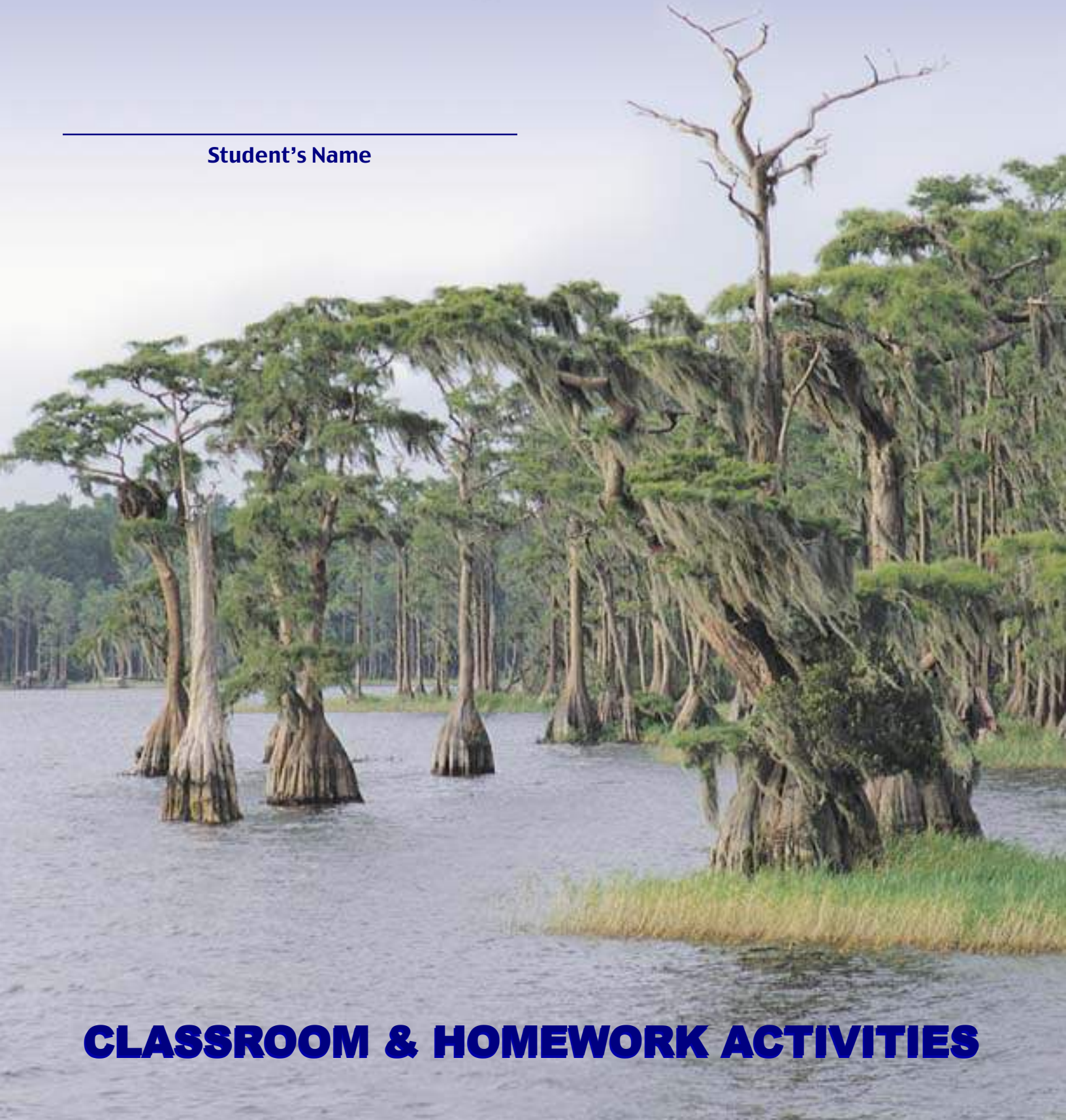
Understanding Invasive Aquatic Weeds



Student's Name

CLASSROOM & HOMEWORK ACTIVITIES

Native Aquatic Plants

Plants that live, grow, and reproduce in water are called aquatic plants. Aquatic plants grow in a variety of different forms. Some grow rooted in shallow water along shorelines and are called emergent plants because much of these plants stick up out of the water. Floating plants drift across water surfaces because their roots do not attach to the soils. Aquatic plants that grow almost entirely under water are called submersed plants.

Plants that evolve or develop in one geographic area or region are said to be native to that area. Native plants are a natural part of lakes, rivers, and wetlands and play several important roles in maintaining healthy aquatic ecosystems.

