PRAIRIE
Water News

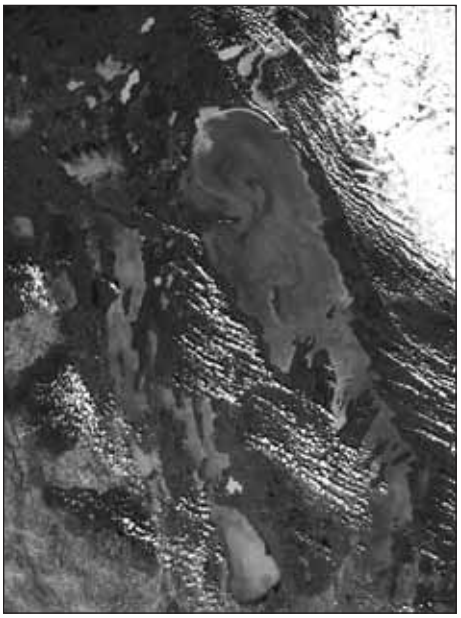
...dedicated to protecting and improving rural water supplies

Our Collective Responsibility – Reducing Nutrient Loading to Lake Winnipeg

By Bill Barlow – Chair, Lake Winnipeg Stewardship Board, and Sharon Gurney – Technical Secretariat, Lake Winnipeg Stewardship Board

The Problem

Lake Winnipeg, one of the world's great lakes, is sending us a message. Activities throughout its huge watershed are stressing the natural balances of its ecosystem. This strong message is being manifested in the appearance of more frequent and intense blooms of algae. The September 2005 satellite image illustrates an immense algal bloom that developed throughout the summer and by September was one of the largest ever witnessed.



Satellite image of Lake Winnipeg – Sept. 2005: Intense algal bloom. (Source: Greg McCullough, University of Manitoba, Note: original satellite data provided by NASA and colour rendering by the MODIS Rapid Response Team, University of Maryland)

"Although algal blooms have been documented on Lake Winnipeg for a very long time, the frequency, duration and intensity of these blooms have been increasing over the past two decades. These intense blooms, which wash up on waterfronts and which clog fishermen's nets, are impacting Lake Winnipeg's ecosystem. Dead zones in Chesapeake Bay on the U.S. east coast, in the Gulf of Mexico just off the mouth of the Mississippi, and many lakes around the world show what can happen if excessive nutrient loading from watersheds upsets natural balances. The healthy Lake Winnipeg fishing industry and all those vibrant lakeside communities that depend in so many ways on the beauty and the bounty of Canada's 6th Great Lake are justifiably concerned about the water quality deterioration observed in recent years.

The Watershed

Lake Winnipeg has a drainage area of nearly one million square kilometres, and is home to more than 5.5 million people and at least 20 million livestock. The lake's watershed extends west to the Canadian Rockies and east to within 20 kilometres of Lake Superior. It

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encompasses portions of four provinces (Alberta, Saskatchewan, Manitoba and Ontario) and portions of four U.S. States (Montana, North Dakota, South Dakota and Minnesota).

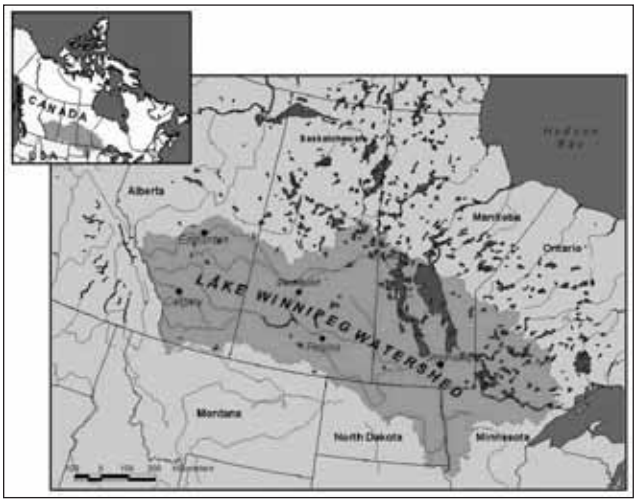
For every one square kilometre of lake surface area, there are 40 square kilometres of watershed. Consequently, nutrients originate from both local sources within Manitoba, as well as from sources throughout the watershed. The interjurisdictional nature of the watershed makes the task of reducing nutrient loading that much more challenging.

The Sources of Nutrients

Sources of nutrients to Lake Winnipeg include municipal sewage, crop fertilizers, industrial discharges, livestock manure, and urban runoff. Nutrients also originate from natural sources, including soil and plant material. Studies conducted by Manitoba Water Stewardship have demonstrated that over the last 30 years nitrogen and phosphorus loading to Lake Winnipeg has increased by 13% and 10% respectively. Table 1 provides a breakdown of the sources of nitrogen and phosphorus from within and outside of Manitoba.

Table 1: Contribution of nitrogen and phosphorus to Lake Winnipeg
(Source Manitoba Water Stewardship).

Category	%Total Nitrogen from total load of 86,701 t/yr	% Total Phosphorus from total load of 7,845 t/yr
Overall annual nutrient load to Lake Winnipeg	100.00	100.00
Upstream jurisdictions	56.45	52.96
United States (Red R)	21.89	32.34
United States (Souris R)	1.30	2.66
Saskatchewan and Alberta (Assiniboine and Saskatchewan Rivers)	9.62	4.58
Ontario (East side)	4.23	3.34
Ontario (Winnipeg River)	19.40	10.04
Manitoba Sources	43.55	47.04
Manitoba Point Sources	5.85	8.53
City of Winnipeg	4.21	5.28
All others	1.64	3.25
Manitoba Watershed Processes	26.75	32.45
Estimated natural background	20.86	17.04
Present day agriculture	5.89	15.42
Atmospheric Deposition	10.96	6.05



Lake Winnipeg Watershed.

