



# MYTHS ABOUT DUGOUT AERATION

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## INTRODUCTION

Dugouts provide water for a wide variety of farm uses, including domestic supplies, livestock watering, crop spraying and more. Aeration is generally accepted as an inexpensive way to improve dugout water quality. After working on farm dugouts for more than 65 years, PFRA has identified a number of myths. This fact sheet debunks some of the more common myths about dugout aeration.

**Myth: You do not need a diffuser to aerate a dugout effectively.**

**Fact:** A diffuser dramatically increases the effectiveness of any aeration system. PFRA data show that oxygen levels in dugouts aerated with a diffuser are twice as high as those in dugouts aerated without a diffuser. A diffuser is relatively inexpensive compared to the cost of a compressor, and by including it as part of your aeration system, you can improve your dugout's water quality significantly.

**Myth: A diffuser should be elevated from the bottom of the dugout.**

**Fact:** Placing the diffuser on the bottom of the dugout at its deepest point produces the best aeration and the highest quality water.

While a diffuser may temporarily stir up some sediment, it produces the best long-term results when placed directly on the bottom of the dugout. Given that diffusers do not mix water located below their elevation and the fact that sediments release nutrients when they come in contact with poor quality water, the diffuser should be located in the deepest part of the dugout.

**Myth: The diffuser should be located near the water intake to get the best possible quality water.**

**Fact:** The diffuser need not be located near the intake. If the aeration system is working properly, the water in the dugout will be well mixed and uniform in quality. So the placement of the diffuser relative to the water intake is not important in an aerated dugout.

**Myth: You should only aerate at night.**

**Fact:** While it may be possible to get away with aerating only at night, or for part of each day, aeration systems produce the best results when operated 24 hours per day.

Besides, aeration systems operate longer and are more trouble free when they are operated continuously. Turning the system on and off produces wear and tear on the compressor and the motor and will ultimately shorten the lifespan of these running parts. Over the long run, this wear and tear will cost more than the energy required to operate the system 24 hours per day.



Diffusers, such as this air stone, increase the effectiveness of all aeration systems

**Myth: You should only aerate in the winter.**

**Fact:** While it is generally recognized that aeration can improve dugout water quality during the winter, aeration can also improve water quality during the summer. By maintaining a high level of oxygen, aeration reduces the risk of plant nutrients being released from the sediments, the chances of a blue-green algae bloom and the creation of taste and odour problems. By aerating and maintaining good water quality during the summer, you improve the ability of the dugout to avoid water quality problems in the winter.

PFRA research shows that aeration systems produce the best results when they are operated 365 days per year. In fact, data indicate that water quality continues to improve for up to five years after an aeration system is installed in a dugout and operated continuously.

**Myth: Aerating dugouts in the summer heats up the water.**

**Fact:** The temperature of the water in a dugout is determined primarily by how much radiant energy the dugout receives from the sun. Things like season and the amount of shade provided by nearby trees have a much greater effect on water temperature than aeration.

It takes 1000 times more energy to increase the temperature of water than air. Therefore, aeration will not significantly increase the temperature of the water in a dugout. PFRA experiments show no significant difference in temperature of aerated versus non-aerated dugouts.

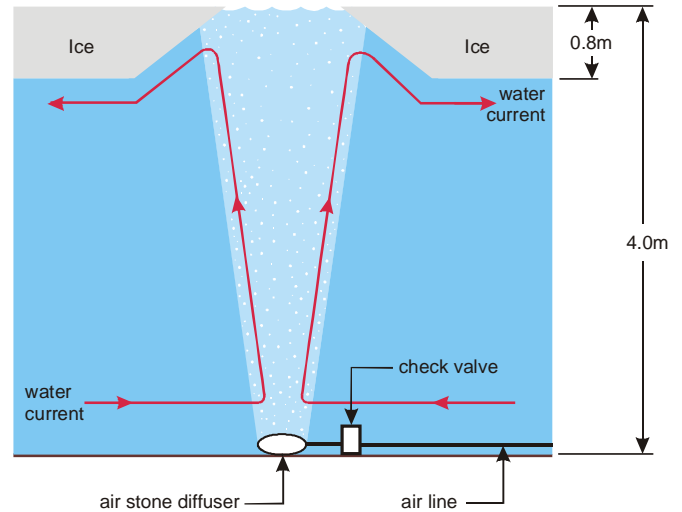
Many farmers who raise fish in their dugouts during the summer are concerned that aeration will warm the water and make it more difficult for the fish to survive. In fact, summer aeration will prevent the development of conditions that can lead to fish kills.

