



The Verdant Element

THE ESSENTIALS

Inside this issue:

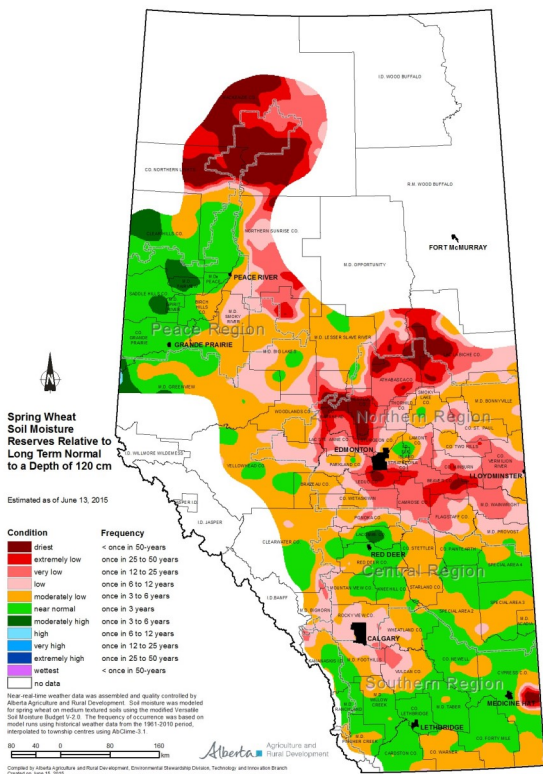
Water For a Lifetime	2
Pest Watch	3
Blue Green Algae	4
Environmental Farm Plan	5
Cyanobacteria Continued	6

Mark Twain said it best as “whiskey is for drinking, and water is for fighting over”. This year is said to be the driest since 2002, and the importance of a safe and secure drinking source is paramount. Although the sloughs, wetlands and lakes seem to still be plentiful, crops are suffering from the lack of rain.

Wetlands are integral for many reasons. They stabilize the flow of water acting like a natural sponge; store water to prevent flooding in wet years and recharging groundwater in dry years. Wetlands and their riparian areas provide wildlife habitat, recreational opportunities, and can even influence local weather. Wetlands across Alberta have been disappearing at an astronomical rate. We must protect these areas and recognize their inherent value. Certain programs, such as ALUS (Alternate Land Use Services) which is offered in County of Vermillion River have a vision of creating a healthy landscape that sustains agriculture, wildlife and natural spaces for all Canadians.

More information on ALUS can be found at alus.ca Water is the most important thing besides air that every creature needs to survive, but so many of us hardly give it a thought. Regular testing of private water sources such as wells and dugouts is often forgotten. Groundwater resources are easily taken for granted in this area as there is an abundance of groundwater resources compared to the rest of the province. It is easy to forget that we can contaminate our well water through poor maintenance, well siting and improper well abandonment; as well that our aquifers are not isolated and we can affect our neighbors groundwater source.

Educate yourself, be proactive, and protect our water resources for future generations.



Visit weatherdata.ca for additional maps and meteorological data



Water Quality is Important for Everyone

Water quality is not only important to the health of you and your family, but also is very important to your livestock and your bottom line.

Cleaner water equals livestock consuming more water, which means more feed consumption, which increases your profits with healthier, heavier animals. Research has shown that when cows have the option to drink from a trough or from an un-fenced creek, 80% of the cattle will use the trough. Access to clean water increases animal performance, and has shown improved growth in yearlings by up to 23%.

Water is the essence of life, yet how often do we think about it. Testing your water is essential to knowing if your water is safe for you and your family to use and to ensure that your water resource is protected. Over time, land use changes, storm events, contaminant storage issues, or structural degradation of an aging well (or dugout) can change or affect water quality. Testing your water on a regular basis provides a baseline of water quality, which can be very important if things go wrong. A baseline is important information to have if another party negatively affects your water source. Without it there is no way to prove that changes have occurred.

