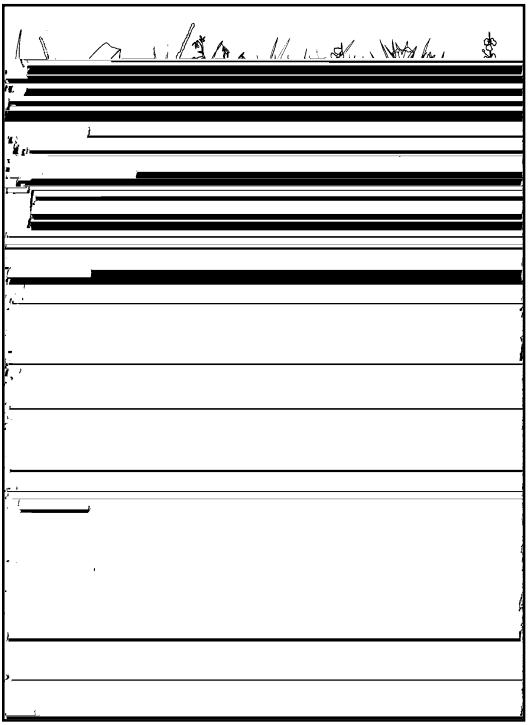
Aquatic Plants and Fish



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Acknowledgements

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Members of the external committee who assisted in the development of the pamphlet include Mark Swartout (Thurston County), Paul Wilson (Pend Oreille County), Sharon Walton (King County), Janine Redmond (Pierce County), Darla Wise (City of Puyallup), Ron Schultz (Black Hills Audubon Society), Terry McNabb and Ernie Marquez (Resource Management, Inc.), Maribeth Gibbons and Harry Gibbons (environmental consultants), Kathey Wyckoff (lake resident), Dan Robinson (lake resident), Barry Moore (Washington State University), Kathy Hamel and Linda Bradford (Department of Ecology), Diane Dolstad and Cindy Moore (Department of Agriculture), Janie Civille (Department of Natural Resources), John Farmer (Benton County Weed Board), Bill Wamsley (Lewis County Weed Board), Rick Johnson (Thurston County Weed Board) and Kathy Whitman (Seattle Parks and Recreation)

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Introduction

Aquatic noxious weeds are introduced plants that now threaten our native vegetation, fish, wildlife and their habitat. In recognition of the importance of controlling aquatic noxious weeds, this pamphlet was created by WashingtonDepartment of Fish and Wildlife (WDFW) to:

- expedite the Hydraulic Project Approval (HPA) process for projects designed to control early infestations of **aquatic noxious weeds**,
- provide guidance in selecting control methods for early and more advanced infestations of **aquatic noxious weeds**, and
- expedite the HPA process for applicants who want to control **aquatic beneficial plants** using small scale projects only (e.g., around docks and in swimming areas).

Note: This pamphlet does not address aquatic plant control through the use of grass carp, herbicides or water colum dye. See Appendix B (page 45) for information on these control methods.

Importance of Native Aquatic Vegetation...

Native aquatic plants play a significant role in lakes and streams by providing food and habitat for fish and wildlife, stabilizing shorelines, and contributing to nutrient cycling. Due to the importance of native aquatic plants to fish and wildlife, this pamphlet is primarily designed to address problems associated with aquatic noxious weeds (defined as those "aquatic" weeds that are on the state noxious weed list). Removal of native vegetation may be allowed in small amounts, but is generally discouraged. An over-abundance of native vegetation is usually an indication of excessive nutrients, such as nitrogen or phosphorus, or other problems in the lake or stream.

About This Pamphlet

This pamphlet may serve as the Hydraulic Project Approval (HPA) for some types of aquatic weed or plant control . If you use this pamphlet as your HPA for aquatic weed or plant control, please complete the following steps:

- Identify weed/plant and level of infestation (see page 8)
- Select method of control (see page 14)
- Determine appropriate timing for project if necessary (see Appendix F, page 54)
- Acquire other permits if necessary (see page 16)
- Conduct project following all provisions for selected control method(s) (see page 18)
- Complete and return project tracking form (see page 58)
- Check method effectiveness and periodically check for re-infestations (see page 38)

Note: Depending on the method you select to control aquatic noxious weeds or beneficial plants, an individual HPA may be required (see Table 2 on page 17).

Endangered Species Act

Some salmon populations in Washington State have been listed under the Endangered Species Act (ESA) and more stock listings are expected. In addition to several Snake River stocks already listed as endangered or threatened, several anadromous steelhead trout populations in the Columbia River were recently listed as threatened or endangered. Bull trout in the Columbia River are also proposed for listing. For threatened populations, the National Marine Fisheries Service (NMFS) will soon issue protective regulations. These regulations may affect your aquatic plant control project. Further information regarding potential listings can be obtained from your local Washington Department of Fish and Wildlife Area Habitat Biologist.

Definitions

To familiarize you with the terms used in this pamphlet we have provided the following definitions.

Aquatic plants: noxious weeds **and** beneficial plants that occur within the ordinary high water line of state waters (see following definitions).

Aquatic noxious weed: an aquatic plant on the state noxious weed list as prescribed by RCW 17.10.010 (10). See page 10 for a list of these weeds.

Aquatic beneficial plant: all native and non-native aquatic plants, except those on the state noxious weed list as prescribed by RCW 17.10.010 (10), and that are of value to fish life.

Authorization: Verbal approval given by a WDFW Area Habitat Biologist **followed by written confirmation or** an on-site visit by the Area Habitat Biologist **and written confirmation**. Authorization may result in a timing restriction on the control project**.**

Bio-degradable: material, such as burlap, that is capable of being readily decomposed by biological means, such as by bacteria.

Bottom barrier/screen: synthetic or natural fiber sheets of material used to cover and kill plants growing on the bottom of a watercourse by depriving plants of sunlight.

Control: level of treatment of aquatic noxious weeds as prescribed by RCW 17.10.010(5).

Diver-operated dredging: the use of portable suction/hydraulic dredges held by SCUBA divers to remove aquatic plants.

Drawdown: decreasing the level of standing water in a watercourse to expose bottom sediments and rooted plants.

Early infestation: an aquatic noxious weed whose stage of development, life history, or area of coverage make 100 percent control and eradication, as prescribed by RCW 17.10.010 (5) likely to occur.

Eradication: kill or kill and remove all individuals from a plant population so that the plant species no longer occurs on the site. See "control."

Entrained: the entrapment of fish into a watercourse diversion without the presence of a screen, into high velocity water along the face of an improperly designed screen, or into the vegetation cut by a mechanical harvester.

Hand cutting: removal or control of aquatic plants with hand-held tools or equipment, or equipment carried by a person when used.

Hydraulic Project Approval: a written approval for a hydraulic project signed by the director of the Department of Fish and Wildlife, or the director's designates, or an "Aquatic Plants and Fish" pamphlet issued by the Department which identifies and authorizes specific aquatic noxious weed and aquatic beneficial plant removal and control activities.

Mechanical harvesting and cutting: the partial removal or control of aquatic plants with the use of mechanical harvesters which cut and collect aquatic plants, and mechanical cutters which only cut aquatic plants.