Native plant benefits include:

- shelter for fish, birds, and other wildlife,
- habitat for insects that are eaten by fish,
- protect shorelines from erosion,
- clean some pollution from water.

Non-Native Aquatic Plants

Plants that are moved, either on purpose or by accident, to other areas are called non-native, non-indigenous, exotic or alien. People move plants from one location to another for many reasons including food for themselves and for livestock, or because of the plant's unusual or beautiful appearance. Most of the crops grown for people and animals in the United States were brought from other continents. Examples include wheat from Asia, oats from Europe, millet from Africa, and potatoes from South America.

Invasive Weeds

Most plants brought to the United States provide great benefit, and only a few grow outside the areas where they are planted. A general rule is that about 1% of the plants introduced into the United States are capable of becoming severe weed problems in agriculture or natural ecosystems. Weeds are simply plants that grow where they are not wanted. Invasive weeds are plants that must be managed intensively or they will overgrow crops or completely take over natural ecosystems.

Invasive weeds share several common traits:

- grow fast and spread across large areas,
- reproduce several ways including seeds, buds, fragments, and shoots from roots,
- survive in many different temperature, light, water, and soil conditions,
- difficult to control, and nearly impossible to eradicate.

Although the number of invasive weeds is small, the costs are huge to the economy and to the environment.

For example, in the United States:

- Invasive weed damage and management costs exceed $30 billion each year.
- Invasive weeds cover about 100,000 million acres – about the size of California.
- Each day, invasive weeds cover an additional 4,500 acres of public lands and waters.

Invasive Aquatic Weed Problems

Native aquatic plants seldom cause problems because they have adapted to one another and their environments over millions of years. Many different insects and diseases also evolved with and control native plants, keeping them from becoming problems. The delicate balance among native plants is often destroyed when people introduce fast growing invasive aquatic weeds from other areas without the controls that keep them in check in their home waters.

Invasive aquatic weeds:

- destroy fish and wildlife habitat,
- block navigation and flood control,
- stop recreation like swimming and fishing,
- reduce tourism and property values,
- clog drinking, irrigation and hydroelectric power water pipes.

This booklet provides information on five of the world's worst invasive weeds that can destroy aquatic and wetland ecosystems and upset human uses of these waters. Some are regional threats. Others are invasive across the United States. These invasive aquatic weeds require continual monitoring and control.

Managing Invasive Aquatic Weeds

Prevention

The most effective way to reduce invasive aquatic weed problems is to prevent their introduction. This is much more difficult than it may seem. Americans love different or unusual plants and pets, and it is difficult to predict which may become problems before they are brought into the United States. Natural controls like diseases, herbivores, or climate may reduce a plant's growth in its native habitat. When freed from these controls, some plants thrive and become invasive weeds in their new surroundings. **You can help prevent problems by never putting aquarium plants in lakes, rivers, or wetlands.**

Early Detection and Rapid Response

Once invasive weeds become widely dispersed within a water body or across a large region, eradicating them becomes difficult and often impossible. Ecosystem managers frequently inspect waters for known invasive weeds and to find plants that do not seem to belong. When invasive weeds are discovered, management programs must begin immediately to reduce environmental damage and economic costs.

Integrated Plant Management

Because water is so important to our survival, scientists and ecosystem managers continually search for additional and more effective ways to control invasive aquatic weeds while preserving native plants and animals and protecting human health and property. Invasive aquatic weed control methods fit into four basic categories:

Biological *– Organisms, usually insects or plant diseases that feed on all or part of an invasive weed. More than a dozen biological controls have been studied and released to manage the invasive aquatic weeds that are included in this packet.*

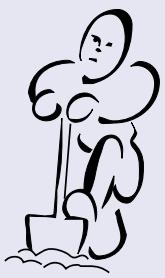
Chemical *- Also called herbicides, chemicals are tested for safety and registered with the United States Environmental Protection Agency to control invasive weeds. Eight types of herbicides are approved for use in public lakes and rivers to manage the invasive aquatic weeds in this packet.*

Mechanical *– Depending on the types of plants and conditions within the water body, many different kinds of machines cut, chop, shred, slurry, press, transport, and remove invasive aquatic weeds.*

Physical *- Means either hand pulling or temporarily changing the environment to control invasive weeds. Temporary environmental changes include reducing light with dyes, dewatering in the winter to freeze, dry, then burn plants, and flooding to shade underwater plants or flush floating plants out of the water body.*

Aquatic plant managers combine, or integrate, as many different methods as possible to control invasive weeds. Their goal is to reduce problems from invasive weeds and improve conditions for native plants and animals using the control methods that are best suited to conditions in and surrounding each water body. Water hyacinth control is a good example of integrated plant management. Several insects and diseases feed only on water hyacinth reducing plant size and the amount of seeds it produces. This reduces the amount, and also the cost, of herbicides needed to control water hyacinth. Mechanical harvesters remove water hyacinth from small areas where herbicides are not practical or if immediate removal is needed like dams and bridges. If possible, water is drained in the winter to freeze and then burn dried out water hyacinth.

