

NEVADA COUNTY RESOURCE CONSERVATION DISTRICT

# POND MANAGEMENT

WEED, ALGAE & PEST CONTROL



2014



113 PRESLEY WAY, SUITE 1, GRASS VALLEY, CA 95945

As lakes and ponds age they fill with sediment rich in nutrients such as nitrogen, phosphorus and potassium. Waters become shallower and more fertile, favoring weed growth.

Weather influences weed growth. Runoff from heavy rain carries nutrients into the water. Drought may lower water levels creating shallow areas suitable for heavy weed growth.

Sunlight contributes to heavy weed growth, particularly in shallow, clear waters.

Human activities contribute to weed growth. Clearing of land for development and farming causes soil erosion leading to increased sedimentation. Discharges from sewage treatment plants, livestock feedlots and leaky septic systems provide additional sources of nutrients. Hard surfaces, such as roads, promote runoff rather than absorption and natural filtration.

## *Yes, you CAN control aquatic weeds!*

There are several methods of aquatic weed control that you can use. Briefly these are:

**Mechanical Cutting** offers immediate short term control. Extended control can only be achieved by cutting on a continual basis. Cut weeds must be removed to prevent fragments from reestablishing or spreading to other areas. High cost and limited mobility in shallow waters prevent the use of large mechanical harvesters by individuals. Small hand operated equipment is available.

**Biological Control** uses weed eating fish, animals and insects or the introduction of plant diseases. This method can be slow to produce results and often is not as effective or consistent as other methods (still experimental).

**Water Draw Down** especially during winter months is effective on submersed weeds. Drying out or freezing will destroy the exposed weeds. Care must be used to prevent destruction of fish and wildlife habitat. Loss of recreational use may occur. Marginal weeds may infest new areas and become a greater problem than the original aquatic weed infestation.

**Chemical Control** is currently the most commonly used, most effective and most economical method of controlling aquatic weed infestations. Aquatic herbicides produce faster, longer lasting results than other methods. Aquatic herbicides can be used in localized areas reducing the impact to non-target sites. The choice of aquatic herbicide depends on the weed(s) to be controlled. Best results are obtained by first identifying your weed(s) and then selecting the product(s) to use.

(Information provided with permission from [Aquacide Company](#)  
1627 9th Street / P.O. Box 10748 / White Bear Lake, MN 55110-0748)

## WEED IDENTIFICATION

If you need assistance identifying your weed(s), consider these options:

- A. Contact your local Agricultural Commissioner or Nevada County Farm Advisor
- B. Contact a local College or University
- C. Talk to your neighbors
- D. Send a sample to a weed, algae, pest control company such as Aquacide Company, or to a local farm supply company for identification. To do this, pull a sample of each weed. Rinse with clear water and shake out. Be sure to include leaf and stem. Place in a plastic bag.
- E. E-mail a close-up photograph of your weed to [Weeds@KillLakeWeeds.com](mailto:Weeds@KillLakeWeeds.com).

### 1) CLASSIFY THE WEED:

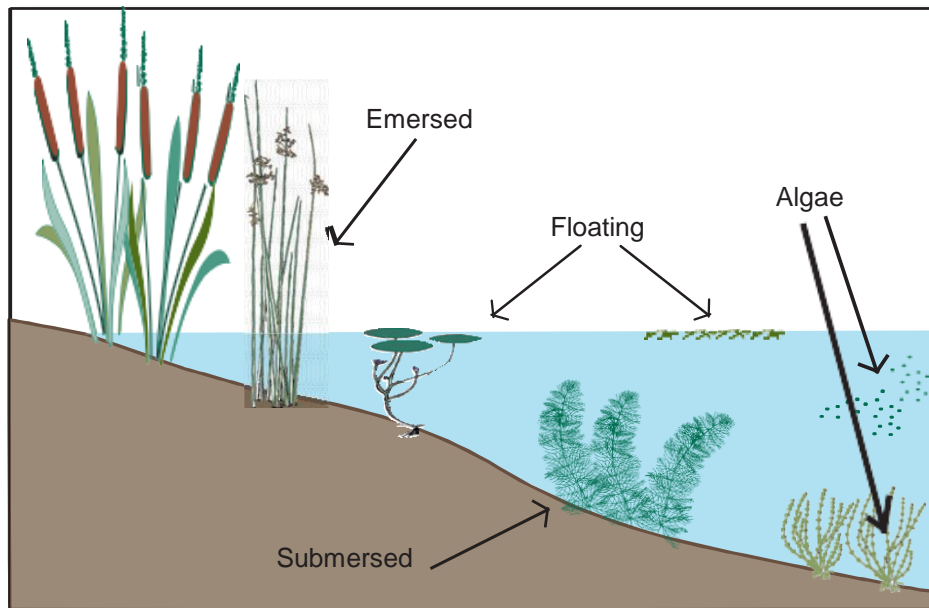
See drawing below.

