Association of Summer Villages of Alberta

Lake Stewardship Reference Guide

2006 Edition

Acknowledgements

The Association of Summer Villages of Alberta (ASVA), representing Alberta's Summer Village municipalities, was formed in 1977. The ASVA advocates on common Summer Village issues, proposes solutions, and provides education for Summer Village Councils. The ASVA has long maintained that every Summer Village is dealing with lake stewardship issues today, and will continue to deal with them in the future. Through this Lake Stewardship Reference Guide, the ASVA has taken a leadership role in the stewardship of our lakes in partnership with other provincial government departments, organizations, and agencies.

The Lake Stewardship Reference Guide was prepared through the ASVA Lake Stewardship Steering Committee.

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Association of Summer Villages of Alberta

AUMA

Alberta Conservation Association

Alberta Municipal Affairs

Alberta Environment

Alberta Sustainable Resource Development

Athabasca University Canada's Open University

Message from the Committee

Dear Councillor,

As Councillor of a Summer Village in Alberta, one of the most important parts of your job will be to help your constituents understand the reality of the lake they own property at, and the best ways to protect that property and the lake ecosystem as a whole - a lofty goal and one not easy to attain. Summer Village residents want a healthy lake to swim and fish in, but are increasingly raising concerns about issues such as declining fisheries and the over-abundance of algae. Many people do not realize that their activities and the activities of their neighbours may be contributing to such problems in their lake. What can seem like an unimportant or minor action by one person can cause significant trouble when many people do the same thing. Incremental change can add up to cause big problems to the entire lake.

Owning land on the edge of one of Alberta's lakes is, in effect, owning property on the edge of a "public park." Alberta's waters belong to all of us. Rules do apply to the use of the water and nearby lands. When you become a councillor of a Summer Village, you assume part of the responsibility of caring for a public natural resource. This ownership responsibility, or stewardship, requires an understanding that what we do on the land as well as in the water affects the lake and our enjoyment of it. As councillors/administrators, you can help protect water quality and the lake's natural beauty for yourself, your neighbours, and for future generations.

There are many reasons people buy property at a lake. Some properties have been in the family for generations. Whether old or new, properties tend to have great value to the people who own them. But people living near lakes have many different ideas about how lakes should be used. They also differ in opinions about their responsibility for taking care of these waters. Opinions often vary from fact. We hope this booklet will give you some guidelines to follow when tackling the varied and sometimes emotional issues that can arise when dealing with owners of lake properties and making good decisions as a council. We hope it will give you the knowledge and tools to make effective management decisions.

We all need to work together to protect our lakes. By working together with your residents, Summer Village councillors and administrators can do much to protect this wonderful and valuable ecosystem, leaving a legacy for our grandchildren of which we can be proud.

We wish you the best of luck.

Table of Contents

Introduction

The landscape at our lakes is changing. There are more cottagers, increased pressures from development, and growing concerns about poor land management practices. These all affect the overall water quality and health of our lakes. We all have the responsibility to take positive action towards improving the condition of our lake's environment. By having a better understanding of lake stewardship issues, involving people at all levels in the Summer Village, and by making better decisions about land use practices, Summer Village councils will be able to lead their community in ensuring their lake ecosystems remain healthy for all users.

The Association of Summer Villages of Alberta (ASVA) Lake Stewardship Reference Guide (Reference Guide) provides Summer Village councillors and administrators with general information, issue identification, legal reference materials, and suggestions for effective stewardship of lake environments. It celebrates and shares success stories of active lake stewardship projects, and suggests policies that can be utilized by Summer Village councils to achieve lake stewardship goals and objectives.

Summer Villages as Municipalities

Summer Villages are municipalities incorporated under the *Municipal Government Act*. Each Summer Village has its own distinct sense of values about the quality of their lake environment. The unique qualities and characteristics of each Summer Village, and the lake stewardship issues they encounter, must be taken into account in planning and decision making. All planning decisions by Summer Village councils must be consistent with Alberta's Land Use Policies, which provide broad policy statements, goals, and objectives to be used by municipal land use decision makers. Council must also consider federal interests and legislative requirements concerning the nation's fisheries and navigable waters. Each Summer Village is required to enact a Land Use Bylaw, which will regulate land development activities. Councils have broad bylaw-making powers, and may enact provisions to minimize or mitigate human impact on the lake environment.

Summer Village Councils as Lake Stewards

Elected councils can provide leadership in all community matters including lake stewardship. Effective ways to address lake stewardship issues include preventing problems from occurring, educating residents about lake stewardship practices and, when necessary, acting on behalf of the community to enforce bylaws.

Councils have the opportunity to ensure good stewardship through instituting proper municipal policies and bylaws. Understanding best management practices can help councillors do this. It can also help them provide property owners with credible advice, guide residents through the Land Use Bylaw, and assist in directing inquiries to other appropriate authorities for private land development and recreational activities. Public consultation with residents and stakeholders is important when developing policies, plans, and bylaws to regulate land use and human activities near the lakes. Community input can help ensure that planning and development reflects community goals and objectives for lake stewardship.

This Reference Guide provides easy access to information to help council and administration understand legislated responsibilities as well as positive stewardship activities they can undertake in the community. Ultimately, councils have a responsibility to be pro-active, to ensure the long-term health of the lake.

Our mission: Effective lake stewardship through leadership, education, public consultation, development of policies and bylaws, and implementation of best management practices.

Adopting Policies and Enacting Bylaws

The following is a brief overview to provide councillors with a better understanding about adopting policies, and enacting bylaws, and with planning tools that support lake stewardship activities.

Policies

Policies are general guidelines that Council provides to administration to instruct them on the course of action to be taken or followed when making administrative decisions. Policies ensure consistent decisions are made by administration when reviewing similar matters.

Policies are not laws unless adopted by bylaw, and are not generally enforceable in the courts. If a lake stewardship issue within a Summer Village requires some kind of "compliance" or "enforcement," a bylaw needs to be developed or "enacted," to support related policy goals and objectives.

Bylaws

Bylaws are municipal laws that are enforceable in the courts. Bylaws often outline the fines and penalties for violations and non-compliance. A Summer Village has broad bylaw making powers as provided in the *Municipal Government Act* and may generally pass bylaws for the following purposes:

1. To provide good government;
2. To provide services, facilities or other things that, in the opinion of council, are necessary or desirable for all or part of the municipality;
3. To develop and maintain safe and viable communities.

Municipal Development Plan

A Municipal Development Plan is optional (for municipalities under 3500 people), and is a policy document adopted by bylaw that provides general guidelines and broad statements about planning policy. A Municipal Development Plan can assist in ensuring good lake stewardship by setting the tone with environmentally responsible guidelines.

Land Use Bylaw

All municipalities in Alberta are required to adopt a Land Use Bylaw to provide for a means of regulating land use in the municipality. Provisions of the Land Use Bylaw are enforceable in the courts, and there are fines and penalties for non-compliance. For example, a municipality can issue stop orders and order reclamation of sites, if the development or use of private land is not authorized, or not in accordance with the Land Use Bylaw.

For more information, refer to the **Planning and Development** chapter of this guide.

The Lake We Live At

Many governance issues dealing with the lake and surrounding land use practices can directly influence the lake, its stewardship, and the lifestyle quality of those living near it. Therefore, Summer Village councillors and administrators must have a basic understanding of lake ecology and of what an ecosystem is. **Ecology** is the relationship between organisms and their environment. An **ecosystem** is an ecological community functioning as a unit, with its physical environment.

Albertans tend to see their lake in different ways. People buying property at a lake often envision a sandy beach and sky blue water. Chances are that if there was not a beach on your property when you bought it, you will never get a "good" beach to be there. If aquatic vegetation grows in your lake now, it will continue to be there in the future.

But why is this? The answer lies in the way that lakes are created and with where they are located. Once we understand the kind of lake we have property at, and we understand the role of that lake in its surrounding ecosystem, we can better understand what we, as councillors and property owners, can do, or should not do, to keep the lake healthy and functioning. Appreciating the natural beauty and purpose of our lake will go a long way to making our time spent there more enjoyable.

So – just what kind of lake is an Alberta lake? Well, we must remember that lakes are not static objects – they are living, changing, dynamic systems. Typically, most Alberta lakes were formed as retreating glaciers created shallow depressions on the earth's surface. The glaciers melted and the water filled these depressions, creating lakes.

Most Alberta lakes are shallow, and the soil beneath the water and around the water is very nutrient rich. These nutrients include phosphorus and nitrogen, which are excellent foods for plants. Most Alberta lakes, therefore, are naturally nutrient-rich and thus highly productive, meaning that many plants grow in and around them. Scientists call these lakes **eutrophic**. Eutrophic lakes can support sizable fish populations, and attract waterfowl and wildlife. Alberta also has many **hypereutrophic** lakes (very highly productive). We also have a small number of **oligotrophic** lakes (relatively deep, clear, nutrient-poor and less productive). Typically, oligotrophic lakes are found in the mountains where they sit on and are surrounded by rock, as opposed to nutrient rich soils. Alberta also has some **mesotrophic** lakes, with mid-range levels of nutrients and productivity.

Lakes gradually "age" over time. This change is slow and depends on, amongst other things, the initial depth of the lake. It occurs as nutrients are released from the soil at the bottom of the lake, and are carried into the lake by runoff from surrounding lands. Eutrophic lakes are "old" lakes. They are well into the process of transforming from open, clear water, to wetland, and eventually to land. This process has ups and downs, but generally, all of our lakes are aging.

Many Albertans have come from, or have visited, places with younger, oligotrophic lakes. We might think that all we need to do is "clean up" the lake to make it like the clear, plant free lakes we have in mind. While this is not possible, we can implement practical measures to minimize our human impacts that may speed up the aging process of Alberta's eutrophic lakes. We can also realize that our Alberta lakes are areas of great beauty and worth. We just need to respect how they work and learn to love what they have to offer.

For More Information

More information on how lakes work can be found in Appendix I - **Understanding Lake Basics.**

To find out what kind of lake you live at, contact your nearest Alberta Environment office.

To see a sample of the trophic status of some Alberta lakes, refer to the Figures 5 and 6 in Appendix I.

You can also find information on many Alberta lakes in the *Atlas of Alberta Lakes*, found on line at:
http://sunsite.ualberta.ca/Projects/Alberta-Lakes/characteristics.php

Using this Guide

To fulfill our lake stewardship role we need to know, or have easy access to, information to help us administer our duties. These duties include providing credible advice, ensuring proper policies and bylaws are in place, directing lake users to appropriate authorities for development activity, educating other lake users, and enforcing compliance where an infraction has occurred.

This booklet uses a chapter approach to identify common lake issues, including those associated with human activities that can shape the lake environment. Each chapter discusses the associated law, what actions a member of council should take, whom one can contact for further information, and other resources available on the subject.

Each identified lake stewardship priority issue is presented in six components:

1. What is the Issue?
2. Background
3. What Does the Law Say?
4. What Should I Do?
5. Who Can I Contact?
6. Are There Any Resources Available?

Some issues may also include a success story, or reference a sample bylaw or suggested policy, which can be found on the Association of Summer Villages of Alberta website: www.albertasummervillages.org.

As noted earlier, the following is a guide. While it provides some information, we encourage you to contact the appropriate agencies for current practices, resources, and rules regarding these subjects.

Aquatic Vegetation Control

What is the Issue?

Many cottage residents remove aquatic vegetation to help make it easier to put in docks and piers, and to enjoy water-based activities like boating and swimming. Often residents remove aquatic vegetation without knowing their actions are illegal. Removing aquatic vegetation requires an approval to ensure that it does not harm the aquatic environment and fisheries, or cause erosion.

Like many Summer Village residents, councillors may feel that removing aquatic vegetation from the lake is the best way to clean up the lake. As our understanding of aquatic environments grows, we are realizing that this is not true. Councillors need to be pro-active. They must attempt to stay up-to-date with the current findings and guide their residents through changing times.

Photo credit: Gerry Haekel

Background

Stands of aquatic vegetation along lake shorelines are important for maintaining healthy lake ecosystems. This vegetation includes submergent plants (plants that are primarily underwater although some leaves may float on the surface), and emergent plants (plant roots are beneath the water, but most of their foliage is on or above the water surface).

Aquatic vegetation provides habitat for fish spawning, nesting habitat for birds, rearing sites for young fish and wildlife, and protects shorelines from wave and wind erosion. It enhances the aesthetic value of the lake and performs many important biological functions that benefit water and land areas, including filtering runoff water before it enters the lake. For more information on the functions and importance of aquatic vegetation refer to Appendix I - **Understanding Lake Basics**.

What Does the Law Say?

Federal Law

Removing aquatic vegetation in fish bearing waters is unlawful and considered a harmful alteration, or destruction, of fish habitat under the federal *Fisheries Act*. Contravention of the Act can result in significant fines and penalties.

Provincial Law

Residents should be aware that the *Alberta Public Lands Act* prohibits:

- The doing of any act on public land that may injuriously affect watershed capacity. (The bed and shore of a lake are considered public land);
- The disturbance of any public land in any manner that results, or is likely to result, in injury to the bed or shore of any river, stream, watercourse, lake or other body of water or land in the vicinity of that public land; or
- The creation of any condition on public land which is likely to result in soil erosion.

Residents need to seek approval, under the *Alberta Water Act*, for any activity that causes, may cause, or may become capable of causing an affect on the aquatic environment. This includes the removal of aquatic vegetation.

Approvals (Permits)

An approval can be granted for the removal aquatic vegetation. Restrictions may apply to the time of year that aquatic vegetation can be removed, or where aquatic vegetation can be removed from. Removal must not occur during fish spawning and bird nesting. Large scale clearing of aquatic vegetation is generally not permitted. The exception is maintaining community swimming areas or boat launches.

Individual cottage owners may apply for an approval for clearing a four metre wide boat lane to access open water. The application will be reviewed to determine the impact on the aquatic environment.

What Should I Do?

A local municipality does not have a jurisdictional role in authorizing the removal of aquatic vegetation from a lake or its shores.

Advise residents that, under the *Public Lands Act*, they can do some general clean up of shoreline areas without a permit as long as the debris is limited to material that is washed up on shore. All other activities require an approval.

Permits granted for the removal of aquatic vegetation must be posted on site and anyone can ask to see this permit. If you see someone removing aquatic vegetation during a restricted period, or continuously throughout the open water season, they are likely in contravention.

Getting a Permit

In Alberta, federal and provincial authorities have developed a common policy framework, or "one-window" approach, to regulate the removal of aquatic vegetation. This means that the person applying for the permit needs to fill out only **one** application to satisfy federal requirements and those of the two provincial agencies involved (Alberta Environment and Sustainable Resource Development, Public Lands and Forests Division).

The application form *LS102-Lakeshore/Water Body Modification* can be obtained from your local Alberta Environment or Public Lands and Forests office.

It takes time to get a permit, so advise residents to plan their request and apply early.

If You See Aquatic Vegetation Being Removed

When dealing with a resident who is removing aquatic vegetation, here are some general guidelines:

- Ask the resident to produce a permit.
- If there is no permit, explain the legislative requirements and violation consequences. Provide the resident with contacts.
- Describe the impacts on the lake the activity may be having and provide relevant educational materials.
- Advise the resident to stop the activity and get appropriate approvals.

Helping residents understand more about the function of aquatic vegetation, providing education resources, and encouraging the proper applications for approvals will prevent residents from harming the aquatic environment.

Who Can I Contact?

For more information on removing vegetation, or any other shoreline alterations at the lake, contact:

- The regional office of Alberta Environment.
- The regional office of Public Lands and Forests Division.
- The regional office of the federal Department of Fisheries and Oceans.

To download a permit to apply for aquatic vegetation removal go to:

- **Application Form LS102-Lakeshore/Water Body Modification** (Form) http://www3.gov.ab.ca/env/water/legislation/forms/index.html http://www3.gov.ab.ca/srd/land/u_shorelands_app_reg.html

Are There Any Resources Available?

- **About Public Lands: Water Bodies and the Management of Bed and Shores** (Fact Sheet) http://www3.gov.ab.ca/srd/land/APL_Water_Bodies.html
- **Caring for Shoreline Properties; Changing the Way We Look at Owning Lakefront Property in Alberta** P. Valastin. 1999. Alberta Conservation Association. P.O. Box 40027. Baker Centre Postal Outlet. Edmonton, AB T5J 4M9. Ph. 1-877-969-9091 or visit their web-site at: http://www.ab-conservation.com/about_us/reports_publications/Caring_for_Shoreline_Properties.pdf
- **Guidelines for Lakeshore Use** (Brochure) http://www3.gov.ab.ca/srd/land/pdf/lakeshore.pdf
- Fisheries and Oceans Canada has resources available on their web-site: http://ww.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/index_e.asp
- **The Shore Primer – Prairie Edition: A Cottager's Guide to a Healthy Waterfront** (Booklet) http://www.dfo-mpo.gc.ca/regions/central/pub/shore-rive/index_e.htm

Summer Village Residents See the Results of Shoreline Restoration

Ross Haven is a Summer Village on the north shore of Lac Ste. Anne, with a population of approximately 109 permanent and 200 summer residents. Ross Haven residents pride themselves as having a great "sense of community."

