell or possess in California. Has arrived in California mixed with shipments of water lilies and as a mislabeled aquarium plant. Fragments quickly start new colonies.

Parrotfeather *(Myriophyllum aquaticum)*
Forms dense mats that impede water flow. Stems are brittle and break easily. Spread by boats or migrating water birds. Occasional problem in California with great potential to spread.

Purple Loosestrife *(Lythrum salicaria)*
Invades stream banks and wetlands throughout the United States. One plant can produce over two million seeds. Has the potential to infest rice fields.

Uruguayan Water-Primrose or Creeping Water-Primrose *(Ludwigia hexapetala, L. uruguayensis, L. peploides)*
Crowds out native plants and reduces water quality. Dense mats slow water movement and may create habitat for mosquito larvae, which can carry West Nile virus. Although native *Ludwigia* species exist, do not collect them from the wild.

Water Hyacinth *(Eichhornia crassipes)*
Reputed to be the fastest-growing plant in the world. Can double in size in a week during hot weather. Forms dense mats that slow water flow. Seeds can live up to 20 years.

Yellowflag Iris *(Iris pseudacorus)*
Forms colonies along stream and pond margins. Listed as a noxious weed in Nevada, and expanding in Pacific Northwest. Increasingly common in California, and a serious problem in regions with similar climates.

Do not plant	Try these non-invasive alternatives instead
FLOATING OR ROOTED EMERGENT	
• giant salvinia *(Salvinia molesta)* • water hyacinth *(Eichhornia crassipes)*	• Cape pondweed *(Aponogeton distachyon)* • Pacific fairy fern *(Azolla filiculoides)* • yellow pond lily *(Nuphar polysepalum)*
SUBMERGED	
• Eurasian watermilfoil *(Myriophyllum spicatum)* • hydrilla *(Hydrilla verticillata)* • Brazilian waterweed, anacharis *(Egeria densa)*	• coontail or hornwort *(Ceratophyllum demersum)* *Note:* There are few safe alternatives to submerged plants. These plants spread freely, especially those that are not rooted.
POND MARGIN OR BOG	
• giant reed *(Arundo donax)* • purple loosestrife *(Lythrum salicaria)*	• Cape thatching reed *(Chondropetalum tectorum)* • clumping bamboos (*Bambusa multiplex* 'Alphonso-Karr,' 'Golden Goddess') • redtwig dogwood *(Cornus sericea)*, yellowtwig dogwood *(C. s. 'Flaviramea')*
• parrotfeather *(Myriophyllum aquaticum)* • yellowflag iris *(Iris pseudacorus)*	• common waterplantain *(Alisma plantago-aquatica)* • common yellow monkey flower *(Mimulus guttatus)* • Japanese iris (*Iris ensata* 'Variegata' and cultivars) • laevigata iris (*Iris laevigata* and cultivars) • mulefat *(Baccharis salicifolia)* • Siberian iris (*Iris sibirica* 'Butter-&-Sugar') • soft rush *(Juncus effusus)* • western blueflag iris *(Iris missouriensis, I. longipetala)*
• Uruguayan water-primrose or creeping water-primrose *(Ludwigia hexapetala, L. uruguayensis, L. peploides)*	• arrowheads *(Sagittaria latifolia, S. montevidensis)* • lobelias *(Lobelia cardinalis, L. fulgens, L. siphilica)* • pickerelweed *(Pontederia cordata)* • Wilson's ligularia *(Ligularia wilsoniana)*

Please contact your local Master Gardener for more information or go online to http://camastergardeners.ucdavis.edu.

We gratefully acknowledge support for this project from the *Elvenia J. Slosson Research Endowment for Ornamental Horticulture* and the *Alexander and Elizabeth Swantz Watershed Science Endowment*. Content and photos used in this publication were excerpted, with permission, from *Don't Plant a Pest: Suggested Alternatives for Invasive Aquatic Plants in California* by the California Invasive Plant Council. **Contributors:** Pat Akers, California Department of Food and Agriculture; Lars Anderson, USDA ARS Western Regional Research Center; Dave Allen, Shore Road Nursery (Port Angeles, WA); Carl Bell, UC Cooperative Extension (San Diego); Neil Bobo, Pond Revival (Berkeley); Holly Crosson, UC Davis Arboretum and UC Sea Grant Extension Program; Joseph DiTomaso, UC Davis Weed Research and Information Center; Jan Enderle, Orchard Nursery and Florist (Lafayette); Jeff Hart, Hartland Nursery (Walnut Grove); Randy McDonald, McDonald's Aquatic Nurseries (Reseda); Mary Pfeiffer, Shasta County Department of Agriculture; Don Shor, Redwood Barn Nursery (Davis); Rick Storre, Freshwater Farms (Eureka). Poster design: Will Suckow Illustration.