Purple loosestrife: *Lythrum salicaria* or *Lythrum virgatum* as prescribed in RCW 17.10.010 (10) and defined in RCW 17.26.020 (5b).

Rotovation: the use of aquatic rotovators which have underwater rototiller-like blades to uproot aquatic plants as a means of plant control.

Shoreline: the line marking the edge of a body of water within the permittee's property boundaries.

Spartina: *Spartina alterniflora, Spartina anglica, Spartina x townsendii* and *Spartina patens* as prescribed in RCW 17.10.010(10) and defined in RCW 17.26.020 (5a).

Viable: any plant or plant part that is capable of taking root or living when introduced into a body of water.

Weed rolling: the use of a mechanical roller designed to control aquatic plant growth.

ecology of the target noxious weed and environmental characteristics of the site. All control strategies are considered and usually some

Steps You Will Need To Follow and Complete

Step 1 - Plant or Weed Identification

The first step in addressing your aquatic plant problem is to identify the aquatic beneficial plants and noxious weed(s) in your lake or stream. This includes identification of the stage of noxious weed infestation. The control strategies/methods available will vary depending on the plant species targeted for control and the level of infestation. If, for example, you have noxious weeds growing among beneficial plants, you should choose a technique that thoroughly removes the noxious weeds and minimizes the loss of beneficial plants.

Plant Identification

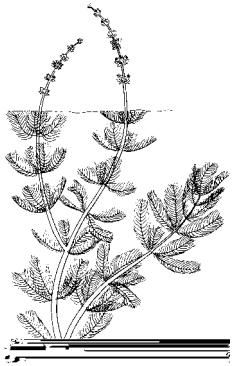
First you must collect a sample of the plant you want to identify. If you plan to seek help in identifying the plant, put the aquatic plant in a ziploc bag with as much intact material as possible, including the flower if available. Double bag, refrigerate and take to the county weed board as soon as possible. If you are attempting to identify an emergent plant, put the plant in a paper towel and put in a ziploc bag and refrigerate. Again, take the sample to the county weed board as soon as possible.

The drawings in this section can help you identify aquatic noxious weeds. However, some species are very difficult to identify correctly. For example, the aquatic noxious weed Eurasian watermilfoil and the native milfoils are extremely difficult to distinguish. Experts sometimes rely on DNA testing. To ensure positive identification it is recommended you contact your county weed board or Ecology. This is especially important in determining whether the problem plants are noxious weeds or beneficial plants. Remember this pamphlet primarily addresses noxious weeds. Other pamphlets/brochures listed in the reference section can also assist with plant identification (e.g., *Aquatic Plants* by King County Surface Water Management and *A Citizens's Manual for Developing Integrated Aquatic Vegetation Management Plans* by Ecology, and *Wetland Plants of the Pacific Northwest* by US Army Corps of Engineers).

Native plants provide important fish and wildlife habitat functions. If you have an **aquatic beneficial plant** over-abundance problem, this pamphlet may serve as the HPA for small-scale control projects and will provide guidance on other control options available to you.

If your problem plant is an **aquatic noxious weed** included in the following list, then this pamphlet may serve as your HPA for several methods of control. Aquatic noxious weeds are non-native, invasive plants that can become established and outcompete native species. These invasive plants can degrade fish and wildlife habitat as well as decrease usability of swimming, boating and fishing areas. Their control and/or elimination is necessary and important for Washington's fish and wildlife. Many aquatic species reproduce from plant fragments that have the ability to

Eurasian watermilfoil
Myriophyllum spicatum

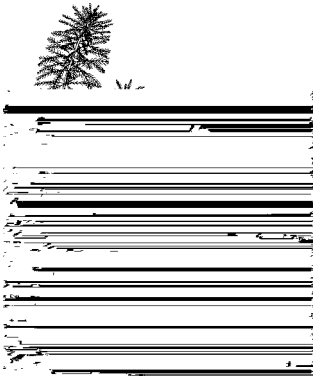


Eurasian watermilfoil grows submersed, tolerates a wide range of water conditions, and often forms large infestations. Stems are reddish-brown to whitish-pink, branched and commonly grow to lengths of six to nine feet. Leaves are deeply divided, soft and feather-like, and are about two inches long. They are arranged in whorls of three to six leaves about the stem. Flowers of Eurasian watermilfoil are reddish and very small. They are held above the water on an emersed flower spike that is several inches long. The plants are spread primarily by stem fragments.

Brazilian elodea
Egeria densa

Brazilian elodea grows submersed, is rooted in the sediment, and sometimes has floating white flowers. Leaves grow in whorls of four (or eight), are greater than one-half inch long and less than one-quarter inch wide. The plants are spread by stem fragments.

Parrot-feather
Myriophyllum aquaticum



Parrot feather is an emersed plant that trails along the ground or water surface. Leaves are oblong, deeply cut and feathery like and bright blue-green in color. Like most water milfoils, parrot feather leaves are arranged in whorls about the stem. Leaves are in whorls of four to six and the stems can be five feet long. Stems trail along the ground or water surface, becoming erect and leafy at the ends. The plants are spread by stem fragments.

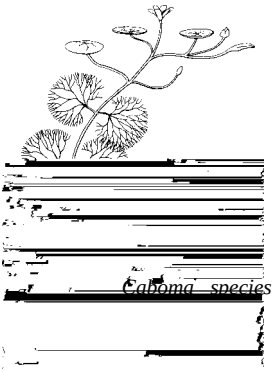
Hydrilla

Hydrilla verticillata

Hydrilla closely resembles Brazilian elodea and our native common elodea (*Elodea canadensis*). The primary distinguishing feature of Hydrilla is the presence of tubers that form on the roots. Hydrilla has small prickles on its leaves that give the plant a rough feel. Hydrilla typically has 3 to 8 leaves in a whorl around the stem. Hydrilla has three means of spreading: stem fragments, tubers and turions.

Fanwort

Cabomba caroliniana



Cabomba species

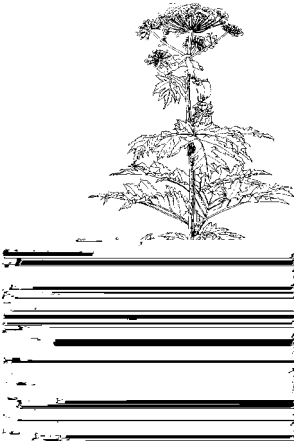
Fanwort has distinctive fan-shaped submersed leaves arranged in pairs on the stem. Distinctive, but small, floating leaves may be present. Floating leaves are long (less than one-half inch) and narrow (less than one-quarterrs aneavecwhite flowers float on the waterrsurfacevecFanwort can regenerate and spread by stem fragments.