**Emersed:** Growing in shallow water with leaves or stems above the water.

**Submersed:** Growing in deeper water entirely below the surface.

**Floating:** Growing unattached or rooted with floating leaves.

**Algae:** Cellular, lower weed form. No distinguishable stem or leaf. Moss or scum.



## 2) DETERMINE SPECIFIC WEED(S):

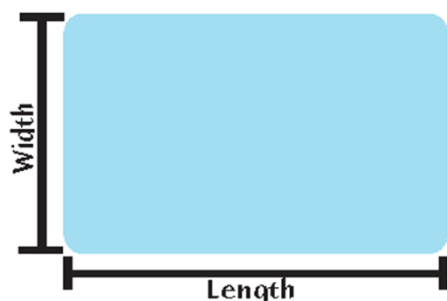
The following pages picture common aquatic weeds found throughout the country. Place your weed in a clear glass jar with water and compare it to the pictures. Pay careful attention to the leaves.

# SIZE OF TREATMENT AREA

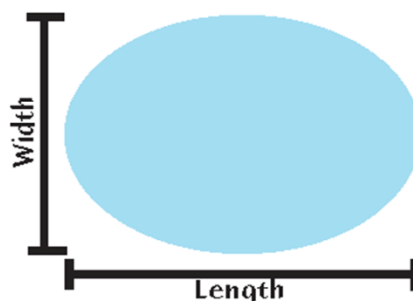
Know what your weed is? Know what product to use? Now, determine how much to apply. Measure the treatment area in feet. Multiply the length (feet) by the width (feet). Divide by 43,560 to convert to acres. To estimate average depth, add deepest and shallowest point in treatment area together, then divide by 2. Multiply acres by average depth in feet to determine volume in acre-feet.

## Surface Area (acres):

$$\frac{\text{Length (ft.)} \times \text{Width (ft.)}}{43,560} = \text{Acres}$$

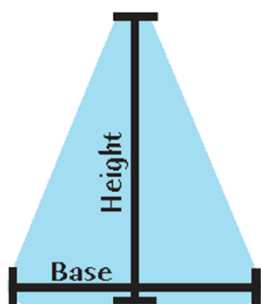


$$\frac{\text{Length (ft.)} \times \text{Width (ft.)} \times 0.8}{43,560} = \text{Acres}$$



## Area of a Triangle:

$$\frac{0.5 \times \text{Height (ft.)} \times \text{Base (ft.)}}{43,560} = \text{Acres}$$



## Area of a Circle:

$$\frac{\text{Diameter (ft.)} \times \text{Diameter (ft.)} \times 0.8}{43,560} = \text{Acres}$$

$$\text{Diameter} = \frac{\text{Circumference}}{3.14}$$



## Average Depth (feet):

$$\frac{\text{Deep (ft.)} + \text{Shallow (ft.)}}{2} = \text{feet}$$



## Volume (acre-feet):

$$\text{Area (acres)} \times \text{Average Depth (feet)} = \text{acre-feet}$$

### Example:

0.5 acre pond with a 12 foot depth.