The Board's Mandate and Actions to Date

The Lake Winnipeg Stewardship Board was appointed in July of 2003 by the Minister of Water Stewardship as part of a larger Provincial Lake Winnipeg Action Plan. The 17 member Board represents a wide range of Manitoba stakeholders from within the Lake Winnipeg watershed. The Board's mandate is to identify actions necessary to reduce nitrogen and phosphorous loading to Lake Winnipeg. The Board submitted its first Interim Report to the Minister in January 2005. The report identified 87 recommendations in 32 specific areas. The recommendations fall into several categories including: agricultural, municipal, research requirements, transboundary issues, and education needs.

Following the release of its Interim Report, the Board undertook a series of public meetings in April and May 2005 to solicit feedback on the interim recommendations. More than 125 submissions were received from agencies, organizations, and individuals during this period. A Report on Public Discussion released in July of 2005 summarized that feedback.

Next Steps

Now focused on preparing its 3 Year Term Report, the Board is considering the feedback received, studying related issues not covered in its Interim Report, and refining its recommendations accordingly. This 3 Year Term Report will be completed for the Minister of Water Stewardship in July 2006.

For More Information

The Board's reports can be accessed on the "publication page" of the Board's web site: www.lakewinnipeg.org or by contacting Sharon Gurney (Technical Secretariat) at 204-452-1401 or by email at sgurney@gov.mb.ca

The Alberta Water Quality Awareness Day: An Example of Community-Based Volunteer Monitoring

By Sarah Depoe and Christina Hiebert, Alberta Agriculture Food and Rural Development

Have you ever wondered about the quality of the water in your local stream or wetland? Some folks are getting answers by taking part in community-based volunteer monitoring programs.

Volunteer water samplers collecting a water sample.

Community-based volunteer monitoring programs are becoming more common in countries around the world. Many excellent community- and education-based programs already exist worldwide and in Canada. Some examples include programs like:

- FrogWatch
- WormWatch
- Christmas Bird Count
- The Great North American Secchi Dip In
- World Water Monitoring Day

The Alberta Water Quality Awareness (AWQA) Day is a community-based volunteer monitoring program that is targeted at raising awareness of water quality issues in the province. The program is modeled after the highly successful World Water Monitoring Day. The main goal of AWQA Day is to build awareness of water resources through local monitoring of Alberta's surface waters and to encourage Albertans to engage in watershed stewardship initiatives. The program began in 2005 and nearly 2000 Albertans took part that year.

Under the program, a province-wide 'snapshot' of water quality is taken in June. Snapshot monitoring means that multiple sites throughout a geographic area are sampled within a short period of time. Although a single water sample does not provide a comprehensive picture of water quality, this type of monitoring helps build awareness and brings citizen science into action, allowing everyone to examine the health of Alberta's waterways

The AWQA day sampling provides information on four general water quality parameters: dissolved oxygen, temperature, turbidity and pH. These

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AWQA Day Success Story: Water Quality Sampling in Gull Lake

"The AWQA Day program was an excellent fit with the goals and objectives of the Gull Lake Water Quality Management Society" says Jock McIntosh. He and another member of the Society collected shoreline water samples from nine locations at main beaches or areas with public access. Along with monitoring results from another study, they will present AWQA test kit findings to others dedicated to preserving and protecting the water quality of their lake.

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School group learning about water quality.

basic measures of water quality have important implications for fish and wildlife habitat, outdoor recreation and human health and, over time, can help develop a repository of locally-generated environmental data to track changes and improvements.

In 2005, participants included school groups, individuals, families, friends, watershed groups, youth groups, government and non-profit organizations. Together, AWQA Day volunteer water samplers submitted water quality results from 974 sites in lakes, streams, wetlands and other waterbodies across the province.

The 2006 program is gearing up. For more information and to register for the program and your free water test kit (Alberta only), please visit the AWQA Day website at www.awqa.ca, email info@awqa.ca or call (780) 422-4385. AWQA Day is a partnership between the Alberta Lake Management Society (ALMS), the Alberta Stewardship Network (ASN), Alberta Agriculture Food and Rural Development (AAFRD), Alberta Environment (AENV), Agriculture and Agri-Food Canada (AAFC), and Fisheries and Oceans Canada (DFO).

Hardisty Creek Restoration Project

By Connie Bresnahan, Athabasca Bioregional Society

The Hardisty Creek Restoration Project (HCRP) is a multi-year community-based watershed restoration project. Hardisty Creek is a small tributary of the Athabasca River. Its headwaters are in the Big Horn Ridge which is 10 to 15 kilometres south of Hinton.

Prior to the development of the project, the creek was suffering from a host of problems that compromised the ecological health of the watershed. These effects included several crossings that were either full or partial barriers to fish passage, forest harvesting, ATV impacts, urban residential development, urban park and recreation use, and light and heavy industrial businesses near or in the riparian zone.

The Hardisty Creek Restoration Project was conceptualized in December 2001 by the West Athabasca Watershed Bioregional Society, a local grassroots watershed group. In early 2002, the Society requested scientific and technical support from the Foothills Model Forest. The Foothills Model Forest became the first partner in HCRP, followed soon after with the endorsement and support of the Town of Hinton, Fisheries and Oceans Canada, West Fraser Mills Inc. (then Weldwood of Canada Ltd.), Canadian National Railways, Alberta Sustainable Resource Development, and Alberta Transportation. Further support for the project was provided by the Cows & Fish Program, Hinton

Canadian National Railways culvert on Hardisty Creek prior to remediation.

