



Alliance of Pigeon Lake Municipalities



# What We Are Doing *to deal with* **Nuisance Algae Blooms**

The Alliance of Pigeon Lake Municipalities (APLM) and the Pigeon Lake Watershed Association (PLWA) are actively addressing the underlying causes of the lake's poor water quality and what can be done to improve it.

Thanks to the support of provincial staff and for funding from the municipal, provincial and federal governments, as well as private donations to the PLWA, much has been learned about what affects our lake's water quality and what we can do about it.

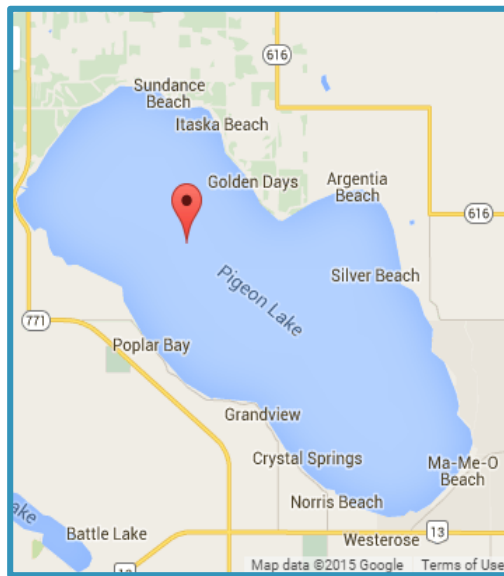
The consensus is - the area of biggest impact on the lake is the phosphorous in the lake bottom sediments but a significant impact on the lake is also through the runoff which carries nutrients. The good news is that runoff is the one area where, together, we can make a difference for the health of the lake.

This brochure is to help ensure that you are informed of the many initiatives that are underway to improve the health of Pigeon Lake.

## Who We Are - APLM

The APLM is an informal, unincorporated group of municipalities that have agreed to work together for the betterment of Pigeon Lake and its greater community.

Municipalities around Pigeon Lake working together...



## Leduc County and the Summer Villages

- ⊕ Sundance Beach,
- ⊕ Itaska Beach,
- ⊕ Golden Days,
- ⊕ Argentia Beach,
- ⊕ Silver Beach,
- ⊕ MaMeO Beach,
- ⊕ Norris Beach,
- ⊕ Crystal Springs,
- ⊕ Grandview, and
- ⊕ Poplar Bay

## Who We Are – PLWA

The PLWA is a charitable, non-profit association made up of 1500 part- and full-time Pigeon Lake residents. Our mission is to enhance, preserve and protect Pigeon Lake and its watershed. We educate, inform and advocate; currently we are focused on critical watershed practices.

## Here's What We Know Today:

- The watershed is a bowl, gravity pulls water along with unused nutrients and pollutants through the watershed into the bottom - the lake.
- Our land use has increased the amount of unfiltered water running into the lake.
- Surface water runoff is the greatest conveyor of nutrients into the lake each year.
- The lake has been overfed nutrients for many years, like extra fat, much resides in the lake sediment.
- Excess nutrients feed the growth of aquatic plants and algae, including cyanobacteria, which impacts water quality; the more nutrients the more plant/algae growth.
- While we have always had many different types of algae blooms, they are more frequent and more prolific.
- Wind followed by calm, warm waters contribute to cyanobacteria, more often experienced later in summer.
- Dust fall and precipitation also add significant nutrients to the watershed and lake.
- The health of the lake, in part, reflects the health of the watershed. We have diminished the watershed/nature's service which cleaned water before it entered the lake.
- Aquatic life is complex. Natural systems are resilient and strive for balance. Trophic studies are on-going which may assist with the improvement of water quality.
- Experts all agree that no matter what is done about the existing nutrients in the lake bottom, we must continue reduce the excess nutrients going into the lake. – **This is where we have the greatest impact about what goes into the Lake.**

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## THE PATH to Better Water Quality:

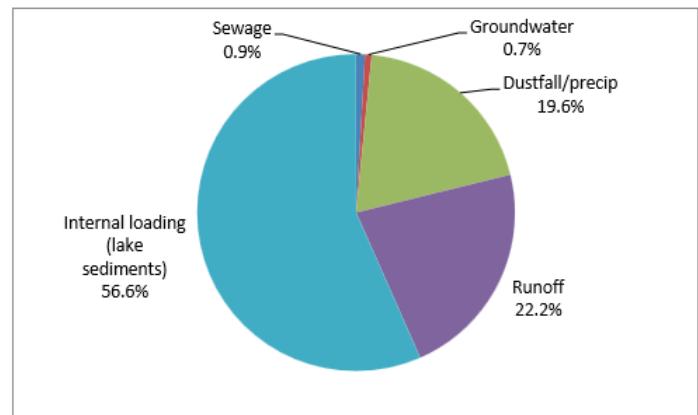
- Reduce the nutrients and pollutants entering the lake each year through improved watershed stewardship.
- Leave the aquatic plants in place to uptake the nutrients already in the lake and to provide additional filtration of nutrients entering the lake.
- Continue to work on binding the nutrients residing in the lake sediments.

## Multi-pronged Approach

Phosphorous in Pigeon Lake is one of the main contributors to algae growth. A significant portion of the lake's total phosphorus content flows in from the surrounding area. Lake sediments also hold large reserves of phosphorus, which have built up over many years. Scientists and lake management experts agree that to improve the water quality we must address the reduction of nutrients going into the lake: those that already reside in the lake and, with watershed run-off work, those that come from external sources.

Therefore, a multi-pronged solution is needed. In-depth Provincial Government studies have told us much about the nutrient sources. "One of the primary reasons a more detailed nutrient budget was carried out at Pigeon Lake was to support exploration of watershed and in-lake management of nutrients with the goal of reducing the intensity and frequency of cyanobacterial blooms." (See Figures below, Ref. Phosphorous Budget Report).

The PLWA is now addressing strategies to mitigate the inflow of nutrients from the watershed, while APLM is investigating actions for in-lake treatments to capture phosphorous already in the lake. This cooperative approach has been endorsed by the provincial government. **Together we can make water quality at Pigeon Lake better.**



**Figure 5-3 Pigeon Lake External and Internal Total Phosphorus Loading Sources<sup>1</sup>**

1. Runoff in Figure 5-3 accounts for both measured and unmeasured inflows, diffuse runoff, outflow and water diversion sources.

We want Residents to know APLM's work: In partnership with PLWA, AEP and others, find viable solutions & take action.

**In-Lake Options – APLM <> Watershed Options - PLWA**

## In-Lake Technical Committee (ILTC)

After the Alberta Department of Environment & Parks (AEP) released the Report *Lake and Watershed Management Options for the Control of Nuisance Blue-Green Algal Blooms in Pigeon Lake* by Chris Teichreb, Limnologist/Water Quality Specialist in May 2012, APLM members examined its 34 options for feasibility. APLM concluded that improving water quality of Pigeon Lake presents a significant challenge and must be addressed with scientific guidance. As a result, the In-Lake Technical Committee was formed with members from APLM, PLWA and the business community, who are mandated to consult scientists and experts for solutions and actions. Support for the committee's work was obtained in 2014 from The Department of Municipal Affairs with a Regional Collaboration Grant of \$245,000 for its project: **Improving the Health of Alberta Lakes – An In-Lake Investigation, Plan and Pilot Project.**

## ILTC Project: Restore Pigeon Lake Water Quality

- ⊕ February 18-19, 2014 Workshop - Scientists and lake management professionals discussed/developed Action Plan.
- ⊕ Pursuing practical workshop suggestions: chemical remediation & biomanipulation (Trophic Cascade).
- ⊕ Review AEP's Paleolimnology (sediment) Study 2014
- ⊕ Water and sediment testing Winter (Feb/Mar) & Summer 2015 - will inform location/quantity for potential chemical remediation.
- ⊕ Support U of A trophic cascade investigation with pilot testing in 2016.
- ⊕ Continuing to investigate other solutions, e.g. algae harvester, toward a pilot project depending on cost/benefit outcome.
- ⊕ Next Steps  
Viability & Regulatory Approval of Interventions, and Plan possible Pilot Project(s)

## Phoslock®- A Bottom-up Approach

*"This appears to be a viable option."*

A possible solution to prevent the growth of algae includes a product called Phoslock. Phoslock consists of bentonite clay (like kitty-litter) and a small amount of lanthanum, a rare-earth element also used by patients during kidney dialysis. Phosphorus is taken out of the water column and captured in the lake sediments so it is not available to feed algae. In February 2014 experts at the Pigeon Lake Workshop pointed out that *"from an application standpoint there is little lake-to-lake variation with the application of the product Phoslock."*

Lake size impacts costs and sufficient supply of the product. Peer-reviewed studies about use of Phoslock in Europe, including Scandinavia and Scotland and Australia have proved the safety and effectiveness of this method.