Area (acre): 0.5 acre

$$\text{Average Depth (feet): } \frac{12 \text{ (deep)} + 0 \text{ (shallow)}}{2} = 6$$

$$\text{Volume (acre-feet): } 0.5 \times 6 = 3.0 \text{ acre-feet}$$

# USEFUL CONVERSIONS

1 acre = 43,560 sq. ft.	1 qt. = 2 pts.	1 oz. = 2 tablespoons	1 ppm = 2.7 lbs./acre-ft.
1 acre-ft. = 1 acre x 1 ft. deep	1 pt. = 2 cups	1 gal = 128 ozs.	1:10 dilution = 12 ozs./1 gal
1 acre-ft. = 325,830 gal	1 cup = 8 ozs.	grain/gal = 171 ppm	1:9 dilution = 13 ozs./1 gal
volume = surface area x average depth	average depth = 1/2 (deepest point + shallowest point)		

# SUBMERSED weeds...

## **Milfoil (*Myriophyllum*):**

Leaves whorled in groups of 4. Each leaf is divided into many thread-like leaflets extending from a central rib (see leaf detail). Forms tangled mats at the surface. Seed heads develop in mid to late season and may extend above the water surface. Treat anytime weeds are actively growing.



## **Parrot Feather (*Myriophyllum brasiliense*):**

A type of Milfoil. Leaves whorled in groups of 4 to 6. Each leaf is divided into 18 pairs of thread-like segments resembling a feather (see leaf detail). This species differs from other types of Milfoil by having its foliage partially out of the water. Emerged foliage is bright green.



## **Coontail (*Ceratophyllum demersum*):**

Leaves whorled around the stem and have a serrated appearance (see leaf detail). Spacing between leaf whorls is variable. Weeds may be long and sparse or bushy. Near end of stem leaves and whorls are crowded. Branches repeatedly forked. May be confused with Bushy Pondweed or Chara. Chara has a strong odor when crushed, Bushy Pondweed and Coontail do not.



## **Elodea (*Elodea canadensis*):**

Similar to Hydrilla. Leaves whorled in groups of 3. Elodea leaves have a smooth edge (see leaf detail). Whorls of leaves are compact near growing tips. Spacing between whorls increases further down the stem.



## **Hydrilla (*Hydrilla verticillata*):**

Similar to Elodea. Hydrilla has leaves whorled in groups of 3 or more. Leaves have a serrated edge with 2 to 3 pointed spines on the midrib of underside (see leaf detail). Whorls of leaves are compact near growing tips. Spacing between whorls increases further down the stem.



## **Bladderwort (*Utricularia*):**

Finely divided leaves scattered along stem with numerous bladder-like structures on leaves. Stems have many branches and are densely leafy at the tips. Flowers are yellow and rise above the water surface when mature.



## SUBMERSED weeds...

### **Horned Pondweed (*Zannichellia palustris*):**

Leaves are long and thread-like. Oppositely arranged on stem unlike other pondweeds. Seeds found at leaf base, flattish in shape, and serrated on one side.



### **Bushy Pondweed (*Najas gracillima*):**

Leaves are narrow with tiny spines along the edges. Leaves slightly enlarged at base. Stems slender with frequent branching. Leaves oppositely attached, or in groups of 2 or more at a node. Leaves densely concentrated at tips. May be confused with Chara or Coontail. Chara has a strong odor when crushed, Bushy Pondweed and Coontail do not.



### **Leafy Pondweed (*Potamogeton foliosus*):**

Short grass-like leaves which measure 1" to 3" long and branch freely on a slender stem. Leaves alternately arranged on stem. Clumps of 4 to 8 fruiting bodies attached to a center stem by a short reed stalk that rises above water surface when mature.



### **Sago Pondweed (*Potamogeton pectinatus*):**

Leaves are stiff, narrow and thread-like. Stems branched with leaves alternately arranged on stem. Spreading leaves resemble a fan with an overall bushy appearance. Nutlets appear like beads on a string. Tiny green flower appears on spike with nutlets above water surface when mature.



