

Delaware Watershed

Delaware Watershed

There has been no concerted effort
to prioritize AIS management in the
Delaware Watershed

Delaware Estuary Aquatic Nuisance Species Survey

Name _____

Organization _____

Address _____

E-mail _____

1a) Please place an "X" beside the aquatic animal species that represent a potential ecological and economic threat to the aquatic communities of the Delaware Estuary.

<u>Animal Species</u>	<u>Scientific Name</u>
<input type="checkbox"/>	Resident Canada Goose <i>Branta canadensis</i>
<input type="checkbox"/>	Spiny Water Flea <i>Bythotrephes spp.</i>
<input type="checkbox"/>	Northern Snakehead <i>Channa argus</i>
<input type="checkbox"/>	Goldfish <i>Carassius auratus</i>
<input type="checkbox"/>	European Green Crab <i>Carcinus maenas</i>

From the list above, please rank the top three plant species that represent the greatest ecological and economic threats to the Delaware Estuary. (1= highest threat).

1. _____
2. _____
3. _____

2) Does your organization have a control or prevention program for any of the aquatic nuisance species listed above? If so, please describe the program and the approximate funding allocated in 2001. If volunteer hours were contributed to this project, please estimate the number of hours.

Types of Respondents

College or University – 3

Philadelphia Government – 2

Private Land Conservancy – 1

Federal Government – 1

Interstate Commission – 2

Private Water Company -1

Pennsylvania Agency – 5

Watershed Association - 1

ANS Survey Summary Questions 1A & 1B

Overall Concern Ranking (Question 1A)		Concern Ranking by Plant and Animal (1A)		3 Highest Concern Weighted Rank (Question 1B) 1st = 3, 2nd = 2, 3rd = 1 values)		Combined Rank (1A + 1B)	
Purple Loosestrife	13	Purple Loosestrife	13	Phragmites	24	Phragmites	36
Phragmites	12	Phragmites	12	Purple Loosestrife	18	Purple Loosestrife	31
Japanese Knotweed	9	Japanese Knotweed	9	Japanese Knotweed	10	Japanese Knotweed	19
Flathead Catfish	8	Eurasian Watermilfoil	7	Eurasian Watermilfoil	5	Eurasian Watermilfoil	12
Eurasian Watermilfoil	7	Garlic Mustard	6	Hydrilla	3	Hydrilla	9
Zebra Mussel	7	Hydrilla	6	Garlic Mustard	2	Garlic Mustard	8
Garlic Mustard	6	Curly Pondweed	4	Water Chestnut	2	Water Chestnut	6
Hydrilla	6	Water Chestnut	4	Hybrid Cattail	1	Curly Pondweed	4
Grass Carp	5	Reed Canary Grass	3	Chinese lobilia, L. Chinesnsis		Reed Canary Grass	3
Resident Canada Goose	5	Japanese Hops	2	Curly Pondweed		Hybrid Cattail	2
Asiatic Clam	4	Chinese lobilia, L. Chinesnsis	1	Fanwort		Japanese Hops	2
Curly Pondweed	4	Hybrid Cattail	1	Japanese Hops		Chinese lobilia, L. Chinesnsis	1
Rusty Crayfish	4	Fanwort		Narrow-leaved Cattail		Fanwort	
Water Chestnut	4	Narrow-leaved Cattail		Reed Canary Grass		Narrow-leaved Cattail	
Northern Snakehead	3	Flathead Catfish	8	Zebra Mussel	14	Zebra Mussel	21
Nutria	3	Zebra Mussel	7	Resident Canada Goose	9	Resident Canada Goose	14
Reed Canary Grass	3	Grass Carp	5	Flathead Catfish	4	Flathead Catfish	12
Bighead Carp	2	Resident Canada Goose	5	Grass Carp	4	Grass Carp	9
Black Carp	2	Asiatic Clam	4	Nutria	4	Nutria	7
Goldfish	2	Rusty Crayfish	4	Mute Swan	2	Rusty Crayfish	6
Japanese Hops	2	Northern Snakehead	3	Northern Snakehead	2	Northern Snakehead	5
Silver Carp	2	Nutria	3	Rusty Crayfish	2	Asiatic Clam	5
Chinese lobilia, L. Chinesnsis	1	Bighead Carp	2	Veined Rapa Welk	2	Mute Swan	3
European Green Crab	1	Black Carp	2	Asiatic Clam	1	Veined Rapa Welk	3
Hybrid Cattail	1	Goldfish	2	Silver Carp	1	Silver Carp	3
Mute Swan	1	Silver Carp	2	Bighead Carp		Goldfish	2
Released Pet Duck	1	European Green Crab	1	Black Carp		Bighead Carp	2
Spiny Water Flea	1	Mute Swan	1	European Green Crab		Black Carp	2
Veined Rapa Welk	1	Released Pet Duck	1	Goldfish		European Green Crab	1
Fanwort		Spiny Water Flea	1	Japanese Shore Crab		Released Pet Duck	1
Japanese Shore Crab		Veined Rapa Welk	1	Released Pet Duck		Spiny Water Flea	1
Narrow-leaved Cattail		Japanese Shore Crab		Spiny Water Flea		Japanese Shore Crab	
Tilapia		Tilapia		Tilapia		Tilapia	

