Movement of Invasive Aquatic Plants Through Water Gardening

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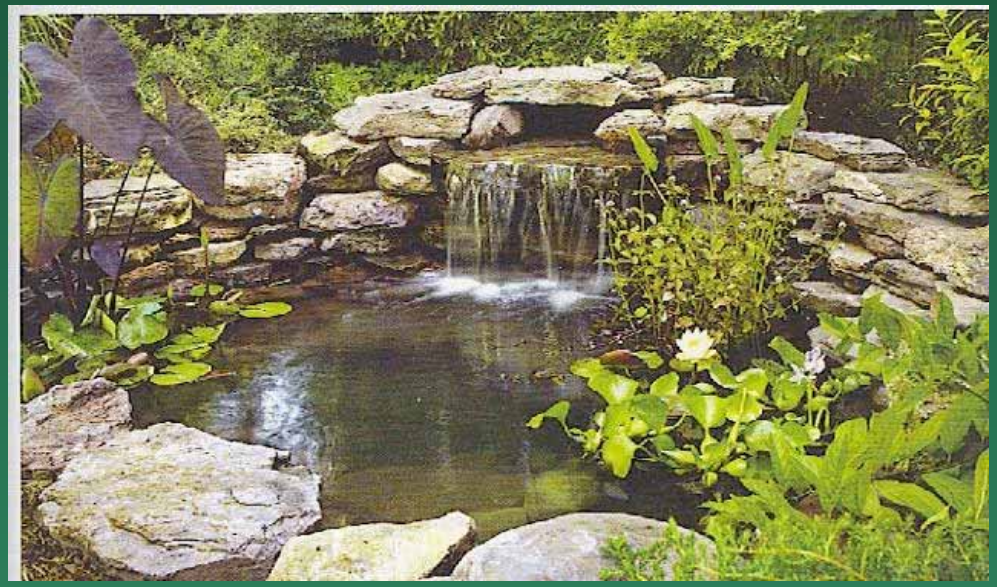


Aquarium and Garden Plants Out of Control

Invasive Aquatic Animals

From Around the Globe

- Faster transport times
- Better packaging
- Catalogs
- Internet
- Plant exchanges
- Aquarium/ gardening groups
- Easy traveling

Modes of Transport

Horticultural trade suspected pathway for invasive plants:

- 88% of invasive aquatic plants in southern New England cultivated plants
- 75% of invasive aquatic plants in New Zealand escaped or introduced plants

(Reichard and White 2001, Les and Mehrhoff 1999, Champion et al. 2000, 2001)

Previous study by the MN DNR:

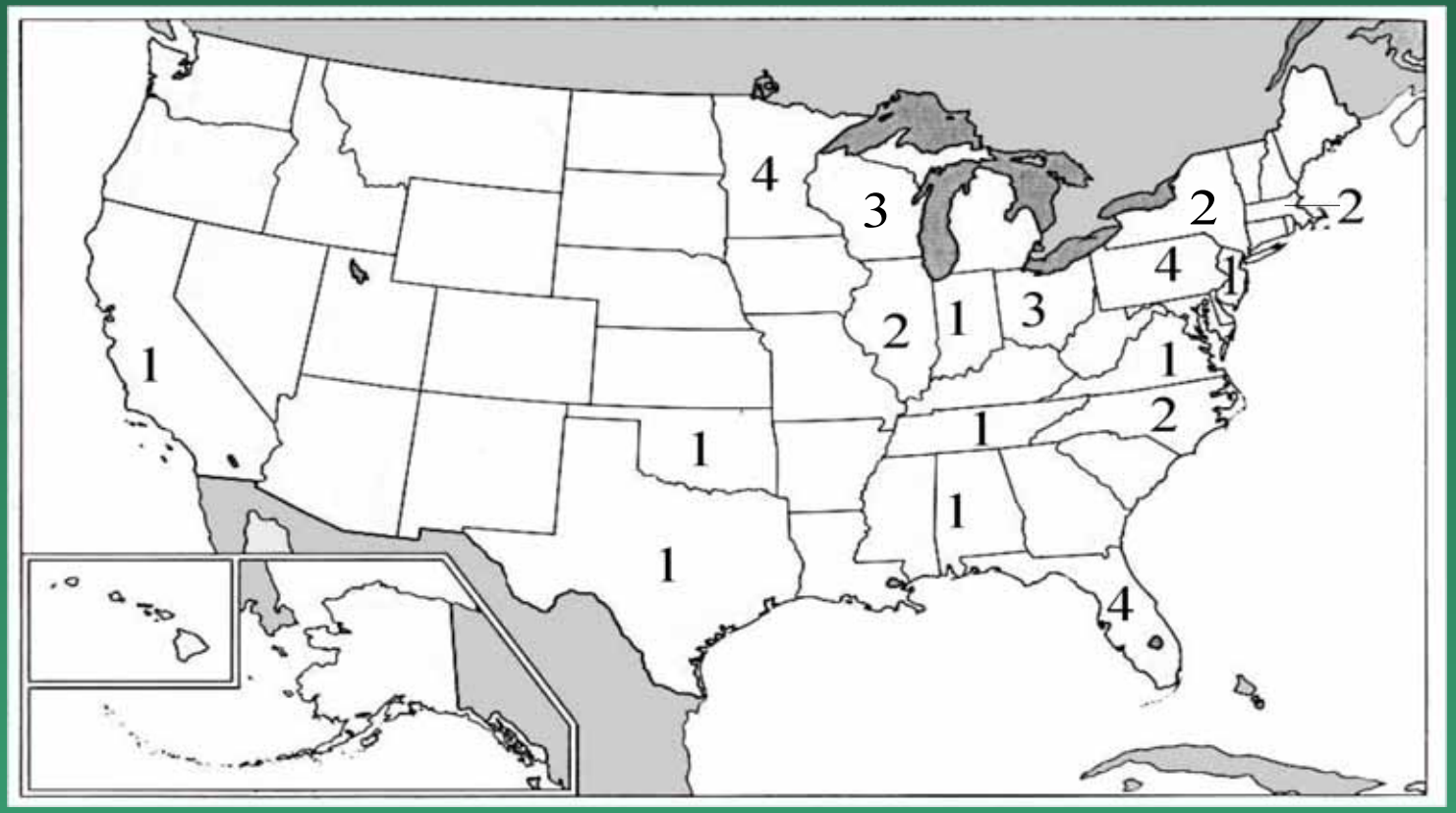
- Reviewed 30 catalog and internet businesses
- 96% of 700 taxa exotic
- 19 of 29 regulated plants listed for sale