Reed canarygrass

Phalaris arundinacea

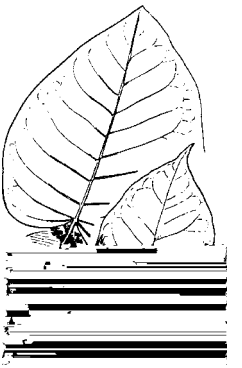
Reed canarygrass is a tall, perennial grass, sometimes exceeding 3 feet in height. The hollow stems have a reddish tinge at the top during the growing seasonvecFlowers and seeds are borne on culms which stand high above the leavesvecIt usually grows where soils remain saturated or nearly saturated during most of the growing season and is commonly found in roadside ditchesvec(Reprinted with permission of the University of Washington Press, *Vascular Plants of the Pacific Northwest* by Hitchcock, et aleav

Giant hogweed
Heracleum mantegazzianum



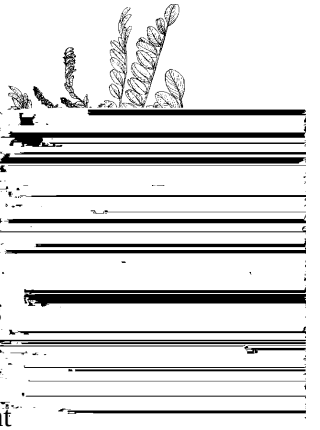
Giant hogweed grows 6 to 14 feet tall. Its height, thick hollow stems, hairy texture, and wide flower clusters make giant hogweed easy to recognize. The leaf stalks are blotched with deep purple and the flower stems are ribbed. The small white flowers of the hogweed are found in huge, flat-topped clusters at the end of long rays. The sap of giant hogweed is photoreactive, causes blistering, and requires careful handling.

Japanese knotweed
Polygonum cuspidatum



Japanese knotweed is a large, herbaceous, rhizomatous perennial. Its stems are erect, leafy, hollow and reed- or cane-like. Leaves are egg-shaped, abruptly pointed and more or less squared off at the base. This species of knotweed is frequently found in moist ravines or ditches. (Reprinted with permission of the University of Washington Press, *Flora of the Pacific Northwest* by Hitchcock and Cronquist).

Indigo bush
Amorpha fruiticosa



Indigo bush is a rapidly growing shrub, generally 4 to 12 feet in height. Its firm woody branches end in hairy green twigs. Alternate compound leaves have 9 to 31 leaflets. Small blue-violet to dark purple flowers grow in densely flowered, erect racemes at the tops of the bushes. The fruit is a straight to curved pod about one-fourth inch long, containing one or two small, smooth, reddish brown seeds. The green pods turn light brown when the fruits ripen.

Yellow nutsedge
Cyperus esculentus

Yellow nutsedge is associated with intensively cultivated row crops, turf, and other disturbed sites. It resembles a grass, but is distinguished by its triangular stems and three-ranked glossy leaves. It grows 12 to 32 inches tall. The flower cluster has numerous straw-colored flowers originating from a single point. Yellow nutsedge reproduces primarily by rhizomes, cormlike basal bulbs, and tubers. (Reprinted with permission of the University of Washington Press, *Vascular Plants of the Pacific Northwest* by Hitchcock, et al).

Salt cedar
Tamarix species

Salt cedar is a shrub or small tree that grows up to 20 feet tall with reddish brown bark. It is commonly found in moist areas in the desert but is sometimes grown as an ornamental. Leaves are scale-like, blue-green and up to

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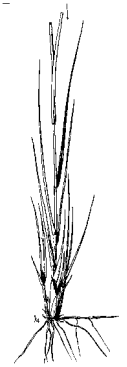
Spartina

Spartina anglica, alterniflora,* and *patens



Also known as smooth cordgrass, this perennial grass typically occurs in low salt and brackish marshes in sandy to muddy substrates where it may be inundated twice a day. This grass commonly grows 3 to 5 feet tall. Long flat leaves are 1 foot in length. The plant is lush green in summer and fades to gold in the fall. (Reprinted with permission of the University of Washington Press, *Vascular Plants of the Pacific Northwest* by Hitchcock, et al).

Step 2 - Determine Level Of Infestation

If you have determined that an aquatic noxious weed problem exists and have identified the plant, it is important to define the extent of the infestation. Are there only a few scattered noxious weeds present, a few localized highly dense patches, or are they widespread? If there are a few plants or they are localized, then you most likely have an **early infestation** and immediate control is needed to prevent further spread.

If you have an early infestation of aquatic noxious weeds, contact Ecology and your county weed board immediately.

If the plant you are concerned about is already well established, you may need a different control strategy. For all levels of infestation please consider the value and importance of developing an Vegetation Management Plan (VMP)- see page 6.

Step 3 - Select Method of Control

Now that you have an idea of the plant species and level of infestation, here is a guide to recommended control methods and options. After determining if your intent is to control an aquatic noxious weed or an aquatic beneficial plant, select one of the classifications below. Then go to Table 1 to select the method(s) recommended for that classification.

Table 2 will help you decide the HPA permit requirements of the control methods(s) you select.

Class 1 • Early infestation of an aquatic noxious weed: contact Ecology and the county noxious weed board, and select an appropriate small scale manual control method. A long term control strategy through development of a VMP is highly recommended (page 7).

Class 2 • Well-established infestation of an aquatic noxious weed: contact the local noxious weed board and select an appropriate small scale manual control method. A long term control strategy through development of a VMP is highly recommended (page 7).

Class 3 • Isolated, aquatic beneficial plants at nuisance levels: select a small scale manual control method, and develop a VMP to keep the plants at an acceptable level while maintaining fish and wildlife habitat.

Class 4 • Well established and widespread beneficial aquatic plants at nuisance levels: select an appropriate manual control method, and develop a long term control strategy through development of a VMP (page 7).

Table 1.
Recommended Methods of Weed/Plant Control

KEY.....

- **-** Not recommended for this type of weed/plant problem
- **0** Of some use for this type of weed/plant problem
- **+** Recommended for this type of weed/plant problem

* for reed canarygrass control only

** sometimes used for removal of water lilies

Caution: this table only gives a general summary of HPA requirements, please read specific requirements in the provisions of each control method selected (beginning on page 18).

Table 2.
"General" HPA Requirements For Aquatic Noxious Weed and Beneficial Plant Control

	Aquatic Noxious Weeds			Aquatic Beneficial Plants		
Control Method	Pamphlet HPA	Pamphlet HPA and WDFW Authorization	Individual HPA[1]	Pamphlet HPA	Pamphlet HPA and WDFW Authorization	Individual HPA[1]
Hand Pulling or Hand Tools					[2]	
Bottom Barriers		[2]			[2]	
Weed Rollers		[2]				
Mechanical Cutting and Harvesting						
Diver Dredges		[2]				
Dragline and Clamshell Dredges						
Rotovators						

[1] Applicants may apply for individual HPAs for projects that exceed pamphlet limitations/thresholds

[2] Prior authorization from WDFW is required for projects that exceed specified thresholds

Step 4 - Acquire Other Permits If Necessary

This Hydraulic Project Approval pertains only to the provisions of the Washington State Fish and Wildlife Codes. It is the permittee's responsibility to apply for and obtain any additional authorization from other public agencies (local, state and/or federal) that may be necessary for this project.

Use of this pamphlet as the HPA for removal or control of aquatic plants does not preclude the need to obtain and follow other applicable rules and regulations.