Maintenance Control



The most important invasive aquatic weed management plan is known as maintenance control. Although invasive aquatic weed problems can be disastrous, they can be managed. Simply stated, maintenance control means managing invasive weeds at the lowest possible level by frequent inspections and control efforts. Invasive weeds still exist, but they are at such low levels that they cannot cause problems mentioned previously. This allows native plants and animals to flourish without interference from invasive weeds and with fewer impacts from smaller management operations.

Hydrilla

Hydrilla Plants

Applying Herbicides to Manage Hydrilla

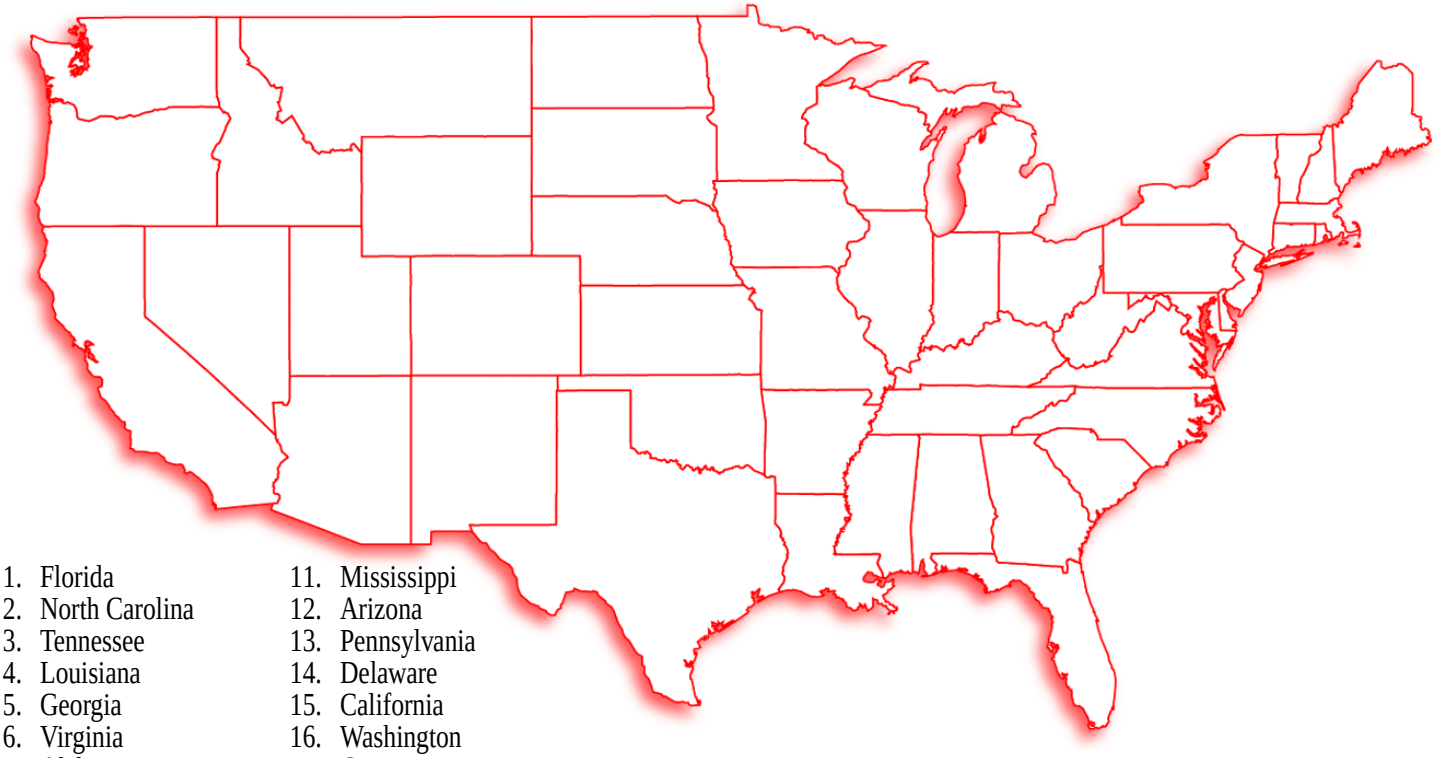
Hydrilla Covering a Florida Lake

Hydrilla

Hydrilla is a submersed plant that was brought to Florida in the 1950s from Asia to grow in aquariums. Back then hydrilla was planted in canals and rivers and picked to sell in pet stores. Hydrilla can grow more than an inch each day and can fill water bodies that are as deep as 15 to 20 feet in only one year. When it reaches the water surface, hydrilla grows across the top of the water forming tangled mats of plants. These mats wrap around propellers and make boating almost impossible. They also slow water flow and jam against bridges and dams, which can cause flooding. Hydrilla mats form a cover over water bodies, like an umbrella, that will not allow light or oxygen into the water, killing native plants, fish and other wildlife.