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Fish and Game Association, local schools, and interested citizens.

The central mission of the project is twofold: 1) to restore biophysical health to the Hardisty Creek watershed, specifically addressing fish passage and fish habitat restoration for target species - bull trout and rainbow trout, and 2) to build capacity for watershed stewardship among citizens, schools, agencies and industry in Hinton, and by extension, within the province of Alberta.

The HCRP was launched in September 2003 to mark UNESCO's International Year for Fresh Water, and was officially endorsed by their Wonder of Water Initiative.

The HCRP entails 4 Phases, each Phase with its own process of planning, fund-raising, assessment and corrective design, implementation, and public participation and education.

Phase I was completed in October 2003, with the successful remediation of fish passage at the Canadian National Railways 1928 hanging culvert. The restoration of this major barrier to fish passage provided a huge boost to the inertia of the project, and was showcased at the HCRP official launch in September 2003.

Phase II included a demonstration site which showcased fish habitat restoration and fish passage remediation. The site is a focal point for public and school restoration activities and education, and demonstrates the science and technology of instream habitat restoration and fish passage remediation.

This phase also included several public and school awareness and education events. These events helped garner continued support for the project within the community at large and also helped bring province-wide recognition to the project. One example of an event was the 'Big Splash' event which saw over 60 people of all ages learning about watershed concerns, participating in re-vegetation monitoring, and watching fish habitat restoration in progress.

During Phase II, West Fraser Mills Inc. replaced their mill-site culvert with a bridge which opened up the entire lower section of Hardisty Creek for fish passage, from the Athabasca River all the way upstream to the Highway 16 crossing. Subsequent electro-fishing at the demonstration site produced not only rainbow and bull trout, but whitefish - a bonus for fish passage restoration and a good indicator of the project's effectiveness to date.

Canadian National Railways culvert on Hardisty Creek after remediation.

Phase III is currently in the planning stages and will include fish habitat restoration in the reach directly downstream of the demonstration site, and bioengineering work along the length of the riparian zone to the Athabasca River.

Phase IV will see the final upstream barriers to fish passage in the watershed remediated, and will involve monitoring, evaluation and ongoing maintenance of the bioengineering work. Public and school participation in watershed education events and field trips will continue over the life of the project, fostering a greater understanding of the challenges communities face in sustaining the health, function and beauty of our local watersheds.

For more information on this project or other fisheries related stewardship projects, contact your local Fisheries and Oceans Canada office.

Welcome to Fisheries and Oceans Canada

Prairie Water News (PWN) is pleased to announce that Fisheries and Oceans Canada is a new sponsor for the newsletter. Allison McPhee has joined the Editorial Board Team. We welcome Allison and Fisheries and Oceans Canada and are certain that they have much to offer in terms of broadening the scope of tissues in PWN and contributing many interesting articles to our newsletter.

Impacts of the 2001 and 2002 droughts in Canada: Some highlights

Introduction

Drought is one of the world's and Canada's most significant natural hazards. Droughts have major impacts on the economy, environment, health, and society. This article highlights the impacts of recent droughts in Canada. The material is abstracted from the synthesis report "Lessons learned from the Canadian drought years of 2001 and 2002" available at Agriculture and Agri-Food Canada (AAFC) - PFRA's Drought Watch website: http://www.agr.gc.ca/pfra/drought/info/11602-46E03.pdf

This work has proven to be an important foundation for further work now underway on understanding and predicting droughts.

Drought Characteristics

The droughts of 2001 and 2002 in Canada covered massive areas, were long-lasting, and brought conditions unseen for at least a hundred years in some regions. Western Saskatchewan was drier in 2001 than in any year of the 1930's dust bowl. Saskatoon, for example, was 30% drier in 2001 than in any other year in the past 110 years.

The years 2001 and 2002 likely brought the first coast-to-coast drought on record. The recent droughts of 2001 and 2002 also appeared to cover more of Canada as compared with previous infamous droughts of 1988, 1961, and 1931. These recent droughts were also rare in that they struck areas less accustomed to dealing with droughts. These areas included parts of Eastern Canada and the northern agricultural prairies. The droughts were concentrated, however, in the West, with Saskatchewan and Alberta the hardest hit provinces.

Drought Impacts

In general, droughts in Canada affect only one or two regions, are relatively short-lived (one or two seasons), and affect only a few sectors of the economy. In contrast, the drought years of 2001 and 2002 brought devastating impacts to many economic sectors. The droughts posed considerable adaptation challenges, and made history.

The droughts of 2001 and 2002 in Canada covered massive areas and brought conditions unseen for at least a hundred years in some regions.

Repercussions were far-reaching and included:

- **Agricultural production** dropped an estimated $3.6 billion for the 2001 and 2002 drought years, with the largest loss in 2002 at more than $2 billion.
- The **Gross Domestic Product** fell some $5.8 billion for 2001 and 2002, again with the largest loss in 2002 at more than $3.6 billion.
- **Employment** losses exceeded 41,000 jobs, including nearly 24,000 jobs in 2002.
- **Net farm income** was negative or zero for several provinces for the first time in 25 years. A negative net farm income occurred in PEI for 2001, in Saskatchewan for 2002, and a zero net farm income was reported for Alberta in 2002.
- **Crop production losses** were devastating for a wide variety of crops across Canada, particularly in 2001.
- **Livestock production** was especially difficult due to the widespread scarcity of feed and water. Some livestock inventories decreased, especially in Alberta.
- **Water supplies** that were previously reliable were negatively affected, and several failed to meet the requirements. Water supplies considered included surface water such as streams, wetlands, dugouts, reservoirs and groundwater.
- **Multi-sector effects** were associated with the 2001 and 2002 droughts, unlike many previous droughts that affected single to relatively few sectors. Impacts were felt in areas as wide-ranging as agricultural production and processing, water supplies, recreation, tourism, health, hydro-electric production, transportation, and forestry.
- **Long-lasting impacts** included soil and other damage by wind

erosion, deterioration of grasslands, and herd reductions. Some of these systems can take decades and longer to recover.