Knowledge about what is in your water is vital for your health and wellbeing. Contaminants can enter your water source and negatively affect your health. Nitrates for example, can indicate nutrients (fertilizer, manure and/or sewage) are entering your water source and can be fatal to infants and the elderly or people with other illnesses. Coliforms (fecal) in your water may indicate that human or animal waste are entering your water source, making it undrinkable.

Arsenic has become a more prominent issue in Northern Alberta. Many of the wells being tested in the area have been positive for this heavy metal. Arsenic has two forms, organic (arsenic five [As(v)]) which is found in plants, animals and some foods or an inorganic form (arsenic three [As(III)]) that is found in water, soil or the air. Arsenic in drinking water can be attributed to both natural sources and human activity. North Eastern Alberta has high arsenic levels in the groundwater, which may be due to the type of bedrock found here containing pyrites which are enriched with arsenic.

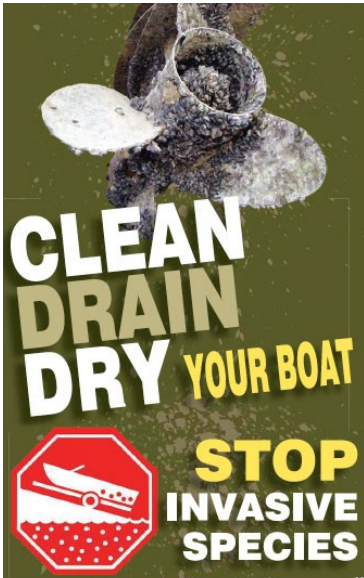
Arsenite (As(III)) is more toxic than organic arsenic (As(v)) and is more prevalent in groundwater due to the low oxygen concentrations. In the Beaver River area As(III) is approximately ten times more prevalent than As(v).

Generally we are exposed to low levels of organic arsenic through our food; this form of arsenic we can metabolize and excrete in our urine. The arsenic found in the groundwater is more toxic and can affect our gastrointestinal system, cardiovascular system and our nervous system. The maximum acceptable concentration (MAC) is 0.01mg/litre.

It is important to test your well water on a regular basis as levels can fluctuate. Water treatments are available to reduce the amount of arsenic or change As(III) into As(v) though oxidation. Reverse osmosis combined with a pre-treatment can remove the majority (roughly 85%) of arsenic from your water. Distillation is an effective method however you must maintain and clean your distiller and replace the carbon filter within the recommended time. Make sure that your treatment systems meet the NSF/ANSI standards. Conducting a pre-treatment and post-treatment analysis is the only way to prove the effectiveness of your system.

Alberta Health Services in partnership with the Beaver River Watershed Alliance have been gathering information and testing local wells for several years. To view the full report on the Drinking Water Quality and Human Health Assessment go to <http://www.health.alberta.ca/documents/Well-Water-Beaver-Basin-2014.pdf>





Zebra and Quagga Mussels originated in the Caspian and Black Sea and were discovered in North America in the late 1980s and have quickly spread across the Midwest states and Ontario. They are fresh water mollusks that were introduced via ships from Europe through ballast water. They are quickly spread laying up to one million eggs per year with their larval offspring being microscopic and free floating. Zebra and Quagga mussels can live up to 30 days out of water. Through boat inspections they can be found in a multitude of locations on boats and trailers, damp storage places on the boats (on life jackets and ropes), ballast water and wading gear. Boats can be decontaminated with hot (60°C), high pressure water. These species have the ability to attach to different substrates whereas native mussels do not have the ability to attach to anything. There is **no control method** so it is impossible to eradicate both zebra and quagga mussels after establishment. Prevention is key in these species.