Hydrilla does not form seeds. New plants sprout from the roots and from broken stems. Each piece of stem can form its own roots and start a new plant. Hydrilla also forms buds on the stems and roots. The root buds, called tubers, can lie in the sand or mud for years before they sprout. Once hydrilla makes tubers, it is almost impossible to eradicate. Ecosystem managers use biological, mechanical, and physical controls along with herbicides to control hydrilla so it causes fewer problems. Because hydrilla can cause so many problems there are now strict laws against owning or planting this prohibited plant in the United States.

Activity: *Scientists track the spread of invasive weeds like hydrilla on maps. See how far hydrilla has spread across the United States since it was brought to Florida about 50 years ago. Write the number next to the states listed below on the correct state on the map. Color these states red. These states have hydrilla problems.*



1. Florida
2. North Carolina
3. Tennessee
4. Louisiana
5. Georgia
6. Virginia
7. Alabama
8. Texas
9. South Carolina
10. Maryland
11. Mississippi
12. Arizona
13. Pennsylvania
14. Delaware
15. California
16. Washington
17. Connecticut
18. Massachusetts
19. Maine

Water Hyacinth

Flowering Water Hyacinth Plants

Water Hyacinth Maintenance Control

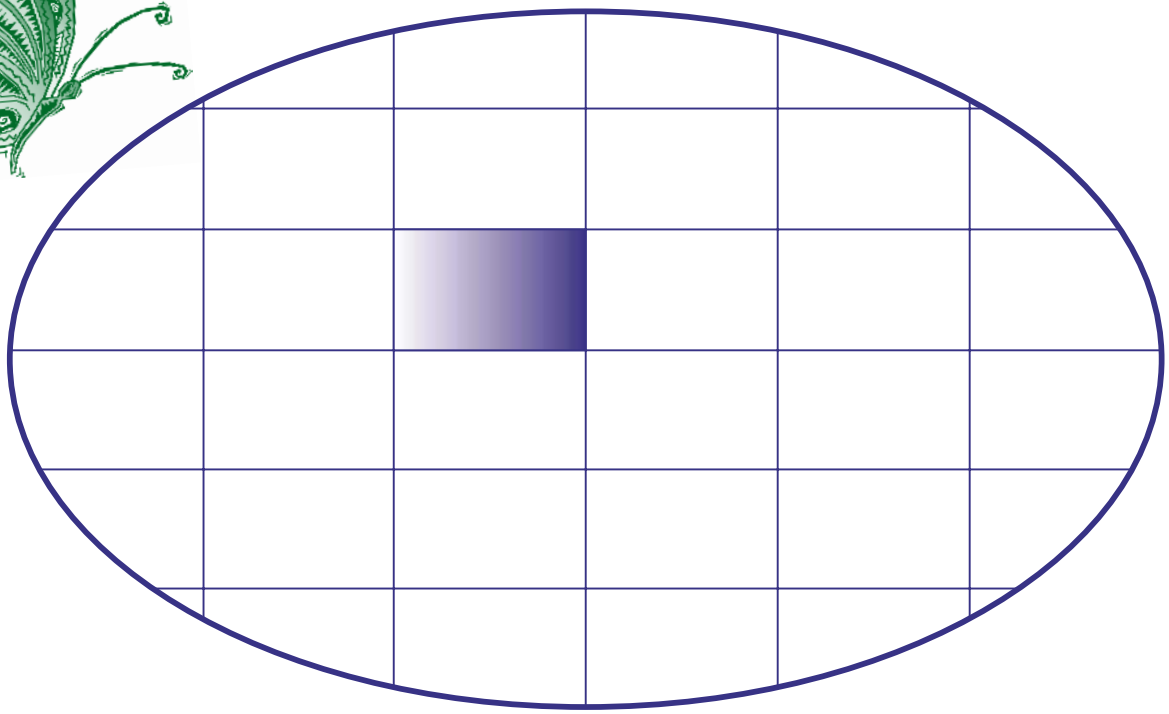
Water Hyacinth Clogging a Florida River

Water Hyacinth

Water hyacinth is one of the world's worst aquatic weeds. Gardeners who liked its beautiful lavender flower brought water hyacinth into the southeastern United States from South America during the late 1800s. It grew so fast that it quickly filled ponds and unwanted plants were thrown into nearby lakes and rivers. Ranchers also planted water hyacinth in ponds, lakes, and rivers to feed cattle. It turned out that cattle did not much like water hyacinth, but it was too late, water hyacinth was too widespread to eradicate. Each plant forms millions of tiny seeds. New plants also grow from buds on the parent plant.