It had been common practice for Village residents to remove aquatic plants (considered weeds) from the shores, and maintain sandy beaches. Over a period of several years, the municipality had speakers on "lake wellness" come out to annual Town Hall meetings. Presentations were put on by organizations such as the Pine Lake Restoration Society and Alberta Environment. They spoke about how individuals could take action to help improve the quality of the lake environment. Among other issues, these speakers stressed the importance of aquatic vegetation and how these plants act as a filtering system, taking up nutrients in the lake. Today, approximately three-quarters of the lake perimeter in the Village has been restored to a natural state, with extensive beds of aquatic vegetation and undisturbed shorelines. To do this, residents simply stopped removing natural shoreline plants as they started to grow back.

The Mayor of the Summer Village reported that there has been a dramatic change in the quality of the water, as a result of these efforts. "Prior to the first replanting ten years ago, our water was dirty and uninviting. Today, our water along the shore is clear," he said, following the presentation of the first annual Bull Rush Award at the Alberta Summer Village Association Convention in October, 2004.

Riparian restoration in Ross Haven is totally voluntary. The majority of residents have a "buy-in" to the philosophy of lake stewardship. They want to make the lake a better environment to enjoy today and in the future.

Lake Stewardship Education Takes Time!

The Summer Village of Norglenwold is located on the south shore of Sylvan Lake, just west of the City of Red Deer. Norglenwold has 267 permanent residents, but many more during the summer. In 2001, Council initiated a study of the environmentally sensitive lands within the Summer Village that examined the health of the riparian areas. A representative from the Bow River Project, in cooperation with the University of Calgary, produced a report on the riparian conditions within the Summer Village and recommended management options for Council that would preserve and enhance these lands.

The Summer Village then offered individual landowners a program to enhance natural landscaping and beach management at their properties. At that time, however, most cottage owners were not yet ready for outside advice. Education about good lake stewardship is an ongoing process, and slowly, the recommendations are being followed and implemented. Today, more and more residents are becoming sensitive of the need to mitigate environmental degradation.

Beach Development / Sand Placement

What is the Issue?

Lakeshore property owners who develop private beaches are changing the natural function of the lake bed and shore. Sand deposited within a fish bearing water body has a negative impact on fish and the aquatic environment as it alters fish habitat and can affect water quality. Beach development/sand placement below the banks of the lake is illegal unless approved.

Councillors may notice certain residents developing a beach, and may themselves receive inquiries from residents regarding beach development by neighbours and other community members.

Photo credit: Gerry Haekel

Background

Few lakes in Alberta have natural, high quality sandy shores, or beaches. Lakeshore property owners often wish to "improve" their shore by removing rocks and vegetation, or by creating beaches. They may deposit sand in the lake or on the shore, or renovate existing natural shore by disking and harrowing to loosen hard packed shores for improved recreational use. New sand is often deposited on the ice in winter when heavy equipment can access shore areas from public access points. When the ice melts, the sand drops in place.

Problems Caused by Bringing Sand into the Lake

Fish typically deposit eggs on, or in proximity to, aquatic vegetation growing in shallow water. Sand can cover eggs deposited by spawning fish, causing these eggs to die. Another problem with sand is that often the quality of the sand is unknown. Earth carried in with the sand adds nutrients to the water, increasing plant growth. This includes the growth of algae, and can certainly add to the possibility of algal blooms. In the same manner, other pollutants can enter the water without us even being aware of them. An example would be biological pathogens such as E. coli, if the sand came from land where cattle were being kept.

Generally, sand is not a very stable material and is easily susceptible to erosion by wave action. It can be slowly carried out into deep water or deposited elsewhere on the shore by currents passing along the shore. Maintaining the presence of a beach often involves repeated applications of sand to compensate for loss by wave erosion. The result is a cumulative negative impact on the lake.

Individual Actions Do Matter

Making a beach at the lake may not seem like a big deal. Over time, however, the combined cumulative impact of repeatedly adding sand to maintain a beach (by one or many individuals), and the removal of aquatic vegetation around a lake, results in the loss of most of the natural components of a healthy, functioning lake ecosystem.

Natural shoreline areas provide habitat for fish and wildlife, protect shorelines from wave and wind erosion, and filter harmful material out of the water. Although altering the shoreline may be desired, in the long run, the cumulative changes of the natural shoreline of a lake will result in the loss of natural habitat and reduced water quality.

What Does the Law Say?

Depositing sand to create a beach, or renovating the shore of a lake through mechanical means, are regulated activities that may require some form of authorization from the provincial and/or federal government.

Private Land – Beach Development

Depositing sand below the bank, or "ordinary high water mark" (OHWM), of the lake requires Public Lands Act approval, as the Crown owns this land. It may also require approval under the aquatic environment provisions of the *Alberta Water Act* or the fish habitat provisions of the federal *Fisheries Act*, as this area is within the bed and shore of the water body.

The deposit of sand on private land above the bank, or OHWM, does not require Public Lands Act approval, but may require approval under the *Alberta Water Act* or the federal *Fisheries Act*, as this area may be within the floodplain of the water body.

Public Beach Development

Often, people who own property on the lakefront wish to develop a beach. Regulatory agencies generally discourage the development of individual beaches on residential properties as these beaches frequently tend to encroach onto Crown land. Regulatory agencies generally will not approve sand placement below the OHWM unless compelling reasons justify this form of development. Consideration for beach development is, however, given for community beach and swimming areas, as these areas serve a broad public function.

Development Without an Approval

Deposit of sand for beach creation without an approval or authorization is either a contravention or prohibited activity under provincial or federal legislation. Persons involved in the unauthorized deposit of sand are subject to fines, orders to restore, or other court imposed penalties.

What Should I Do?

A local municipality does not have a jurisdictional role in authorizing the deposit of sand, or other fill material, on the shores of a lake below the legal bank, or OHWM, except where a surveyed legal road allowance extends into a water body. When this occurs, it is usually to facilitate public access.

A local municipality does have a jurisdictional role in authorizing activities occurring within environmental reserves, as these are titled lands owned by the municipality.

If You See Someone Making a Beach

General guidelines when dealing with a resident who is creating or renovating a beach:

- Ask the resident to produce a permit.
- If there is no permit, explain the legislative requirements and violation consequences. Provide the resident with contacts.
- Describe the impacts on the lake the activity may be having and provide relevant educational materials.
- Advise the resident to stop the activity.

If a resident complains of sand being deposited in the water or on the shores of a lake, forward the complaint to the local Public Lands and Forests office, the local Alberta Environment office, or the Department of Fisheries and Oceans Canada. They will confirm whether there is an approval, or initiate an investigation if there is not.

Developing a Community Beach and Swimming Area

While it is not advisable for every landowner in a Summer Village to create their own private beach, it is understandable for residents to want a sand beach where they can go out and enjoy the water. A reasonable compromise here would be for the Summer Village to develop a community beach. The impact on the lake would be much less than that of many private beaches. Alberta Environment and the Public Lands and Forests Division of Alberta Sustainable Resource Development (SRD) are quite sympathetic towards creating community beaches and would likely grant an approval for one. It is important to follow all government recommendations and Best Management Practices when developing a community beach.

If a Summer Village council has the support of the community to develop a community beach, they could promote the naturalization of shorelines within the Summer Village. Council/administration could agree to develop and maintain the community beach in return for residents allowing the shoreline fronting their properties to return to a natural state.

Information and Education

Changing people's attitudes about having a beach at the lake is not an easy task. Consider using the Summer Village newsletter or a public meeting to give residents information on the effects of beach development. The more people understand how important natural shorelines are, the less inclined they will be to alter them.

Who Can I Contact?

For more information on creating beaches, sand placement, or any other shoreline alterations at the lake, contact:

- The regional office of Alberta Environment.
- The regional office of Public Lands and Forests Division, SRD.
- The regional office of the federal Department of Fisheries and Oceans.

To download a permit to apply for sand placement on the shoreline go to:

- **Application Form LS102-Lakeshore/Water Body Modification** (Form) http://www3.gov.ab.ca/env/water/legislation/forms/index.html http://www3.gov.ab.ca/srd/land/u_shorelands_app_reg.html

Are There Any Resources Available?

- **About Public Lands: Water Bodies and the Management of Bed and Shores** (Fact Sheet) http://www3.gov.ab.ca/srd/land/APL_Water_Bodies.html
- **Approvals & Regulatory Requirements-Public Lands-SDR** (Fact Sheet) http://www3.gov.ab.ca/srd/land/u_shorelands_app_reg.html
- **What You Should Know about Fish Habitat and Building a Beach** http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/factsheets-feuillets/alberta/ab4_e.asp
- **Common Lakeshore & Wetland Activities Requiring Approvals** (Reference Table) http://www3.gov.ab.ca/srd/land/pdf/Activity_Approval_Table1.pdf
- Fisheries and Oceans Canada has resources available on their web-site: www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/index_e.asp
- **The Shore Primer – Prairie Edition: A Cottager's Guide to a Healthy Waterfront** (Booklet) http://www.dfo-mpo.gc.ca/regions/central/pub/shore-rive/index_e.htm

Blue-Green Algae (Cyanobacteria) Blooms

What is the Issue?

During the warm summer months some lakes experience algal blooms. This happens when the microscopic algae multiply and become so numerous that the water looks like thick soup. Most often what looks like algae blooms are actually caused by cyanobacteria. It is not possible to tell cyanobacteria apart from algae with the naked eye.

Cyanobacteria are always present in Alberta lakes, but become a problem when they bloom. Severe cyanobacterial (and algal) blooms can occur when excessive nutrients, especially phosphorus, enter the lake. This is often the result of human activities within the watershed. Cyanobacterial blooms can pose health risks to humans, pets, livestock and wildlife.

Councillors often receive complaints from residents regarding the presence of these blooms. They need to be aware of the signs of a cyanobacteria bloom, know why they occur, and be aware of the activities around their lake that may be contributing to these blooms. Councillors should also become familiar with the signs or symptoms of people or animals that have ingested toxic cyanobacteria.

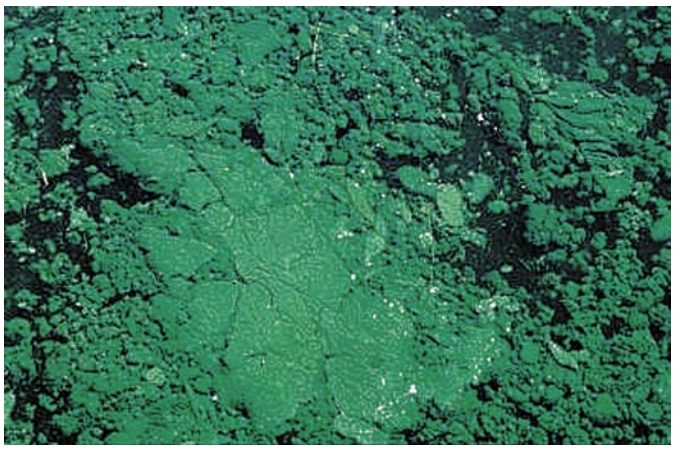


Photo credit: Ron Zurawell

Aphanizomenon bloom

Background

What are Cyanobacteria?

Cyanobacteria, commonly called blue-green algae, are not algae at all. They are classified as bacteria, but they do exhibit plant (algae)-like characteristics. Cyanobacteria live in the water and are photosynthetic, meaning that by converting energy from light they can manufacture their own food, using phosphorous and other available nutrients.

Under nutrient rich conditions, these microscopic organisms can grow rapidly to form extensive "blooms." They may eventually float to the surface and accumulate near shore as a bright green surface scum, which cannot be picked up like filamentous green algae mats can be.

Pigments in the cyanobacteria cause the water to appear colored. The cyan part of their name means blue-green. It is due to the combination of green chlorophyll pigment and a unique blue pigment (phycocyanin). Not all blue-green algae are blue-green in color. Their pigmentation can be yellow-green, green, grey-green, grey-black, or even red. The water can become paint-like and coat sand and rocks along the shore.

Problems Caused by Cyanobacterial Blooms

Cyanobacterial blooms are visually unattractive. Some bloom-forming species produce organic compounds responsible for giving off a bad smell. They also produce foul smelling masses as they die and decompose. The process of decomposition requires oxygen and can significantly reduce the amount of dissolved oxygen in the water. This can cause aquatic organisms to suffocate and can result in a "summerkill" of fish.

More importantly, a small number of bloom-forming species of cyanobacteria produce potent liver and nerve toxins. Toxic cyanobacteria can cause serious illness and possibly death in the pets, livestock, wildlife and humans that ingest them. Cyanobacteria are toxic throughout their life cycle. Some toxins are stable enough in the environment that surface waters may remain highly toxic for several weeks following the collapse of a bloom. For this reason, the disappearance of bloom material is no indication of safe, non-toxic water.

What Causes a Bloom?

Cyanobacteria can inhabit almost any aquatic environment. They thrive in alkaline lakes with sufficient nutrients to sustain their growth and reproduction. Blooms can occur in relatively undeveloped lakes, but in general, the more fertile, or nutrient rich, the lake is, the more likely it will support a bloom.

Alberta's prairie and boreal lakes are naturally productive, or "green," to some degree, primarily due to the soils they sit on and that surround them. Excessive nutrients, especially phosphorous and to some degree nitrogen, entering the water, can tip the scale in favour of these blooms. When conditions are right, blooms of cyanobacteria can occur, usually appearing from mid-summer through mid-autumn as thick green scum covering the water's surface.

Photo credit: Ron Zurawell

The Affect of Human Activities

Human activities within the watershed are often the source of the extra nutrients that get carried into the lake. Besides being naturally present in the lake, phosphorous can be added in various ways.

Fertilizers – even really good ones – are never totally taken up by the grass they are put on. When people with property at the lake fertilize their lawns some of the fertilizer will end up in the lake with surface water runoff. If fertilizer is "good" for land plants such as grass, it is also "good" for aquatic plants.

Laundry and dishwashing detergents can also have high concentrations of phosphorus. If they manage to get into the lake, they will also add to "nutrient loading."

Runoff from faulty septic systems and **manure** from agricultural lands can also add to the problem.

What Should I Do?

Municipalities and cottagers are advised to monitor lakes for the detection of cyanobacterial blooms through weekly visual inspections along shorelines.

Through local publications or meetings, advise residents to avoid recreational contact with severe blooms and to keep pets from entering these waters. **It is very difficult to tell if a bloom is toxic.** The best thing to do when there is a bloom at your lake is to err on the side of caution.

- Treat any intense bloom with suspicion.
- Do not drink water from bloom-infested lakes or reservoirs.
- Do not swim or wade in water containing concentrated algae or cyanobacteria.
- Watch children carefully, as they are more likely to drink lake water than adults are.
- Provide alternative sources of drinking water for pets and livestock.
- Contact your local Public Health Department.

Note:

It is not the purpose of this chapter to give medical information or advice. Councillors can get this from the Regional Health Authority or from a medical doctor.

Photo credit: Ron Zurawell

Education and Information

During a bloom, chances are that many residents will be contacting Summer Village councillors and administrators about it. Councillors can use this as an opportunity to explain the human activities that are likely contributing to this problem.

Some residents may suggest poisoning these plants, but this is not a viable solution in something as large as a lake. Many of the chemicals that would be used to kill these organisms are also toxic to other forms of life. The best long-term solution is to reduce the amount of nutrients entering the lake.

Management Strategies

For more information on management strategies that can help reduce nutrient inputs into the lake, see the **Fertilizer Use** chapter of this guide.

Photo credit: Ron Zurawell

Who Can I Contact?

- For information regarding algae/cyanobacterial blooms at your lake, contact the regional office of Alberta Environment.
- For information on health matters and cyanobacterial blooms, contact your Regional Health Authority.
- If someone experiences symptoms that may be related to a cyanobacterial bloom, contact a physician immediately.
- If a pet has symptoms, contact a veterinarian as soon as possible.

Are There Any Resources Available?

- Alberta Environment provides educational materials on toxic cyanobacterial blooms at: http://www3.gov.ab.ca/env/water/swq/brochures/algalblooms.html and, http://www3.gov.ab.ca/env/water/swq/brochures/algaltoxicity.html.
- The Soil and Water Conservation Society of Metro Halifax has information on cyanobacteria at: http://www.lakes.chebucto.org/cyano.html
- The Minnesota Pollution Control Agency has information on cyanobacteria at: http://www.pca.state.mn.us/water/clmp-toxicalgae.html
- **Managing Phosphorus to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex929
- **Managing Nitrogen to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex928
- **A Primer on Water Quality: Pollutant Pathways** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wat3350
- The Alberta Lake Management Society (ALMS) has information on lake monitoring on their web-site at: (http://www.alms.ca).
- General information on lake fertility can be obtained by calling the Evaluation and Reporting Section of Alberta Environment at 780-427-6278.

