AGRI-FACTS
Practical Information for Alberta's Agriculture Industry

Revised August 2004 Agdex 716(B37)

Hydrated Lime Treatment Improves Dugout Water Quality

For many farms, dugouts are the only source of water for their domestic and livestock needs. Due to the dugouts susceptibility to contaminants (e.g. algae, silt, nutrients), maintenance is essential.

Traditionally, copper sulphate and Reward treatments have been used to provide short-term control of algae blooms. However, recent studies have shown that the use of hydrated lime is a more complete and longer lasting method of improving dugout water quality.

The benefits of dugout liming include the following:

- reduced algae growth
- reduced growth of submerged rooted plants
- phosphorous removal from the water
- settlement of silt from the water
- a clean and clear dugout

Hydrated lime (calcium hydroxide) is mixed into the dugout water and allowed to settle. The lime acts as a coagulant, which causes the algae, silt and phosphorous to settle to the bottom of the dugout. The settling of the phosphorous will result in less algae growth over the following season because of the reduction in phosphorous required for algae growth. Experience has also shown that the lime treatment will reduce the growth of most rooted water plants, such as Richardson's pondweed.

The images in Figure 1 illustrate the results achieved with a hydrated lime treatment. The dugout was split in half to show a comparison between the treated and untreated water.

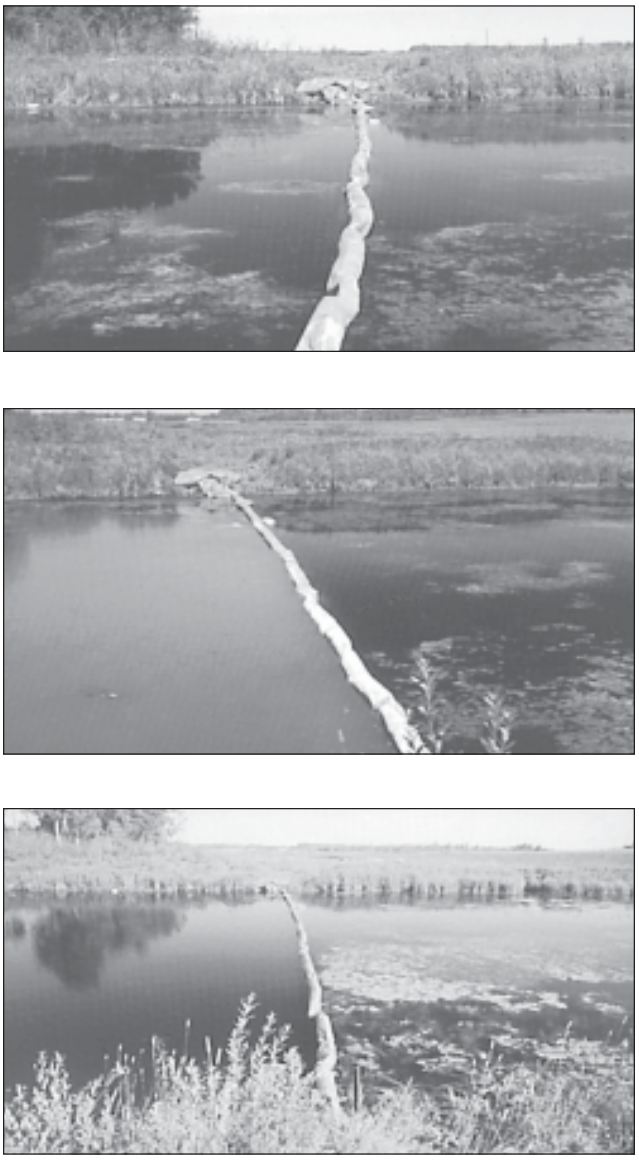

Figure 1. Dugout before treatment (top), during (center) and after (bottom)

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Caution

- **Hydrated lime is extremely corrosive.** Safety equipment **must** be worn to protect skin and eyes from chemical burns. A number of qualified custom applicators are available who have the necessary equipment for water testing, safe handling and application of hydrated lime. The cost of a custom lime treatment ranges from $200 to $500 per dugout.
- **Do not treat dugouts stocked with fish.** A hydrated lime treatment will kill fish.
- In the short term, some intensive livestock operations such as dairies, poultry barns, piggeries and feedlots may encounter reduced production due to the change in taste of the water.
- Lime treatment temporarily increases the pH level of the water. The pH level will return to normal levels within a few weeks to one month after treatment.