Perleberg 1999

Goal: Quantify importance of water garden sales to potentially expanding the distribution of aquatic plants and animals

- sale of regulated plants
- rate of unintentional plants
- presence of seeds
- mis-identification
- additional organisms

Locations of vendors in study



United States map courtesy of The General Libraries, The University of TX at Austin

Typical Orders Received

In the greenhouse

Overall Incidental Receipts

Total No. Orders: 40

Incidental Receipt Rate:

Overall 93%

Plant 90%

Invasive 10%

Seed 43%

Animal 80%

Algae/Moss/Fungus 63%

Incidental Receipt	No. of purchases with incidental receipt	% of purchases with incidental receipt
Lemna minor	30	75
Azolla caroliniana	22	55
Unknown	20	50
Spirodela punctata	13	33
Salvinia minima	10	25
Utricularia sp.	8	20
Myriophyllum sp.	3	8
Wolffia sp.	3	8
Spirodela polyrhiza	3	8
Cabomba caroliniana	2	5
Ceratophyllum demersum	1	3
Lemna trisulca	1	3
Leersia oryzoides	1	3
Marsilea sp.	1	3
Ricciocarpus natans	1	3
Egeria densa	1	3
Salvinia molesta	1	3
Potomogeton sp.	1	3
Potomogeton crispus	1	3
Hydrilla verticillata	1	3

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Ordered Regulated Plants

- Federal Noxious Weeds or Minnesota Prohibited Exotic Species
- Ordered from 13 vendors
- Received from 12 vendors
- *92% success rate*

Received MN Prohibited Exotic Species

- *Hydrocharis morsus-ranae* (MN)
- *Butomus umbellatus* (MN)
- *Lythrum salicaria* (MN)
- *Potamogeton crispus* (MN)

Federal Noxious Weeds Received

Alternanthera sessilis

Hygrophila polysperma

Seed bank assay

- 17 vendors
- 27 taxa
- Poaceae most common

Mis-identification

18% of orders had a mis-identified plant

Egeria densa

Elodea canadensis

Hydrilla verticillata

Incidental Animal Organisms

- 31 orders contained live animal species
- 30 of 40 orders contained invertebrates
- Aquatic vertebrates in 2 orders

G. Montz, MN DNR

Animal Frequency Distribution

Class/Specimen	# of orders	# of organisms
Gastropoda	17	48
Hirudinea	10	14
Diptera	9	28
Egg Mass	7	12
Oligochaeta	6	10
Coleoptera	5	10
Lepidoptera	4	5
Odonata	3	5
Acarina	2	2
Fish	2	2
Sphaeriidae	1	1
Amphipoda	1	1

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Results

- 90% of purchases contained plant receipts not ordered
- Regulated plant sent 92% of the time
- Seeds found in orders from 50% of the vendors
- 15% of plants mis-identified

Overall Risk for Movement of Plants

1. Sale of regulated plants largest risk
2. Confusion between species and uncertainty of correct identification
3. Unintentional movement of invasive aquatic plants

If there are approximately 1 million individual purchases/yr, and 10% of these include an unintentional invasive, there would be

100,000

opportunities for an invasive to be introduced.

Rare Events

- Increase the rate and geographic spread of an invasion
- Resulting nascent foci important front for spread

(Buchanan and Padilla 1999, Moody and Mack 1988)

Consequences of Movement

- New introductions
  - Hydrilla movement from Maryland to California
- Cryptic invasions
  - *Phragmites australis*

(Western Aquatic Plant Management Society 2002, Saltonstall 2002)

Potential Risks

- Expanded distribution of invasives
- Increased movement of genetic material

Acknowledgements

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