Declining Lake Fisheries

What is the Issue?

Summer Village residents often voice concerns to councillors about the reduction in the number of fish in their lake. They may remember a time when fish were plentiful and there were large limits for fish you could catch and take home. Now, many Alberta lakes are open for catch and release fishing only. Both loss of habitat and over-fishing have contributed to the decline of the numbers of fish in Alberta.

Summer Village councillors can promote sound environmental stewardship practices to help turn this situation around. Councillors can take measures to ensure that land management practices within the Summer Village are not having a major effect on fish populations or fish habitat. Good lake stewardship practices such as retaining natural shorelines and restricting or prohibiting the use of fertilizers are important steps to keeping the ecosystem of the lake in a balanced, healthy state and, therefore, a good environment for the fish and wildlife living there.

Photo credit: Jason Pohranychny

A large northern pike caught and released in Northern Alberta.

Background

Healthy Fisheries

Healthy sport fisheries require an abundance of both young and old fish. Because of Alberta's northerly location, fish species here mature to breeding age slowly. To ensure sustainable lake fisheries, the Alberta Government uses a range of management tools to reduce fish mortality, encourage natural reproduction, and protect habitat. These tools may include varying the number and size of fish that can be kept by anglers, enacting temporary closures of lake fisheries, and restricting areas where anglers can fish. To determine the best management tools, fisheries managers use information on current fish populations and historical data that show how fish populations have changed over time.

Angling Pressure

Fish populations are commonly affected by angling pressures and mortality from improper handling. Alberta has a growing population base, but a relatively small number of fish bearing waters. Notwithstanding its growing population, Alberta already has the highest number of anglers per lake ratio in Canada. The Province has limited the fishing at many lakes to "catch and release" only. This can be effective, but anglers need to be careful when handling fish so as not to damage them, which could contribute to their mortality rate. For example, limit the amount of time a fish is out of the water, and use soft, wet gloves when handling fish. To help protect our lake fisheries it is important that all Albertans follow fishing regulations.

Land Use Practices

Many residents are not aware of the kinds of activities that can have an affect on fish populations. Over time, some land use practices damage important habitat and contribute to declining water quality. Altering shorelines by removing vegetation and creating sand beaches can reduce the amount and quality of fish spawning and rearing habitat.

Contamination from over fertilizing, runoff from septic fields, stormwater runoff, and road salts can ultimately reduce water quality and result in fish kills. For example, excess nutrients from fertilizers and septic fields can cause algal blooms in the lake. When the algae die, microorganisms break down their organic material – a process that requires oxygen. If enough dissolved oxygen is removed from the water a deficit of dissolved oxygen can result, causing aquatic organisms to suffocate. This causes what is referred to as a "summerkill" of fish.

Photo credit: Alan Dalton

What Does the Law Say?

Laws Governing Fish Harvesting

The Fish and Wildlife Division of Alberta Sustainable Resource Development is responsible for setting sport fishing and commercial harvesting regulations. These regulations are based on a wide range of scientific sources of information including data describing the number and size of sport fish species.

The *Fisheries Act* (Alberta) provides regulations governing declining fisheries, the number of fish that can be kept, and where anglers can fish. The *Alberta Guide to Sportfishing Regulations* is published annually. Anglers are responsible for understanding and following the regulations. Fines and penalties can be issued for violations.

The Report A Poacher program also provides opportunities for reporting illegal harvesting of fish and violations under the *Fisheries Act* (Alberta).

Laws Protecting Fish Habitat

The *Environmental Protection and Enhancement Act* (EPEA), administered by Alberta Environment, deals with the release of substances into the environment, including releases into water. The deposit of harmful, or deleterious material of any type (e.g., contaminated water, excess silt loading from earth or sand, etc.), into water, or in a place where it may enter water frequented by fish, is contrary to the EPEA and to the federal *Fisheries Act* (Canada). Environment Canada administers this part of the *Fisheries Act* for the federal government.

Any destruction of fish habitat, such as the unlawful removal of aquatic vegetation that is considered to be fish habitat, is also in violation of the federal *Fisheries Act*. The Department of Fisheries and Oceans enforces this aspect of the *Fisheries Act* for the federal government. Provincially, the Public Lands Division of Alberta Sustainable Resource Development enforces infractions that have to do with removing aquatic vegetation without a permit.

Fines and penalties can be issued for violations of the Acts.

What Should I Do?

All Albertans need to work together to prevent the further decline of fisheries and to support Alberta Sustainable Resource Development's efforts to "Help Keep Fish in Our Future."

Help Protect Fish Numbers

Refer Summer Village residents to the *Alberta Guide to Sportfishing Regulations*, which provides information on the number and size of fish that anglers may keep, and closures for lake fisheries. It is the responsibility of anglers to know how to carefully retrieve, handle, and release fish. Techniques include: landing fish quickly, releasing fish immediately, keeping the fish in the water while releasing them, and careful handling to avoid squeezing. Hooks should be carefully removed and wire cutters should be used to cut the hook instead of the line. Survival is also increased when fish are revived by holding them in the water before they are released. Anglers and other Albertans should report poachers by calling the Report-A-Poacher phone line at 1-800-642-3800.

Help Protect Fish Habitat

Councillors can become more familiar with how land use practices can affect fish populations in the lake. They can explore ways to raise awareness and educate residents on the harmful effects of runoff from septic systems and over-fertilizing. These human impacts can lead to excess nutrients in the lake that may result in fish kills. (For more information, see the Background section under Land Use Practices of this chapter, and the Fertilizer Use chapter in this guide).

Consider creating or reviewing bylaws to ensure land use practices within the Summer Village are managed to help maintain healthy lake fisheries. For example, Council could create and enforce bylaws governing the activities and uses that occur in any environmental reserves within its boundaries. A bylaw preventing the removal of the shoreline vegetation from these reserves would be of great benefit to both water quality and fish habitat. A bylaw banning or restricting the use of fertilizers in the Summer Village would also help preserve fish habitat and water quality.

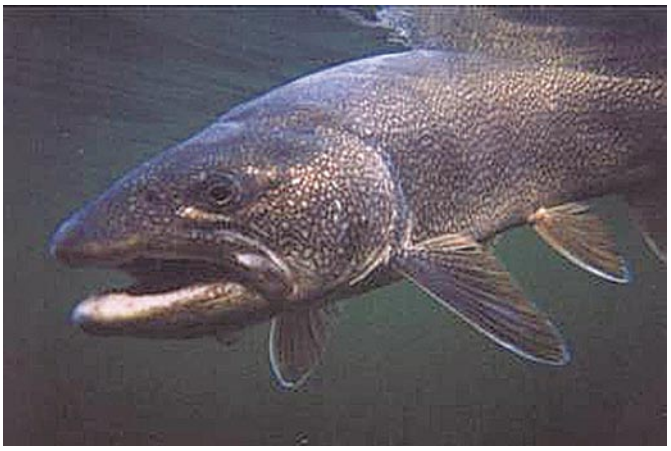


Photo credit: David Fairless

Carefully releasing angled fish can greatly increase their survival.

Taking a Leadership Role

Summer Village councils have opportunities to work with their residents, Sustainable Resource Development, the Alberta Conservation Association, and other non-government agencies to develop policies and bylaws to protect the lake ecosystem.

Summer Village councils can initiate and encourage lake stewardship programs and volunteer lake monitoring activities to protect the aquatic environment and lake fisheries.

Partnerships with Alberta Sustainable Resource Development and the Department of Fisheries and Oceans can help to protect and enhance fish habitat, support the posting and enforcement of closures, and protect fish species at risk.

Industrial sectors such as agriculture, forestry, and oil and gas have obligations and responsibilities to protect aquatic environments, and they should be asked to participate in lake stewardship programs.

Who Can I Contact?

For information on lake fisheries and fishing regulations see the Alberta Sustainable Resource Development web-site at: http://www3.gov.ab.ca/srd/fw/fishing/index.html, contact your local Fish and Wildlife Division office, or call the Edmonton office at 780-427-4407. Dial 310-0000 first to call toll free.

For information on fish habitat and the rules and regulations surrounding the removal of aquatic vegetation at the lake, contact:

- The regional office of Alberta Environment.
- The regional office of Alberta Public Lands and Forests Division.
- The regional office of the federal Department of Fisheries and Oceans.

To report suspected resource violations, contact your local office of the Fish and Wildlife Division or Report A Poacher at 1-800-642-3800, or #3800 on the TELUS Mobility cellular network (courtesy of TELUS Mobility).

Are There Any Resources Available?

- For information on fish populations, angling opportunities and fishing regulations in Alberta see the Alberta Sustainable Resource Development web-site at: http://www3.gov.ab.ca/srd/fw/fishing/index.html
- **Focus on Fisheries Management** (Fact Sheet) http://www3.gov.ab.ca/env/resedu/edu/focuson/fishmgmt.pdf
- **Department of Fisheries and Oceans Canada: Working Around Water** (Fact Sheet) http://www.dfo-mpo.gc.ca/canwaters-eauxcan
- **Fisheries and Oceans Canada: What You Should Know About Fish Habitat** Fact Sheet) http://www.dfo-mpo.gc.ca/canwaters-eauxcan/habitat/index_e.asp
- The Alberta Conservation Association provides information on the care of lakeshores and conducts many fish inventories throughout Alberta. Call 780-427-5192, or visit their web-site at: http://www.ab-conservation.com/
- The Alberta Conservation Association (ACA) has produced a guide on caring for shorelines. Copies can be obtained from any ACA office or at: http://www.ab-conservation.com/about_us/reports_publications/Caring_for_Shoreline_Properties.pdf
- For information on protecting the shoreline go to the Vincent Lake Working Model web-site at: http://www.healthyshorelines.com/index.asp
- For an example of an Environmental Reserve bylaw go to the Vincent Lake Working Model web-site at: http://www.healthyshorelines.com/pdf/Building%20an%20Environmental%20Reserve%20By-Law%20Fact%20Sheet,%20%2021-Mar-2001.pdf

Docks and Associated Mooring Structures

What is the Issue?

A dock, pier or wharf, and other associated mooring structures like boat lifts, swimming rafts, and offshore mooring anchors and buoys are desired by many lake residents for recreational activities such as boating, water skiing, and fishing. Where demand for boat mooring is high, conflicts between users can occur over the placement of mooring structures. Councillors should become familiar with federal and provincial regulations regarding these structures so that they can assist residents, if the need arises.

Building a dock can also stress the very sensitive shoreline environment. Our actions can easily disrupt the ecological balance of this area, and negatively affect the plants and animals that live here, and the water quality of the lake. We should try to minimize our impact by planning dock-building projects so that they do the least damage to the environment.

Photo credit: Gerry Haekel

Background

Residents with lakefront property, whose properties extend to the bank of the lake, have a common-law, but non-exclusive right to access the water and to place a pier onto the lakebed. The pier must be placed in front of their property. This right may be subject to other regulatory requirements (see **What Does the Law Say?** section below).

Residents who own a back lot or those who own property where a Reserve parcel of land exists between their property and the lake may also wish to place a mooring structure on the lake. Provincial policy allows this, provided the use is reasonable and the user has legal access to the lake.

Reasonable use is the governing principle. The Public Lands and Forests Division normally does not get involved in mediating disputes between neighbours involving the placement of seasonal mooring structures.

What Does the Law Say?

Regulations for Temporary Structures

An approval is normally required under the *Public Lands Act* to place a structure on public lakeshores. However, the Public Lands and Forests Division currently provides an exemption by policy, allowing individuals to place a single dock/pier on the bed of a lake, **without a permit,** according to the following guidelines:

- The pier, dock or boatlift is temporary (**seasonal**), meaning it is removed completely from the lake at the end of the open water season.
- The structure is for non-commercial use.
- The structure allows the free flow of water under it.
- The structure respects the rights of neighbouring residents, and does not interfere with the general public's right of access along the shore of the lake.

The exceptions to this are when:

- An environmentally sensitive area or a management concern is identified by the provincial or federal government, and restrictions have been established.
- Where a local municipal development plan, a lake management plan, or water management plan limits or restricts such uses.
- Where the proposed structure's design may interfere with the normal flow of water or is likely to increase the probability of bank or shoreline erosion.
- Where such structures may adversely block public access along the bed and shore of the lake.

Regulations for Permanent Structures

Development of permanent structures, open water marinas and mooring fields require formal authorization. Approvals for permanent mooring structures on lakebeds are not issued to individuals. Occasionally they are issued in support of commercial enterprises or to other levels of government.

Penalties

The penalty for unauthorized occupation of public land under the *Public Lands Act* is $5000 for each day of contravention (at the time of this writing). The responsible party may also be required to remove the works and rehabilitate the area. If the Public Lands and Forests Division investigation suspects possible damage to the fisheries resources, an investigation may be launched under the federal *Fisheries Act*. The penalty for harmful alteration, disruption or destruction of fish habitat is substantial, as much as $500,000 for a first time, indictable offence.

The Public Lands and Forests Division is currently updating its boat mooring (pier and marina) policy and will be consulting with municipalities for comment in 2006.

What Should I Do?

Summer Village councillors should be aware if there are any "restricted development/ activity" areas within the village, and where they are located. They can get this information from the local Public Lands and Forests Division office.

If a Summer Village resident, without lakefront property, wishes to place a boat dock in the lake for seasonal use, help them determine where they may have legal access to the lake, if there are any bylaws in place governing the placement and use of mooring structures in the Summer Village, and if a permit is required.

Developing a Community Dock

If there is insufficient mooring or access to mooring in the lake adjacent to the Summer Village, the municipality could consider development of a community dock, mooring field or marina. A multi-slip community dock could be funded and managed as a partnership between residents and the Summer Village administration.

Development of open water marinas and mooring fields require formal authorization, and usually require some form of public consultation before an approval can be issued. Therefore, it is important for developers to seek prior approval to ensure the development's impact is minimal, both environmentally and socially (e.g., works do not interfere with neighbouring property owner's enjoyment of the lake).

If There is a Complaint

If you observe someone constructing a permanent mooring structure or it is brought to your attention, you should contact the local Public Lands and Forests Division office and check the Summer Village records to see if the developer has approval to build the mooring structure.

If there is no permit, or if the work appears to be done in a questionable manner, you should be prepared to provide the authorities with key information to help them launch an investigation. This would include your contact information, location of the work, who observed the work and when, and, if possible, a photograph(s) of the work in progress.

Who Can I Contact?

For more information on how and where docks and other mooring structures can be placed, contact:

- The regional office of Public Lands and Forests Division.

Are There Any Resources Available?

- For information on activities affecting the bed and shore of lakes go to:
  http://www3.gov.ab.ca/srd/land/u_shorelands.html
  http://www3.gov.ab.ca/srd/land/u_shorelands_app_reg.html
- **Guidelines for Lakeshore Use** (Booklet)
  http://www3.gov.ab.ca/srd/land/pdf/lakeshore.pdf
- Fisheries and Oceans Canada has resources available on their web-site:
  www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/index_e.asp
- **Working Around Water? What You Should Know About Fish Habitat And Docks, Boathouses And Boat Launches** (Fact Sheet)
  http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/factsheets-feuillets/alberta/ab2_e.asp
- **The Dock Primer – Prairies Edition, A Cottager's Guide to Waterfront Friendly Docks** (Booklet)
  http://www.dfo-mpo.gc.ca/regions/central/pub/dock-quais/index_e.htm

Environmental Reserves

What is the Issue?

An environmental reserve on the edge of a lake is intended to protect the lake environment from adjacent human activities, and provide public access to the lake. It also protects the private landowner from natural fluctuations in the water level of the lake that may cause problems such as flooding and erosion. If this strip of land is managed with good stewardship practices, it can act as a valuable protector of the lake environment.

Environmental reserves are often considered by adjacent landowners to be an extension of their private property. These adjacent landowners have been known to clear vegetation off the reserve, build on the reserve, and/or fence the reserve in an attempt to keep the public out. Councillors may receive complaints from their constituents about landowners intentionally or unintentionally using or developing these lands. Environmental reserves belong to the municipality. Unauthorized activities on an environmental reserve may harm the aquatic ecosystem.

Background

Through Alberta's subdivision and development process, the *Municipal Government Act* 1994, Chapter M26.1, states that an applicant for subdivision may be required to dedicate, as environmental reserve, land that consists of:

- A swamp, gully, ravine, coulee or natural drainage course,
- Land that is subject to flooding, or land that is unstable, or
- A strip of land, not less than six metres in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of preventing pollution, or providing public access to and beside the bed and shore.

The Use of Environmental Reserves

The *Municipal Government Act* (MGA) states that these strips of land next to a lake are taken for two main purposes: to prevent pollution of the water body, and to provide public access to and beside the bed and shore of the lake. Environmental reserves also ensure that building does not occur on land subject to natural hazards. Individual residents cannot use environmental reserves for their own purposes, (e.g., erect structures on it, or fence it off from the public).