AQUATIC SUPERTRAMPS OF THE DELAWARE VALLEY

Open your eyes!

You don't have to look far to see plant and animal invaders from another ecosystem.

Most of the weeds under your feet have been transported by humans from Europe and other continents.

Popular sport fish, like the channel catfish, German brown trout, and small-mouth bass have only been present in the Delaware River and tributaries since they were first stocked with these non-native fishes.

So, what makes a species a SUPERTRAMP?

- Invasive
- Non-native
- Exotic
- Alien
- Foreign
- Introduced
- Nonindigenous

These are all names for plant and animal species that grow and breed outside their native ranges.

We identify super successful, harmful invaders as *SUPERTRAMPS*, and foreign species that thrive in wetlands and waterways as *AQUATIC SUPERTRAMPS*.



www.pseas.sea.upenn.edu

Impacts of Aquatic Supertramps



Photo Credit: Oswald 'O' Sanger

Prey on native species

Large, introduced flathead catfish have a huge appetite for a variety of fish and shellfish including shad, surfscum crayfish, and blue crabs.



Photo Credit: Michigan Sea Grant
www.sea.umich.edu/engines/zebra.html

Compete with native species

Introduced zebra mussels usually win their struggles against native mussels for habitat and food, and may cause local extinctions of native species.



Photo Credit: Eray Dincel

Hybridize with native species

Hybrid cattails are a cross between a native and non-native cattail species. Vigorous hybrids may invade wetlands that are unsuitable for either parent species, and subsequently may reduce plant biodiversity.



Photo Credit: Friends of Blackwater

Alter ecosystems

Adult nutria weigh 15-20 pounds and can eat up to 25 percent of their body weight in vegetation each day. Their insatiable appetites, combined with construction of swim channels, converts highly productive wetland areas into barren mud flats.



Photo Credit: USFWS

Economic Damage

The Atlantic shipworm, introduced to the San Francisco Bay in 1913, resulted in \$3.1 billion (in today's dollars) in damage to wooden structures between 1919 and 1921. Nationwide, aquatic invaders are estimated to cause more than \$9 billion in damage each year.

PURPLE LOOSESTRIFE

CHARACTERISTICS



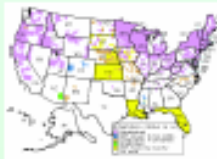
Ring around the roses, a pocket full of purple loosestrife??