### **Large-Leaf Pondweed (*Pot. amplifolius*):**

Leaves both floating and submersed. Submersed leaves are large, oblong, wavy and taper to stem. Floating leaves are oval-shaped. Parallel leaf veins are evident. Stems are seldom branched. Leaves alternately arranged on stem. Solid, tightly packed spike of nutlets at tip of weed rises above water surface when mature.



### **Floating-Leaf Pondweed (*Pot. natans*):**

Leaves both floating and submersed. Submersed leaves long and narrow. Floating leaves oblong and slightly heart-shaped at base. Parallel leaf veins evident. Stems occasionally branched. Leaves alternately arranged on stem. Solid, tightly packed spike of nutlets at tip of weed rises above water surface when mature.



## SUBMERSED weeds

### **Curly-Leaf Pondweed (*Pot. crispus*):**

Leaves thin with wavy and finely serrated edges. Stems branched. Upper leaves often crispy and appear waxy. Leaves alternately arranged on stem. Flowers born on spikes rise above water surface when mature.



### **Clasping-Leaf Pondweed (*Pot. richardsonii*):**

Leaves wide and wavy with smooth edges. Broad leaf base clasps stem. Upper stem commonly branched and leafy. Leaves alternately arranged on stem. Solid, tightly packed spike of nutlets at tip of weed rises above water surface when mature.



## FLOATING weeds

### **White Water Lily (*Nymphaea odorata*):**

Leaves large, round and slit to center. Underside of leaf often purplish. Stem below surface. Roots thick and fleshy, often buried in mud. Flowers white with multiple petals born on a single stalk above water surface. Don't confuse with Spatterdock.



### **Water Shield (*Brasenia schreberi*):**

Leaves oval in shape with smooth edges usually with rust-colored underside. Stem is attached to middle of leaf. A clear jelly-like slime covers underside of leaves and stems on mature weeds. A dull purple flower develops in early summer. Best treated early before jelly-like slime develops.



### **False Loosestrife (*Ludwigia palustris*):**

Leaves both floating and submersed. Oblong and narrow near stem. Leaves oppositely attached to stem, most often in pairs. Stems rooted at joints. Forms tangled mat on water surface when mature.



### **Duckweed (*Lemna minor*):**

Leaves the size of a pencil eraser. May be observed individually or in clusters upon close observation. Small root hairs may be seen hanging down from underside of the leaf. No stem distinguishable. Heavy growth may blanket water surface to depth of several inches. Duckweed is not as interconnected as Filamentous Algae. Do not confuse with Algae.



## EMERSED weeds...

### **PURPLE LOOSESTRIFE (*Lythrum salicaria*):**

Leaves slightly heart-shaped at base coming to a point at leaf tip. Leaves small and more numerous near tip. Stems rigid, four-sided and have fine hairs on them. Leaves oppositely arranged on stem usually in pairs. Flowers bright purplish on a spike closely attached to stem.



### **WATER WILLOW (*Dianthera americana*):**

Leaves long, narrow and tapered at each end. Branched veins are evident. Edges are smooth. Stems usually unbranched. Leaves oppositely arranged on stem usually in pairs. Flowers born on spikes, purplish in color.



### **WATER PRIMROSE (*Jussiaea repens*):**

Leaves lance-shaped with smooth edges. Veins evident in leaves. Stems and leaves are hairy. Leaves numerous and alternately arranged on stem. Flowers bright yellow and develop at top of the weed when mature.



### **SMARTWEED (*Polygonum hydropiperoides*):**

Leaves oblong and smooth on edges. Leaves alternately arranged on stem. Stems distinctly jointed. Lower portion of stem rooted at joints. Flowers small and tightly clustered, white or pink in color. Weed may be emersed in shallow water or completely submersed with only flowers visible above surface in deep water.



### **BULRUSH (*Scirpus spp.*):**

Leaves may or may not be present. If present, leaves appear as a continuation of the stem. Stems are tall and smooth, either round or triangular in shape. A loose cluster of brownish flowers and seeds located near tip of stem.