Water hyacinth is one of the fastest growing plants known. Left alone, it can double the area that it covers in as little as two weeks. Since it floats, large mats or rafts of water hyacinth can drift in lakes and rivers and cause problems like stopping boats, clogging irrigation pipes, pushing over bridges, providing places for mosquitoes to live, and covering up native plants that are good for fish and wildlife. Large mats of water hyacinth also use up most of the oxygen in a water body so animals underneath cannot breath, and either move away or die.

Activity: *Although ecosystem managers cannot completely get rid of water hyacinth, they can keep it from becoming a problem by controlling small patches of plants before they grow into big mats. Water hyacinth covers one small area shown as the shaded block in the imaginary pond below. If water hyacinth can double every two weeks, color how many blocks would be covered in two weeks (green), four weeks (blue), and six weeks (red).*



Purple Loosestrife

An Insect that Eats Only Purple Loosestrife

Flowering Purple Loosestrife

Purple Loosestrife Filling a New York Wetland

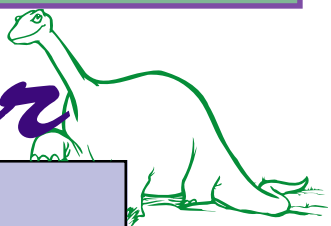
Purple Loosestrife

Purple loosestrife is an invasive wetland weed that came to the eastern United States about 200 years ago from Eurasia. Seeds may have traveled accidentally in ships or people may have planted purple loosestrife on purpose since it was used as a medicine for stomach problems. People spread purple loosestrife across North America to add color to wetlands and water gardens. It now causes problems in all 50 states except Florida. Purple loosestrife clogs irrigation canals and replaces native plants in wetlands and along lake and river shorelines. It is so bad in some places that people nickname it "Marsh Monster" and "Exotic Invader."

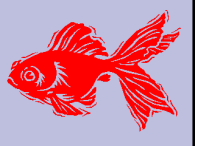
Purple loosestrife grows and spreads quickly in wet soils. It grows to almost six feet tall. Each plant flowers for about four months and produces two to three million seeds. Mowing purple loosestrife in roadside ditches spreads the seeds that stick to the mowing equipment and are carried to new areas. New plants also shoot up from the roots. Small amounts of plants can be dug out by hand. Herbicides are often used, but the most promising control might come from four different insects brought in from Europe that feed only on purple loosestrife leaves, roots, and seeds.

Activity: *Although poetry does not always follow strict rules of grammar to get its point across to the reader, the same components that make up sentences can be found in a line of poetry. Read the poem below about purple loosestrife then write words indicated on the blank lines to the right.*

Marsh Monster



I know a weed with an unusual name	verb _____
When it invades a wetland it is never the same	verbs _____
For it grows so fast, dense, and tall	adjectives _____
That good native plants barely live at all	adjectives _____
Wildlife and fish are harmed by this weed	subject _____
Because life is tough when it's hard to feed	subject _____
With pretty purple flowers it's easy to find	prepositions _____
Look in the wetlands and keep it in mind	prepositions _____
Purple loosestrife is the name of this invasive weed	subject _____
And control would be easy if not for the seed	subject _____
So I won't pick the flower that helps the weed spread	verbs _____
I'll show it to others to remove it instead	verbs _____