The up-coming report on water and sediment sampling this past winter/summer will be reviewed for presentation to the APLM Board to determine next steps.

## Bio-manipulation - A Top-Down Approach

The 'food web', the natural biology of larger fish eating smaller ones and on down the food chain, was studied this summer. *"Dr. Rolf Vinebrooke from the University of Alberta and Dr. Ron Zurawell of AESRD have experience with this concept and expressed that the high abundance of phytoplankton and low numbers of herbivorous zooplankton along with the shallow and moderately nutrient-rich conditions of Pigeon Lake are all conditions that suggest that bio-manipulation is a potential strategy for improving water quality."*

Improved water clarity would come from potentially suppressing blue-green algae, allowing more light to reach underwater aquatic plants, stimulating growth and using up phosphorus on the lake bottom.

Trophic cascade has been used and documented in Scandinavian, other European countries and the US; this lake management technique has only been used once in Canada. This may prove to achieve relatively quick results.

The ILT Committee met with Dr. Vinebrook to approve and contribute funding to the project. Samples were taken from the lake to understand the exact nature of food-web dynamics and the species present. Following collection of this year's field data, results will be compiled; experts in fisheries will be contacted and final testing will provide recommendations in 2016.

*APLM partners with government and non-governmental agencies to effectively achieve its goals. The PLWA partners with individuals, groups and governments who are willing to step up because we are stewards and **together we can enhance the health of the watershed and lake... our special place.***

2013

1950

Sediment Core Sample

1900

## Algae Harvester

APLM continues investigation of an Algae Harvester to skim algae blooms from the surface of Pigeon Lake. Harvesters are used in Delaware and Oregon and experts at the Pigeon Lake Workshop outlined the logistics of mechanical removal of algae via this aesthetic solution. Besides possibly reducing algae buildup on shorelines, this may break the nutrient cycle and mitigate oxygen depletion from the decomposing algae, reducing formation of subsequent blooms and also causes of fish mortality. A resolution was passed in support of a feasibility study at the recent convention of the Association of Summer Villages of Alberta. Grant funding is being pursued while APLM works on specifics for potential testing next summer.

## What's that smell?

The lake is a living system. Scientists say Pigeon Lake is unique for the number of algae species, over 50 kinds, and about 30 are cyanobacteria --- blue green algae. And while fecal coliform are normally present, this year counts higher than the standard was found in a couple of places. This is a concern. It can be from different sources and we are asking for tests to identify sources.

A great concern is algae blooms. Lyngbya is a species that grows in shallow lake sediments and lifts to the water surface in large, thick mats. Sunlight can burn it; as it dies, it releases nitrogen, to fuel further algae growth, and ammonia. This includes a foul smell that can lead one to believe that wastewater is the culprit when it is not.

Visit [aplm.org](http://aplm.org) for options considered and not pursued



The action-oriented Pigeon Lake Watershed Management Plan has identified 10 overlapping topics to put clean water into the lake. This initiative is guided by the best available science and input from residents, watershed leaders and experts. To date, the lake communities are acting on:

### *Healthy-Lake Clean Runoff Project (July 2015 onward)*

#### **Clean Runoff Introduction and Education to date:**

1. An initial pamphlet was created and two hundred were handed out in 2015.
2. A brief presentation was made at six Summer Village Annual Information Meetings.
3. The Alberta Low Impact Development Partnership Executive Director gave a [presentation](#) at the PLWA AGM: "Building capacity for the implementation of urban drainage practices in Alberta that will protect and restore our watershed resources."

See: <http://www.plwmp.ca/surface-water-runoff/>

#### **Watershed Support:**

1. The July Clean Runoff Survey had 300 responses on behalf of at least 646 watershed residents which gave clear support. Highlights presented at the PLWA AGM will have a full report to come.
2. The Summer Village of Ma-Me-O is committed to demonstrate the municipal drainage approaches.
3. Four residents have committed their properties as demonstration sites some for clean runoff.
4. Two APLM representatives & 4 municipal councillors participate on the PLWMP Steering Committee.

**Grants attained so far:** Federal EcoAction Grant and a Watershed Stewardship Grant - PLWA has committed to match both the amount in cash and volunteer hours.

**Expertise attained:** The ALIDP is managing the creation of an illustrated "how to" guide for property owners. ([www.ALIDP.ca](http://www.ALIDP.ca)) The PLWA will soon announce the hiring of a **Project Manager** to oversee ongoing and overlapping projects.