With one phone call to the Washington State **Permit Assistance Center** you can get information on environmental permits issued by federal, state or local government. (360) 407-7037

For example, some projects may require review under the State Environmental Policy Act (SEPA)- this is coordinated through your local jurisdiction and may require completing a checklist. Smaller projects are generally exempt from SEPA requirements. Before you start an aquatic plant removal or control project contact the **Permit Assistance Center (PAC) at (360) 407-7037.**

Phone numbers of agencies and departments that may require permits or have other involvement are listed in Appendix E: Agency Contacts (page 42).

Step 5 - Control Methods - Provisions (Requirements) and Recommendations

This section contains specific information on each type of control method including:

- general description
- advantages and disadvantages
- HPA requirements (individual, pamphlet or pamphlet with authorization)
- provisions (requirements that must be followed for each control method)

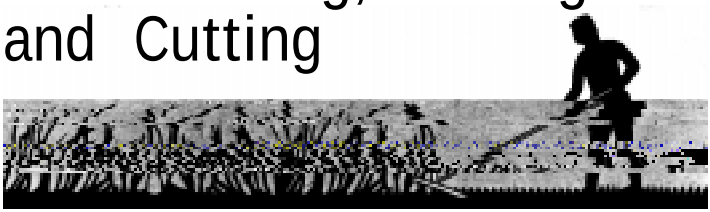
remove and properly dispose of all viable residual plants and viable plant parts from the equipment prior to the equipment's use in a body of water.

6. Existing fish habitat components such as logs, stumps, and large boulders may be relocated within the watercourse if necessary to properly install the bottom barrier, screen, weedroller or to operate the equipment. These habitat components shall not be removed from the watercourse.

7. Alteration or disturbance of the bank and bank vegetation shall be limited to that necessary to conduct the project. All disturbed areas shall be protected from erosion, within seven calendar days of completion of the project, using vegetation or other means. The banks shall be revegetated within one year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure 80% survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. After prior authorization by the Department, the requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.

8. Due to potential impacts to sockeye spawning areas, prior authorization by the Department shall be required for activities in Baker Lake and Lakes Osoyoos, Ozette, Pleasant, Quinault, Sammamish, Washington, and Wenatchee. Authorization may or may not be given for the activity, and if given, may require mitigation through a written agreement between the applicant and the Department for impacts by the activity to the spawning area.

Hand Pulling, Raking and Cutting



Hand pulling is similar to pulling weeds out of a garden.

Rakes for aquatic plants usually have a rope attached to the handle to facilitate a longer swath of plant removal.

A nonmechanical weed cutter is two, single-sided stainless steel blades forming a “V” shape and connected to a handle which is tied to a rope. The cutter is then thrown out about 20 feet into the water. As the cutter is pulled through the water it cuts a 48-inch wide swath through the vegetation.

Note: Raking shall not be conducted in Baker Lake and Lakes ... Wenatchee without prior authorization by WDFW, due to potential impact to sockeye spawning areas.

Advantages

Site specific
Species specific (hand pulling)
Low impact to native plants
(except raking)
Immediate plant removal
Low cost

Provisions

F (page 53). Aquatic noxious weed control projects may be completed year-round. The pamphlet shall be on the job site at all times.

- Common provisions 1, 2, 3, 4 and 5 (see page 19).
- Due to potential impacts to sockeye spawning areas, prior authorization by the Department shall be required for raking in Baker Lake and Lakes Osoyoos, Ozette, Pleasant, Quinault, Sammamish, Washington, or Wenatchee. Authorization may or may not be given for raking, and if given may require mitigation through a written agreement between the applicant and the Department for impacts by raking to the spawning area.
- Work shall be restricted to the use of hand-pulling, hand-held tools or equipment, or equipment that is carried when used.
- Removal or control of aquatic beneficial plants to maintain an access for boating or swimming shall be allowed along a maximum length of 10 linear feet of the applicant's shoreline. Projects for boating and swimming which cover a larger area shall require prior authorization by the Department.
- Where possible, the entire plant shall be removed when using hand-pulling for aquatic noxious weeds.
- Existing fish habitat components such as logs, stumps, and large boulders shall not be removed or disturbed.

Recommendations

Hand pulling is suitable primarily for small initial infestations and long-term maintenance projects. For noxious weed control it is most successful if you remove the entire plant, including the roots. Native plants should be left undisturbed as they will help control the growth of noxious weeds, and they provide benefits to fish and wildlife. Plant fragments generated during noxious weed removal must be carefully contained (using a net or similar device) and removed from the water to avoid re-rooting or drifting onshore. This technique is best conducted on calm days to minimize the movement of fragments offsite.

Use of hand cutters or rakes is also effective for small areas and for confined locations around docks and floats. Plant stems and fragments will float to the surface following cutting or raking and must be promptly removed from the water to avoid re-rooting at other locations. Use of

these techniques should also be reserved for calm days to avoid plant stems and fragments from floating offsite during removal.

Purple loosestrife plant parts and roots must be removed from the site, however, permission is required to transport purple loosestrife. This is obtained by calling:

Department of Agriculture
Greg Haubrich
Weed Specialist
2015 South 1st St.
Yakima, WA 98903
(509) 576-3039, fax (509) 575-7858

For final disposal of purple loosestrife:

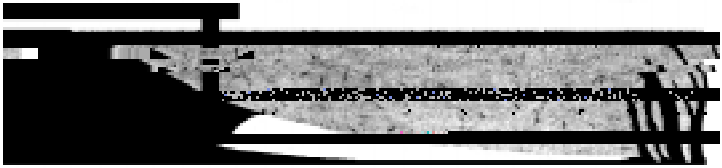
1. bag plant and roots,
2. allow plant material to dry and burn completely or,
3. deposit bagged material in landfill or other approved site.

To address long term plant management issues, the development of a Vegetation Management Plan is recommended (see page 7).

Hand pulling, raking and cutting is only allowed in small areas for beneficial plant control in recognitition of the spawning and rearing habitat they may provide for fish.

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 39, before you begin your project. You may also want to contact the WDFW Area Habitat Biologist for more information on priority species in your area.

Bottom Barriers



A bottom barrier covers the sediment like a blanket. By blocking light, it reduces the growth of aquatic plants.

Note: Bottom barriers shall not be installed in Baker Lake, Lakes Osoyoos, Ozette, Pleasant, Quinault, Sammamish, Washington, or Wenatchee without prior authorization by WDFW, due to potential impact to sockeye spedX

- Common provisions 4, 5, 6 and 8 (page 19).
- For removal and control of **aquatic noxious weeds**, bottom barrier or

Control of beneficial plants using bottom barriers is only allowed for small areas due to the use of aquatic vegetation for spawning and rearing by fish.

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 39 before you begin your project. You may also want to contact the WDFW Area Habitat Biologist for more information on priority species in your area.

Weed Rollers

Weedrollers are useful for controlling beneficial plants only in a small defined area. This technique “wears down” weeds by frequent agitation. Weed rollers consist of a mechanically driven roller that sets on the lake bed and is moved across an arc up to 270 degrees by means of a small electrical power unit. Plants are detached from the soil or flattened (inhibiting growth) by the roller and attached fins.