Invasive Aquatic Weeds

Eurasian Watermilfoil

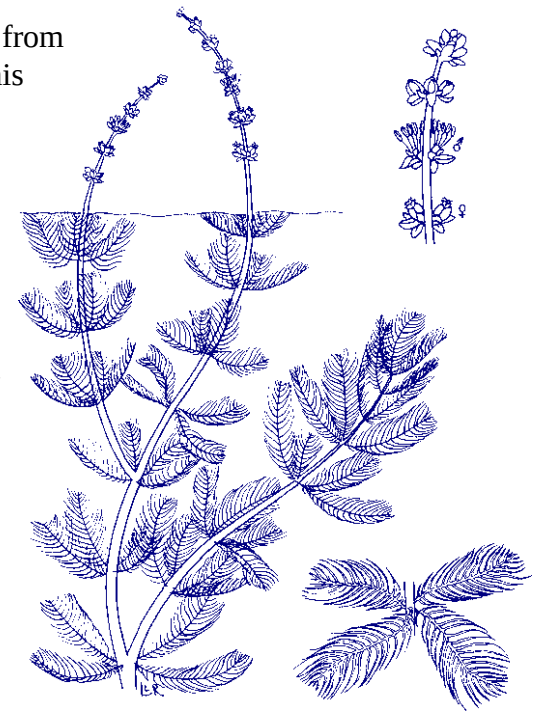
Watermilfoil Plants

Harvesting Watermilfoil in Washington

Eurasian Watermilfoil Filling a Minnesota Lake

Eurasian Watermilfoil

Eurasian watermilfoil was accidentally introduced into the United States from Europe in the 1950s. Boats, trailers and birds have since helped spread this invasive underwater weed throughout the country. Eurasian watermilfoil roots in the bottoms of lakes and rivers and grows to the surface to form dense mats of plants. These mats prevent water recreation like fishing, swimming and boating. It begins growing early in the spring and rapidly crowds out desirable native plants.



Eurasian watermilfoil is fragile and reproduces by stems breaking and forming new plants from small fragments. These fragments spread easily from one water body to another, especially on boat motors and trailers, and usually require control efforts to prevent problems. Aquatic plant managers must be careful when using mechanical harvesters to remove Eurasian watermilfoil because the many fragments created by cutting stems can spread the weeds to new areas. Herbicides that are tested and approved for use in water are often selected for controlling this invasive weed. Eurasian watermilfoil causes so many problems that laws now prohibit owning or transporting this plant in the United States.

***Activity**: Find the hidden words in the puzzle below that relate to Eurasian watermilfoil.*

INVASIVE	FRAGILE
EURASIAN	FRAGMENT
WATER	SPREAD
WEED	DENSE
LAKE	MAT
WETLAND	CONTROL
TRAILER	RECREATION
	PROHIBIT

I	A	B	T	S	B	T	W	R	N	N	M
E	N	Q	D	E	S	N	E	D	W	O	C
P	C	V	F	L	A	K	E	M	T	I	V
N	G	W	A	T	L	G	D	R	K	T	L
A	R	A	D	S	I	T	F	S	R	A	O
I	S	T	M	N	I	B	M	A	T	E	R
S	H	E	K	X	A	V	I	X	P	R	T
A	F	R	A	G	I	L	E	H	A	C	N
R	R	N	H	D	E	W	T	X	O	E	O
U	C	S	P	R	E	A	D	E	P	R	C
E	O	L	J	R	Y	B	M	N	W	N	P
L	F	R	A	G	M	E	N	T	S	D	Z