Resources Accessible Online

Web Sites

California Master Gardeners
http://camastergardeners.ucdavis.edu/

California Department of Fish and Game (CDFG), Invasive Species Program
http://www.dfg.ca.gov/invasives

California Division of Food and Agriculture (CDFA), Division of Plant Health and Pest Prevention Services, Integrated Pest Control Branch
http://www.cdfa.ca.gov/phpps/ipc/

California Invasive Plant Council (Cal-IPC)
http://www.cal-ipc.org/

Center for Aquatic and Invasive Plants, Institute for Food and Agricultural Sciences, University of Florida
http://aquat1.ifas.ufl.edu

Habitattitude
http://habitattitude.net/

PlantRight - California Horticultural Invasives Prevention Partnership (Cal-HIP)
http://www.plantright.org/index.php

Reducing the Introduction and Distribution of Non-Native Aquatic Invasive Species Through Outreach and Education (RIDNIS)
http://www.ridnis.ucdavis.edu/

The Nature Conservancy's Global Invasive Species Team
http://tncweeds.ucdavis.edu/

USDA National Invasive Species Information Center (NISIC)
http://www.invasivespeciesinfo.gov/aquatics/main.shtml

U.S. Geological Survey, Nonindigenous Aquatic Species
http://nas.er.usgs.gov/taxgroup/plants/default.asp

Washington State Department of Ecology Aquatic Plant Identification Manual
http://www.ecy.wa.gov/programs/wq/plants/plantid2/index.html

Western Aquatic Plant Management Society
http://www.wapms.org

Publications/Brochures

Aquatic and Riparian Weeds of the West
ANR Publication 3421
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=3421

Aquatic Nuisance Species Identification Cards ANR Publication SG010
http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=SG010

Catalog of Aquatic Invasive Species
http://www.clr.pdx.edu/projects/edoutreach/

Don't Plant a Pest: Suggested Alternatives for Invasive Aquatic Plants in California
http://www.cal-ipc.org

Do Your Part To Protect Our Waterways. Do Not Release Live Aquatic Organisms!
http://www.ridnis.ucdavis.edu/Docs/ERP-02-P37PosterEng.pdf

PlantRight Brochure
http://www.plantright.org/materials/pdfs/PlantRightBrochure.pdf

Recommended Voluntary Guidelines - Aquatic Horticulture Industry
http://www.ridnis.ucdavis.edu/NovWrkshp/FnlIndGlns.pdf

In Spanish

Invasores de la bahia
http://www.ridnis.ucdavis.edu/Docs/final%20Spanish%20brochure.pdf

In Chinese

Do Your Part To Protect Our Waterways. Do Not Release Live Aquatic Organisms!
http://www.ridnis.ucdavis.edu/Docs/ERP-02-P37PosterChnse.pdf

English Metric Conversions

English	Conversion factor for English to metric	Conversion factor for metric to English	Metric
inch (in)	2.54	0.394	centimeter (cm)
foot (ft)	0.3048	3.28	meter (m)
acre (ac)	0.4047	2.47	hectare (ha)
acre-foot (ac-ft)	1,233	0.000811	cubic meter (m^3)

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Ask a UC Master Gardener

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Invasive aquatic plants have escaped from water gardens into natural waterways, harming native plants, fish, and other aquatic life.

Water hyacinth surrounding boat. *Photo:* Bob Case

To prevent these introductions, do not dump plants from your water garden or aquarium into local storm drains, streams, or ponds.

Please contact your local Master Gardener for more information (http://camastergardeners.ucdavis.edu).

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How you can help:

- **Prevent introductions – DO NOT RELEASE** or purchase invasive plants, such as:

FLOATING

Giant Salvinia

leaves $^{1}/_{16}$ – $^{1}/_{2}$"

Water Hyacinth

leaves 4 – 8"
flower 2"

SUBMERGED

Brazilian Waterweed

leaf width $^{1}/_{4}$"

Eurasian Watermilfoil

leaf width $^{1}/_{2}$"

Hydrilla

leaf width $^{1}/_{8}$ – $^{1}/_{4}$"

POND MARGIN or BOG

Giant Reed

height up to 20'

Parrotfeather

height up to 1' above waterline, leaves $^{3}/_{4}$– 2"

Purple Loosestrife

height up to 6$^{1}/_{2}$'

Uruguayan Water Primrose

plant height 3'
flower length 1– 1$^{1}/_{2}$"

Yellow Flag Iris

height up to 6'
flower length 4 – 6"

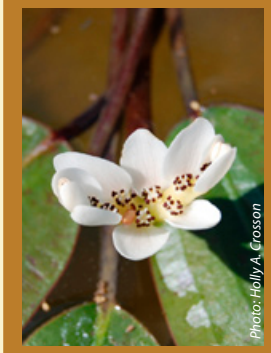
Aquatic Gardens, Not Aquatic Pests: How To Practice Responsible Water Gardening

How you can help:

- Grow plants in containers to reduce the chance of spread. Even native plants can grow vigorously in your pond.
- Dispose of unwanted pond plants by composting away from water bodies or sealing in plastic bags and placing in a trash container.
- Build your water garden away from natural waterways.
- Plant non-invasive alternatives, such as:

FLOATING

Cape Pondweed



flower 2–4"
leaves 3–8" (length), 2" (width)

Yellow Pond Lily

flower 4–6"
plant height up to 24"

SUBMERGED

Coontail or Hornwort

leaf length 3"

NOTE:

There are few safe alternatives to submerged plants.

These plants spread freely, especially those that are not rooted.

POND MARGIN or BOG

Arrowhead

flower spike 3"
plant height 2–3'

Common Yellow Monkeyflower

flower 1–2" wide
plant height 4–20"

Lobelias

flower spike 1'
plant height 3'

Pickerelweed

flower spike 3–4"
plant height 3½'

Western Blueflag Iris

flower 4 – 6" long
plant height 8 – 20"