- **Several government response** and safety net programs partially offset negative socio-economic impacts of the 2001 and 2002 drought years. Given the unprecedented nature of these droughts, the response from all sectors could not be expected to completely address the problems. Crop insurance payments were very high in 2001 and 2002, especially in Saskatchewan and Alberta. Saskatchewan saw a large increase in payments from $331 million in 2001 to $1.1 billion in 2002. In Alberta, crop insurance payments jumped from $274 million in 2001 to $790 million in 2002.

Some Lessons Learned

The 2001 and 2002 droughts would have likely been much worse without the experiences of previous droughts. However, lessons learned include:

- Several **adaptation** measures were suggested and used, however many were costly and disruptive. Many adaptations proved insufficient to deal with such an intense, large-area, and persistent drought, underlining Canada's vulnerability to such events.
- **Wind erosion** and dust storms posed serious problems, particularly in Alberta and Saskatchewan, in the spring of both 2001 and 2002. Blowing dust was associated with traffic accidents on the Prairies, and linked to some fatalities. Routine monitoring of wind erosion and dust storms is required to reduce risks.
- **Drought causal factors** are not well understood. The large-area atmospheric and oceanic patterns suspected to cause previous major droughts were distinctly different than those associated with these recent droughts. This suggests that a better understanding of the causal factors is needed to reduce our vulnerability by providing early warning.
- The **risk of drought** is greater than previously thought. Indicators of this increased likelihood include the recent knowledge of great decadal droughts before 1900, the increasing societal demands for water and food production, preliminary understanding of drought causal factors, and climate change. Evidence indicates that droughts may become worse as a result of climate change, requiring a far greater adaptive capacity.
- **Drought monitoring** and assessment of causes, impacts, adaptation and vulnerability research requires additional coordination, resources and expertise.

Wind erosion and dust storms caused considerable soil and much other damage in a large area south of Saskatoon, Saskatchewan, in the summer of 2003. (photo by E. Wheaton, SRC)

Conclusion

The 2001 and 2002 droughts were exceptional by many measures and extremely important to examine because they:

- were unusually large, severe, and embedded in a long dry period
- were associated with devastating impacts
- required considerable costly, disruptive and problematic adaptations that still left losses
- led to residual and longer-term impacts that resisted adaptation, and
- provided lessons that can be used to reduce the risk of losses to future droughts

Project Team

This project originated with PFRA, supported by the AAFC Canadian Drought Committee. The Project Team included: Elaine Wheaton and Virginia Wittrock, Saskatchewan Research Council; Suren Kulshreshtha, University of Saskatchewan; Barrie Bonsal and Grace Koshida, Environment Canada; Charles Grant, University of Manitoba, and, Phil Adkins, Aston Chipanshi, Gord Bell, Allan Howard, Bob MacGregor, and George Brown, AAFC.

Planning for Drought – An Alberta Example

By Isabel Simons-Everett, Alberta Agriculture Food and Rural Development

Why plan for drought?

Recurring drought is part of the Prairie climate. Drought can cause serious impacts on the regions' agriculture industry.

A risk management approach to drought allows an immediate, effective response during a drought crisis, and also reduces drought impacts over the long term through planning and preparedness. In contrast, ad hoc program responses to an existing drought crisis may lead to untimely and costly short-term solutions.

In Alberta, one risk management approach taken was the development of the Agriculture Drought Risk Management Plan (ADRMP).

Where is drought a concern?

The Prairie Provinces are not strangers to drought and when there are consecutive seasons of low moisture conditions, producers face a constant battle to keep crop yields high and take care of livestock.

Government has recognized that ad hoc responses to an existing drought crisis do not prepare Albertans for future droughts and that during non-drought times priorities tend to lie elsewhere. Once the drought is over, a level of apathy tends to take hold and planning and preparing for future droughts becomes a low priority.

As in other prairie regions, 2002 went on record as the driest in Alberta's history and the multi-agency Alberta Drought Management Committee (ADMC) was formed to provide scientific and technical input, develop educational materials and recommend delivery of programs.

The Agriculture Drought Risk Management Plan for Alberta (ADRMP) was developed by the ADMC to provide a framework for a coordinated, proactive and fiscally responsible approach by government agencies to reduce the effects of drought on Alberta farmers and ranchers.

The ADRMP's risk management approach helps producers become less vulnerable to drought, and helps government agencies provide timely, effective responses before, during and after drought. The ADRMP identifies three conditions: normal, drought alert and drought.

During **normal** conditions, the focus of producers and government agencies will be on preparedness which includes ongoing monitoring of soil moisture, water levels and climatic conditions.

Drought alert conditions require more focus on reporting, monitoring and response actions, with a limited attention to preparedness.

During **drought** conditions, the focus shifts entirely to monitoring, reporting and responding to producer needs.

When is drought a disaster for Prairie producers?

There are many definitions for "disaster":

- The Concise Oxford Dictionary defines disaster as "a great or sudden misfortune".
- The Alberta *Disaster Services Act* defines disaster as "an event that results in serious harm to the safety, health or welfare to people, or in widespread damage to property".
- An accepted definition of an agricultural disaster is "an event which seriously threatens the livelihood of one or more members of the agricultural community".