Photo credit: Michigan Sea Grant
www.seagrant.msu.edu/education/ligustris.html

Purple loosestrife is an invasive perennial plant, adored by gardeners for its brilliant purple display. The plant can grow 1.2-3 m (4-10 ft.) tall along streams, ditches, and wetlands. Its flowers typically have 5-6 petals, and may be purple, pink, or even white. Primarily an invader of disturbed freshwater habitats, purple loosestrife spreads by seeds as well as root and shoot fragments. Seedling densities may reach as high as 20,000 plants per square meter!



INVASION HISTORY



Purple loosestrife distribution 2001

Map credit: National Agricultural Pest Information System
www.naris.gov/usa/usa/ligustris.html

Native to Europe, purple loosestrife was already well established in New England by the 1830s. A contaminant of ship ballast and livestock feed, purple loosestrife was also imported as a medicinal herb to treat dysentery and stop bleeding. Conversion of wetlands to crop fields, construction of canals for waterborne commerce, and a lack of natural herbivores enabled purple loosestrife to rapidly spread across inland areas. The bright purple flowers are also a favorite among gardeners; widespread distribution occurred through the sale of plants and seedlings.

WHY IS IT SUCH A NUISANCE?



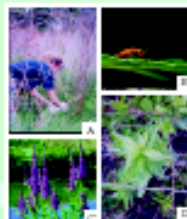
Monotypic stand of purple loosestrife

Photo credit: Michigan Sea Grant
www.seagrant.msu.edu/education/ligustris.html

Ecological impacts

- Purple loosestrife often forms dense, monotypic stands that prevent growth of native aquatic and riparian plants.
- Formation of monotypic stands alters the function and ecological value of a wetland. Changes in the plant community may impact waterfowl, mammals, and other aquatic life that rely on the wetland for food and habitat.

CAN IT BE CONTROLLED?



- A. Beetle release in purple loosestrife plot
- B. *Galerucella* beetle on purple loosestrife
- C. *Galerucella* leaf damage

Photo credit:
(A, C) Kevin Winkfield
(B, D) Michigan Sea Grant

Current techniques

- In 1997, Pennsylvania declared purple loosestrife a "noxious weed," prohibiting the sale, transport, planting, and propagation of purple loosestrife hybrids and cultivars like Morden Pink, Purple Spires, and the Rocket.
- Traditional control techniques, such as pulling by the root, burning, or applying herbicides are not effective in eradicating large stands of purple loosestrife. However, two European *Galerucella* beetles provide a promising biological control alternative. Feeding mainly on purple loosestrife, the beetles remove foliage and reduce flower and seed production.

www.pserie.psu.edu/seagrant

State of Delaware Restricted and Invasive

Japanese barberry
Periwinkle
Garlic mustard
Winged euonymus
Porcelain berry

Berberis thunbergii
Vinca minor
Alliaria petiolata
Euonymus alata
Ampelopsis brevipedunculata

Bradford pear
Marsh dewflower
Lesser celandine
Purple loosestrife
Reed canarygrass
Amur honeysuckle
Tartarian honeysuckle
Tree of heaven
Spotted knapweed

Pyrus calleryana
Murdannia keisak
Ranunculus ficaria
Lythrum salicaria
Phalaris arundinacea
Lonicera maackii
Lonicera tatarica
Alianthus altissima
Centaruea biebersteinii

Widespread and Invasive

Multiflora rose

Japanese honeysuckle

Oriental bittersweet

Japanese stilt grass

Japanese knotweed

Autumn olive

Norway maple

Common reed

Hydrilla

Morrow's honeysuckle

Mile-a-minute

Yam-leaved clematis

Privet

European sweetflag

Wineberry

Rosa multiflora

Lonicera japonica

Celastrus orbiculata

Microstegium vimineum

Polygonum cuspidatum

Elaeagnus umbellata

Acer platanoides

Phragmites australis

Hydrilla verticillata

Lonicera morrowii

Polygonum perfoliatum

Clematis terniflora

several species

Acorus calamus

Rubus phoenicolasius