Before applying treatment

- Wait until the water temperature is above 15°C (generally between June 1 to October 1).
- Divert or block off any unwanted water flow into the dugout (e.g. gated culvert). This step will prevent any dirty runoff water from entering the dugout and destroying all the benefits of a lime treatment. Summer rainstorms are extremely destructive because of the huge amount of sediment and nutrients they deposit into the dugout during runoff.
- Raise the floating water intake line close to the surface of the water. This approach will allow you to take the clear water from near the surface of the dugout.

Calculating the amount of lime required

1. Use the following table to determine the volume of water in the dugout in imperial gallons.

Table 1. Approximate dugout capacities (imperial gallons)

	Width (ft)		
Length (ft)	**60**	**80**	**100**
160	388,500	570,000	751,500
200	524,500	776,500	1,028,000
240	661,000	982,500	1,304,000
280	797,000	1,118,500	1,580,000
Based upon: 14' depth, 4:1 end slopes, 1.5:1 side slopes			

2. Determine the alkalinity level of the water. This determination can be done by a laboratory or by purchasing a small test kit. Most custom applicators have test kits.
3. After determining the alkalinity level, refer to the following table to determine the proper dosage of lime required.

Table 2. Amount of lime needed for algae control

	Dosage	
Alkalinity (mg/L $CaCO_2$)	**Hydrated lime in mg/l**	**Correction factor**
50 to 100	100	0.0000182
100 to 200	150	0.0000273
more than 200	200	0.0000364

4. Multiply the dugout volume (gallons) by the proper correction factor for the alkalinity listed above. This value equals the number of 25 kilograms bags of lime required.
   e.g. 1,000,000 gallon dugout x 0.0000182* = 18 bags
   * For alkalinity of 50 to 100 mg/L $CaCO_2$

Applying the lime

Lime is most often applied by a custom applicator. The hydrated lime is mixed into a wet slurry and sprayed evenly over the entire water surface of the dugout. Concentrate on the deeper areas of the dugout and on any rooted plants along the edge. The hydrated lime must be thoroughly mixed in the dugout water. Apply one treatment.

Wait until the water surface clears (three to seven days) before using the water for any purpose.

Note: Studies have shown that aerating the dugout during the first few days after treatment improves rather than deters the settling of the lime. Wave action created by a windy day will also improve the mixing.

Maintenance

After the application of the lime (or any other treatment), maintenance is essential to sustain good quality dugout water. Here are some guidelines that must be followed to achieve this result:

- Keep barnyard and silt-laden runoff out of the dugout.
- Keep all livestock out of the dugout.
- Keep all organic matter (e.g. leaves, hay, grass) out of the dugout.

- Do not spread manure or fertilizer near the dugout.
- Maintain grassed waterways feeding into the dugout.

Summary

Although the dugout liming treatment has proven to be successful, it is only one management tool available for improving water quality. Aeration, sedimentation controls and other methods of algae and weed control should also be used.

Liming has worked successfully on most dugouts; however, a small percentage of dugouts have not shown improvement after treatment by a qualified liming company. Dugouts with a high level of organic color (yellow to brown) fit into this category. It is recommended that another coagulant such as aluminum sulphate be considered instead of the hydrated lime. It is much more effective on dugouts with a high level of dissolved color.

Further information on the use of other types of coagulants such as aluminum sulphate can be found on the Agriculture and Agri-Food Canada website at http://www.agr.gc.ca and search for the following article titles:

- *How to Coagulate your Dugout or Cell*
- *On-Farm Coagulation*
- *Coagulation Improves Water Quality*
- *Aluminum and Health*

More information

Additional information is available through health inspectors, agricultural water specialists or on the web.

For further information on dugouts, refer to the publication *Quality Farm Dugouts*, Agdex 716(B01). A copy of this manual can be obtained by calling the Publications Office at 1-800-292-5697, by visiting the Alberta Agriculture and Rural Development website (www.alberta.agriculture.ca) or by contacting an Agricultural Water Specialist.

Alberta Agriculture and Rural Development Agricultural Water Specialists can be contacted through the Alberta Ag-Info Centre by calling 310- FARM (3276).

The Rural Water Quality Information Tool on the Alberta Agriculture and Rural Development website (http://www.agric.gov.ab.ca/app84/rwqit) can help assess water test results and provide links to additional factsheets and websites regarding water treatment.

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