Like other natural hazards or 'disasters', the impacts of drought span economic, environmental and social sectors, and can be reduced through mitigation and preparedness. Droughts are a normal part of climate variability for most regions and global warming may even result in increased frequency of drought in the future. With effective planning and preparedness, the effects of drought may be mitigated enough so that the situation does not become a "disaster".

How does the ADRMP help producers assess their level of risk?

The ADRMP helps by providing information and decision-making tools. One example of a tool is the drought preparedness checklist (see article in this issue of PWN entitled *How Prairie Farmers and Ranchers can Prepare for and Respond to Drought*). The plan also encourages producers to begin assessing their risk by asking themselves the following questions:

- How much loss can my farm absorb or handle?
- Can I withstand a crop failure or loss of some or all of my livestock?
- Would my insurance adequately cover the loss of capital assets and/or income in the event of a disaster?

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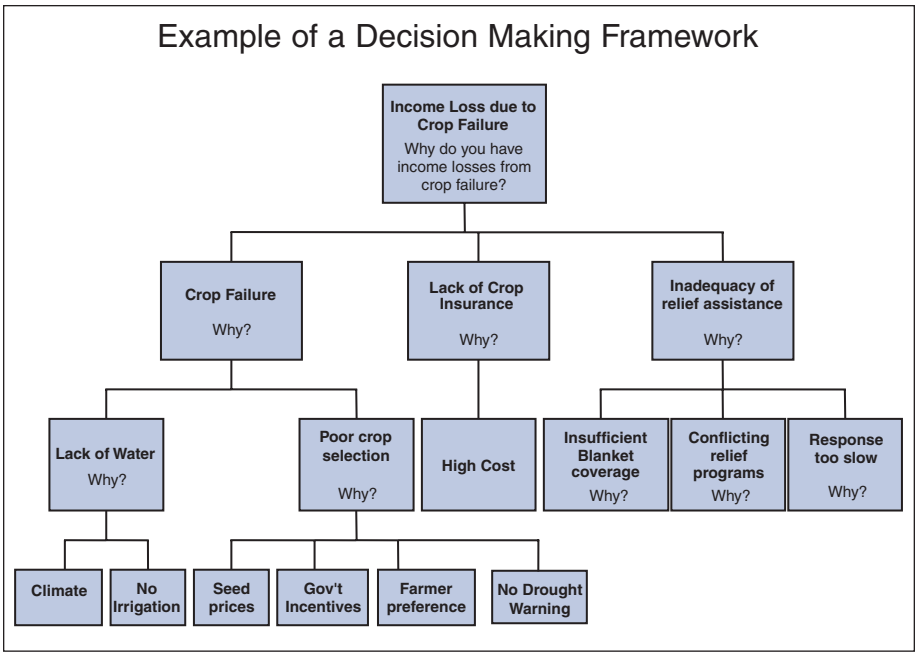
- What adverse weather could affect my farm?
- What precautions have I taken to protect my family and the farm?
- Am I familiar with the Disaster Services Act, the Water Act and the Soil Conservation Act?
- Keeping in mind potential disasters, have I considered all my production options?

Note: Producers are responsible to insure those items for which insurance is available.

What type of information and reporting is available under the ADRMP?

In Alberta, the ADMC monitors drought-related weather data from across the province, compiling the information into regular scientific Drought Reports. The frequency of Drought Reports increases with the severity of drought conditions in the province. Under normal conditions, drought reports are available monthly from October 30 to May 1, and bi-weekly May through October. Under drought alert and drought conditions, the frequency of the reporting increases.



The Drought Reports include current moisture conditions, trends and explanations. Crop reports are also available from AAFRD, as well as access to the map viewer called the AgroClimatic Information Service.

The Alberta Agriculture Food and Rural Development (AAFRD) website also provides links to other sources of information that can assist farmers in assessing their level of risk.

For more information on the Alberta Drought Risk Management Plan and on partner activities, contact the ADMC Secretariat (in AAFRD) by phone at (780) 422-9167, or toll free at 310-0000. You can also access AAFRD's website at www.agric.gov.ab.ca to view the drought reporting that is available.

How Prairie Farmers and Ranchers can Prepare for and Respond to Drought

By Isabel Simons-Everett, Alberta Agriculture Food and Rural Development

Farm producers make important decisions about a variety of critical things, but the weather is one critical factor that producers cannot make a decision to change. There are, however, decisions that can be made to minimize or mitigate the effects of the weather and of drought.

Government agencies and partners can help producers make these decisions by providing information and decision-making tools. A Response Toolbox provides a range of possible actions from mitigation during the early stages of drought to financial stabilization during and following more severe conditions. Producers can also adopt business, crop, and livestock and forage management practices that may reduce their vulnerability to drought.

One of the simplest tools that farmers can use to plan for drought is a Drought Management Checklist.

Drought Preparedness Checklist

Pre-drought planning and actions to increase the producer's level of readiness are important. Producers

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can prepare for drought by doing the following:

- Identify business, crop, and livestock and forage management practices that reduce vulnerability to drought;
- Develop and maintain inventory lists of waters resources; and
- Encourage long-term water development.

Year-round drought management decisions

- Use appropriate soil moisture management
- Consider all reasonable options for long-term water conservation and riparian management
- Use appropriate long-term range and pasture management
- Establish adequate on-farm water storage
- Have the farm's marketing plan up-to-date, and develop a contingency plan, if necessary
- Stay informed of climate and weather patterns in the area

Drought management decisions during winter

- Check the long-range forecast for winter precipitation in the area
- Gather information to make production decisions for the spring
- Make plans to adjust spring range and pasture management for drought conditions
- Honestly gauge the effects of drought and the resulting financial and mental stress on the family and take steps to deal with it
- Learn more about drought-related management decisions that can be made in the winter.