### **AMERICAN LOTUS (*Nelumbo lutea*):**

Floating circular leaves with stems attached to center of leaf underside. Emersed leaves also circular and depressed to center of upper surface. Solitary flowers pale yellow and composed of numerous petals. Seed pod in flower center with seeds embedded in surface.





## EMERSED weeds...

### **Spatterdock (*Nuphar advena*):**

Leaves heart-shaped at base, shiny and smooth. Some leaves float but most stand above water. Solitary flowers on long stalk slightly above water surface, yellow with green outer petals. Roots become very thick once weed is well established.



### **Pickerelweed (*Pontederia cordata*):**

Leaves heart-shaped at base. Veins very fine and numerous. Flowers blue-purple and crowded on elongated terminal spikes. Each flower has 6 petal-like parts united below into a tube.



### **Water Pennywort (*Hydrocotyle*):**

Leaves round with low rounded lobes. Attached at center to stem. Leaf about the size of a half dollar. Stems extend from a horizontal root in shallow water. Flowers rise in groups from smooth stems. Each individual flower has 5 small white petals. Often rooted in mud, forming dense mats.

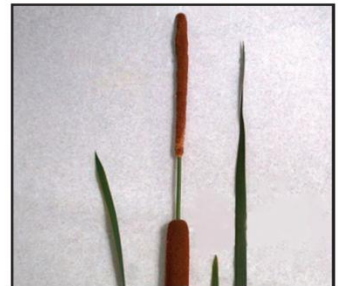


### **Cattail (*Typha latifolia*):**

Leaves tall and flat. Stems tall, round and unbranched. Flower the distinctive cigar-shaped cattail which is green in early summer and turns brown and fuzzy in fall. Weed has an extensive root system. Difficult to control when well established. Stout rootstocks make this weed difficult to pull out.

**Common Cattails** have leaves more than 1/2" wide with the two parts of the spike nearly continuous.

**Narrowleaf Cattails** have leaves less than 1/2" wide and a space between the two parts of the cattail spike.



### **Water Chestnut (*Trapa natans*):**

Submersed leaves thread-like and far apart on stem. Floating leaves nearly triangular or diamond-shaped, toothed in upper half on inflated stems. Flowers have 4 white petals.



## EMERSED weeds

### REED GRASS (*Phragmites maximus*):

Leaves long and flat with parallel veins. Stems tall and round with alternately arranged leaves. Flower of weed is made up of spikelets with a long, silky, thread-like mass of hairs. Stout rootstocks make this weed difficult to pull out.



### GRASS FAMILY (*Gramineae*):

Many kinds of grasses grow in damp places and at times are found in water. Leaves long and slender, usually 10 times as long as wide. Veins within leaves run parallel to length of blade. Leaves arranged alternately on stem. Most grasses emersed including but not limited to Giant Cutgrass, Giant Foxtail, Maidencane, Paragrass and Sawgrass.

## ALGAE

### CHARA (*Chara vulgaris*):

Leaf-like structures whorled around hollow stem. Dense growth attached, but not rooted to bottom. May "carpet" large areas of a lake or pond bottom. Strong musky odor when crushed. May have a gritty texture due to mineral deposits on weed surface. May be confused with Bushy Pondweed or Coontail.



### FILAMENTOUS ALGAE:

Individual filaments are a series of cells joined end to end that give a thread-like appearance. Often referred to as pond moss or scum. Forms felt-like surface mats. Growth begins at the bottom and rises to water surface as a bubble-filled mass. May also form fur-like growths on logs and rocks at bottom.



### PLANKTONIC ALGAE:

Microscopic growth often visible as a greenish tinge suspended in the upper few feet of water. Severe blooms resemble pea soup and actually thicken the water.