ZEBRA AND QUAGGA MUSSELS

Zebra and Quagga mussels are filter feeders which will affect the entire ecosystem by removing food for fish and plant species. The mussels outcompete native species, accumulate toxins and pollute the water and can lead to increased frequency and duration of toxic algae blooms such as blue-green algae. They attach to hard substrates such as boats, docks and infrastructure in the water along with softer surfaces such as sand and vegetation, eventually carpeting entire shorelines. They colonize at such a rate that can lead to huge increases in operational costs of water pipelines, intakes, and water treatment systems and boat maintenance.



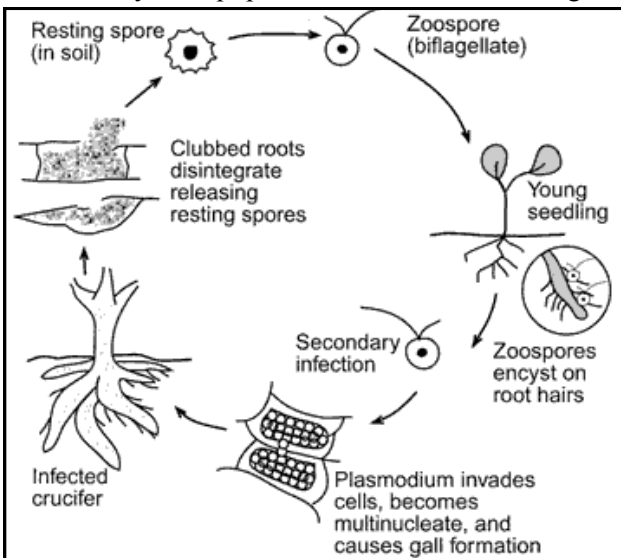
Photo courtesy of Kate Wilson, AESRD

The Alberta Environment and Sustainable Resource Development office is currently developing a prevention and monitoring program. This past summer there were voluntary boat inspection sites at border crossings on weekends that had several confirmed cases of mussels. A large concern is Albertans buying boats in the “snowbird” region of Nevada and Arizona and bringing not only their boat back, but having some mussels along with it. These mussels have recently been added to the fisheries act and Fish and Wildlife officers have the right to confiscate your boat if it has (or suspected to have) mussels on board.

CLUBROOT

Clubroot is a serious soil-borne disease that has been rapidly spreading across Alberta, that once it infests a field it is impossible to eradicate. The spores of the disease are dispersed with soil particles or plant debris and can be transported by wind or water erosion, on machinery, in manure (from animals fed with contaminated feed), on straw or on soil attached to seed. Spores can survive 20 years.

Being proactive is the only way to protect yourself from this disease. Practicing good sanitation on your equipment is a must. Restricting access to your land to prevent others from



Life cycle of *Plasmodiophora brassicae*, the pathogen that causes clubroot (source: Ohio State University).



Severe clubroot galls or ‘clubs’ on canola root. [Photo courtesy of T.K. Turkington, AAFC Lacombe]

bringing the disease onto your land through soil transport on equipment, vehicles, and footwear. Practice good weed control to reduce amount of host plants such as stinkweed, shepherd’s purse, flixweed, anything in the mustard family, volunteer canola, dock and hoary cress. Avoid the use of straw from areas with known clubroot issues. **SCOUT YOUR FIELDS!** Pay special attention to field entrances as this is usually the first place for the disease to be found. Use long rotations to slow progression of the disease.

The rule of thumb for yield losses due to clubroot are about half the percentage of infected stems. With 100% infestation you can expect a 50% yield loss, 10-20% infected stems results in a 5-10% yield loss.

For more information go to: <http://archive.canola-council.org/clubroot/default.aspx>

Pest Watch

Blue-Green Algae (Cyanobacteria) in Surface Water Sources for Agricultural Usage

-Shawn Elgert, Alberta Agriculture and Rural Development

Blue-Green Algae is the common term for a type of bacteria called cyanobacteria. Cyanobacteria are natural inhabitants of surface waters and are widely present in dugouts and reservoirs. They become a problem when conditions promote rapid growth and eventual death and decomposition. For more information on its identification the sources at the end of this document should be reviewed. You can also contact a water specialist by calling 310-FARM (3276) for help regarding identification and recommendations.