Note: Weed rollers shall not be installed in Baker Lake, Lakes

provisions listed below (in addition to the listed common technical provisions) are followed and the project is conducted within the timing guidelines in Appendix F (page 54). The pamphlet shall be on the job site at all times.

- Common provisions 1, 2, 3, 4, 5, 6 and 8 (page 19).
- Weed rollers shall not be used to remove an aquatic noxious weed **early** infestation. To remove or control all other infestation levels of aquatic noxious weeds, weed rollers shall not cover an area of more than 2,500 square feet. Weed roller projects covering a greater area shall require prior authorization by the Department.
- Where the intent is to remove or control aquatic beneficial plants, prior authorization by the Department shall be required.

Recommendations

Weed rollers are best used when control of all aquatic plants is desired. The area should be hand pulled before installing the weed roller. Following this, they may be used when necessary to maintain an area clear of plants. This pattern of use will minimize the production of plant fragments. Food grade oil is recommended to be used in the weed roller motor where possible.

To address long term plant management issues, the development of a VMP (page 6) is recommended. Prior authorization to use weed rollers for beneficial plant control is required due to the spawning and/or rearing habitat provided by this vegetation for fish.

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 39, before you begin your project. You may also want to contact the WDFW Area Habitat Biologist for more information on priority species in your area.

Diver Dredging

Diver dredging utilizes a small barge or boat carrying portable dredges with suction heads that are operated by SCUBA divers to remove individual rooted plants (including roots) from the sediment. Divers physically dislodge plants with sharp tools. The plant/sediment slurry is then suctioned up and carried back to the barge through hoses operated by the diver. On the barge or boat, the plant parts are sieved out and disposed of off-site. The water sediment slurry is filtered and discharged back to the water or piped off-site for upland disposal.

Note: Diver dredging shall not be conducted in Baker Lake, Lakes Osoyoos, Ozette, Pleasant, Quinault, Sammamish, Washington, or Wenatchee without prior authorization by WDFW, due to potential impact to sockeye spawning areas.

Advantages

Site specific
Species specific
No depth constraints
Used near obstacles

Disadvantages

Labor intensive
Slow
Potential fragment production
Temporary bottom disturbance and increased turbidity
Expensive

Provisions

The following provisions apply for both *aquatic noxious weed* and *beneficial plant* control or removal projects except where otherwise noted. This pamphlet serves as an HPA if all provisions listed below (in addition to the listed common technical provisions) are followed. Aquatic noxious weed control projects may be completed year-round. Aquatic beneficial plant removal or control projects shall be completed within the timing guidelines in Appendix F (page 53). The pamphlet shall be on the job site at all times.

- Common provisions 2, 3, 4, 5, 6, 7 and 8 (page 20).
- If the intent of the project is to remove or control **aquatic beneficial plants**, prior authorization from the Department shall be required.

- Dredging shall be conducted at all times with dredge types and methods that cause the least adverse impact to fish life.
- Dredges shall be well-maintained and where practicable, food-grade oil in the hydraulic system should be used.
- Upon completion of the dredging, the bed shall not contain pits, potholes, or large depressions to avoid stranding of fish.
- Removal of plants and plant fragments from the watercourse shall be as complete as possible. This is especially important when removing or controlling aquatic noxious weeds. Plants and plant fragments shall be removed from the dredge slurry prior to its return to the watercourse. Dredged bed materials, including detached plants and plant fragments, shall be disposed of at an upland disposal site so as not to reenter state waters.
- A hydraulic dredge shall only be operated with the intake at or below the surface of the material being removed. The intake shall only be raised a maximum of three feet above the bed for brief periods of purging or flushing the intake system.

Recommendations

Considered a selective technique, diver dredging is particularly well suited for low-level, early infestations of aquatic noxious weeds. It can also be used to assist in long term maintenance following herbicide treatments. Diver dredging is not recommended for use to control aquatic beneficial plants.

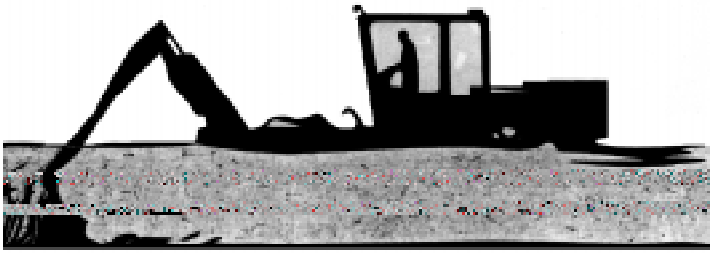
A temporary water quality modification permit from Ecology and a shoreline permit from your local jurisdiction (city or county) may be needed (see page 16). A permit from the Corps of Engineers may also be required. To address long term plant management issues, the development of a VMP is recommended (page 6).

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 38, before you begin your project. You may also want to contact the WDFW Area Habitat Biologist for more information on priority species in your area.

dredging operations. Dragline and clamshell dredges should not be used for early infestations of aquatic noxious weeds. To address long term plant management issues, the development of a VMP is recommended (page 6).

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 38, before you begin your project. You may also want to contact

Rotovation



Rotovators are floating machines that use underwater rototiller-like blades to uproot aquatic plants. Rotovation is not an appropriate technique for addressing early infestations of aquatic noxious weeds.

weeds due to the high potential for spreading of plant fragments. Individuals hiring rotovators should request to see maintenance logs for verification of decontamination of equipment.

To address long term plant management issues, the development of a VMP is recommended (page 6).

Because priority species of fish and/or wildlife may be present in the area of your proposed project, please refer to Appendix A: Priority Species on page 38, before you begin your project. You may also want to contact the WDFW Area Habitat Biologist for more information on priority species in your area.

Step 6 - Complete and Return Tracking Form

Completion and return of the tracking form will help WDFW better understand the nature and extent of aquatic weed control projects. The form is located inside the backcover of the pamphlet (see page 57). Your participation in completing this form will also ensure that you will receive any future updates or changes to the pamphlet (techniques, provisions, timing tables, etc.). We are also interested in your comments on the pamphlet to ensure that future editions meet the needs of both the user and the resource.

Step 7 - Monitor for Reinfestation

Monitoring is one of the most important steps of noxious weed control. Early detection of reinfestations of noxious weeds and prompt follow-up can greatly increase the effectiveness of control efforts, reduce control costs, and decrease environmental impacts. Without monitoring and follow-up, a potentially effective control effort can be wasted. Monitoring should include:

- method effectiveness (the best basis for planning future control)
- checking for re-invasion of the noxious weed(s)
- checking for new infestations of different noxious weeds, particularly after disturbing the site and providing an open niche for weed establishment

The establishment of desirable native species will compete with future weed invasions. However, even when competing native vegetation has been established, weed species that were once present may re-occur or new species may appear.

Appendices

Appendix A: Priority Species

The Priority Species List is a catalog of those species identified by the Washington Department of Fish and Wildlife (WDFW) as priorities for management and preservation. These species require protective measures to ensure their perpetuation due to their population status, sensitivity to habitat alterations, and /or recreational, commercial, or tribal importance. Priority species include all State Endangered, Threatened, Sensitive, and Candidate species; animal aggregations considered vulnerable; and those species of recreational, commercial, or tribal importance that are also vulnerable.