**Shoreline / Creek Restorations** – shorelines and the buffers around creeks are the last opportunities to filter nutrients and contaminants from runoff.

1. The PLWA has supported the completion of two restorations:
  - 2013 - The Grandview Creek Restoration
  - 2014 - The Norris Beach reserve restoration
2. Two of the Healthy-Lake Clean Runoff demonstration sites will include residential shoreline restorations.

### *Eliminating the use of lawn fertilizers and promoting healthy soil. (2014 – Ongoing)*

#### **Healthy-Lake Education program**

(<http://www.plwa.ca/pages/healthy-lake-lawn-care>)

**Regulations:** Most municipalities now have lawn fertilizer regulations with fines.

### *Healthy-Lake Land Use for new and re-development within 800 meters from the lake. (2014 - Ongoing)*

#### **A Model Land Use Bylaw**

(<http://www.plwmp.ca/model-land-use-bylaw/>)

**Regulations:** Two municipalities have land use bylaws in place which recognize the importance of protecting the lake's ecosystem. Others have begun a process to pass similar land use bylaws

**Education Resources:** Illustrations are being created to assist municipalities to bring these regulations into effect and for the PLWA "New Comers" packages.

**For More Information go to [www.plwmp.ca](http://www.plwmp.ca)**



### **Binding Nutrients already in Pigeon Lake**

Many quick fix solutions have been investigated but have been ruled out for our lake by the PLWA, and now by the APLM - ILTC (which includes PLWA Directors).

It is a big lake. It will not be possible to bind enough of the nutrients in the lake to solve the algae problem. Even if we could, the problem would continue as long as there are excess nutrients in watershed runoff.

A single approach won't work --- **we must stem the flow of nutrients going into the lake via runoff now.**

Visit APLM and PLWA websites to keep informed.

[www.aplm.ca](http://www.aplm.ca) [www.plwa.ca](http://www.plwa.ca) [www.plwmp.ca](http://www.plwmp.ca)



## Leave Aquatic Plants in Place Filters & Takes Up Sediment Nutrients

Some people think that removing live aquatic plants (reeds and other lake plants) helps to “clean up” the lake. This is not true.

Lakes that have lost significant aquatic vegetation are especially vulnerable to water quality problems. In 2013 and 2014 the PLWA met with staff and politicians from Environment and Sustainable Resource Development (now, Alberta Environment and Parks) asking them to enforce the regulations. The Province has undergone changes and asked that we understand they have limited resources to enforce regulations.

The PLWA worked with the Province to create a better pamphlet to help people to understand how important leaving the reeds and aquatic plants is for lake health. The pamphlet, [Aquatic Vegetation and Lake Health](#) is now available and was handed out by PLWA volunteers. The PLWA is continuing to look into other ways to educate people to stop removing reeds.

## Residents Stop Using Lawn Fertilizers

In 2014 the APLM recommended municipalities pass bylaws to prohibit use of residential lawn fertilizers within the watershed. This was a result of the work of the Pigeon Lake Watershed Management Plan’s Subcommittee on Cosmetic Fertilizers & Soil Management. A lake-wide survey of residents was conducted by PLWA’s sub-committee in winter of 2013-14 to measure the attitudes and fertilizer use. It found many property owners have or were willing to stop using lawn fertilizers. PLWA provides alternative practices with a brochures to help municipalities and private property owners. **The goal is to stop using fertilizers.** Municipalities have looked at or passed bylaws regulating fertilizers. With or without municipal regulation, individual property owners have chosen to make this change to help improve water quality.

**Lakeside residents have got the message  
--- Stop Using Lawn Fertilizers ---**

### Partners

Alliance of Pigeon Lake Municipalities  
In Lake Technical Committee  
Pigeon Lake Watershed Association (PLWA):  
Watershed Options & Watershed Management Plan  
Alberta Environment & Parks:  
Scientific Support – Scientific Reports  
Alberta Lake Management Society:  
Water Monitoring, Overview Report 2013  
Alberta Municipal Affairs:  
Regional Collaboration Grant (2014)  
Alberta Summer Villages Association (ASVA):  
Cyanobacteria Committee

## Project: Water Testing & Algae Advisories

Lake residents can accomplish great things by working together! Like the volunteer-based blue-green algae (cyanobacteria) sampling program that took place at Pigeon Lake this summer.

