



DUGOUT MAINTENANCE

February, 2004



Aquatic Vegetation

Algae are small rootless plants that are normal inhabitants of surface water. They thrive when the right combination of sunlight, warm temperature and food is available. In farm dugouts a good supply is provided by nutrients in run-off water from agricultural land.

There are three main types of algae:

- **Planktonic Algae** These are single cell, or small colonial groups which are free-floating and green, blue green or brown in colour. They commonly appear as small specks in the water. Upon death they may release foul odours, add tastes to the water and, in some species, toxins may be released which are capable of poisoning livestock.
- **Filamentous Algae** These consist of long stringy hair-like filaments forming mats or pond scums during the summer. In early spring they grow on the pond bottom rising to the surface during hot, calm, sunny weather.
- **Branching Algae** This form of algae is more advanced and grows attached to the bottom. Branches are rough, gritty and give off a fish like odour.

Aquatic Plants

Aquatic plants are more complex than algae with specialized tissues such as roots, leaves, stems or flowers. They are divided into four groups:

- **Free-floating** These are generally unattached; but in some species may have simple roots. The main free-floating plants in Canada are the duckweeds.
- **Submergent** These plants are usually completely submerged in depths from 0.5 to 3.5 metres (1 to 12 ft.). Rooted to submerged soils their leaves are thread-like, broad or finely dissected. Examples of submergents are Canada water weed, coontail, water milfoil and water buttercup.
- **Emergent** These are plants rooted on soil covered with water or on exposed soils where the water table is within 0.5 metres (1.5 ft.) of the soil surface. These plants are perennials with creeping root stocks. Vegetative parts are above the water. Some species are cattails, bullrushes, rush and marsh smart weed.
- **Floating-leaved** These plants are rooted to the bottom with long stems extending to the surface. The leaves float on the surface of the water. One example is water lilies.

Methods of Controlling Aquatic Vegetation

Mechanical

This method should be the first process selected in controlling aquatic vegetation. The following methods are suggested:

- Hand cleaning and pulling can be practical where there is a small amount of aquatic plants. Also, remove any foreign material and deadfall.
- Chaining by dragging a heavy chain from a boat may be effective in cutting submerged weeds. A heavy chain or cable attached between two

tractors and dragged down the edge of the pond or dugout is another method. Where two tractors are not feasible, one or two sections of harrows can be dragged through the growth. **Remember to Remove the Floating Debris.**

Drying or draw down, if it is feasible to drain the pond or dugout, will kill many of the submerged aquatics and algae due to exposure to sun and air for a few days. This method is not effective on emergent weeds well rooted in the bottom. Note that all weeds removed should be placed some distance away from the water source to prevent their nutrients, released upon decomposition, from being washed back into the dugout.

Altering Dugout Shape

Keeping all bank slopes, including the ends, sloped on a 2:1 ratio will reduce the large shallow water areas normally found on the ends of the dugout. Since the depth of water increases more quickly with the steeper slopes, there will be less area of shallow water for aquatic weed growth.

Chemical

Chemical control of aquatic vegetation should be restricted to:

That portion of the dugout where weed control is necessary.

Water that is free of turbidity. If the water is turbid and has suspended clay particles, pretreatment will be necessary before any chemicals can be used effectively. Turbidity or suspended particles in the dugout results in a dirty looking water. It is frequently caused by rapid run-off from a heavy rain. Clay or other fine particles can remain suspended in dugout water for several months. Spreading 45 to 90 kilograms (100 to 200 lbs.) of powdered aluminum sulfate (alum) evenly over the entire surface will settle the suspended particles. This leaves the water clear for chemical application.

Water weeds should be kept out of dugouts. When weed growth becomes apparent, usually in early June, apply Reward (Diquat) at 22 litres per surface hectare (7.83 qt./surface acre) up to 1.5 metres (5ft.) deep. Water treatment with Reward should not be used for swimming, human or animal consumption for 24 hours after application or for irrigation for five days after application.

NOTE:

Reward is the only chemical with a low waiting period after application. All other chemicals have either one year waiting periods or they are not recommended at all if humans or animals are consuming water.

Algae

During the past number of years, one particular strain of algae, commonly referred to as small green algae, has become very resistant to the copper normally used in the control of algae in dugout water.

This algae creates a series of problems due to its extremely small size. The algae is too small to be seen with the naked eye or filtered out with any standard filtering equipment presently on the market. In large numbers, it will tint the water a light green colour, cause staining, and create taste and odours in the water.

With the introduction of large doses of bluestone to the dugout to control other algae growth, the natural biological controls that hold this algae in check are upset. All competition for available nutrients is also eliminated, resulting in ideal conditions for the development and growth of this particular strain of algae.