Before you begin your aquatic plant control project, please read the following information and review the maps to determine if your project may impact the indicated species. If you are unsure of the impacts please contact your WDFW Area Habitat Biologist for localized information. For a complete listing of priority habitats and species please request a copy of the publication *Priority Habitats and Species List* from the nearest WDFW Regional office.

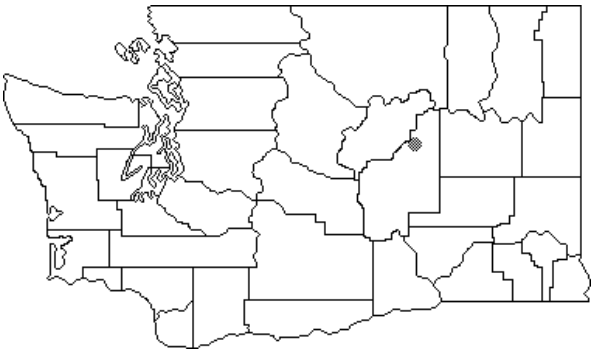
Olympic Mudminnow (*Novumbra hubbsi*)

Mudminnows breed from early March to mid-June. Male fish defend territories in clumps of vegetation, including seasonally flooded reed canarygrass, or over carpets of moss; females lay their eggs on the bottom substrate. They feed on a variety of aquatic invertebrates and

essential for early development, especially when immediately upstream from the quiet, soft bottom habitat of mature clams. Adult clams, as well as young clams in the final stages of maturation, live partially buried in soft mud or sand bottoms. The floater requires a relatively stable substrate to avoid being buried and/or suffocated by shifting sediments.

A decreasing area of stable, unpolluted habitat appears to be the most limiting factor for this species. The use of insecticides and herbicides may also negatively affect this species. If pesticide use is planned for areas where this species occurs, review Appendix B: Other Methods/ Chemical Control Methods for contacts useful when assessing pesticides and their alternatives (see page 45). This species should be considered when projects are planned which might cause erosion, siltation, or bedload movement in streams, fish blockage, deleterious effects on native fish populations, or those projects which might introduce non-native aquatic organisms.

Yuma Skipper *(Ochlodes yuma*)

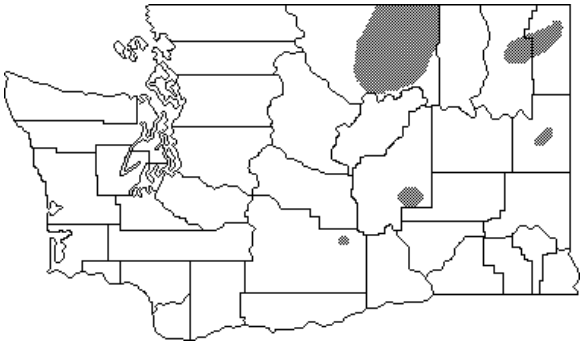


The Yuma skipper *(Ochlodes yuma*) is a butterfly species that should be one of the highest priorities for Washington butterfly conservation. It is found near dense hedges of the native, corn-like host plant, *Phragmites communis,* which grows along edges of seeps, springs, riverbanks, sloughs, canals, and lakes. This butterfly uses the host plant for egg deposition, larval nests, and as a larval food source. Adults take nectar from a variety of tall flowers.

If insecticide or herbicide use is planned where this species occurs, refer to Appendix B (page 44) for contacts helpful when evaluating pesticides and their alternatives.

Silver-bordered bog fritillary

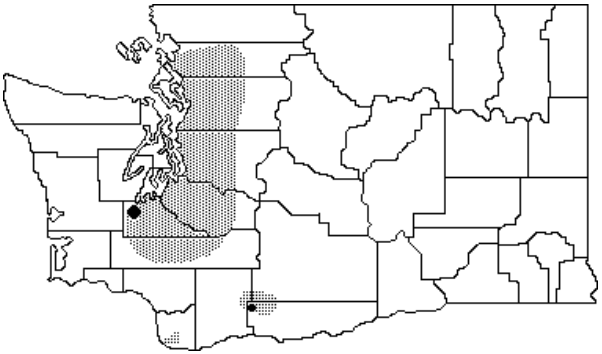
(*Boloria selene atrocostalis*)



In Washington, this butterfly occurs east of the Cascade Mountains in the Columbia Basin, and in Okanogan and Pend Oreille counties. Though numerous where it occurs, the distribution of this species is disjunct, with fewer than 20 sites known. This butterfly is strongly associated with boggy meadows and true bogs, with the northern bog violet.

The silver-bordered bog fritillary is a State Candidate species. Many localized populations of butterflies have been lost and a great many more are in jeopardy. The most common causes of butterfly habitat loss and human-caused mortality are development, logging, grazing, impoundments, and the use of herbicides. If insecticide or herbicide use is planned for areas where this species occurs, review Appendix B: Other Methods/Chemical Control Methods (page 44), which lists contacts that may be helpful when assessing pesticides and their alternatives.

Oregon Spotted Frog (*Rana pretiosa*)
Columbia Spotted Frog (*Rana luteiventris*)



Until recently, Columbia and Oregon spotted frogs were considered one species, the spotted frog, *Rana pretiosa*. However, recent evidence supports separate species designations. In Washington, there is only one known population of Oregon spotted frog west of the Cascades. Other lowland western Washington populations are believed to be extinct. In 1990, one specimen was found in Thurston County, Washington. This is the only confirmed sighting in western Washington lowlands in over 20 years. The Columbia spotted frog is found in parts of the Cascade mountains, and in areas of eastern Washington.

The Columbia spotted frog and the Oregon spotted frog are State Candidate species. The Oregon spotted frog is also a Federal Candidate species.

Both species of spotted frogs are highly aquatic, inhabiting marshes, and marshy edges of ponds, streams and lakes. Spotted frogs usually occur in slow moving waters, with abundant emergent vegetation, and a thick layer of dead and decaying vegetation on the bottom. The frogs take refuge in this layer when disturbed. Female spotted frogs tend to deposit their eggs near other spotted frog egg masses sometime in March to early April. The egg masses are not attached to vegetation, but rest on the bottom in shallow water (less than 12 inches deep).

If pesticide or herbicide use is being considered for areas where Columbia or Oregon spotted frogs exist, refer to Appendix B: Other Methods/Chemical Control Methods, which contains contacts useful when assessing pesticides and herbicides (see page 44).

Northern Leopard Frog

Appendix B: Other Methods

The following aquatic plant control techniques are less frequently used than those previously discussed, or do not require approval through the Hydraulic Code administered by WDFW. These techniques are therefore not addressed relative to HPA requirements (except in those few instances where it is appropriate) and are primarily included here for discussion and information purposes.