Background

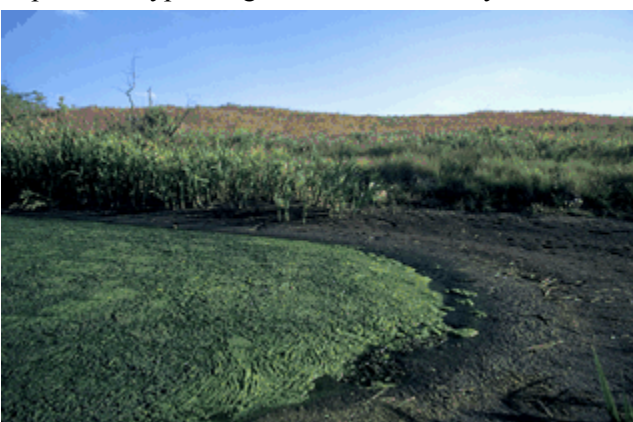
Some cyanobacteria produce toxins that can make the water less palatable, cause distress or illness in livestock, pets or wildlife and in some cases cause fatality. Other species of bacteria do not produce toxins; however these often occur with toxin-producing species in dugouts. Monitoring data from Alberta suggests that more than 50% of cyanobacteria blooms are toxic, but often exceeds more than 75% in some years. Therefore, suspected cyanobacteria blooms should initially be treated as if harmful toxins are present and a water specialist contacted immediately if used for animal consumption.

Higher levels of nutrients in the dugout can lead to more intense growth of cyanobacteria. It is recommended to limit nutrients in the dugout by implementing best management practices such as grassed waterways, buffer strips surrounding the water source, and shut off culvert controls to divert water with high nutrient loads through a bypass ditch. Some sources of nutrients can be manure, runoff from fertilized fields, nearby trees or brush, or water that travels through peat land. Nitrogen and phosphorous are critical nutrients for their growth. Light, temperature and inorganic carbon are the other main inputs required for growth. The temperature for maximal growth rate for most cyanobacteria is above 25° C which is higher than for most other growths.

Still and confined waters, such as with dugouts and reservoirs with warm surface water, tend to promote development of cyanobacteria blooms. Shallower water generally means that the water will be warmer. Many dugouts have enough nutrients to sustain the growth of cyanobacteria; however temperature is often the limiting factor. When temperature increases the occurrences of cyanobacteria also increase in general. Sometimes other algae or plants can dominate, thereby limiting the growth of cyanobacteria. Increasing the depth of the dugout and installing an aeration system will help reduce water temperature and improve water quality. Duckweed is a natural form of a dugout shade and may become dominant over cyanobacteria. Dugout evaporation covers may be feasible in southern areas of Alberta.

Optimal conditions vary from one species to another. Some species are able to survive long periods without sunlight and all have a remarkable ability to store essential nutrients. Various species can survive in fresh or salt water, oxygenated or anoxic water, and with or without dissolved organic matter. Cyanobacteria can over-winter in a dugout and once established, is likely to reappear given acceptable conditions.

The word cyan (from cyanobacteria) means blue-green, but in addition to green chlorophyll, cyanobacteria contain many other accessory pigments that can influence their color and gives rise to species that appear green and blue-green but also other colors like red, purple and red-brown. The additional pigments allow them to harvest light at spectrums other phytoplankton types of growths can't use. Cyanobacteria can out-compete other types of algae such as green algae for example



in turbid water as light is less available. Cyanobacteria out-compete other algae during periods of nutrient limitation as some species can fix atmospheric nitrogen. Notably, in nitrogen enriched conditions other harmless forms of algae outcompete cyanobacteria (see pic below).