Drought management decisions in the spring

- Check the current and long-term weather forecast for the area
- Monitor if there is adequate soil moisture to seed
- Select the most appropriate crops to seed for current moisture and market conditions
- Have alternate plans in place for feeding livestock, in case spring pasture production is poor
- Have adequate production insurance coverage
- Learn more about drought-related management decisions that can be made in the spring.

Drought management decisions to be made during summer

- If emergency hay or grain, or extra pasture, is needed, arrangements have been made to get it
- Alternate uses for crops have been considered
- A dependable water source has been secured
- Production inputs have been adjusted to reflect current moisture and market conditions
- Weather forecast are being monitored
- Consideration has been given to reducing livestock inventory
- Information on federal and provincial government agencies support programs that may provide financial support during a drought has been obtained
- Any signs of stress in individual or family have been noted
- Learn more about drought-related management decisions that can be made in the summer.

Drought management decisions for the fall

- Using proper soil moisture conservation techniques in the fall can improve growing conditions next spring
- Harvest and post harvest inputs have been appropriately adjusted to reflect current moisture and market conditions
- Adequate feed and water stores are available to maintain herd through the winter
- Consider whether or not to reduce livestock inventory
- Check the current and long-term weather forecast for the area
- Learn more about drought-related management decisions that can be made in the fall.

Additional information with links on these decision-making strategies can be obtained at www.agric.gov.ab.ca or by calling Alberta Agriculture Food and Rural Development Strategy and Business Planning Division at (780) 422-9167.

Where Did the Bluestone for Dugouts and Ponds Go?

By Stephen Madden, Alberta Agriculture Food and Rural Development

Copper sulfate, commonly referred to as Bluestone, is a copper-based product that works quickly and efficiently to control some types of algae that grow in farm dugouts. Algae control is important for household and livestock uses of dugout water since certain types of blue-green algae, called cyanobacteria, can produce deadly toxins. As well, most algae will cause taste, odor, color and water system problems that can shut down operations for unwanted time periods.

Until recently, bluestone was readily available from local farm and feed supply stores. It was preferred because of its low cost (about one dollar per pound) and a typical farm dugout only requires a few pounds per treatment. Depending on weather and dugout conditions, one to three treatments per year were effective for cyanobacteria control. Over the past few years, the control of cyanobacteria problems has become a bit more complicated. It seems like someone pulled the carpet out from under Bluestone and now people are unable to find it.

Many people believe that Bluestone can no longer be purchased to treat dugouts and ponds. This is not true. The appropriate copper-based product is just a bit more difficult to find. In 2003, Health Canada's Pest Management Regulatory Agency, holders of the Pest Control Products Act (PCPA) and issuers of control numbers for Registered Products, indicated that all products sold or used in Canada for algae control in ponds and dugouts require registration.

Therefore, products such as Bluestone, when specified for use to control algae, need to be registered and have a PCPA Control Number. Since copper sulfate is considered an "algaecide", manufacturers of copper-based products now require a PCPA number or they must stop selling the product for use in dugouts and ponds. Some manufacturers opted not to obtain the PCPA registration number and now only provide Bluestone as "feed grade" (which is not suitable for use in dugouts).

Rest assured that a number of registered granular and liquid copper-based products exist that are the same, or similar, to the original Bluestone that everyone used for years. Retailers should know where to get these products and understand that they can sell these products for the treatment of dugout water. These products may be available through farm supply stores, water treatment supply stores, chemical suppliers or hazardous goods warehouses. Registered copper

Prairie dugouts are often plagued by high concentrations of algae.

Copper Sulphate (Bluestone) can be applied in granular form by filling a sock with the product (Photo 2a) and dragging it back and forth through the water (Photo 2b). Photo Credit: PFRA

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sulphate products are easily identified by their five digit registration number on the front of the package, which should appear as "REGISTRATION NO. XXXXX PEST CONTROL PRODUCTS ACT (PCPA)" or as "Reg. No. XXXXX PCPA".

One thing to note is that each product may have different amounts of the effective ingredient, which is copper (Cu). To deliver the recommended dosage of 0.25 mg/L Cu to the top meter of water in a dugout, you may have to use different amounts of different products. Each registered product will list the percentage of effective ingredient by weight or by volume so that you can calculate how much is needed.

Always remember that it is important to understand the specific dugout water quality problem you have and then match an appropriate treatment solution before purchasing products for dugout use. Achieving good water quality always starts with protecting the source of the water first. Therefore it is important to control nutrient loading into the dugout by using appropriate best management practices. As well, there are non-chemical means, such as the use of aeration, that can help control algae in farm dugouts.

For further information on algae control and improving dugout water quality, pick up the publication "Quality Farm Dugouts". It is available from your local Alberta Agriculture Food and Rural Development, Agriculture and Agri-Food Canada-PFRA, Manitoba Water Services Board, Saskatchewan Research Council, or Sask Water offices. The manual is also available on the Internet at www.agric.gov.ab.ca

For more information, please contact your local provincial farm water specialist or regional PFRA office.

Dugout Odors – What Causes Them and How Do I Fix This?

By Stephen Madden, Alberta Agriculture Food and Rural Development

Dugouts are a common sight in the Prairies. Many people use them for livestock watering or to meet household water needs. One of the challenges with using dugouts as a water source is that they are constantly at the mercy of environmental factors. A common complaint we receive revolves around dugout odours.