APLM and other stakeholders asked for a meeting with Alberta Health Services (AHS) and expressed concerns about policy and process. In the past, even if cyanobacteria did not produce toxins, blanket health advisories were issued because of concern for skin irritations. Whole lake advisories were issued when one of three conditions existed: the presence of a visible bloom, cell counts higher than 100,000 cells/ml, or a toxin concentration greater than 20 micrograms per litre. At this point the press would post alarmingly-worded advisories. This year AHS followed the recommendation of APLM’s representative and modified Advisory wording to more accurately describe water conditions.

As well, the APLM ILT Committee recommended and assisted AHS by providing improved water testing program with additional sampling and testing. In partnership with the PLWA, the crucial issue of water sampling was tackled as a group --- to address the safety, image and use of Pigeon Lake. The sampling program added beach locations and offshore sites to provide timely updates about Pigeon Lake recreational water quality. Volunteers recruited by Susan Ellis and coordinated by Jerry Gordy of PLWA were trained by water quality specialists from Hutchinson Environmental Sciences Ltd.

Beginning late June, 10 beaches and 3 off-shore sites were sampled for blue-green algae cell counts and the algae toxin microcystin using scientific protocols.

For most of the summer, water sampling proved recreational activities on Pigeon Lake are safe. Pulling together volunteers, scientists, APLM and PLWA provided AHS with more information. Sampling has now concluded and the full data set will be analyzed and reported on later this fall. Pigeon Lake municipalities and residents contributed to the financial support of this project.

***Thanks to all the volunteers who helped gather water samples this summer!***

# Do you Care about Pigeon Lake?

## Here's 10 ways you can help!

### 1. Visit Our Web-sites

The Association of Pigeon Lake Municipalities (APLM) web-site is at [www.aplm.org](http://www.aplm.org).

The Pigeon Lake Watershed Association (PLWA) web-site is at [www.plwa.ca](http://www.plwa.ca). While you're at it, why not subscribe to up-dates.

### 2. Volunteer and/or become a PLWA Member

Or renew your past Membership! It's Free! Since May, 2013, all members, past and present, are recognized as members without a membership fee! DO make sure your contact information is on file. Email [info@plwa.ca](mailto:info@plwa.ca) to let them know you can help or check your membership status or call 403-816-6049.

### 3. Adopt Lake-friendly Landowner Actions

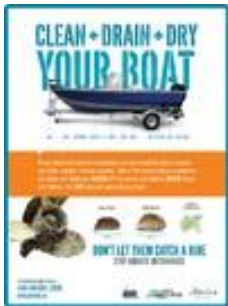
Show commitment with stewardship actions - Agricultural users can help save the Lake too

### 4. Talk to Your Friends & Neighbors

Let them know how you are helping the lake and encourage them to do the same!

### 5. Protect PL from Aquatic Invasive Species

[Learn more about AIS!](#)



### 6. Sign Up for a Home-site Consultation

Living by Water, in connection with Nature Alberta and the PLWA, offers home-site consultations for free!

### INCREASE YOUR KNOWLEDGE

By adopting new actions, attending programs such as workshops or PLWA sponsored events

### 7. Pigeon Lake Watershed Management Plan

Visit [www.plwmp.ca](http://www.plwmp.ca) for progress as watershed residents supported by experts plan and make recommendations for the health of the lake.

*Healthy Lake Runoff Project* now launched!

*Healthy-Lake Lawn Campaign*. Please don't contribute to the nutrient "overload" that promotes blue-green algae growth to be a healthy-lake lawn steward. STOP FEEDING THE LAKE!

### 8. If you're Building at the Lake

Developing a new cabin? Redeveloping within 800 metres of the lake? Make lake smart decisions - let the [Model Land Use Bylaw](#) guide you.

### 9. Attend Local Meetings

Annual Information meetings (AIMs) put on by Summer Villages each summer – Learn about your community and the progress made on projects by APLM and PLWA. Attend your local Council meetings and encourage your Councillors to budget funding support to support APLM In-Lake projects and PLWA and its watershed projects. The Annual General Meeting for PLWA - In 2014/15 reported Great Progress! 240 Attendees, included a Presentation to Members and Alberta Low Impact Development Program Presentation - Guest Speaker Leta van Duin (see [www.plwa.ca](http://www.plwa.ca)) for more information.

...AND...

### 10. Make a Donation

PLWA accepts tax-deductible donations via PayPal [donation to the PLWA](#).

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