Many species of cyanobacteria can trap the gasses they produce in bubbles so as to control their buoyancy allowing them to rise to or lower in the water column to optimal levels of light intensity and spectrum. During the daytime by-products of photosynthesis cause them to become heavy and thus, sink. They respire at night and feed off their reserves produced during the daytime. The need for light causes cyanobacteria to rise rapidly to the surface the

Growing Forward 2 provides programs and services to achieve a profitable, sustainable, competitive and innovative agriculture, agri-food and agri-products industry that is market-responsive, and that anticipates and adapts to changing circumstances and is a major contributor to the well-being of Canadians. The On-Farm Stewardship Program made changes to the funding list, as of November 28th 2014, applications for the following projects/expenses can no longer be submitted:

GROWING FORWARD

- Portable Shelters and Windbreaks
- Improved Manure Storage
- Fuel Storage
- Chemical handling systems
- auto boom height
- low-drift nozzles (with the exception of pulse-width modulation systems)

Most of these projects that the ARD dropped from the funding list have been funded for over 10 years. The ARD is continuously evaluating the program and based on discussion with producers and industry, it was concluded that these projects could be removed from our incentive list because they are considered common practice and do not require additional promotion through the Growing Forward program. This change is only for the On-Farm Stewardship Program.

Growing Forward Stewardship Programs

Program Area	Eligible Costs	Cost Share
Riparian Area Fencing and Management	Permanent fencing (controlled access or exclusion): <ul style="list-style-type: none"> • Permanent barbed/electric fencing systems • Construction materials and supplies. NOTE: all materials must be new materials and not materials on hand • Labour and equipment will be paid at a 1:1 ratio to materials expenses. (NOTE: refer to section 7.4 in the Terms and Conditions); Purchase and planting of native trees and shrubs and/or native or non-invasive introduced species of grass and legumes; Seed and seeding operation for revegetation; Cultural weed control systems and mulch	70% to a funding maximum of \$50,000
Year Round / Summer Watering Systems	Deeply buried, shallow buried, or surface pipeline installation used to distribute water within a pasture and protect a water body/water source; Portable watering systems; Year-round watering systems; Troughs, stock tanks, plastic tanks (or similar water storage); Frost free nose pumps; Pumping systems; Power sources such as solar panels, windmills etc. And other electrical supplies; Plumbing materials	50% to a funding maximum of \$30,000
Wetland Restoration	Earthwork related to construction or plugging of old drains; Engineering consultant fees for design and construction; Re-vegetation costs (seed plantings etc.); Applicant's equipment use at custom rates; In-kind labour at set program rates (\$25/hour)	70% at funding maximum of \$50,000
Livestock Facility and Permanent Wintering Site Relocation	Construction costs to rebuild an equivalent facility or adequately sized facility in a more suitable location; Plumbing, electrical, fence lines, feeding areas, shelter/wind protection; Earthwork; Engineering design and fees (if applicable); Tear down and removal costs of the old livestock facility; Re-vegetation costs of the old site; Applicant's equipment use and in-kind labour	50% at funding maximum of \$50,000
Used Oil and Lubricant Storage	Double wall steel storage tank design expressly for the temporary storage of used oil and lubricants that have a ULC or CSA approved stamp or plate indicating it is for that purpose (ULC-652)	50% at a funding maximum of \$2,000
On-Farm Water Management	Wells (including test drilling, new pump and well casing, electroseismology test, disinfection of new well); Dugouts (including aeration, fencing and floating intakes); Dams (including intake and fencing); Spring Development; Water tanks/storage/cisterns for low producing wells or as part of a permanent water supply; Buried pipelines Special projects include: Specified water conservation measures (purchase and installation of water use meters, well depth meters for agricultural use of water, well decommissioning by a certified contractor, well pit conversions by a certified contractor; Tie-ins	Various funding levels, refer to the terms of reference

The environment is becoming a more prominent issue. It is a large factor in marketing agriculture and food products in today's global markets. Consumers are demanding more transparency and are demanding high quality and safe products. Reputation of food safety is critical to retain and gain access to domestic and international markets.