The MGA states that environmental reserves are to be left in their natural state or used as public parks. If the Summer Village follows this directive, it results in a functioning buffer zone between private residences and the lake.

Roads and other specified structures such as pipelines and public utilities can be constructed on environmental reserve lands subject to a public hearing, and a determination that the interest of the public will not be adversely affected.

The Misuse of Environmental Reserves

Unfortunately, environmental reserves are sometimes misused. Many documented cases reveal that adjacent landowners have compromised the purpose and nature of these reserves through the removal of trees and vegetation, the on-site development of fences, boat launches, decks and other buildings, the re-contouring of the site, and other private uses of these reserve lands. These actions deny the public nature of these properties, as stipulated in the Municipal Government Act, creating conflicts between area landowners and the general public, and can result in the degradation of the lake environment.

Designations Prior to 1978

Subdivisions surveyed after 1978 will have the environmental reserves marked "ER" on the survey map. Prior to the 1978 Planning Act, subdivision plans showed reserves as "R." These reserves could be municipal or environmental, depending upon their use. Generally, if a parcel of land marked "R" on a survey map indicates a strip of land between a private property and the lake, this land is to be treated as environmental reserve.

What Does the Law Say?

The Summer Village owns the environmental reserve. The *Municipal Government Act* (Section 671) specifies that an environmental reserve must be left in its natural state or be used as a public park. A municipality, however, may authorize some other use by passing a bylaw under Section 676 of the MGA.

Environmental reserves cannot be sold, but they can be leased for not more than three years. This would require a bylaw. A Summer Village could also issue a **temporary** "License of Occupation" for environmental reserve lands, to permit uses such as the placing of a boathouse near to the water.

Any unauthorized activity on an environmental reserve should be considered by the municipality to be an act of property trespass, which could be addressed through appropriate legal channels.

What Should I Do?

People often wonder just what they can do to "help" the environment. Proper management of environmental reserves is one way municipalities can make a big difference to the lake environment.

Councillors can become familiar with the environmental reserves in their village and their permitted uses. They can review or update any bylaws regarding environmental reserves. If there are no bylaws and these lands are being abused, Council could consider drawing up bylaws to outline how they are to be managed. Environmental concerns must be considered when determining what activities will be allowed on the environmental reserve.

Provide information to your residents about the importance of environmental reserves and how they may be used. If a resident or member of the general public observes that an environmental reserve is being misused, they should be instructed to register a complaint.

Protecting the Environmental Reserve

Be prepared to respond if Council is made aware of an environmental reserve being used without permission, or for activities that have not been approved. Council or administration should take steps to stop unauthorized activity and enforce any bylaws, or take legal action if required. Failure to take action may expose the Summer Village to risks and liability arising from the non-legitimate use of these lands.

Enforcing the regulations governing an environmental reserve is not always easy, especially when it has never been done before. Residents with property abutting a reserve may have come to feel that this land is "theirs," an extension of their property. It is not. Survey maps (and pins) will clearly show where the private property ends and the reserve begins. A ratepayer who encroaches is not paying taxes for the **private exclusive use** of environmental reserve land. Environmental reserves belong to the Summer Village.

Environmental Reserves and Lake Stewardship

Environmental reserves can serve a very important function when it comes to good lake stewardship. Perhaps the most important thing Council can do is to protect the vegetation on an environmental reserve. The trees and shrubs that may be on this land are not the property of private landowners and these landowners have no right to remove them. This vegetation serves a very important function. It acts as a filter keeping pollutants, including silt, from entering the lake water. It will also anchor the bank and protect private property from erosion in high water years.

An environmental reserve can also provide an area for public access to the lake. It could become a municipal park with a lakeside trail and even picnic benches. Having the entire village involved with caring for this land would contribute greatly to its protection, and thereby to good lake stewardship.

Who Can I Contact?

For information about reserve lands within a municipality contact, Alberta Municipal Affairs-Local Government Services Division at:

Phone: 427-2225

Dial 310-0000 first, for a toll-free connection.

Fax: 420-1016

E-mail: lgsmail@gov.ab.ca

web-site at: http://www.municipalaffairs.gov.ab.ca/ms_index.htm

To find out more about removing fences or other unauthorized structures on the lakebed and shore, contact the Regional Office of Alberta Sustainable Resource Development, Public Lands and Forests Division.

Are There Any Resources Available?

- Alberta Municipal Affairs at:
  http://www.municipalaffairs.gov.ab.ca
- ***Municipal Government Act*** (including Sections 664, 671, 676 and 677) at:
  http://www.gov.ab.ca/qp
- **The Legislative Framework for Municipal Planning, Subdivision and Development Control** at:
  http://www.municipalaffairs.gov.ab.ca/ms/pdf/legframework.pdf
- For information on protecting the shoreline go to the Vincent Lake Working Model web-site at:
  http://www.healthyshorelines.com/index.asp
- For an example of an Environmental Reserve bylaw go to the Vincent Lake Working Model web-site at:
  http://www.healthyshorelines.com/pdf/Building%20an%20Environmental%20Reserve%20By-Law%20Fact%20Sheet,%20%2021-Mar-2001.pdf
- Section 3.4 "Natural Environment," of the Half Moon Bay Municipal Development Plan.
- Strathcona County – Bylaw 68-2005 – Unauthorized Use of Conservation Easements for the Purposes of Protecting and Enhancing the Environment Through the Use and Enforcement of Environmental and Conservation Easements.
  http://www.strathcona.ab.ca/Strathcona/Departments/Legislative+and+Legal+Services/Bylaws/default.htm
- The Summer Village of Norglenwold - Municipal Development Plan (Section 8) – Environmental Protection.
- The Summer Village of Golden Days – Bylaw No.194 – Designate Lands as Environmental Reserve.
- The Summer Village of Half Moon Bay – Letter to Residents on Environmental Reserves.

Fertilizer Use

What is the Issue?

Municipalities and cottage owners apply fertilizers during the summer months to stimulate and nourish the growth of park turf, sport fields, and private lawns and gardens. Improper (over) application and/or rainfall can cause fertilizer to run off into adjacent water where it can accelerate the production and growth of aquatic plants (macrophytes), algae, and cyanobacteria. It can result in algal and cyanobacterial blooms. These conditions are aesthetically unpleasant and can prevent recreational activities such as boating and swimming.

The impacts of fertilizer use are connected to land management practices. There is no provincial legislation regulating the use of fertilizer on private residential properties. It really is up to the Summer Village to be pro-active about this matter. Once Council is up to speed on how lake ecosystems work, and how fertilizers can affect this system, councillors can institute bylaws to regulate fertilizer use within the Summer Village.

Background

Trophic status refers to how productive the lake is and is an indicator of the amount of nutrients in a lake. Plant nutrients, such as phosphorus and nitrogen from chemical fertilizers, or from livestock wastes used as fertilizer, can accelerate the eutrophication of a lake, and thus change its trophic status. Most Alberta lakes already have naturally high concentrations of nutrients. For more information on the trophic status of lakes, see Appendix I - **Understanding Lake Basics**.

Carbon, nitrogen, and phosphorus are necessary for plant, algae, and cyanobacterial growth in aquatic environments. The supply of phosphorus is much more limited on earth than nitrogen is. Nitrogen comprises the majority of atmospheric gas surrounding earth. Some plants, including common bloom forming species of cyanobacteria, can fix atmospheric nitrogen for growth, so nitrogen is never in short supply for these plants. Phosphorus, however, is not available in the atmosphere, so phosphorus becomes the limiting nutrient for growth in aquatic environments. It is important to note however, that nitrogen is just as important as phosphorus for the growth of aquatic plants and algae - especially to those plants that cannot fix atmospheric nitrogen.

Phosphorus

Phosphorus is the primary nutrient that determines plant, algae, and cyanobacterial growth in aquatic ecosystems. A lack of phosphorus will limit their growth in freshwater, even if there is plenty of nitrogen. A very small amount of phosphorus (measured as parts per billion) in freshwater can cause cyanobacterial blooms and increased aquatic plant growth. Besides existing naturally in lake water and in the underlying sediments, phosphorus is found in fertilizers, manure, detergents, and sewage.

Surface runoff carries phosphorus from the land into streams and lakes. The phosphorus is either attached to eroded soil particles or dissolved in the runoff.

Phosphorus in runoff can cause excessive algal, cyanobacterial, and plant growth to occur. Blooms eventually collapse or die and start to decompose. During decomposition, dissolved oxygen is removed from the water by microorganisms that break down the organic material. The lack of dissolved oxygen can cause aquatic organisms, such as fish, to suffocate and die.

Nitrogen

Nitrogen is the primary nutrient required for plant growth on land, but is also essential for growth of aquatic vegetation. Organic matter in soil, chemical fertilizers, and livestock manure provide sources of nitrogen. Nitrogen, in the form of ammonium salts and nitrates (found in commercial fertilizers), is easily diluted in water and can move easily through the soil into shallow groundwater or be carried into the lake with runoff.

Excess nitrogen in aquatic ecosystems can be harmful. Under certain conditions (optimal pH and temperature), high ammonium levels in surface waters can be toxic to fish. High nitrate-nitrogen levels in drinking water can harm human health. High nitrate levels in drinking water can impair the blood's oxygen carrying capacity in small infants, causing "Blue Baby Syndrome." Also, when there is a sufficient supply of phosphorus available in the lake, as is usually the case in Alberta, high concentrations of nitrogen can cause an increase the growth of aquatic plants, algae, and cyanobacteria.

What Does the Law Say?

The federal *Fertilizer Act* defines what fertilizer is. It controls what can make up a fertilizer in Canada.

Alberta Environment carries out its work under the authority of the *Environmental Protection and Enhancement Act* (EPEA) and the Water Act. The EPEA regulates the release of substances into the environment, including releases into water. The storage and application of fertilizers is controlled under the *Environmental Protection and Enhancement Act*.

The deposit of a deleterious material of any type, including fertilizer, into water, or in a place where it may enter water frequented by fish, is contrary to the federal *Fisheries Act* [Sec. 36 (3)]. Environment Canada administers this section of the Act.

Fertilizers and Agriculture

Fertilizers used by the agriculture industry (farmers and ranchers) in Canada are controlled by the *Agricultural Chemicals Act* and the *Fertilizer Act* (Canada). The *Provincial Agricultural Operation Practices Act* (AOPA) regulates the agricultural application of phosphorous and other nutrients. This includes what kinds, how much, and where they can be applied. The AOPA also regulates the location of intensive livestock operations.

The AOPA lays out clear manure management standards for all farming and ranching operations in Alberta. In this case manure refers to livestock excreta, associated feed losses, bedding, litter, soil, and wash water. It does not include manure to which the federal *Fertilizers Act* (Section 1) applies. This section of the Act covers manure not related to agriculture.

All operators must manage and apply manure, composting materials, and compost in accordance with the nutrient management requirements in the *Provincial Standards and Administration Regulation* (Sections 23 to 25).

What Should I Do?

Short–term Solutions

Councillors should work to keep all fertilizers out of the water.

Using newsletters or public meetings, advise residents not to apply fertilizer to any property where there is a high risk of runoff. Applying fertilizer on frozen, snow-covered, saturated, or heavily compacted bare soil increases the risk of contaminated runoff reaching the water of the lake. Lawns that slope downward, towards the lake, are also very susceptible to having surface runoff from rains carry excess fertilizer directly into the water.

Advise residents to use phosphate-free detergents, they are readily available. It would also be beneficial to discourage people from washing themselves, their pets, or their vehicles in the lake. Those activities should happen on dry land, well away from the lake.

Council could encourage the establishment of volunteer lake monitoring programs. These programs can yield valuable information on the trophic status and water quality of the lake.

Long-term Solutions

Alberta's eutrophic lakes are very nutrient rich and prone to plant, alga, and cyanobacterial growth. The only real solution to decreasing the number of blooms that occur at a lake is to reduce the amount of nutrients in the lake. Certainly it is important that human activities **do not** add nutrients to the water.

Municipalities, cottagers, and farmers can adopt management strategies designed to reduce nutrient inputs to surface waters, in order to reduce the production of aquatic plants and algae with time. These strategies include the reduction of fertilizer use around lakes and the streams and rivers that flow into them, inspection of septic systems, and maintenance and restoration of riparian vegetation.

This vegetation, found along the shoreline of the lake, takes up nutrients for its own growth, keeping the nutrients out of the water where they could "feed" aquatic plants and algae. Removing shoreline vegetation removes the lakes natural filtering system and increases the chances of erosion. Erosion results in earth entering the water. This earth contains nutrients, so the problem is worsened. Bringing in sand or fill to the shoreline also adds nutrients to the water.

A Different Way of Landscaping

Encourage naturescaping within the Summer Village. The concept of naturescaping is about increasing biodiversity and preserving the balance of an ecosystem. A naturescaped yard would have no chemical inputs. For example, an alternative would be to use "grass-cycling" when mowing your lawn. Approximately half the required nitrogen for a typical growing season can be achieved simply by leaving grass clippings on the lawn. Naturescaping is all about becoming good stewards of nature, and what better place to do this than out at the lake. For more information on naturescaping see the reference in the **Are There Any Resources Available?** section of this chapter.

The Use of Bylaws

Summer Village councils can develop bylaws that:

- Ban or restrict the use of fertilizers on residential lawns.
- Ensure that all grass and plant cuttings are kept well away from the water. (Decomposing vegetation uses up oxygen in the water and also adds nutrients to the lake).

Setting a Good Example

Councillors can provide leadership and set a good example of lake stewardship by practicing environmentally friendly gardening at their own residences. Council can set an example for the Summer Village by restricting fertilizer use in municipal lands, and by encouraging the growth of shoreline vegetation in areas under their control.

Being a Good Neighbour

All the activities within a watershed affect the water quality of the lake. Summer Village council, besides working with its residents, should start a dialogue with other groups in their watershed. In particular, it would be advantageous to start working with farmers/ ranchers who have property adjacent to the Summer Village. Only by all of us working together, can we really address the problem of nutrient loading at the lake.

Who Can I Contact?

For excellent information on the science of phosphorus and nitrogen, contact your local Alberta Agriculture, Food and Rural Development office.

To find out what the trophic status of your lake is, contact your regional office of Alberta Environment.

Are There Any Resources Available?

- **Managing Phosphorus to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex929
- **Managing Nitrogen to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex928
- **A Primer on Water Quality: Pollutant** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wat3350
- For information regarding the *Agriculture Operation Practices Act* visit: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/epw8746
- **NatureScape Alberta; creating and caring for wildlife habitat at home** M. Pearman and T. Pike. 2000. Co-published by: Federation of Alberta Naturalists. Box 1472. Edmonton, AB. T5J 2N5. ISBN 0-9658765-0-8.

Seba Beach Solves a Problem and Residents Benefit

The Summer Village of Seba Beach, located on the west shore of Wabamun Lake, has a population of 137 year-round residents. During the summer months, however, the population swells to 1400. It was common practice for residents to take the grass clippings and leaves from their lawns and dispose of them in the Village drainage ditches. The result was clogged ditches, and stormwater drainage was compromised. The municipality was concerned about the potential for flooding in the Summer Village. Clippings that didn't go into the ditches went to the municipal landfill, contributing greatly to filling it. The idea of all grass clippings going into the landfill would only add to that problem.

In response to this dilemma, Council initiated a recycling/composting program. Residents can now pick up clear plastic bags, free of charge, from the Village office. They can fill these bags with grass clippings, leave them out, and Public Works employees collect them weekly. The clippings are then taken to a composting site one-kilometer outside the Village. Summer Village staff manages the compost piles. Garbage is not mixed with the clippings, and Village residents are encouraged to use the compost, free of charge, in their gardens and flower beds.

This program is now in its second year and is very popular with the residents. A plan is in the works to start collecting and recycling the plastic bags used in the composting program. The success of this program has had a significant effect on drainage improvements in the Summer Village

Filamentous Algae

What is the Issue?

Although not toxic, filamentous algae are regarded as a physical nuisance. They can plug water intake lines, entangle boat props and anchor lines, and affect the enjoyment of fishing, paddling, and swimming. When they die their decomposition can give off a bad odour.

Living plants produce oxygen, but the process of decomposition requires oxygen. The decomposition of excessive amounts of dead algae in the water can cause oxygen depletion, leading to fish kills in the summer.

Summer Village residents often complain when large mats of filamentous algae are present in the lake. Councillors should become aware of the biology of these plants, what they require for growth, and the best ways to minimize their numbers.

Photo credit: Richard Casey

Filamentous Green Algal Bloom

Background

Algae are a very diverse group of organisms. They form the base of most aquatic food chains and are very important to a healthy lake ecosystem. Green algae are common in lakes, but become a problem when certain types form stringy, slimy-feeling masses. Their numbers greatly increase when there are high levels of nutrients in the water. In nutrient-rich waters, filamentous algae may produce severe surface accumulations, or blooms, throughout the open water season.

What are Filamentous Algae?

Filamentous (green) algae, often called "moss" or "pond scum," are characterized by long, hair-like strands, or filaments, of attached cells (often reaching two metres in length). Filamentous green algae respond to dissolved nutrients, especially nitrogen, with increased growth and reproduction.