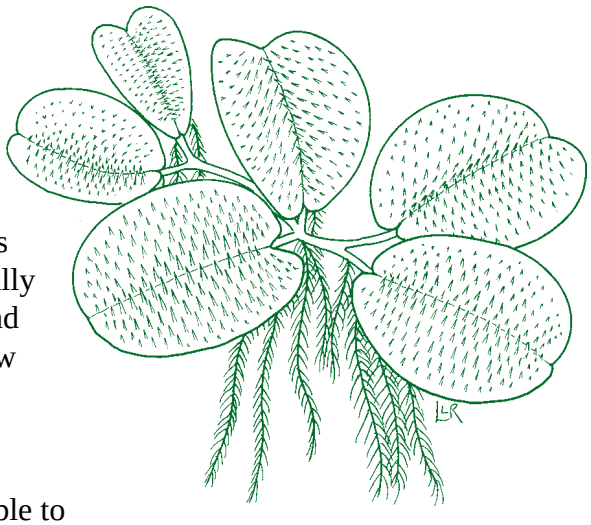
Giant Salvinia

Giant Salvinia Plants

Eradicating Giant Salvinia from a Texas Pond

Giant Salvinia Blocking a Louisiana River

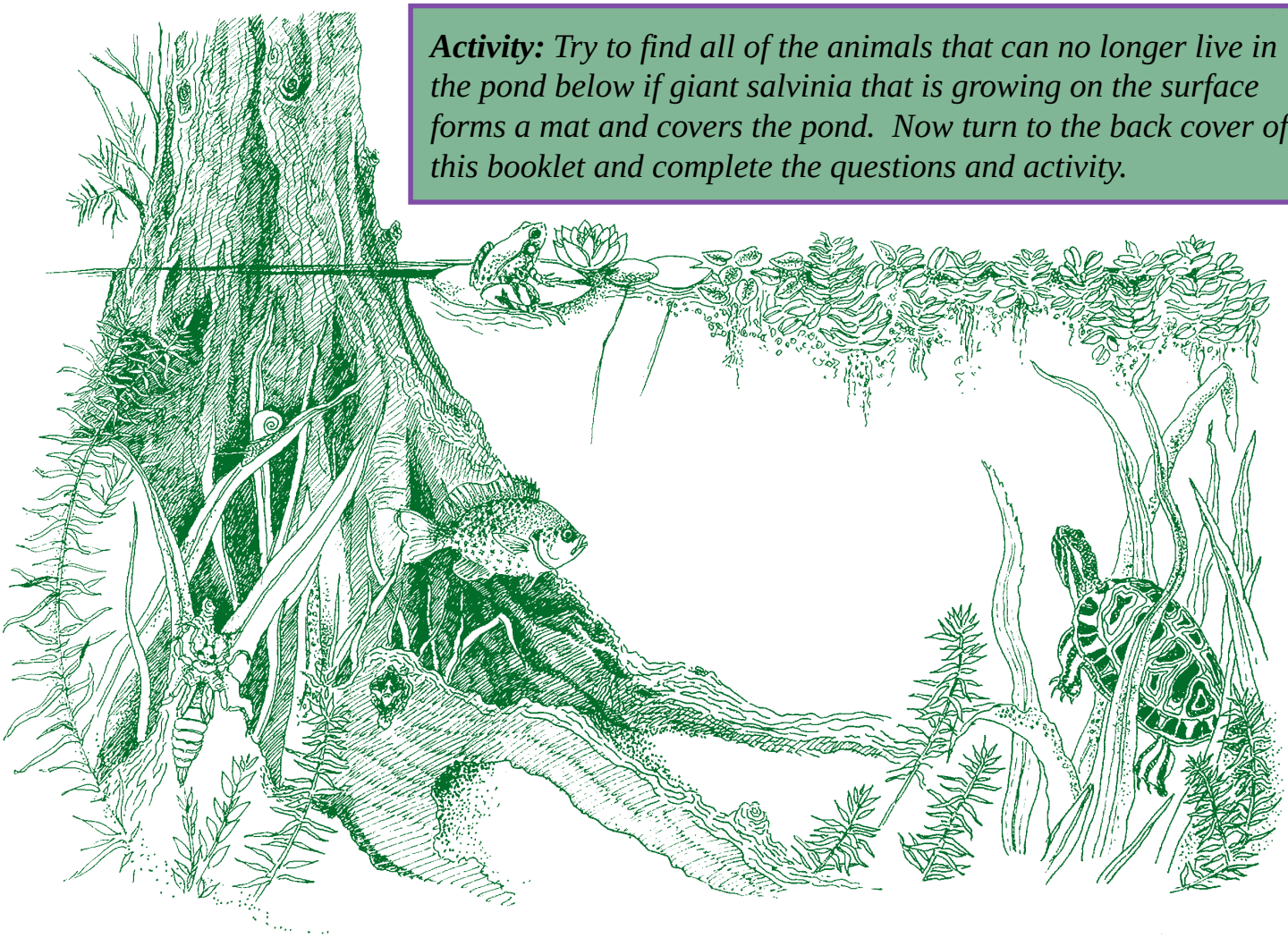
Giant Salvinia



Giant salvinia is a small floating fern from South America. People plant it in aquaria and outdoor gardens because of its unusual and delicate appearance. Although the leaves are only 1/2 to 1 inch long, as plants grow older they form chains that can quickly cover the surfaces of lakes, canals, and rivers. They can also pile up in dense mats that are several inches thick. These mats block sunlight that native underwater plants need to grow, eventually killing them. Mats also prevent oxygen from entering the water and suffocate fish and other aquatic animals. They also slow water flow and jam against bridges and dams, causing flooding and clogging irrigation pipes.

Once giant salvinia enters a large water body, it is almost impossible to eradicate. Each plant is small and hard to see, and some almost always escape management efforts. Giant salvinia caused terrible problems after it was released in Australia and South Africa. Therefore, there are now strict laws that prohibit owning or planting giant salvinia in the United States. These laws came too late to prevent giant salvinia from being planted in some waters. Now boats and trailers and even people who don't pay attention to the laws carry giant salvinia to new water bodies. Ecosystem managers use mechanical controls along with herbicides to keep giant salvinia under control so it causes fewer problems.

Activity: *Try to find all of the animals that can no longer live in the pond below if giant salvinia that is growing on the surface forms a mat and covers the pond. Now turn to the back cover of this booklet and complete the questions and activity.*



Job Opportunities in Aquatic Plant Management

Teacher

Researcher

Here are some of the many job opportunities in the Aquatic Plant Management field...