Decomposing materials within a dugout use up oxygen; this can lead to odour problems. Troubleshooting these odour problems is relatively easy and we will deal with the two most common dugout odors within this article.

First, determine the smell. Is there a fishy smell? If so, this could indicate algae growth in the dugout. Is there a rotten egg odour? If so, this likely indicates that oxygen depleted water is now producing hydrogen sulphide gas.

Regardless of the smell, your dugout should be visually inspected to find other signs that may assist with a resolution to the problem. Signs you may see are:

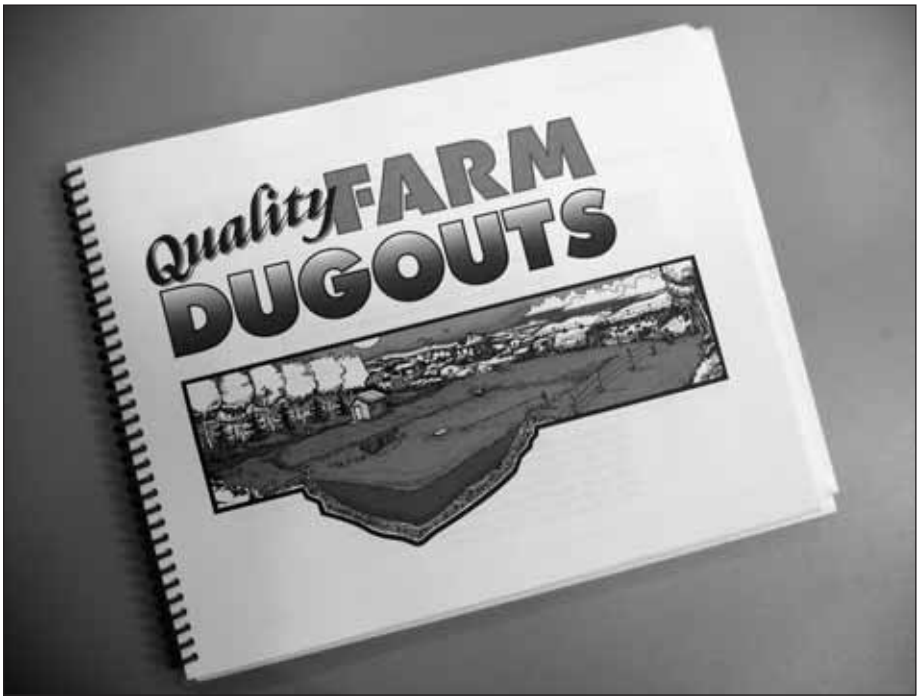
- Black colored and smelly dugout water – usually a sign of lack of oxygen, which will cause rotten egg odour.
- Algae growth – causes fishy odours when abundant, and rotten egg odours when the material dies off and decomposes, using oxygen.

If you have a fishy smell in your water and you inspect your dugout and notice algae growth, you will need to treat the algae. Common treatment for algae is Bluestone (copper sulphate). Use 1/2 pound per 100,000 gallons of water to treat the problem. The algae should quickly die off after treatment but the odours will likely persist for another week or two after treatment.

If you have a rotten egg odour, this will require a bit more investigation. First determine if the odor is coming from both your hot and cold water taps.

(1) If the odor is from both hot and cold water taps, find a point in your main water line where you can obtain a water sample before any water treatment equipment. If you don't notice any odour at this point, your water treatment system is probably the culprit and will likely require a service call. If you still notice odour, then your dugout is likely the problem. To treat the dugout odour problem, you will need to install an appropriate aeration system.

An aeration system can help reduce odours associated with a lack of oxygen in the dugout.



The Quality Farm Dugouts publication can answer most questions related to dugout construction and management.

An aeration system generally consists of an electric pump, air-line and diffuser. The diffuser takes air from the air line and releases it as small bubbles into the water. This greatly improves the efficiency of the aeration system. The diffuser location is important. It should be placed in the middle and on the bottom in the deepest point of your dugout. Ensure that the air line is below your water intake.

(2) If the odour is from your hot water tap only, this is likely caused by your hot water tank. There are two potential causes:

- Biological growth within your hot water tank resulting from the presence of sulphate-reducing bacteria. To treat this problem, you can increase the temperature on the tank to "cook out" any growth. The thermal death point of sulphate-reducing bacteria is approximately 140°F (60°C). Water heaters are usually factory set at 140°F +10°F (60°C+6°C), which is the "meeting setting" on the temperature control dial. Increasing the temperature to the "high" setting (160°F at 71°C) for several hours and flushing the tank should kill the sulphate-reducing bacteria and greatly reduce the odour problem until the population of the bacteria becomes high again. CAUTION: The hot water tank must have an operable pressure relief valve; otherwise, this method of treatment may be dangerous. The temperature setting must be reduced following treatment to eliminate the risk of people being scalded from dangerously hot water and to avoid high energy costs.

  Alternatively, you can use household chlorine bleach to disinfect the tank.

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NOTE: do not use bleach to treat water treatment equipment. Bypass the treatment equipment during the chlorine bleach treatment.

- Anode rod breakdown – The anode rod in the hot water tank is made of material that is designed to break down over time. Consult with your local plumber for alternative anode rods and replacement. Zinc has an electrode potential that is much closer to that of the steel tank than magnesium. If a zinc anode is used instead of magnesium, the zinc will sacrifice fewer excess electrons to reduce the sulphates. This remedy will not eliminate problems associated with sulphate-reducing bacteria, but it can greatly reduce them.

  Another option is the removal of the cathodic-protection anode. This is not a preferred method, but it may alleviate the odour problem. This method eliminates all cathodic-protection from the tank, which may shorten tank life.