Algae strands can form dense floating mats called blooms. This occurs when large subsurface masses become buoyant with oxygen generated by their own photosynthesis. As they grow, the algae give off oxygen that becomes trapped in the mat of strands. This gives the mat buoyancy and causes it to rise to the surface. Filamentous algae blooms generally occur near shore, in open bays, and at other offshore areas protected from wind and wave action.

Problems Caused by Filamentous Algae

Fortunately, filamentous green algae are not toxic, but they are a physical annoyance. Filamentous blooms are visually unattractive, produce unpleasant odours during their decay, and can deplete dissolved oxygen in the water, contributing to fish kills.

The Affect of Human Activities

The majority of Alberta's lakes are eutrophic, meaning they are naturally nutrient rich. Therefore, our lakes naturally support some degree of filamentous algae growth. Severe blooms form when excessive nutrients, especially nitrogen, enter the water. This is often the result of human activities within the watershed including municipal wastewater discharges, residential use of fertilizers, and agricultural practices.

Photo credit: Dave Trew

Filamentous Green Algal Bloom

What Should I Do?

Short-term Solutions

Mats of filamentous algae that wash up on shorelines can be removed. They must be taken well away from the shoreline. They can be composted and applied to gardens etc., as a natural alternative to chemical fertilizer.

Long-term Solutions

Alberta's eutrophic lakes are very nutrient rich and prone to algae growth. The only real solution to decreasing algae at a lake is to reduce the amount of nutrients in the lake. In particular, limiting human activities that add nutrients to the water.

For more information on management strategies that can help reduce nutrient inputs into the lake, see the **Fertilizer Use** chapter of this guide.

Who Can I Contact?

- For more information on filamentous algae, contact your local Alberta Environment office.
- For more information on nutrients in the water, contact your local office of Alberta Agriculture, Food and Rural Development.

Are There Any Resources Available?

- The Soil and Water Conservation Society of Metro Halifax, for information on phytoplankton in fresh-water lakes at: http://www.lakes.chebucto.org/phyto.html#Green
- **Managing Phosphorus to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex929
- **Managing Nitrogen to Protect Water Quality** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex928
- **A Primer on Water Quality: Pollutant Pathways** from Alberta Agriculture at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wat3350

Municipal Reserve Lands

What is the Issue?

Summer Village councillors are often asked questions about the kinds of activities and uses that are permitted on municipal reserve lands within the village. They may receive complaints from some residents that landowners who live next to reserve lands are intentionally or unintentionally using or developing these areas. It is important that councillors become familiar with the purpose of these lands and the laws regulating them so that they can properly manage them for the benefit of the entire Summer Village and with good lake stewardship in mind.

Background

The Creation of Reserve Land

A Summer Village may, at the time land is proposed for subdivision, require an applicant to provide up to ten percent of the developable area to the municipality for park, recreation, or school authority purposes, or to separate lands that are used for different purposes. These lands are designated MR (municipal reserve), MSR (municipal and school reserve), or SR (school reserve). The municipality owns municipal reserve land. Land is rarely taken for school purposes in Summer Villages.

Prior to 1978, lands dedicated for park purposes were designated with a "P" or "R" on the title, and generally are to be treated as if they were acquired under the current reserve provisions of the *Municipal Government Act* (MGA). Municipal reserves are intended for active or passive park and recreation areas for the use of the general public. These reserves may have been taken with the specific intent of providing public access to the lake or public recreation areas adjacent to the lake.

Summer Villages often have municipal reserves that are immediately adjacent to the lake. Municipal reserves can support environmental stewardship efforts by allowing existing natural stands of vegetation (or portions thereof) to remain in place or by incorporating trees and shrubs into the reserve when natural vegetation has been removed. This vegetation may also help anchor the bank, preventing erosion. Vegetation in the municipal reserve will act as a filter, drawing up nutrients that might otherwise enter the lake. Municipal reserves can be used to provide "buffer zones" separating areas of land that are used for different purposes.

Selling Reserve Lands

Municipal reserve lands may not be sold, leased, or otherwise disposed of without removing the MR designation. Municipalities may remove the designation only after giving notice, holding a hearing, and considering the views of those affected. The land may then be sold or used for any purpose. Proceeds from the disposal of municipal reserves may be used for park or recreation purposes only.

Some municipalities have issued temporary "Licenses of Occupation," for specified purposes such as grazing vacant municipal reserve lands.

Note:

Municipalities should be mindful of the purposes for which reserve lands were dedicated when deciding to remove a reserve designation and dispose of property. Once sold, they are lost to the municipality.

What Does the Law Say?

The municipality owns the reserve lands within its jurisdiction. Under the guidelines of the Municipal Government Act it administers these lands. The MGA empowers municipalities to use bylaws to regulate activities on these lands and establish fines or penalties for violation.

How Are the "Rules" Enforced?

Bylaws are enforced by local bylaw enforcement officers, local police, or, where none, the RCMP.

What Should I Do?

Summer Village councillors should understand the importance of municipal reserve lands, how municipal reserve lands can assist in protecting the lake, and the roles and responsibilities a councillor or administrator has in protecting and managing these lands.

Information and Education

Provide information to Summer Village residents about the categories of reserve lands, why they are important, and how they may be used. If using a newsletter or fact sheet for this information, include a map of the reserve lands. Council could ensure that these areas are properly signed.

Residents should be aware that they have a responsibility to inform Council about questionable activities on reserve lands.

The Use of Bylaws

Consider developing and updating a bylaw to clearly identify reserve lands and outline how they are managed. Consider environmental concerns when determining what activities will be allowed on municipal reserve lands, especially where these are located near the lake.

Taking Action

Be prepared to take action when your Summer Village Council is made aware of reserve lands being used without permission or for activities that have not been approved. Council or administration should take steps to stop unauthorized activity and enforce any bylaw provisions, or take legal action if required. Failure to take action may expose the Summer Village to risks and liability arising from the non-legitimate use by the public of these lands.

Who Can I Contact?

For information about reserve lands within a municipality contact, Alberta Municipal Affairs-Local Government Services Division at:

Phone: 427-2225

Dial: 310-0000 first, for a toll-free connection.

Fax: 420-1016

E-mail: lgsmail@gov.ab.ca

web-site at: http://www.municipalaffairs.gov.ab.ca/ms_index.htm

Are There Any Resources Available?

- Alberta Municipal Affairs at: http://www.municipalaffairs.gov.ab.ca
- ***Municipal Government Act*** (including Sections 664, 671, 676 and 677) at: http://www.gov.ab.ca/qp
- **The Legislative Framework for Municipal Planning, Subdivision and Development Control** at: http://www.municipalaffairs.gov.ab.ca/ms/pdf/legframework.pdf
- Environmental Law Centre at: http://www.elc.ab.ca/home/index.cfm
- For information on Municipalities and the Environment access the Environmental Law Centre Publications page at: http://www.elc.ab.ca/publications/detailspage2.cfm?id=891
- **Municipal Powers, Land Use Planning, and the En vironment: Understanding the Public's Role**, James S. Mallet, Environmental Law Centre, Edmonton, 2005: http://www.elc.ab.ca/ims/client/upload/Municipal%20law%20project%20_Final%20Print%20Draft.pdf
- For information on protecting the shoreline go to the Vincent Lake Working Model web-site at: http://www.healthyshorelines.com/index.asp
- For an example of an Environmental Reserve bylaw go to the Vincent Lake Working Model web-site at: http://healthyshorelines.com/pdf/Building%20an%20Environmental%20Reserve%20By-Law%20Fact%20Sheet,%20%2021-Mar-2001.pdf

Planning and Development

What is the Issue?

Municipal planning and development responsibilities can influence and have a long lasting effect on lake stewardship. Good quality planning and development, including land use bylaws, other planning documents, and education programs can help enhance and protect the integrity of the natural environment and "health" of the lake.

Background

Council shapes the physical and environmental future of the community through its authority over land-use planning and development control. A councillor must focus on the future of the community as a whole and its relation to neighbouring municipalities, while balancing the current rights, needs, and concerns of property owners and residents.

What Does the Law Say?

The Municipal Government Act and Land Use Bylaws

Under the *Municipal Government Act*, every municipality must have a Land Use Bylaw. This bylaw provides a specific means of implementing the policies that are expressed, in a general way, in the Municipal Development Plan (if one exists). If Council wishes to adopt a direct control district in the land use bylaw, council **must** also adopt a Municipal Development Plan.

The Land Use Bylaw provides for a system of development permits and divides the municipality into land use districts prescribing permitted and discretionary uses for land, buildings, and development standards. Development permits are obtained through the Summer Village administration or Development Officer.

Provincial Land Use Policies

Provincial Land Use Policies (LUPs) provide broad policy direction to municipalities with respect to such matters as the environment and water resources. Municipalities are expected to reflect these policies in their municipal development plans, other statutory plans, and Land Use Bylaws.

Using Bylaws to Protect the Lake

Nuisance bylaws, waste management bylaws, pesticide application bylaws, water conservation bylaws, etc., can assist Summer Village Councils to control and manage a number of human activities that may have adverse affects on aquatic ecosystems.

What Should I Do?

A number of tools exist to assist municipal councils with planning.

Municipal Development Plan

A municipality with a population of 3500 or more **must** adopt a Municipal Development Plan (MDP). It provides a general framework for development within the municipality, and is the official statement of the municipality's policies concerning the desired future pattern of development.

Inter-Municipal Development Plan

Two or more municipalities may adopt an Inter-Municipal Development Plan to address issues of mutual concern with respect to designated lands. The plan may provide for the future use of land, and the manner of and proposals for development, or other matters relating to the area that the councils consider necessary

Area Structure Plans

Council may, by bylaw, adopt an **Area Structure Plan** to provide a framework for subdivision and development for a particular area. The Area Structure Plan will generally describe the sequences of development, proposed land use, population density, and the location of major transportation routes and public utilities.

Area Redevelopment Plan

When an area is undergoing redevelopment, the council may adopt an Area Redevelopment Plan which, in addition to providing guidelines, may result in a redevelopment levy being used to acquire land for park, school, or recreation purposes purposed in the redevelopment area.

Who Can I Contact?

For information on municipal planning and development contact Alberta Municipal Affairs. See their web-site at: http://www.municipalaffairs.gov.ab.ca

Are There Any Resources Available?

- **The *Municipal Government Act*** can be ordered from the Alberta Queens Printer at: http://www.qp@gov.ab.ca or 780-427-4952 (dial 310-0000 first, for a toll free call).
- **The Subdivision and Development Regulation** can be ordered from the Alberta Queens Printer at: http://www.qp@gov.ab.ca or 780-427-4952 (dial 310-0000 first, for a toll free call).
- **The Provincial Land Use Policies** can be downloaded from the Municipal Affairs web-site at: http://www.municipalaffairs.gov.ab.ca/ms/pdf/landusepoliciesmga.pdf
- To order the **Environmental Reference Manual for the Review of Subdivisions in Alberta** from Alberta Environment go to their web-site at: http://www3.gov.ab.ca/env/info/infocentre/PubDtl.cfm?ID=2320 or find it online at: http://www3.gov.ab.ca/env/info/infocentre/pubs/Environmental_Ref_Manual_Review_of_Subdivisions.pdf
- **Summer Villages at Sylvan Lake:** Joint West Sylvan Lake Area Structure Plan – March 14, 2005
- **Sylvan Lake Management Plan:** 2000 Update
- **Summer Villages at Sylvan Lake: Public Consultation Process:** Public Access Study
- **Summer Villages at Sylvan Lake: Regional Partnership Initiative:** Sylvan Lake

Summer Village Council Plans for the Future

The Summer Village of Norglenwold is located on the south shore of Sylvan Lake, just west of the city of Red Deer. Norglenwold has 267 permanent residents, but many more during the summer. In1994, Council initiated a Municipal Development Plan (MDP), but ratepayers did not like the draft and the proposed MDP was not accepted. A MDP is a statutory document that provides a general framework for development within the municipality, and is the official statement of the municipality's policies concerning the desired future pattern of development. During the process of the development of a MDP, public input is sought through public meetings.

A MDP can set environmentally responsible guidelines for the municipality. Councillors and the Village Administrator worked on developing the MDP 2000 with significant goals, objectives, and policies to protect both lands within the community and the aquatic environment. They did this in consultation with their residents and Alberta Environment. Council felt that having a MDP with a large environmental component would ensure that landowners, when planning a development, would be sensitive towards preserving environmentally sensitive lands, and implementing mitigating measures for the protection of the lake.

The importance of maintaining the health of the environment and how this contributes to the quality of life for the citizens is an ongoing educational program. A MDP with an environmental focus can help. Norglenwold's MDP 2000 is referred to many times by the municipality, when setting policy, and was also used as an example document by other Summer Villages in the area.

Road Construction and Maintenance

(Including Road Salts, Dust Control, Snow Removal)

What is the Issue?

At many Summer Villages the increased number of seasonal and permanent residents has resulted in requests from property owners for the development of new roads, and the upgrade and maintenance of existing roads to better standards. Road maintenance, including the application of road salts, and chemicals applied to roads for dust control, may pose risks to the aquatic ecosystem. The removal and collection of snow from roads in winter, if done improperly, can also cause problems for the lake.

Council needs to find a way to balance their responsibility to their constituents for providing safer roads, with protecting the lake. In the end, both are important to creating a desirable environment for Summer Village residents.

Background

Summer Village Councils are responsible for road construction and maintenance within their municipal boundaries. They are also responsible for the safe storage and application of dust control substances and road salts, and the proper placing of snow dumps.

Road Construction and Maintenance

To promote good lake stewardship, the Summer Village administration must be responsible for ensuring that road construction and maintenance practices, including snow removal activities, protect the water quality of the lake and that they do not harm the habitat of the fish and wildlife living at the lake.

Practices that promote the proper placing and use of snow dump areas, and the safe storage and application of road salts and other chemical substances are becoming more commonplace as we understand the importance of proper management in these areas.

Following the Guidelines

Summer Villages are required to follow guidelines when constructing and maintaining roads, pathways, and associated culverts and drainage ditches.

Application of Dust Control Substances and Road Salts

Summer Villages may apply dust control substances for obvious reasons during the summer months. They may also apply salt during the winter to provide traction, and melt ice and snow.

Calcium chloride, commonly used for dust control, poses a low risk to the environment when properly applied.

Snow accumulations, however, on municipal roads may contain contaminants such as suspended solids, organic chemicals, phosphates, dissolved salts, heavy metals, oil, and trash. These contaminates can be harmful to terrestrial and aquatic environments. Summer Village councillors should find ways to reduce or eliminate the impacts of winter road maintenance on the lake.

Information on Road Salts

Sodium chloride (NaCl) is the most common road salt, although other salts such as Potassium Chloride (KCl) and Calcium Chloride (CaCl2) are sometimes used. Road salts do not pose a risk to humans; however, exposure to high levels of chloride can be harmful to plants and wildlife, and road salts can affect lake water quality. These salts can inadvertently get into the water by various means, including:

- When the snow and ice on roads and in snow dumps melts and runs off the land, ending up in the lake.
- From stormwater runoff.
- From transportation yards, where large volumes of salt, mixed with sand, are often stored without adequate protection against leaching into groundwater. (Groundwater around lakes is often close to the surface and drains into the lake underground, without being seen).

Environment Canada has carried out comprehensive scientific assessments on road salts and has stated that road salts pose a serious threat to the aquatic environment, ground water table, vegetation, and wildlife.

Most municipalities in Alberta have developed a Snow and Ice Control Policy and Procedure manual, and a Salt Management Plan, to comply with provincial and federal requirements to keep salt and other harmful substances from entering the water.

What Does the Law Say?

Approvals Are Required

If road construction or maintenance will have any immediate or potential effect on the lake, it will require an approval.

Provincial Approval

Approval will be required from Alberta Environment under provisions of the Water Act and/or the Environmental Protection and Enhancement Act. If any work is to happen on the bed or shore of the lake, or cause potential erosion or silting of this area, it will require a permit from the Public Lands and Forests Division of Alberta Sustainable Resource Development, to meet conditions of the Public Lands Act.

Before starting any major project in the Summer Village, contact the local office of one of the above agencies. They will advise what permits are required. Usually, you need to submit only one application for approval to satisfy both agencies.

Federal Requirements

The deposit of a harmful substance of any type, including road salts and dust control substances from runoff, into water or in a place where it may enter water frequented by fish, is contrary to the federal Fisheries Act. Environment Canada administers this section of the Act.

Provincial and Federal Resources for Snow Removal and Road Salt Use

Alberta Environment restricts snow dumping into watercourses or onto ice covered water bodies, including lakes. Salt Management Plans usually identify snow dump locations. Sites should be inland, and selected and designed to maximize treatment, minimize safety hazards, and control the rate and location of snowmelt discharges. Alberta Environment currently requires a snow

dump to be set back a minimum of 200 metres from any water body. Alberta Environment has developed a document titled *Salt Contamination Assessment and Remediation Guidelines* (May 2001), for municipalities to follow when designing their salt management strategy.