Biological Control Methods - Grass Carp

Sterile grass carp used to control aquatic vegetation have produced extremely variable results in Washington. In most cases their use has resulted in either complete eradication or no noticeable control of aquatic plants. Successfully using them to reduce aquatic plants to an intermediate level of abundance has seldom occurred. Therefore, grass carp should not be used in lakes unless complete eradication of aquatic vegetation is acceptable. Their use should be restricted to circumstances where potential adverse impacts are minimal, such as small ponds, closed ditch systems, and lakes with no outlet. Use of grass carp in large lakes should only occur in rare instances, under carefully defined conditions, and they should never be planted in rivers. In addition, grass carp should not be planted in lakes where submersed plant communities provide important habitat for fish and/or wildlife.

A fish stocking permit from WDFW must be obtained prior to planting grass carp in Washington waters. An individual HPA will also be required if installation of barriers, including screens, is proposed or required.

Chemical Control Methods - Herbicides

Traditionally, herbicides have been relied on to address many aquatic weed problems. In recent years, however, greater concern with environmental and human health impacts from herbicides has led to increased restrictions on their use. As a result, aquatic herbicide use has become more selective and is often part of a VMP (page 6). Application of aquatic herbicides is regulated primarily by Ecology and the Department of Agriculture. Each agency should be contacted for information on herbicide label restrictions, required applicator licensing, and other limits on use in aquatic environments (see Appendix E: Agency Contacts, page 52) . Also, local jurisdictions can further restrict or

prohibit aquatic herbicide use and should be consulted early. Lastly, aquatic herbicide use may be of direct concern to your neighbors. It is recommended that you contact them prior to planning any use of herbicides in the water.

Herbicides can adversely impact fish, wildlife and non-target plants. WDFW recommends that herbicide application be restricted to those circumstances where other weed removal or control techniques are not sufficient. Herbicides should only be used as part of an integrated plan

Washington Department of Ecology, RegionalContacts

Ecology provides information and permits on applying pesticides directly or indirectly to open bodies of water.

Eastern Region, Spokane	(509) 456-2873
Central Region, Yakima	(509) 457-7207
Northwest Region, Bellevue	(425) 649-7070
Southwest Region, Olympia	(360) 407-6292

Watershed Controls

The reduction of external nutrient and sediment inputs to lakes and streams can be accomplished through implementation of Best Management Practices (BMPs) in the watershed. Decreasing or eliminating the input of growth-stimulating nutrients like phosphorus and nitrogen to lakes and streams can help in the overall process of controlling aquatic weeds and plants. Use of BMPs in watersheds complements other in-lake weed control techniques and is a useful part of a whole lake plan (i.e., an integrated approach). Examples of homeowner BMPs include: regular septic tank maintenance, careful use of lawn and garden fertilizers, cleaning up pet wastes, and disposal of lawn clippings well away from the water's edge. Additional inputs of nutrients and sediment can be reduced by implementing prudent agricultural, forestry, construction and road maintenance practices in the watershed. Contact your local jurisdiction, Conservation District, WSU Extension Service, or Ecology regarding nutrient reduction programs for your area.

Physical Control Methods

Drawdown

Lowering the water level exposes plants and root systems to extreme temperature and moisture conditions (freezing and dry or hot and dry) and can effectively control some plants. Control of aquatic weeds using drawdown is more common in reservoirs and ponds than in natural lakes. It is important to accurately identify the plant species to be controlled by this technique due to the variability of responses among different plants. In western Washington where mild, wet winters are common, drawdown has not been effective for control of many aquatic weeds. This technique can also adversely affect native plants, associated animal communities and recreational use of the water body. An individual HPA is required

for water level manipulations to remove or control aquatic vegetation. Technical provisions for water level manipulation projects can be found in WAC 220-110-338.

Water Column Dye
This technique utilizes dark-colored dyes to reduce sunlight penetration into the water column thereby shading aquatic plants. Applications are restricted to closed systems (ponds or lakes with no outflow), and effectiveness is generally best when used in shallow water bodies during the early part of the growing season. All label recommendations should be closely followed during use. Contact Ecology and your local jurisdiction for further permit information and requirements.

Appendix C: Sockeye Salmon and Kokanee Spawning Habitat

Most sockeye spawning occurs in rivers and streams that are tributary to lakes, but often substantial numbers of sockeye salmon spawn along lake shores in areas where ground water percolates through the gravel (upwelling). Generally, sockeye utilize areas along lake shores where the gravel is small enough to be readily dislodged by digging. Sockeye, however, may also utilize lake shore areas with other substrate types and sizes, depending largely on the presence or absence of upwelling. Populations of lake spawning sockeye are found in Baker Lake and Lakes Osoyoos, Ozette, Pleasant, Quinault, Sammamish, Washington and Wenatchee.

Kokanee prefer smaller streams that are tributary to lakes for spawning areas, but like sockeye will utilize lake shore areas as well. Along lake shores they generally spawn in areas with pea-sized gravel and prefer locations that have upwelling. Native stocks of kokanee in Washington occur in Lakes Chelan, Sammamish, Washington, Wenatchee and Whatcom. In addition, WDFW stocks several Washington lakes with kokanee. Contact your local WDFW Area Habitat Biologist for further information on sockeye or kokanee in your area.

Appendix D:
Long Term Management Issues

Importance of Native Vegetation

Aquatic noxious weeds (non-native species) can adversely affect ecological functions and aesthetics in lakes and streams by crowding out native vegetation and creating single species stands. While it is recognized that native aquatic plants can become a nuisance to swimmers and boaters due to excessive growth, it is important to recognize the value of native plant species for fish and wildlife. These native plants provide habitat for fish and wildlife, help stabilize shorelines and streambanks, produce oxygen, trap beneficial nutrients, and keep sediment in place. Aquatic beneficial plants are defined as native plants (such as pondweeds, bladderwort, or coontail) or non-native plants not included on the state noxious weed list (such as fragrant water pondlily).

Habitat Value to Fish and Wildlife

Native aquatic plants provide habitat (e.g., food and cover) for fish and wildlife. For example, pondweed is a critical food source for waterfowl and marsh birds. These plants are of particular importance to canvasbacks, trumpeter swan, mallard, redhead, canada goose, ring-necked duck and coot, in addition to 17 other waterfowl species. Pondweed also provides cover from predators for warmwater fish such as perch and bass.

Nutrient Recycling
Aquatic plants form a vital part of the complex system of chemical cycling in a lake. They influence the supply of oxygen in the water and can assist in absorbing pollutants from contaminated water.

Algal blooms are generally caused by excess nutrients such as phosphorus or nitrogen in lakes. Rooted aquatic plants remove nutrients from sediments as they grow while free-floating plants like coontail and bladderwort remove nutrients directly from the water. Emergent aquatic vegetation also slows water movement along shorelines and allows nutrient rich sediment to settle to the bottom, where it is less available to algae.