Environmental Farm Plans (EFP) provide a tool for producers to self analyze their operation and identify environmental risks, current standards, areas for improvement and also highlight what they are doing well.

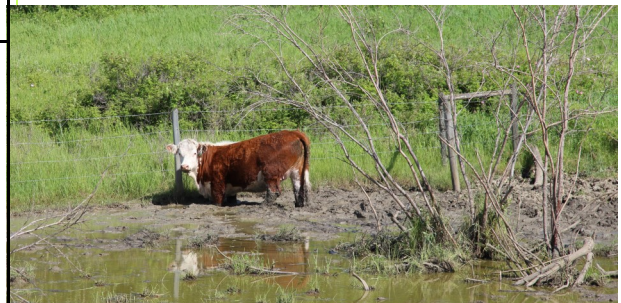
Having a completed EFP allows producers to access different funding opportunities, such as the Growing Forward Stewardship Program. It is also useful in product branding that demonstrates specific environmental standards.

The EFP Process

An EFP can be completed through workshops or one-on-one session(s). The EFP first identifies the soil and farm site characteristics. Following this, the producer completes only the relevant chapters that apply to their operation; such as wintering sites, fertilizer, pesticides, crop management etc. Upon completion the EFP is submitted to a Technical Assistant for review. Once reviewed the EFP will be returned along with a letter of completion.

The EFP is a living document and should be reviewed and updated periodically.

If you wish to complete an EFP or have any questions regarding EFP please contact the LARA office at 780-826-7260



Stuck in the mud? Consider an offsite watering system.

ENVIRONMENTAL FARM PLANS

BLUE GREEN ALGAE CONTINUED

following day giving the appearance of a sudden growth. This rapid appearance can also intensified by water column mixing from wind action, followed by a period of calmness. During the fall photosynthesis is relatively higher than respiration because of the colder temperature and they fall to the bottom of the dugout where can survive the winter slowly feeding off their reserves. Over-wintering populations provide seed for the following spring and when conditions permit, allow cyanobacteria to become dominant once again.



Diagnosis

It is important to properly diagnose the growth in the dugout so the proper course of action can be taken. Cyanobacteria can in some instances be difficult to diagnose visually therefore it is best left to a professional. It is most accurately diagnosed by proper sampling and testing the water to see if the cells exist, or if their toxins are present. Often if one species of cyanobacteria is found in a dugout, another species may also be present. Therefore, unless the water is sampled correctly and tested, it is better to treat it as if there is a harmful species present if any growth of cyanobacteria is diagnosed. Sometimes wind action can concentrate the growth of cyanobacteria and increasing concentration of toxins. At other times the wind action may cause mixing of the growth within the water column. If the sample has not been taken where the concentration of toxin bearing growth is present it may be misrepresented in the analysis.

Field inspection involves assessing its structure, color and smell. Shapes may appear as grass clippings, pea soup, blue paint slick, globules or shapeless clumps. One simple test to determine if a growth is planktonic (which cyanobacteria is) or filamentous (non-cyanobacterial growth) is to try and grab it. Cyanobacteria can occur as single cells, or these cells can bond together into filaments or colonies giving the appearance of a solid mass however if you attempt to grab them they will end up as film on the surface. It is recommended to use water proof gloves as they can produce a rash on the skin. Some green algae growths have similar appearances to some cyanobacterial growths.

Example pictures of cyanobacteria:

Some growths may appear as a green pea soup as in the following picture of Microcystis.