Environment Canada has released a *Code of Practice for the Environmental Management of Road Salts* (April 3, 2004). And, the Transportation Association of Canada also released a *Synthesis of Best Practices - Road Salt Management*. Both documents advise road maintenance agencies, public or private, to develop and implement a Salt Management Plan for their operations. Salt storage methodology is addressed in both documents.

What Should I Do?

Doing It Right

Councillors can become more aware of the affects of road construction and maintenance on the lake environment. If the Summer Village is planning to construct a new road they should consider engaging a professional engineer to design it, to ensure the road and associated road ditch system does not create flooding or erosion problems. The professional engineer can assist the village with any approval requirements related to the works.

If the Summer Village is considering road maintenance work and have concerns that the operation of the proposed work may adversely affect adjacent property or the downstream receiving water bodies, they should consider engaging a qualified individual, preferably a professional engineer, to assess the impact of the proposed maintenance.

Council can seek out opportunities to reduce impacts on the lake due to contamination and pollution from stormwater runoff from road construction, the application of road salts and dust control substances, and the collection of snow. The best place to start is by contacting the local Alberta Environment office.

Create Policies

To ensure that proper procedures are followed, Council could develop a Snow and Ice Control policy that addresses snow removal storage areas that will eliminate or reduce the risk of contaminants entering water bodies during the melt. See the information under Provincial and Federal Resources for Snow Removal and Road Salt Use, in the **What does the Law Say** section of this chapter.

Additional policies or plans may be required for your Summer Village. If there isn't one already, consider developing a Road Maintenance Policy and Procedure manual for the application of road salts and dust control substances, as well as the safe storage of salt in your community. Policies may be made to utilize chip gravel for traction control purposes, as opposed to chemical applications.

Some Helpful Information to Consider in Decision Making and Planning:

Dust Control (Calcium Chloride)

Calcium Chloride stabilizes roadbeds and suppresses dust by maintaining proper moisture levels. Calcium Chloride is environmentally safe. It has a low toxicity to plants and animals, it does not leach easily into soils and only small quantities are required for effective dust control. When spraying calcium chloride, operators should avoid road shoulders, watercourses and bridge decks.

Road Salt (Sodium Chloride)

Road salt is the fastest, least expensive, and most effective method for the management of ice and snow. Road salt should be stored in an enclosed structure for three reasons:

- To prevent the formation of lumpy salt that is difficult to handle.
- To eliminate the possibility of contaminating water bodies and wells with salt runoff.
- To eliminate salt loss through dissolving in runoff or leaching into the soil.

Who Can I Contact?

For more information on road construction and maintenance, contact your regional Alberta Environment office. Dial 310-0000 first, for a toll free call.

For information on what permits are required when working around water, contact the regional offices of Alberta Environment and Public Lands and Forests Division.

Are There Any Resources Available?

- **Salt Contamination Assessment & Remediation Guidelines** at: http://www3.gov.ab.ca/env/protenf/soilgrndwater/documents/SaltContAssess&RemediationMay01.pdf
- **Snow Disposal Guidelines for the Province of Alberta – February 1994** at: http://www3.gov.ab.ca/env/protenf/publications/snowdisposalguidelinesfeb94.pdf
- **Environmental Impacts of Road Salts** at: http://www.ec.gc.ca/science/sandejan02/article3_e.html
- **Road Salts – Reducing the risk of road salts to the environment, while keeping our roads safe** at the Environment Canada web-site at: http://www.ec.gc.ca/issues/roadsalt_e.htm
- **Dust Control for Unpaved Roads** at the National Guide to Sustainable Municipal Infrastructure web-site at: http://www.infraguide.ca/bestPractices/PublishedBP_e.asp#sw
- Transportation Association of Canada, (TAC) web-site at: http://www.tac-atc.ca/english/index.cfm has a series of Best Practices including:
  - **Salt Management Plan**s at: http://www.tac-atc.ca/english/informationservices/readingroom.cfm#syntheses
  - **Snow Storage and Disposal** at: http://www.tac-atc.ca/english/informationservices/readingroom.cfm#syntheses
  - **Design and Operation of Road Maintenance Yards** at: http://www.tac-atc.ca/english/informationservices/readingroom.cfm#syntheses
- Alberta Infrastructure and Transportation at: http://www.trans.gov.ab.ca/home/index.asp
- **Code of Practice for the Environmental Management of Road Salt, April 2004** on the Environment Canada web-site at: http://www.ec.gc.ca/nopp/roadsalt/cop/en/rs_main.htm
- Environment Canada List of Canadian Programs, Initiatives and Guidelines Related to Road Salts (June 2001) http://www.ec.gc.ca/nopp/roadsalt/pdfs/list_e.pdf
- For information on the scientific assessment of road salts, contact the Transportation Research Board at: www.trb.org

Shoreline Modification / Erosion Control

What is the Issue?

Shorelines can be fragile areas. Normally, unaltered shorelines have enough **vegetative** structure to withstand significant damage from natural forces. This can change when people alter the shoreline area by removing vegetation from the land and the water. Erosion can result.

An eroding shoreline can contribute to increased siltation into the lake, loss of habitat, and, eventually, loss of property. Property owners can see they are "losing" land. They may be inclined to "fix" the problem. If employed, erosion control solutions must be designed appropriately to avoid creating new problems.

Councillors should be well informed on the value of natural shorelines and the benefits they offer. Sharing of this information with the Summer Village residents will promote the retention of natural shorelines and their use in effective erosion control.

Photo credit: Alberta Sustainable Resource Development

Background

The shoreline around the lake is subject to natural erosion from wave and ice action. The characteristics of the shoreline have developed over a long period of time and if left unaltered, they have enough **vegetative** structure to withstand these forces. The vegetation found on the shoreline – in and out of the water – dampens the energy of wave action and can even protect against ice scouring. Willows, for example, will bend under the pressure of incoming ice, while holding the soil of the bank in place.

Modifying the Shoreline Can Aid Erosion

The potential for erosion and loss of property is significantly increased when people modify the lake shore and bank by removing deep rooted native vegetation that would otherwise hold bank soils in place, or remove aquatic emergent vegetation from shallow water where it dampens the energy of waves. Landscaping that clears and converts all native vegetation into turf grass lawns, harrowing exposed lakebeds, and regular ATV use on and near the shore can also result in an increased potential for erosion.

In addition, excessive boat speeds near shorelines can create large boat wakes, and the generated waves can also significantly impact shorelines, particularly if they occur frequently.

Protecting Against Erosion

Erosion is normally more of a problem during high water years, but can occur anytime. Where bank erosion is ongoing, active intervention may be required using erosion control measures to stop further loss. Various methods are available to control shoreline erosion. These include re-shaping mildly eroding banks, re-vegetating sloped banks, re-establishing washed out shorelines, and providing protection with armoring material, such as rock rip-rap, gabion baskets, and retaining walls.

Provincial agencies are increasingly reluctant to grant permits for "hard" solutions to erosion, such as armoring, unless absolutely necessary. Armoring would likely only be approved where the potential for erosion is very high. In most cases, natural vegetation will address erosion issues while maintaining wildlife habitat, reducing sediment flow into lakes, and protecting water quality by filtering and removing a variety of materials that are picked up by water as it flows over land.

Keep in mind that self-designed erosion control measures are often inadequate or poorly constructed, and will not produce the desired outcome. They become an ongoing project that may cause erosion problems for adjacent properties, negatively impact the aquatic environment, or result in the loss of the shore area entirely. It is therefore critical that expert advice be sought to appropriately plan measures that will be effective.

Photo credit: Alberta Sustainable Resource Development

What Does the Law Say?

Controlling shoreline erosion is subject to the requirements of the Public Lands Act (administered by the Public Lands and Forests Division of Alberta Sustainable Resources Development) and the Water Act (administered by Alberta Environment).

On Private Land

In some cases lakefront property owners are able to take measures to prevent loss of property from erosion, without a permit. This common law right, however, is not absolute and is subject to the following:

- Erosion protection works must be confined to private property, (encroachment on the Crown' lakebed requires prior authorization); and,
- Construction of the works may be subject to other regulatory requirements such as development permit requirements from the Summer Village or approval from federal and/or provincial agencies (if the work will affect the bed and shore or water of the lake).

On Public Land

Anyone planning to modify the beds or banks of any body of water in Alberta must obtain provincial approval from Public Lands and Forests Division and Alberta Environment, prior to proceeding with the work. Authorization may also be required under the federal *Fisheries Act* and the federal *Navigable Waters Protection Act*. Shoreline modification could affect fish habitat, and this aspect of the Fisheries Act is administered by the Department of Fisheries and Oceans. Transport Canada administers the *Navigable Waters Protection Act*.

What Can I Do?

Know Who Owns What

Councillors should be aware of where property boundaries are in relation to the bank of the lake, including those of Reserve parcels. These boundaries generally determine the jurisdictional responsibilities for regulating activities at a lake. An up-to-date copy of the registered subdivision plan(s) for the Summer Village should be available for consultation purposes. Contact your Summer Village's Development Officer for property boundary information, and to determine if the municipality issues development permits for work done on private land.

Advising Summer Village Residents

Provincial legislation requires that anyone planning to modify the beds or banks of any body of water must obtain approval. Councillors should be able to advise their constituents on whether permits are needed for specific erosion control measures.

Summer Village councillors should familiarize themselves with the various methods available for controlling shoreline erosion. They could advise their residents on the benefits of a natural shoreline with respect to erosion protection. In the event that shoreline vegetation is not effective hard solutions may need to be considered.

To ensure that constructed erosion control work does not fail or negatively affect the environment, landowners should be advised to consult a professional engineer (APEGGA regulated). The professional can assess the wave environment and erosion potential of the site, and advise or design the most appropriate shore protection works for the site's environmental conditions. Landowners should also discuss their plans with neighbours to limit potential conflicts.

Erosion Control on Municipal Land

If a Summer Village wishes to construct erosion protection works to prevent the loss of environmental reserve lands, they should similarly obtain the necessary approvals from Alberta Environment and the Public Lands and Forests Division of Alberta Sustainable Resource Development.

If You See Construction Work On or Near the Shore

General guidelines when dealing with a resident who is doing some type of construction on the shore of the lake:

- Ask the resident to produce a permit. It is required to be on-sight during construction.
- If there is no permit, explain the legislative requirements and violation consequences. Provide the resident with contacts.
- Describe the impacts on the lake the activity may be having and provide relevant educational materials.
- Advise the resident to stop the activity. If the work is on an environmental reserve, consider issuing a Stop Work order.
- Contact regulatory authorities, if the resident refuses to comply.

Regulating Boating Speeds

To regulate specific boat speeds on a lake, or part of a lake, requires a regulatory amendment to the federal Boating Restriction Regulations under the Canada Shipping Act. Requests for boating restrictions are made from the Provincial to the Federal Government through the Fish and Wildlife Division, of Alberta Sustainable Resource Development. For more information on boating restrictions and boating regulations contact Pat Dunford (Head, Legislative and Advisory Services Section; Phone 780-427-4277) or Richard Lyons (Regulations Officer; Phone 780-422-1370).

Who Can I Contact?

To download a permit to apply for erosion control measures on the shoreline go to:

Application Form LS102-Lakeshore/Water Body Modification (Form)
http://www3.gov.ab.ca/env/water/legislation/forms/index.html http://www3.gov.ab.ca/srd/land/u_shorelands_app_reg.html

Alberta Environment through its Alberta Water Management and Erosion Control (AWMEC) Program may be able to assist local authorities resolve surface water management and erosion control problems. This program is not available to individual property owners. For more information, contact your regional Alberta Environment office. A brochure on the AWMEC program is available at: http://www3.gov.ab.ca/env/water/Reports/AWMEC.pdf

Are There Any Resources Available?

- Alberta Sustainable Resources has several publications available for download on their web-site located at:
  http://www3.gov.ab.ca/srd/land/u_shorelands_lakeshores.html, including:
  - **Caring for Shoreline Properties** (Booklet):
    http://www3.gov.ab.ca/srd/land/pdf/Caring_For_Shoreline_Properties.pdf, and
  - **Guidelines for Lakeshore Use** (Brochure):
    http://www3.gov.ab.ca/srd/land/pdf/shorelines.pdf
- Alberta Environment, Water Management Division has information at:
  http://www3.gov.ab.ca/env/water/index.cfm
- Information, regional contacts and access to the joint application form for developing shoreline modifications may be obtained from the Alberta Environment web-site at:
  http://www3.gov.ab.ca/env/water/Legislation/index.cfm
- Fisheries and Oceans Canada also has resources available on their web-site:
  www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/index_e.asp
- **Working Around Water? What You Should Know about Fish Habitat and Shoreline Stabilization** (Fact sheet):
  http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/factsheets-feuillets/alberta/ab5_e.asp#Top

Stormwater Management

What is the Issue?

Stormwater management is the responsibility of the Summer Village. If not done properly, it can result in flooding, erosion, and nutrient loading and contamination of the lake. Council should ensure that stormwater drainage systems are properly designed and maintained. In the interest of good lake stewardship, Council should carefully consider where stormwater will enter the lake and minimize the impacts of this water on the lake.

Background

The stormwater that a Summer Village will be required to manage may include water that is generated outside of its jurisdictional boundaries. Typically, Summer Villages are linear urban developments that follow the shoreline of lakes. Given this linear nature, Summer Villages may often have several small natural watercourses that drain through the municipality to the lake basin.

Summer Villages must maintain these natural drainage courses as well as manage stormwater coming off roads through a system of road ditches. The outlet for the stormwater from these road ditch systems will be small water bodies, watercourses, and/or the lake.

The Hazards of Bad Stormwater Management

Improperly designed or maintained stormwater management systems can result in flooding problems for upstream neighbouring lands, as well as for properties within Summer Village. The ditch carrying capacity and culvert/bridge crossings need to be sized large enough to comfortably pass the expected flow of water for the spring melt and major rains. Culvert systems must be maintained to allow the free flow of water – this will include ensuring that culverts are kept clear of growing vegetation and grasses, trash, and accumulations of silt. Culverts may also require "thawing" during the spring melt and freeze cycle, to ensure that they remain free of ice during the spring runoff.

Improperly designed or maintained stormwater management systems can also result in erosion problems within the ditch system itself and to adjacent properties. When the water velocity reaches a critical rate, erosion will occur, resulting in material being carried downstream to receiving water bodies, including the lake. This eroded material can increase the nutrient loading in the lake contributing to algal blooms and increased aquatic vegetation growth, and may adversely affect critical fish spawning beds by covering them with silt.

Pollutants in Stormwater

Excess fertilizers and other chemicals applied to properties for lawn development or other purposes can be carried by stormwater to the road ditch system and transported downstream to the receiving water body. These chemicals can increase the nutrient loading in the lake. (See the F**ertilizer Use** chapter of this guide).

Best Management Practices

There are methods of managing stormwater that provide flood control for the community while preventing, or at least minimizing, water quality and habitat degradation. These methods may be called Best Management Practices, or Best Practices. A new ditch that conveys stormwater to the lake without considering these practices may create environmental problems. Best Management Practices can be used at the source, on the lot, in the conveyance system (ditch), or at the outlet. A stormwater management system may consider several Best Management Practices such as reduced lot grading and grassed swales, with check dams to trap sediment.

What Does the Law Say?

Any activity affecting the land that will impact and/or alter surface water is subject to prior review and Water Act approval from Alberta Environment.

The *Water Act* and the *Water (Ministerial) Regulations* does allow activities that do not require an approval. These include the installation of small culverts in non-fish bearing streams and some minor landscaping of properties, provided that the activity does not affect adjacent properties.

Stormwater Management

The *Environmental Protection and Enhancement Act* (EPEA), administered by Alberta Environment, regulates the release of substances into the environment, including releases into water. Alberta Environment provides the approvals under the EPEA on issues that are related to runoff and contamination from activities that may affect lake environments. Summer Villages should obtain information from Alberta Environment to help develop and review community plans, and to find out what Best Management Practices they can use to reduce the effect of runoff or stormwater on the lake.

The deposit of a harmful substance of any type, into water or in a place where it may enter water frequented by fish, is contrary to the federal *Fisheries Act*. Environment Canada administers this section of the Act. This is usually not a problem with stormwater runoff, as long as proper guidelines are followed.

What Should I Do?

If the Summer Village is planning to construct a new road, they should consider engaging a professional engineer to design it, to ensure the road and associated road ditch system does not create flooding and/or erosion problems. The professional engineer can assist the village with any approval requirements related to the works.

If someone outside, or inside, the Summer Village is undertaking stormwater management work that you feel may adversely affect the operations of the Village's stormwater management system, and/or the receiving watercourses or water bodies, contact the local Alberta Environment office. Be ready to provide the legal land description of the location of the activity, and provide a brief description of the activity in progress.