**Myth: Aeration creates open water or thin ice making the dugout unsafe.**

**Fact:** Aeration produces thinner ice and sometimes open water only over the location of the diffuser. The extent of the open water or thin ice depends on the type of diffuser used. Linear diffusers generally produce the least amount of open water, while the complete absence of a diffuser creates the most. Data collected from a large number of dugouts show that the ice returns to normal thickness just a metre or two away from the diffuser.

If the safety of children and animals, including pets, is a concern, the dugout should be fenced. Always exercise caution on ice-covered waters.

**Ice Thickness Near the Diffuser**



**Myth: Aerating dugouts in winter cools the water and results in thicker ice.**

**Fact:** There is no difference between ice thickness on aerated and non-aerated dugouts. Thickness of snow on the dugout is the overwhelming factor determining ice thickness.

Some rural residents are concerned that thick ice reduces the amount of liquid water available for use during the winter months.

Data collected over many years from a wide variety of dugouts show no statistical difference between ice thickness on aerated and non-aerated dugouts. The data does show that ice thickness is determined primarily by the snowfall patterns. A thick layer of snow shortly after freeze-up provides insulation and prevents the formation of a thick layer of ice.

**Myth: You must have open water in the winter in order to have a well-aerated dugout.**

**Fact:** The best aerated dugouts have little or no open water. The aeration system pumps air to the bottom of the dugout and so open water is not needed to get oxygen into the dugout.

Data collected from a large number of aerated dugouts shows that the highest concentrations of dissolved oxygen occur in the dugouts with no open water.

The amount of open water is determined by the type of diffuser and the overall efficiency of the aeration system. Point source diffusers such as air stones create a lot of turbulence at the surface and help prevent ice formation. Open water is also maintained in winter if the aeration system brings warm water from the bottom of the dugout to the surface, preventing ice formation. An effective aeration system mixes all of the water in the dugout and maintains a constant temperature throughout. With a good aeration system, there is no warm water to bring to the surface to prevent ice formation.

## THE BIG PICTURE

Dugouts represent an important water source on the Prairies. They are used to provide water for drinking, household uses, livestock watering, crop spraying and aquaculture. Each of these uses is affected by water quality. Therefore, it is important to maintain the best possible quality of water in your dugout.

Aeration is one of the many tools available to improve dugout water quality. Other techniques include appropriate management of the land surrounding the dugout and controlling inflows to the dugout. Regardless of what tools might be used, dugout water is not safe for human consumption without additional treatment and disinfection. Aeration can however reduce the cost of these treatment processes and make them more effective.

While it is generally accepted that aeration can improve dugout water quality, a number of myths related to aeration exist. It is important to understand the facts when designing and operating an aeration system.

For more information on dugout aeration see the following **Water Quality Matters** publications: "Why Aerate Your Dugout" and "How To Aerate Your Dugout".

For further information on rural Prairie water quality and treatment technology:

- read the other publications in PFRA's **Water Quality Matters** series;
- visit the PFRA Website at [www.agr.gc.ca/pfra](http://www.agr.gc.ca/pfra)
- get a copy of "Rural Prairie Water Quality: Searching for Solutions for On-farm Users" available from PFRA;
- read Prairie Water News available from PFRA, or on the internet at [www.quantumlynx.com/water](http://www.quantumlynx.com/water); or
- **contact your local Prairie Farm Rehabilitation Administration Office** (PFRA is a branch of Agriculture and Agri-Food Canada).

AUTHORED BY: B. Mackay, W.C. Mackay & Associates and B. Fairley, PFRA.

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