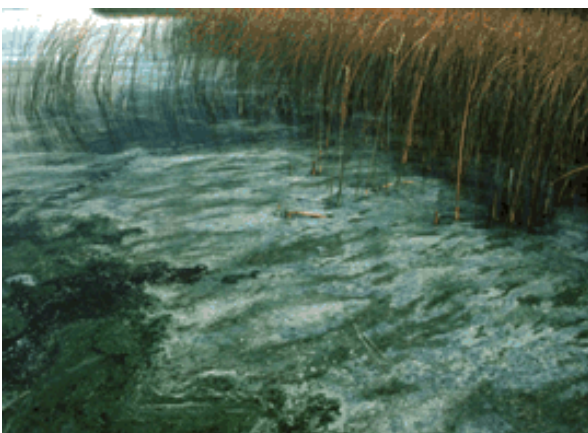
On Left: In situ R. Zurawell. Some may appear as grass clippings in the water as in this picture of Aphanizomenon.

On Right: Dispersed Aphanizomenon colonies, Ron Zurawell

Below Left: Decaying Aphanizomenon bloom, R. Zurawell.

A light blue paint color is seen in this picture of Anabaena

Below Right: In situ: S. Murrell

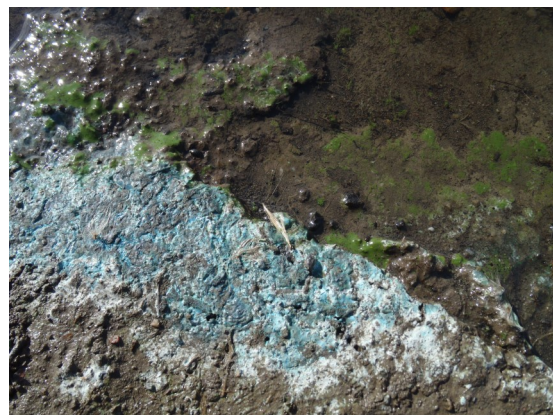


BLUE GREEN ALGAE

Treatment

Not all toxic species are susceptible to copper treatment therefore diagnosis is an important step before treatment. Most strains however can be treated with a registered product of which copper is the active ingredient. Copper treatment should be restricted as a treatment for growths in general unless necessary, such as the presence of cyanobacteria, as it is toxic to aquatic life.

After treatment of the dugout with the copper product, the cells burst open releasing all the toxins at once potentially creating a high concentration of toxins. These toxins may remain viable in the water for up to a month therefore it is important to remove the cattle from this water source during that time. Once the cyanobacteria have been killed the dead cells provide nutrients for another cycle of growth to reoccur. Therefore it is important to monitor the dugout after treatment is administered.



Copper products are not to be applied where the water may overflow and enter a public stream. Some copper products are not registered for farm dugout usage so check the registration number and contact the Pest Management Regulatory Agency to determine if particular products are appropriate for your situation.

Timing of treatments should be done to maximize their chances of success. For instance, avoid doing an in-dugout treatment just before an anticipated runoff event. Runoff that washes a new load of contaminants into the dugout may nullify the first treatment and create conditions that require yet another treatment. Keeping a record of all dugout treatments and observation of their effect is very good practice.

Copper products can be diluted and sprayed out evenly over the dugout however the correct amount for the dugout size must be predetermined. Spot spraying can reduce the amount of copper used.

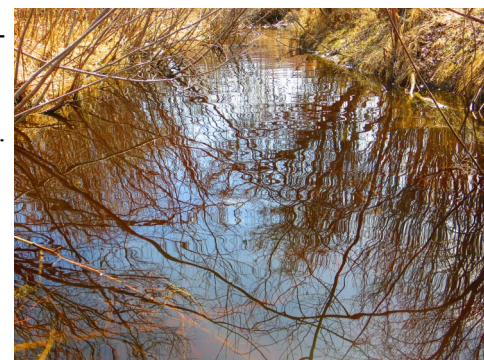
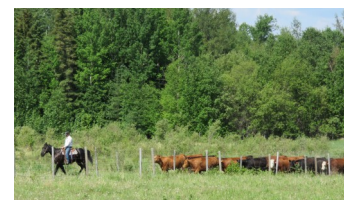
A fairly inexpensive and simple preventative treatment can be done by adding a blue dye to the dugout to prevent photosynthesis, a principle component of cell growth. If you add the dye in early spring, it can help prevent initial stages of growth.