Landscaping and Site Restoration

Preventing contamination and pollution of the lake from stormwater runoff when building roads, developing drainage ditches, or installing culverts should be a priority. After that, site restoration of disturbed areas should be done immediately to prevent soil erosion. This would usually involve seeding the exposed earth with various fast growing plants (e.g., clover). It is generally wise to plant only native species, so as to prevent future problems with aggressive plants. Alberta Environment has information on which mixes of seed work best for this work.

Everything is Connected

Everything we do within the watershed affects the ecosystem of the lake. Making sure the Summer Village drainage system is operating efficiently is good, but drainage systems carry things besides water to their point of discharge. Runoff from lawns picks up fertilizers; runoff from roads carries soil particles, etc.

Councillors can practice good lake stewardship by considering all aspects of what living by a lake means. Bylaws banning fertilizer use within the Summer Village will mean no extra fertilizer can get into the lake with runoff. Protecting the vegetation in environmental reserves and around the shoreline leaves a zone of plants that can help take up any nutrients carried to the lake by runoff. If a Summer Village is lucky enough to have a marshland within its boundaries, perhaps stormwater runoff could be routed to it. The plants in the marsh will filter out nutrients and other pollutants, keeping them out of the lake.

Who Can I contact?

For more information on stormwater management contact your regional Alberta Environment office. Dial 310-0000 first, for a toll free call.

Are There Any Resources Available?

- **Stormwater Management Guidelines for the Province of Alberta – 1999, January** at: http://www3.gov.ab.ca/env/protenf/publications/StormwaterMGNTGuidelines.pdf
- **Wastewater and Storm Drainage Regulation Fact Sheets - 1997, January** at: http://www3.gov.ab.ca/env/protenf/legislation/factsheets/wastewat.html
- To access the Alberta Environment Information Center visit their web-site at: http://environment.gov.ab.ca/info/topics.asp http://www3.gov.ab.ca/env/info/infocentre/PubDtl.cfm?ID=126
- S**tandards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems** - published by Alberta Environment and available at the Queens Printer, or online at their web-site at: http://www3.gov.ab.ca/env/protenf/publications/SandG_MuniWater.pdf
- **Stormwater Management Planning** at the National Guide to Sustainable Municipal Infrastructure web-site at: http://www.infraguide.ca/bestPractices/PublishedBP_e.asp#sw
- **Road Drainage, Design Alternative, and Maintenance** at the National Guide to Sustainable Municipal Infrastructure web-site at: http://www.infraguide.ca/bestPractices/PublishedBP_e.asp#sw
- Transportation Association of Canada, (TAC) web-site at: http://www.tac-atc.ca/english/index.cfm has a series of Best Practices including:
- **Drainage and Stormwater Management** at: http://www.tac-atc.ca/english/informationservices/readingroom.cfm#syntheses

Ross Haven Changes Policy on Stormwater Management

The Summer Village of Ross Haven is a small Village on the north shore of Lac Ste. Anne, in the County of Lac Ste. Anne. The Village population is approximately 109 year-round residents and three times that during the summer months. Like many lakes in Alberta, Lac Ste. Anne is very productive and subject to "blooms." In the past, several of the drainage ditches in the Village were kept clean and mowed close to the ground to allow runoff water to go into the lake as fast as possible. This was done to alleviate chances of water back-up. Today, the Village has reversed this practice, allowing grass and other natural plants to grow back, in order to slow down the rate of stormwater moving through the ditches. This vegetation also acts as a filtering system, taking up nutrients being carried by the water to the lake. The Village also planted trees along the edge of the waterways, and reforested park areas where trees had died as the result of age and drought conditions.

This change of thinking came about, in part, due to information provided by speakers at Town Hall meetings. This project ties in with other good stewardship projects, such as shoreline restoration, that the residents of Ross Haven are endorsing. The result has been a dramatic improvement in the water quality of the lake, at the Village.

Wastewater Management Systems

What is the Issue?

Wastewater (domestic) is the combination of liquid and water-carried wastes associated with drinking, cooking, cleaning, hygiene, sanitation, or other domestic purposes. The effective and safe collection, storage, treatment, and disposal of wastewater are important issues that can be complex for Summer Villages.

Poorly designed and improperly operated wastewater systems - private and municipal – can lead to wastewater seeping into the lake. This effluent is both nutrient rich and high in biological contaminants (pathogens). Its presence in the water exposes lake users to public health risks, and contributes to increased plant growth in the lake. Effective and safe management of wastewater is a necessity.

Councillors should try to assist Summer Village residents with making the very best decisions regarding how they treat domestic wastewater. They should keep in mind that standards set by the government are minimum requirements based on most common situations. There are times, however, when unique circumstances or the wish to go beyond the minimum standards requires considering higher standards. As an example, people living around lakes, because of their proximity to a water body, should aim higher than the minimum standards when it comes to protecting the environment. A small cost increase today for a properly installed and maintained system can have huge benefits for future generations.

Background

Wastewater Effects on the Environment

A brief summary of harmful affects resulting from the improper release of wastewater effluent includes:

- **Ecosystem change and loss of biodiversity.** Pollutants entering the water can cause changes in water chemistry. This can lead to the increased presence of some species (e.g., algae), and also to a decrease in the presence of others. Fish are very sensitive to habitat changes, including the presence of toxic substances. Fish populations will usually decline as water quality declines.
- **Decreased quality of the environment for citizens.** Nutrients coming into the lake with wastewater can cause an increase in algae and plant growth in the lake.
- **Harm or material discomfort to citizens.** Wastewater contains sewage and can cause serious health concerns for citizens. Blooms of toxic cyanobacteria, often caused by increased nutrient input into the lake, are also a health concern for animals and people.

Wastewater Systems

When it comes to cottages, homes, and businesses in a Summer Village, there are typically two systems used to manage wastewater; municipal wastewater collection and treatment facilities, and onsite sewage disposal systems. There are acts, regulations, standards and guidelines, and codes of practice for both public and private systems to regulate their installation, and the collection and disposal of wastewater. Around lake communities, wastewater disposal from boats may also be an issue.

Municipal Wastewater Systems

Municipal wastewater collection and treatment facilities release treated effluent to the environment by evaporation, irrigation, or by discharge to a receiving watercourse or water body. During government approval of these systems, approval conditions are established to ensure that treated effluent does not adversely impact the environment and acceptable precautions are taken to avoid human health concerns. It is the responsibility of the operator to ensure that the system operates within the guidelines.

Private Onsite Systems

Onsite sewage disposal systems include septic tanks, holding tanks, fields, mounds, sand filters, packaged sewage treatment plants, lagoons, and open discharge. With the exception of holding tanks and lagoons, these systems, or combination of systems, use the soil for the final treatment and dispersal of the effluent to the surrounding environment. A system that is well designed for the development it serves and meets the required standards will effectively treat the wastewater. A system that is not properly designed for the development could cause groundwater contamination and have a negative impact on nearby lakes.

Effective and safe onsite treatment of sewage is a complex process and site specific. Proper decisions regarding the initial design of the system must consider the soil texture and structure, depth to ground water, and other site-specific information. A soil profile evaluation to a depth of approximately two point four metres (eight feet) is required. The correct initial design of the system will help prevent system failures, which can create health hazards and contaminate the environment.

Private Onsite System Maintenance

Private onsite systems require regular maintenance. Holding tanks have all collected materials pumped out routinely. Septic tanks require the periodic pump out and removal of solids to maintain treatment effectiveness and prevent severe failure of the treatment field. These solids are referred to as septage. Pump out trucks are contracted by homeowners to take out and dispose of the septage. For more information see **What Does the Law Say** of this chapter.

Private Boats and Yachts

Boats or yachts may have their own holding tanks to manage wastewater generated while boating, sailing, or while sitting in port. If the wastewater, including the contaminated water that collects at the bottom of a boat or yacht, is improperly disposed of, it can pose a health risk, as well as contribute pollution and add to the eutrophication of the lake.

What Does the Law Say?

The Environmental Protection and Enhancement Act (EPEA) regulates the release of substances into the environment, including releases into water. Alberta Environment has authority under the EPEA to regulate wastewater management and stormwater drainage systems.

The deposit of a deleterious material of any type, including wastewater, into water, or in a place where it may enter water frequented by fish, is contrary to the federal F*isheries Act* [Sec. 36 (3)]. Environment Canada administers this section of the Act.

Summer Village Responsibility

A Summer Village has responsibilities as either the owner of a municipal wastewater collection and treatment system, and/or in relation to the use of private onsite wastewater treatment systems. The Summer Village is responsible for deciding whether a municipal wastewater collection and treatment system or private sewage systems may be used to serve a subdivision.

A Summer Village may be accredited by the Alberta Government, under the *Alberta Safety Codes Act*, to be responsible for issuing permits and inspecting private onsite systems within its municipal jurisdiction. If the Summer Village is accredited to administer the Safety Codes Act and Private Sewage Regulation, it also has responsibility for the permitting and compliance inspection of private sewage systems. A Summer Village may employ a private sewage system inspector or chose to use the services of an accredited Safety Codes Inspection Agency for the delivery of the permitting and inspection services. If a Summer Village **is not** accredited, the responsibility for issuing permits and inspecting private onsite systems remains with Alberta Municipal Affairs. Municipal Affairs uses Accredited Inspection Agencies to deliver these Services.

Municipal Wastewater Systems

Under the EPEA, Alberta Environment regulates the construction and operation of municipal wastewater collection and treatment facilities. The facility operation must comply with approvals issued in accordance with the EPEA or Code of Practice for wastewater systems using a wastewater lagoon. Specific design and operating criteria for wastewater management systems are included in the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems,* published by Alberta Environment.

An approval or registration must be obtained from AENV for construction and operation of a municipal wastewater system. An approval or registration for a municipal wastewater system will specify operating and monitoring requirements, and the level of certification required for the facility operators.

The quality of treated effluent is regulated to provincial standards to ensure minimal release of organic and inorganic materials, nutrients, and pathogens.

Private Onsite Systems

Private onsite sewage systems handling less than 25 cubic metres (5500 Imperial gallons) sewage volume per day are regulated by Alberta Municipal Affairs. Regulations for onsite sewage disposal systems are established under the *Alberta Safety Codes Act*. Under this Act, the Private Sewage Disposal Regulation adopts the *Alberta Private Sewage Systems Standard of Practice 1999* as the rules in force.

As an accredited municipality, the Summer Village may decide that residents must use the services of a "certified contractor" in the design and installation of private onsite systems, as outlined in the *Alberta Safety Codes Act* and the *Alberta Private Sewage Systems Standard of Practice 1999*. Design and installation by the homeowner could be restricted.

Onsite System Maintenance

The owner of a private onsite system is responsible for ensuring that the system is maintained and operated to ensure it continues to effectively treat the wastewater.

An onsite system will require the periodic removal of solids, referred to as septage, from the septic tank or treatment plant. Alberta Environment (AENV) regulates the disposal of septage. Septage must be disposed of at an approved wastewater treatment facility. If a septage hauler is using an alternative method of disposal, the hauler requires Letter of Authorization (LOA) from AENV.

An alternate method of septage disposal is land application. The LOA outlines the criteria for

land application, such as setback distance from a water body, limited application rates, and that septage must not be applied to frozen ground. These criteria have been established to prevent potential environmental impacts and health danger. If land application of septage is not carried out according to these criteria, there is a potential for the septage, which is high in nutrients and pathogens, to enter into a watercourse or groundwater and negatively impact it.

Municipal Bylaws

The *Safety Codes Act* sets out some restrictions on the bylaws a municipality may make in relation to requirements set out in the Act, including those relating to onsite sewage systems. It is best for the Summer Village to obtain legal advice from their solicitor before drafting bylaws concerning this matter.

Contaminated Water From Boats and Yachts

Wastewater generated on boats and yachts, including water that collects in the bottom of boats and yachts, is contaminated and must be collected and disposed of at an approved wastewater treatment facility. Improper dumping violates the pollution prevention aspect of the federal *Fisheries Act*, administered by Environment Canada.

What Should I Do?

Getting a Municipal Wastewater System

The Alberta Association of Municipal Districts and Counties (AAMDC) has developed a *Model Process for Considering Subdivisions*, which provides information on how to obtain information that assists with making decisions on whether onsite systems can be used and what type are appropriate, or if a municipal collection system is most appropriate.

If your Summer Village residents express the wish to change from private systems to a municipal wastewater system, it is often most effective to use input from the community to establish upgrading requirements. Town Hall meetings, newsletters, information sessions, and assistance from a public consultation expert are helpful in determining community needs, and developing support and understanding for the project.

Maintaining a Municipal Wastewater System

The construction and operation of municipal wastewater systems are regulated by Alberta Environment. All municipal wastewater systems are required to have certified operators.

Follow the monitoring and operating conditions that are outlined in the approval or the codes of practice for the municipal wastewater facility. Conditions and reporting requirements will depend on the type of wastewater system in place. Immediate notification is required in the event of an accidental release.

Regarding Private Onsite Systems

Summer Villages should strongly consider becoming an "accredited" municipality that has the authority to administer the *Safety Codes Act* and the provincial *Private Sewage Disposal Regulation and Standards*. An accredited municipality is better positioned to manage the onsite sewage systems within their municipality. Benefits include being able to set inspection times and having the power to ensure that installations within the Summer Village have permits and inspections conducted as per the *Safety Codes Act*.

Consider exploring the development of a Private Onsite System re-inspection program that has the purpose of ensuring continued effective operation and maintenance of all private onsite systems, and to minimize the impact of older faulty systems.

Note:

The *Safety Codes Act* does not directly address re-inspection and what a municipality could do. The municipality should get direct legal advice on what it is they want to do and if they can do it. The specifics of the program should be set up after the municipality considers how best to manage the risk and cover cost in a way that is appropriate for the individual Summer Village.

Guiding Residents Through the Legislation

Provide assistance to ensure residents develop their lands according to the Land Use Bylaw, other municipal bylaws controlling disposal of waste, and any required provincial legislation.

The *Model Process Reference Document* developed by the AAMDC can be used to assist in the planning of subdivisions and subsequent development. Before a development permit is issued, the applicant could be required to provide a report of the proposed private onsite system, which must be designed to meet the *Alberta Private Sewage Systems Standard of Practice*. This ensures that the landowner has properly planned and designed the system (i.e., the soil is suitable for an onsite sewage disposal system and they have good knowledge of ground water levels).

Boats and Yachts

A Summer Village cannot create a bylaw requiring owners and operators of boats and yachts to treat their wastewater in a certain way, because a Summer Village has no authority over the federal *Fisheries Act*.

If a Summer Village rents docking space to boats and yachts, they should have a clause in the rental agreement that is very clear about watercraft owners not dumping wastewater into the lake. They could stipulate that watercraft owners store their wastewater, including the contaminated water that collects at the bottom of a boat/yacht, in approved holding tanks that must be pumped out and disposed of by approved haulers. If they do not require such a clause, there is a possibility that the Summer Village could be charged, along with the craft owner, should there be a violation against the federal *Fisheries Act*.

Education and Information

Consider publishing articles in the Summer Village newsletter (or in any other publication) informing residents of how dangerous improper wastewater disposal can be to the lake environment and to their own health. Encourage them to be proactive in protecting the lake they love. Include tips such as proper maintenance and regular inspections of their onsite sewage system.

Who Can I Contact?

Becoming Accredited

A Summer Village administration can choose to become accredited for managing the private onsite sewage treatment systems within its jurisdiction. To do so they must apply to the Alberta Government. The accreditation form can be downloaded at: http://www.safetycodes.ab.ca/Forms/accredit.pdf. Further information can be obtained from the Safety Codes Council or Alberta Municipal Affairs.

Municipal Wastewater Systems

Contact Alberta Environment for information on establishing a municipal wastewater system or to ensure an existing facility is operating properly.

Private Onsite Systems

All new onsite sewage systems require a permit, either from an accredited municipality, or from an Inspection Agency working on behalf of Alberta Municipal Affairs. Unauthorized installation of private onsite systems can be reported to the Summer Village administration or safety codes officer, if the municipality is accredited, or to the Province at safetyservices@gov.ab.ca.

On occasion, there are complaints of private citizens running hoses from holding tanks into a lake or stream. For a suspected release of sewage from a private onsite sewage system into the lake or any other water body, contact your local Public Health Authority, Alberta Environment, Summer Village administration, or, if the Summer Village is not accredited, Alberta Municipal Affairs.

The inappropriate disposal of septage from private onsite systems should be reported to the Summer Village administration, Alberta Environment, and the Regional Health Authority.

Anyone who observes a person dumping wastewater or contaminated water into a lake, or in a place where it can enter a lake, can call the Alberta Environment Emergency Complaint number at 1-800-222-6514. Alberta Environment will handle the complaint and refer it to Environment Canada, if necessary.

For more information about private onsite systems, contact a certified private sewage installer, a certified private sewage system inspector, or a Public Health inspector.

Boats and Yachts

If you observe a person dumping any waste or contaminated water from a boat or yacht into the lake, or in a place where it can enter the lake, call Environment Canada.