# WHAT CONTROLS WHAT



	Aquacide Pellets	Aqua Neat & Shore-Klear Liquid	Aquathol Super K Granular	Citrine-Plus Granular & Liquid	Hydrothol Granular	Restore Liquid & Sonar Granular	Weedtrine-D Liquid	Combined Weedtrine-D Liquid & Citrine-Plus Liquid
	Pg. 14-15	Pg. 22	Pg. 18	Pg. 16-17	Pg. 19	Pg. 26 & 27	Pg. 20-21	Pg. 20, 21 & 17
<b>SUBMERSED</b>								
Bladderwort	G					G	G	G
Coontail	E		G		G	G	G	G
Elodea					G	G	G	E
Hydrilla			G		G	G	G	E
Milfoil	E		G		G	G	G	G
Parrot Feather	E		G		G	F	G	G
Pondweed			E		E	G	G	G
<b>FLOATING</b>								
Duckweed	G*					E	E	E
False Loosestrife	G							
Water Lily	G	E	F		F	G		
Water Shield	E	G			F	G	F	F
<b>EMERSED</b>								
American Lotus	E	G	G		F	G		
Bulrush	E	E					F	F
Cattail (Common)	G	E				F	G	G
Cattail (Narrowleaf)		E				F	G	G
Pickerelweed	G	G					G	G
Purple Loosestrife	G	G						
Reed Grass/Grass		E					G	G
Smartweed	G	F	G			F	F	F
Spatterdock	G	E	G		F	G		
Water Chestnut	G							
Water Pennywort	G						E	E
Water Primrose	E	G	F		F	F	F	F
Water Willow	G	G				G	F	F
<b>ALGAE</b>								
Chara				E	G			
Filamentous Algae				E	G		G	E
Planktonic Algae				E	G		F	E

**E = Excellent, G = Good, F = Fair**

\* in water less than 3 feet deep.

# WATER USE RESTRICTIONS (days)

Product Name	Active Ingredient	Weight % Active Ingredient	EPA Reg. No.	Human			Animal	Irrigation		
				Drinking	Swimming	Fish Consumption	Drinking	Turf	Forage	Food Crop
Aquacide Pellets	2,4-dichlorophenoxy acetic acid	17.5	5080-2	0+	0	0	0	0	21	21
AquaClear Liquid	5 bacterial strains	N/A	N/A	0	0	0	0	0	0	0
AquaClear Pellets	5 bacterial strains	N/A	N/A	0	0	0	0	0	0	0
Aquashade	Acid blue 9 Acid yellow 23	26.02	33068-1	*	0	0	0	0	0	0
Aquashadow Dry Packets	Acid blue 9 Acid yellow 23	100	N/A	*	0	0	0	0	0	0
Aquashadow Liquid	Red 40, Acid blue 9 and yellow	100	N/A	*	0	0	0	0	0	0
Aqua Neat Liquid	Isopropylamine salt of glyphosate	53.8	228-365	0+	0	0	0	0	0	0
Aquathol Super K Granular	Dipotassium salt of endothall	63.0	70506-191	7	0	0	0	7	7	7
Clear-Pond	Aluminum sulfate Sodium bicarbonate	50/50	N/A	0	0	0	0	0	0	0
Citrine-Plus Granular	Copper ethanolamine complexes	3.7	8959-12-AA	0	0	0	0	0	0	0
Citrine-Plus Liquid	Copper ethanolamine complexes	9.0	8959-10	0	0	0	0	0	0	0
Cygnat Plus Liquid	d,l-limonene	100	N/A	0	0	0	0	0	0	0
Hydrothol Granular	Dimethylalkylamine salt of endothall	11.2	70506-174	7-25	0	0	7-25	7-25	7-25	7-25
Restore Liquid	Fluidone aqueous suspension	41.7	8959-57	0+	0	0	0	30++	30++	30++
Shore-Klear Liquid	Isopropylamine salt of glyphosate	53.8	228-365-8959	0+	0	0	0	0	0	0
Sonar Q Granular	Fluidone quick-release pellet	5.0	67690-3	0+	0	0	0	30++	30++	30++
Weedtrine-D Liquid	Diquat dibromide	8.53	8959-9	5	0	0	5	5	5	5

- \* Not to be used in potable water.
- + See label for distance allowed from potable water intake.
- ++ Voluntary restrictions suggested by manufacturer.