- Teacher
- Researcher
- Lab Technician
- Chemist
- Fisheries / Wildlife Biologist
- Herbicide Applicator
- Harvester Operator
- Flood Control / Irrigation Manager
- Plant Biologist
- Entomologist
- Law Enforcement
- Lake Manager
- Public Administrator

Lab Technician

Harvester Operator

Law Enforcement

For more information contact your school guidance counselor or log-on to the Aquatic Plant Management Society website at: http://www.apms.org

Glossary

acre: unit of measure about 15% bigger than a football field (208ft. x 208ft.)

aquatic plant: any plant that lives, grows, or reproduces in water

dense: closely crowded or packed together

ecosystem: the interactions of all plants and animals with their environment

entomologist: a person who studies insects

environment: the combination of all of your surroundings including air, water, and land

eradicate: to eliminate all members of a plant or animal species from an area

Eurasia: the region where the continents of Europe and Asia come together

fragment: a piece or part that is broken off, like a stem broken off from a plant

habitat: the surroundings where a plant or animal lives

herbivore: an animal that eats plants – aquatic examples include some fish, turtles, and insects

integrated plant management: a plan that uses combinations of tested and proven control methods for managing invasive weeds to preserve or improve native plant and animal habitat. Control methods include: biological, chemical, mechanical, and physical (see pg.4).

irrigation: applying water to land to grow crops

invasive weed: a plant that grows over or replaces native plants and animals or agricultural crops

management: keeping invasive weeds under control to reduce problems in the environment

organism: any form of animal or plant life

native plant: a plant found in North America before European settlers arrived

prohibited plant: a weed that is so invasive that state and federal laws prohibit its possession

shoot: new growth that forms from the roots or stems of a plant

shoreline: the line where land and water meet

weed: a plant growing in a place where it is not wanted

wetland: an area that is sometimes wet then dry

Questions & Activity

1. What is an aquatic plant?_____

2. What are the three growth forms of aquatic plants?_____, _____, _____

3. What are two benefits of native aquatic plants?_____, _____

4. List three problems caused by invasive aquatic weeds._____, _____, _____

5. Name three methods for managing invasive aquatic weeds._____, _____, _____

6. What is intergrated plant management?_____

Activity: Visit at least three of the websites below. Briefly describe the site that is most informative or interesting to you and what you learned. _____
_____
_____
_____

Allstate Resource Management
www.allstatemanagement.com

Applied Biochemists
www.appliedbiochemists.com

Aquatic Ecosystem Restoration Foundation
www.aquatics.org

Aquatic Plant Management Society
www.apms.org

Cerexagri
www.cerexagri.com

Cygnet Enterprises
www.cygnetenterprises.com

Ducks Unlimited
www.ducks.org

Florida Aquatic Plant Management Society
http://www.homestead.com/fapms/main.html

Florida Department of Environmental Protection
www.dep.state.fl.us/lands/invaspec

Griffin Corporation
www.griffinllc.com

Midsouth Aquatic Plant Management Society
www.msapms.org

Midwest Aquatic Plant Management Society
http://www.mapms.org/

National Sea Grant College Program
www.nsgo.seagrant.org

Northeast Aquatic Plant Management Society
www.neapms.org

Scott Aquarium
www.aquarium.usm.edu

SePRO Corporation
www.sepro.com

South Carolina Aquatic Plant Management Society
www.scapms.org

Syngenta Professional Products
www.syngentaprofessionalproducts.com

Texas Aquatic Plant Management Society
www.tapms.org

University of Florida, Center for Aquatic and Invasive Plants
http://plants.ifas.ufl.edu/
Teachers: Please visit this site for additional free information and posters about aquatic and invasive plants.

Western Aquatic Plant Management Society
www.wapms.org

The sponsors of this packet want to increase awareness of the importance of native plants in lakes, rivers, and wetlands, and the destructive potential of invasive weeds to these resources. Although invasive aquatic weeds are difficult or impossible to eradicate once they establish, they can and must be managed to conserve aquatic ecosystems. Text and photographs offer insight to biology, problems, solutions, and careers related to invasive aquatic plants and ecosystem management. We encourage you to present this material in the classroom as well as through take-home assignments.

Published by the Aquatic Plant Management Society, Inc. *To download additional copies and make suggestions and comments contact our website at www.apms.org. To obtain additional copies of this activity booklet, please contact scott.aquarium@usm.edu and request "Understanding Invasive Aquatic Weeds." There may be a small fee for postage.*