To control the small green algae, a number of steps are recommended to minimize the nutrients (food for algae) available in the water, maximize the natural biological controls present, and provide some competition for the nutrients that make their way into the dugout water.

1. Stabilize the dugout banks and the surrounding area by establishing, and maintaining, a grassed area extending out from the dugout at least 10 metres (30 ft.) on all sides.
2. Keep all trees and shelter belts back at least 50 metres (150 ft.) from the dugout.
3. **DO NOT** allow cattle or other farm animals to drink directly from the dugout.
4. **DO NOT** divert any runoff from cultivated and nutrient rich fields into the dugout unless absolutely necessary. Only allow the "first melt" water into the dugout by diking and using a culvert control gate or by pumping the water into the dugout while diverting all the rest around the dugout. This will reduce the amount of nutrients entering the dugout and thereby reduce the algae growth.
5. **DO NOT** treat dugout with bluestone unless algae growth is clearly visible to the eye and then only at reduced rates. Unnecessary treatment can result in upsetting the natural biological controls present and cause an uncontrollable algae bloom.

6. The preferred method of controlling blue-green algae is with spot treatment (applying chemical directly to high algae density area). For spot treatment dissolve 2.5 ml (1/2 teaspoon) of bluestone per 4.5 L (1 gallon) of water. Spray on the affected area at the rate of 4.5 L (1 gallon) per 40 sq. M (400 sq. ft.).
7. Use mechanical control as previously outlined to control aquatic weeds wherever possible. Any above surface growth (example: cattails) should be cut off and removed from the area in the fall to limit nutrients being introduced back into the dugout.
8. To control black water and smell, aerate dugout water continuously.

Major problems with the copper resistant strain of algae can be averted by following the proceeding steps, and not trying to maintain a sterile and algae free dugout.

Unless algae is visible to the eye, **NO TREATMENT** should be undertaken. Where algae is noticeable, the dugout can be treated at the reduced rates (1/2lb./100000 gal. of water) shown below. It should be noted that treating the dugout with larger dosages of copper sulphate than indicated below will cause the phosphates stored in the bottom sludge to be reabsorbed into the water resulting in increased algae growth. Where no algae can be seen, but the water has a green tint, treatment with copper sulphate will increase the problems.

Table 1a. Maximum Weight of Copper Sulphate (bluestone) to treat a 50 m x 20 m x 4.3 m (165' x 65' x 14') Dugout

Water	Depth	Approx. Water Volume		WT. Of Copper Sulphate	
		Litres	Gals.	kg.	lbs.
4.3	14	2 050 000	450,000	1	2.25
3.6	12	1 500 000	330,000	.6	1.5
3	10	1 060 000	233,000	.5	1.25
2.5	8	705 000	155,000	.35	.75

Table 2a. Maximum Weight of Copper Sulphate (bluestone) to treat a 60 m x 21 m x 4.3 m (200' x 70' x 14') Dugout

Water	Depth	Approx. Water Volume		WT. Of Copper Sulphate	
		Litres	Gals.	kg.	lbs.
4.3	14	3 000 000	650,000	1.5	3.25
3.6	12	2 200 000	490,000	1.25	2.25
3	10	1 600 000	360,000	.75	1.75
2.5	8	1 120 000	250,000	.5	1.25

Research is continuing in an attempt to learn more about the life cycle of this algae and to determine an effective control. In cases where high nutrient loading exists in the water and algae growth becomes excessive, treatment with lime or aluminium sulphate may be required to settle the nutrients to the bottom of the dugout. If the dugout is fairly old and has accumulated a quantity of organic matter and nutrients in the bottom, it is likely wise to clean out the dugout making sure to move the material removed back from the water's edge and out of the drainage area to prevent the nutrients from washing back into the water.

Dugout Aeration

Where dugout water turns a dark colour during winter months and has an offensive odour, dugout aeration should be considered. (See Water Facts: Dugout and Pond Aeration).

Not all water weeds are easily controlled with the above chemical. If the foregoing procedures are not effective in controlling growth in dugouts, contact the Weed Control Section, Manitoba Department of Agriculture and Food, Brandon or Carman, for specific recommendations or The Manitoba Water Services Board Technicians in Beausejour, Brandon or Dauphin. To treat a town dugout (i.e. public water systems) approval must be received prior to treatment from:

Environmental Control
 Second Floor, Union Station Building
 123 Main Street
 Winnipeg, MB R3C 1A3

For further information, please contact your Regional Farm Water Source Technologist at one of the following locations:

Wes Friesen Dauphin, MB (204)622-2116	Rob Sykes Brandon, MB (204)726-6078	Mursel Kluge Beausejour, MB (204)268-6059
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E-mail: farmwater@gov.mb.ca