For further information on improving dugout water quality, pick up the publication "Quality Farm Dugouts". It is available from your local Alberta Agriculture Food and Rural Development, Agriculture and Agri-Food Canada-PFRA, Manitoba Water Services Board, Saskatchewan Research Council, or Sask Water offices. The manual is also available on the Internet at www.agric.gov.ab.ca

For more information, please contact your local provincial farm water specialist or regional PFRA office.

A Prairie-Wide Study on the Use of Barley Straw for Algae Control

By Rob Butler and Sharon Reedyk, Prairie Farm Rehabilitation Administration

Background on Barley Straw

The use of barley straw is often suggested as an inexpensive method for controlling algae in ponds. It has been demonstrated to work in Europe, and is referenced in many extension fact sheets in the United States. The exact mechanism which causes the barley straw to stop algae growth is not fully understood but most laboratory studies provide evidence that there is something that inhibits the growth.

There have been some demonstrations of the technology in the prairies, but no follow-up on their effectiveness has been reported. In particular, no comprehensive evaluation of the effectiveness of the technique as described in existing fact sheets has been conducted in the prairies.

The technique for barley straw application described in published fact sheets suggests that barley straw should be loosely packed with floats

Typical dugout site showing geotextile membrane curtain and barley straw bags.

in porous fabric bags and tethered in the centre of the dugout. The water should be aerated and there should be a mechanism to distribute the rotting straw extract throughout the dugout. Recommended dosages range from 10-50 g/m^2 and it is also recommended that the straw is applied before significant algae growth is present.

The Current Study

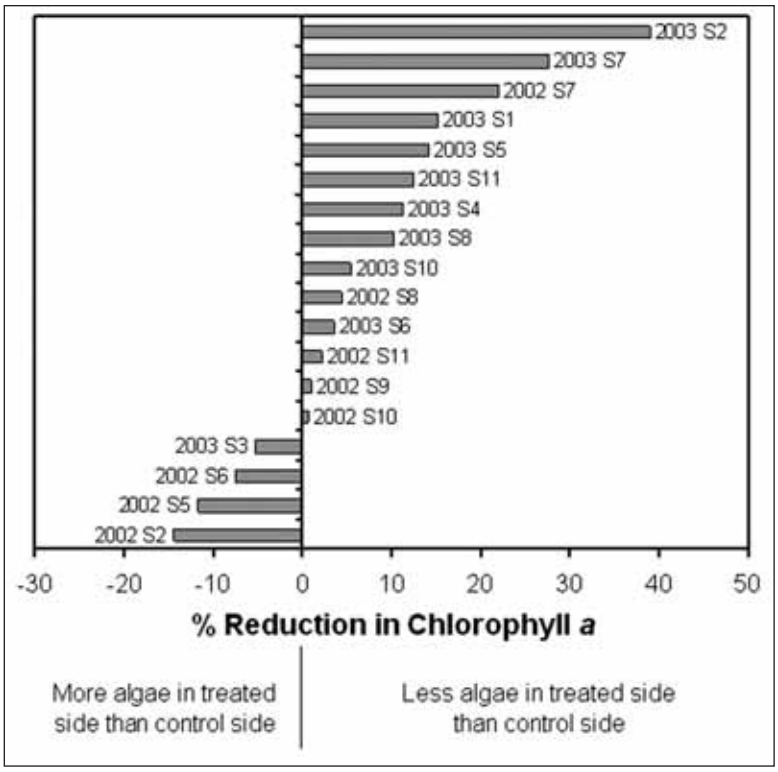
From 2002 to 2004, a prairie-wide field-scale study of 11 dugouts was conducted to evaluate the effectiveness of barley straw in reducing algae concentrations when applied according to directions in the existing fact sheets. In this study, each dugout was divided into treatment and control sides using a geotextile membrane. The dugouts were aerated and dosed with barley straw according to the doses and methods identified in the published literature.

Algae concentrations were estimated by measuring chlorophyll-a (a pigment in algae) and secchi-disk depth (a measure of how clear the water is).

What Did the Study Find?

In the first year of the study, there was no difference between the control and treated sides of the dugouts. However, in the second year, a slight reduction in algae concentration was found. The maximum percent reduction in algae concentration in the treated sides of the dugouts was 39%.

Although there was a reduction in algae concentrations in the second year, the actual magnitude of the change was quite small. The mean difference between treated and control sides was less than 3 μg/L, and the maximum difference was only 10 μg/L. Generally a dugout is considered to have problematic algae concentrations when the chlorophyll a concentration is around 50 μg/l or greater.



Percent reduction in chlorophyll a concentrations in the treated sides of the dugouts. Labels indicate year and site number.

In the second year of the study, both dose and water temperatures were higher. In the European studies, where barley straw has been shown to be effective, water temperatures were higher for longer periods of time than in this study.

What Can We Conclude?

In dugouts on the prairies, barley straw treatments which use the techniques recommended in existing fact sheets produce algae reductions which are **inconsistent** and **not substantial** enough to be viewed as a significant benefit to a producer.

The prairie climate, with low average water temperatures, may be a contributing factor limiting the applicability of the technique. A slight response was experienced with increased **temperature** and **dose**, and this suggests that changes to the application techniques could possibly be used to overcome the limitations of water temperature.

Based on the findings of this study, we recommend that the traditional best management practices such as **Livestock Exclusion, Aeration, Gated Inlets,** and **Grassed Buffer Strips and Waterways** continue to be adopted to improve water quality in farm dugouts.

For more information on this study or a copy of the complete report, contact Rob Butler at 204-983-3123 or Sharon Reedyk at 780-495-5965.

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