If you suspect cyanobacterial growth in your dugout that is used for animal consumption:

- Contact an Agricultural Water Specialist as soon as possible to determine if your cattle need to be removed from the source so treatment can be done.
- Provide an alternate source of drinking water for your livestock or pets if cyanobacteria are in your dugout until diagnosis is determined and the problem resolved.
- Proper identification of the algae must be made, and treatment recommendations must be provided by a Water Specialist so as not to cause harm to livestock or pets. Water analysis may be required.
- Cyanobacterial growths can lead to fish kills.

Additional Information:

- Toxins may remain in the water for up to a month after the death or treatment of the algae.
- Cyanobacterial blooms may not always be apparent as they may sink down into the water column at times.
- Do not irrigate or rinse edible crops with water that is suspected to have cyanobacteria in it, especially spray irrigated salad, leafy vegetables or strawberries.
- Laboratories for testing may be found in the Yellow Pages
- Cyanobacteria can plug emitters used for spraying crops, as well as clog filters.
- Remember to use safe practices when inspecting water sources, such as a rope tied to the edge with a floatation device and another person present.



Contacts for water source professionals

Alberta Agriculture and Rural Development: 310- FARM (310-3276) – then ask for a Water Specialist

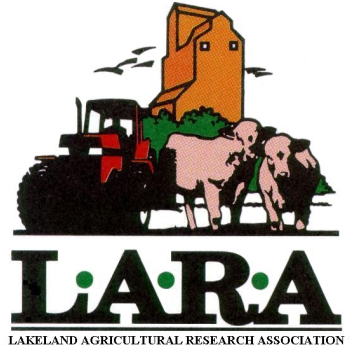
Lakeland Agricultural Research Association

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Sustainable farming encompasses a wide range of practices and principles; combining environmental stewardship with profitability and ensuring that the family farm will be there for generations to come.



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Animal health and performance are superior when given access to clean water. Research has shown that when cows have the option of drinking out of a trough or along an unfenced creek, 80% of cows would use the trough. Access to clean water increases animal performance and has shown improved growth in yearlings by as much as 23%.

COMING EVENTS:

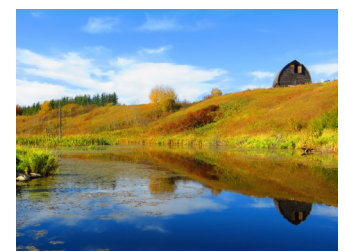
WATER TREATMENT WORKSHOP AUGUST 12

DUGOUT MANAGEMENT WORKSHOP AUGUST 12

FIELD DAYS:
SMOKY LAKE JULY 23
FORT KENT JULY 28
ST. PAUL AUGUST 6
LAC LA BICHE AUGUST 11



BUILDING SOIL – CREATING LAND DR. CHRISTINE JONES AUGUST 4



Ways to Protect Your Water Source:

Attend a Working Well Workshop or visit www.workingwell.alberta.ca

Maintain your well (clean, shock chlorinate, test your water)

Attend a Septic Workshop

Attend a Water Treatment Workshop

Attend a Dugout workshop and monitor your dugout for changes in structure and water quality

Test your Water it is cheap and easy to do through your Alberta Health Unit Drop off locations and times <http://www.albertahealthservices.ca/EnvironmentalHealth/wf-eh-north-zone-water-sample-bottle-locations.pdf>

Talk to Alberta Health Services about having your water tested for heavy metals, especially Arsenic which can be done in this area at a reduced cost due to naturally high levels. For more information on arsenic visit <http://www.albertahealthservices.ca/Padis/hi-padis-faq-arsenic.pdf> and FAQ's <http://www.albertahealthservices.ca/assets/news/rls/ne-rls-bkg-2014-12-04-arsenic-faq.pdf>

To report prohibited noxious weeds call the Alberta Pest Surveillance System at :

310-APSS (2777)