Maintaining Lake Health
Native plants can become a "problem" if they are so numerous they impede recreational activities such as boating and swimming. Dense surface canopies of aquatic plants (both native and non-native) can significantly impair water quality, reducing fish habitat and altering water pH and oxygen levels. The causes of unnaturally high levels of plant growth are complex. Often excess nutrients, which come from around the lake or in the watershed are responsible. Failing septic systems, fertilizer run-off or animal waste can all contribute to the nutrient overload and cause the natural process of lake aging to proceed at an accelerated rate. Increased plant and algal growth are indications of this process. Reducing and eliminating pollutant and excess nutrient sources are therefore vital to maintaining lake health. Controlling these sources through the use of best management practices in the watershed is the most effective way to achieve this end. Forming a citizen-based organization is an important first step in addressing these issues. A VMP (page 6) should then be developed to ensure the problems are addressed using an integrated approach that balances resource protection, water quality, and recreational uses.

Avoidance of Non-native Plant Introduction
Many of the aquatic noxious weeds present in our lakes and streams have been introduced when someone discarded aquarium plants into a lake. These plants are frequently spread to other lakes by boats, trailers and jetskis that have not been thoroughly cleaned after use in lakes or

rivers with weed problems. Other noxious weeds have been introduced as landscape plants, "escaping" into the environment. It is therefore important to avoid use of noxious plants in landscaping to avoid unwanted spreading to areas outside your yard or garden. Contact your local county weed board for more information on landscaping plants to avoid.

Importance of Monitoring Plant Community Changes

Plant community changes can be monitored by collecting and identifying aquatic plants on a year to year basis. This is also a good way to detect detrimental changes and/or introduction of noxious weeds at an early stage, when control or elimination of the problem will be cheaper and less complicated.

Appendix E: Agency Contacts

The agencies and individuals listed below can provide you with additional information on aquatic weeds and the permit requirements that may apply to your project.

WA Dept. of Ecology	Kathy Hamel	(360) 407-6562
	Jenifer Parsons	(360) 407-6679
	Allen Moore	(360) 407-6563
	Permit Assistance Center	(360) 407-7037
WA Dept. of Agriculture	Diane Dolstad	(360) 902-2071
	Greg Haubrich (for purple loosestrife transport permit)	(509) 576-3039
WA Noxious Weed Control Board	Bridget Simon	(253) 872-2318
	Lisa Lantz	(253) 872-2972
WA Dept. of Natural Resources	Janie Civille	(360) 902-1095
	Regional Information	1-800-497-8283
WA Dept. of Fish and Wildlife - Area Habitat Biologists	Region 1 (Spokane)	(509) 456-4082
	Region 2 (Ephrata)	(509) 754-4624
	Region 3 (Yakima)	(509) 575-2740
	Region 4 (Mill Creek)	(425) 775-1311
	Region 5 (Vancouver)	(360) 696-6211
	Region 6 (Montesano)	(360) 249-6523
U.S. Army Corps of Engineers	Seattle	(206) 764-3495
	Walla Walla	(509) 527-7153
	Portland	(503) 326-6998
County weed boards*	contact your local weed board (seGS2e3eo	

COUNTY	*GENERAL TIMING*[1]	*TIMING FOR SPECIFIC STREAMS*	
		STREAM (WRIA)	***TIMING***
Mason	July 1-September 30	Hamma Hamma River (16.0251)	July 1-August
		31 Skokomish River (16.0001)	July 1-August 31
		Union River (15.0503)	July 1-August 15
Okanogan	July 1 - August 31	None	
Pacific	July 1 - September 30	None	
Pend Oreille	July 1-September 30	None	
Pierce	July 1-September 15	Clearwater River (10.0080)	July 1-September 1
		Greenwater River (10.0122)	July 1-September 1
		South Prairie Creek (10.0429)	July 1-September 1
San Juan	June 15-October 15	None	
Skagit	June 15-September 30	Sauk River (04.0673)	July 15-August 15
		Suiattle River (04.0710)	July 15-August 15
Skamania	July 1-September 30	Wind River (29.0023)	July 15-August 31
		White Salmon River (29.0160)	June 1-August 15
Snohomish	June 15-September 30	Sultan River (07.0881)	July 1-September 15
		NF Skykomish River (07.0982)	July 1-September 15
		SF Skykomish River (07.0012)	July 1-September 15
		Pilchuck River (07.0125)	July 1-September 30
		Stillaguamish River (05.0001)	July 1-September 15
		SF Stillaguamish River (05.0135)	
		- above Granite Falls	July 1-August 31
		- below Granite Falls	July 1-September 15
		NF Stillaguamish River (05.0001)	July 1-August 15
Spokane	June 15-September 30	None	
Stevens	July 1-September 30	Big Sheep Creek (61.0150)	July 1-August 31
Thurston	July 1-September 30	None	
Wahkiakum	July 1-September 15	None	
Walla Walla	July 15-October 15	Mill Creek (32.1436) above Walla Walla	July 15-August 31
		Blue Creek (32.1497)	July 15-August 31
Whatcom	June 15-September 30	Nooksack River (01.0120)	June 15-August 31
		NF Nooksack River (01.0120) & tribs	July 1-August 15
		SF Nooksack River (01.0246)	July 1-August 15
Whitman	June 15-October 15	None	
Yakima	June 15-September 15	American River (38.1000)	June 1-June 30

GENERAL AND SPECIFIC TIMING FOR MAINSTEM COLUMBIA AND SNAKE RIVERS; ISOLATED FRESHWATER LAKES; AND MARINE WATERS

Columbia River			
Mouth-McNary Dam	December 1-February 28	None	
McNary-Priest Rapids Dams	January 1-February 28	Hanford Reach (36.0001)	August 1-August 31
Priest Rapids Dam-Wenatchee	October 16-March 31	None	
Above Wenatchee	September 1-March 31	None	
Snake River	January 1-February 28	None	
	August 1-August 31	None	
Isolated Lakes[2]	July 1-September 30	None	
Marine Waters			
Pacific Ocean	June 15-February 28		
Puget Sound & Straits	June 15-March 14	Contact local WDFW Area Habitat Biologist regarding additional, specific restrictions for surf smelt and sand lance spawning	Area and species dependent

1 The general timing by county applies to all fresh and brackish streams within that county, unless specific timing is listed for a specific stream or streams in that county. If a specific stream is listed, the timing for that stream supersedes the general timing listed for the county. The

References

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US Corps of Engineers - Seattle District, 1984. *Wetland Plants of the Pacific Northwest.* Publication 695-231.

WDFW Aquatic Plant Control Tracking Form

Please complete this form, fold and mail to WDFW after your project is completed.

Completion and return of this form will help WDFW better understand the nature and extent of aquatic weed control projects. Your participation in completing this form will also **ensure that you will receive any future updates or changes to the pamphlet (techniques, provisions, etc.)** that may be of interest. We are also interested in your comments on the pamphlet.

What weed(s) or plant (s) did you attempt to control?

_____
_____
_____

What control method did you use? (Check all that apply)

____bottom barrier
____hand pulling, cutting or raking
____weed roller
____mechanical harvesting or cutting
____rotovation
____diver dredging
____herbicide
____draw down
____watershed controls
____dragline and clamshell dredging
____grass carp
____water column dye

What waterbody (lake, stream or river) did you complete your control project on?

Lake name _____
Stream name _____
County _____
Nearest city/town _____

Did you begin the process of developing a Vegetation Management Plan (VMP)?

Yes____ No ____ Thinking about it _____

Comments? _____