Are There Any Resources Available?

- **Alberta Private Sewage Systems Standard of Practice, Safety Codes Council 1999**. This is the legal document for Alberta's private sewage treatment systems codes and standards. To order a copy go to: http://www.lrc.learning.gov.ab.ca/pro/resources/item.htm?item-no=384298
- **Alberta Private Sewage Systems Standard of Practice 1999 Handbook**. This is a convenience document for explanatory and interpretive information only. It does include the content of the actual Standard. This handbook will be of more use than the Standard on its own. It does not replace the legal, regulatory document. Available online at: http://www.municipalaffairs.gov.ab.ca/ss_handbook_handbook_index.htm
- **Alberta Environment: Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems**
  http://www3.gov.ab.ca/env/protenf/publications/SandG_MuniWater.pdf
- Alberta Onsite Wastewater Management Association
  The Association and its members can provide advice on private sewage systems. The association is made up of private companies and individuals having an interest in the private sewage industry. They actually design and install private sewage treatment systems. They have useful information on their web site at: http://www.aowma.com
- **Alberta Association of Municipal Districts and Counties (AAMDC): Model Process for Considering Subdivisions**
- **Alberta Environment: Wastewater and Storm Drainage (Ministerial) Regulation**
  http://www.canlii.org/ab/laws/regu/1993r.119/20050801/whole.html
- **Municipal Affairs: "Tips on Private Sewage Systems"**
  www.municipalaffairs.gov.ab.ca/ss/pdf/ps/TipsPrivateSewageSystems.pdf
- **Alberta Environment: Approvals and Registrations Procedure Regulation**
  http://www3.gov.ab.ca/env/protenf/approvals/factsheets/approv.html
- **Alberta Environment: Code of Practice, for Outfall Structures on Water Bodies**
  http://www3.gov.ab.ca/env/water/Legislation/CoP/
- **Alberta Environment: Release Reporting Regulation**
  http://www3.gov.ab.ca/env/protenf/legislation/factsheets/release.html
- **Alberta Environment: Substance Release Regulation**
  http://www3.gov.ab.ca/env/protenf/legislation/factsheets/substrel.html
- **Final Report: Alberta Environment-Septage Management Advisory Committee-Recommendations for Septage Management in Alberta**, October 2004
  http://www3.gov.ab.ca/env/waste/domwwater/pubs/FinalReport.pdf

Appendix I –
Understanding Lake Basics

Summer Village councillors and administrators continually make decisions that ultimately affect the lake, its stewardship, and their residents' quality of life. To do this properly councillors should, therefore, have a basic understanding of how a lake and its ecosystem functions, as many of their governance issues dealing with surrounding land use practices will directly impact the lake and the lifestyle quality of those living near it.

What is a Lake?

A lake is a body of standing water entirely surrounded by land, with no sustained directional flow detectable to the naked eye. Within its watershed, a lake is often the largest collection point for surface water from the surrounding drainage area.

In general, a lake has sufficient depth that light does not penetrate all the way to the bottom in the deepest parts of the lake (Figure 1), and often separates into three distinct layers of water during the summer (Figure 7).

Alberta's lakes were formed 10,000 to 20,000 years ago when the retreating glaciers formed lake basins by gouging holes in bedrock or loose (glacial) till, or by leaving buried chunks of ice whose melting shaped and filled lake basins with water. More recently, humans have created lakes and reservoirs by damming rivers and streams.

Lake Zones

A typical lake has distinct zones of biological communities linked to the physical structure of the lake.

The Littoral Zone

The **littoral zone** is the shallow near-shore area where sunlight penetrates all the way to the sediment, allowing large aquatic plants (macrophytes) to grow. This is a highly productive area within a lake. The plants in this zone provide food and habitat for fish and other organisms, and protect shores from wave action that may cause erosion.

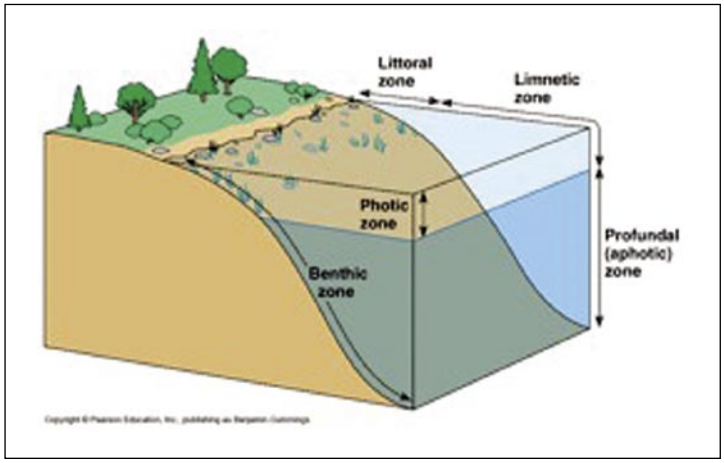


Figure 1. Zones within a lake.

Source: http://www.io.uwinnipeg.ca/~simmons/16cm05/1116/50-18-LakeZonation-L.gif

The Limnetic Zone

The **limnetic** (or **pelagic**) zone is the well-mixed surface water layer in offshore areas, beyond the influence of the shoreline. Within this open water area you have the **photic** (or **euphotic**) zone of the lake, which is the layer from the surface down to the depth where light levels become too low for photosynthesis to occur. The **profundal** (or **aphotic**) zone is also located within the open water area of the limnetic zone, and is that area deep within a lake where light levels are too low for photosynthesis to occur.

The limnetic zone is a very productive region of the lake and is dominated by free-floating microscopic plants and animals (e.g., planktonic algae, cyanobacteria, phytoplankton and zooplankton) suspended in the water (Figure 2).

The Benthic Zone

The **benthic** zone is composed of the bottom sediment of the entire lake basin. In shallower areas it is abundant with organisms that are collectively referred to as **benthos**. In the deepest regions of the lake, the sediment supports a large population of bacteria that break down organic matter and release inorganic nutrients back into the lake. This nutrient rich area is where oxygen is in limited supply, and where available oxygen is quickly consumed.

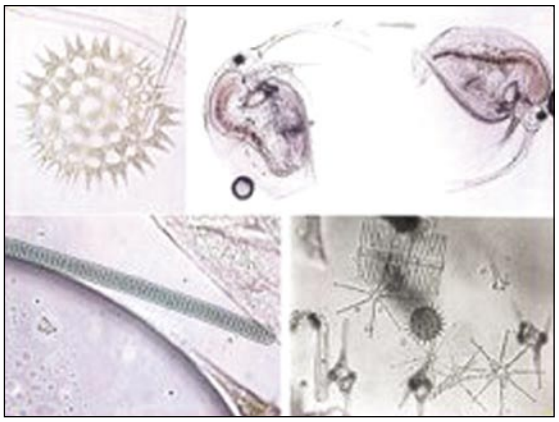


Figure 2. Phytoplankton (algae and cyanobacteria) and zooplankton in lake water.

Source: www.chemie.hu-berlin.de/linscheid/sommer/studenten/bilder/23.jpg

Water Clarity

Water clarity is an important area of concern for people living at, or visiting lakes. They want to know how "green" the lake is and how the water quality compares to other lakes. The abundance of phytoplankton in the lake is one measure of general lake productivity. High numbers of phytoplankton indicate high lake productivity. Phytoplankton can be found in the euphotic zone. The depth of this zone increases throughout summer as the sun's rays penetrate further into the water, allowing a greater area for photosynthesis and therefore phytoplankton growth. A device called a Secchi disk can be used to measure the depth of the euphotic zone and give an indication of lake productivity. For information on using a Secchi disk, contact the Alberta Lake Management Society (ALMS), or visit their web-site at: http://www.alms.ca. Lake productivity is discussed further under the **Eutrophication** heading of this section.

The Water Cycle: Water Comes and Water Goes

Water continually cycles through our environment (Figure 3). Water evaporates from soils, vegetation, lakes and other bodies of water; accumulates as water vapour in clouds; returns to the Earth, oceans and other bodies of water as rain and snow; and runs off as river flow, or through the soil and aquifers as groundwater flow, back into lakes and other bodies of water.

Residents are often concerned with the water level at the lake, as it can affect their enjoyment of the lake, the amount of available shore area, the potential for flooding and erosion, and their perceptions of water quality in general.

Water levels within a lake are a function of the amount of water received from the watershed through precipitation and inflows (inputs), and from what is lost through evaporation and outflows (outputs). Most of the water is lost through evaporation from the surface of the lake. In north central Alberta, the average annual evaporation is about 640mm, or just over two feet of lake depth. Normally this is offset by precipitation, groundwater, and other inputs.

Water levels are also affected by changes in climate. In the absence of inputs (e.g., during a drought), water levels can recede noticeably within a short time simply through evaporation.

Water also cycles within the lake. Under normal climatic conditions, water entering the lake will eventually replace water leaving the lake. The average time required to completely replace the total volume of water within a lake is called the **residence time** (or renewal time). Residence time may be short in lakes with large watersheds, as the volume of inflow is high. In contrast, lakes with small watersheds may have long residence times, due to smaller inflows requiring greater time to replenish the lakes' volume. Most lakes in Alberta have a water residence time greater than 50 years. This is important, because surface runoff from within the watershed carries sediment, nutrients and pollutants into the lake.

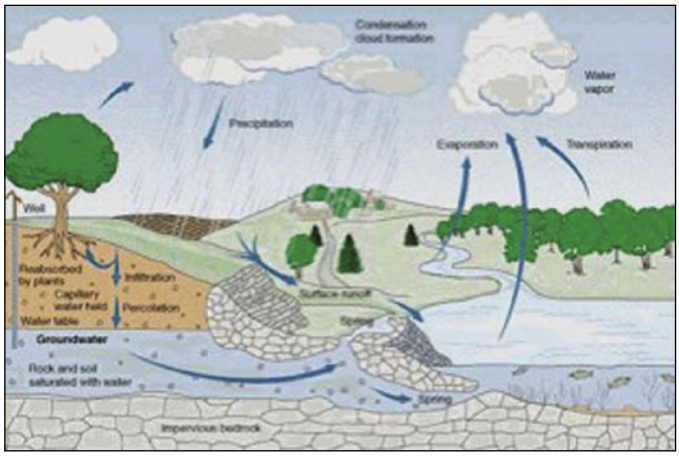


Figure 3. Hydrological Cycle of a Lake.

Source: http://www.ldeo.columbia.edu/~martins/climate_water/slides/hydrol_cycle/jpeg

What goes into a lake generally stays in the lake.

Eutrophication: The Life Cycle and Aging Process of a Lake

Like all living things, lakes age with time. The process by which lakes gradually age and become more biologically productive is called eutrophication. This is a natural process by which a lake fills in over geologic time, with erosional materials carried in by streams and overland flows, materials deposited directly from the atmosphere, and materials produced within the lake itself.

The aging, or filling-in process, begins from the time that a lake is created. Wind and water move soils from the watershed into a lake, which then settle on the bottom. Large plants and phytoplankton grow seasonally, die off, settle and decompose on the lake's bottom. With time, these processes cause a lake to become increasingly shallow. The natural succession is from lake to pond, pond to marsh, marsh to wet meadow, and wet meadow to dry land. This natural process can take thousands of years.

Human activities, however, can dramatically change lakes, for better or worse, in a much shorter time. This accelerated transition is called **cultural eutrophication**. Land use changes can result in significant changes in nutrient runoff. Nutrients from agricultural areas, stormwater runoff, urban development, fertilized yards and gardens, failing septic systems, land clearing, shoreline modification, municipal and industrial wastewater, runoff from construction projects, and recreational activities all contribute to accelerated enrichment (i.e. increased plant and phytoplankton growth) and thus, eutrophication, of the lake.

Four Lake "Ages"

Lakes are divided into four **trophic** categories: oligotrophic, mesotrophic, eutrophic, and hypereutrophic. An **oligotrophic** lake is typically a large deep lake with crystal clear waters and a rocky or sandy shoreline. There is little growth of rooted plants or plankton and the lake can support cold water fish like trout. These are thought of as "young" lakes.

A **eutrophic** lake, on the other hand, is typically shallow with a soft, mucky bottom. Rooted plant growth is abundant along the shores and out into the lake, increased algae growth and blooms of cyanobacteria are not unusual. Water clarity is not great and the water often has a green color. These are "older," very productive lakes.

A **mesotrophic** lake has an intermediate trophic state with characteristics between oligotrophic and eutrophic. A **hypereutrophic** lake is very nutrient rich (very productive). A hypereutrophic lake is an "old" lake, well into the process of transforming from open, clear water to wetland, and eventually to dry land.

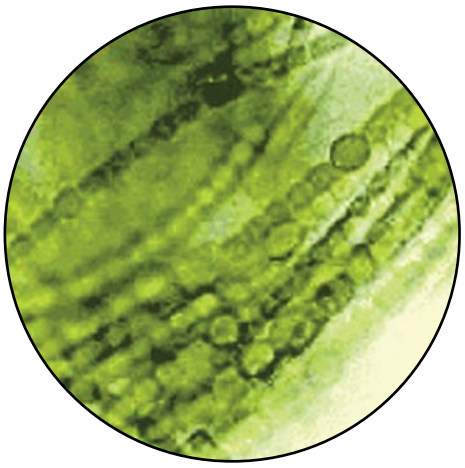


Figure 4. Free floating cyanobacteria

Measuring Trophic Status

The nutrient, or trophic status of lakes and their biological productivity can be determined by measuring two water quality parameters – the amounts of **chlorophyll** a and **phosphorus** in the lake.

Chlorophyll a is a measure of the green photosynthetic pigment found in phytoplankton (figure 4). Chlorophyll a values can be used to estimate the amount of phytoplankton in a lake. The more phytoplankton, the more productive the lake.

Figure 5 groups various Alberta lakes and their trophic status using Chlorophyll a.

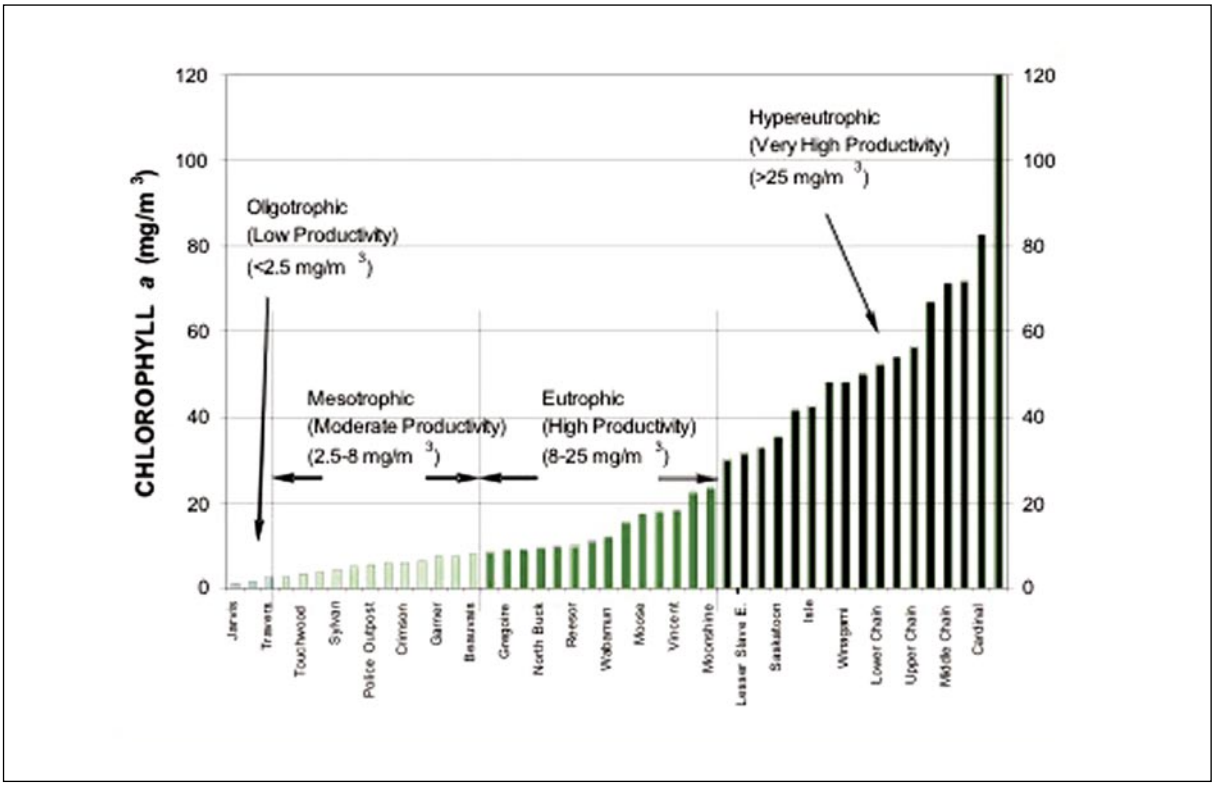
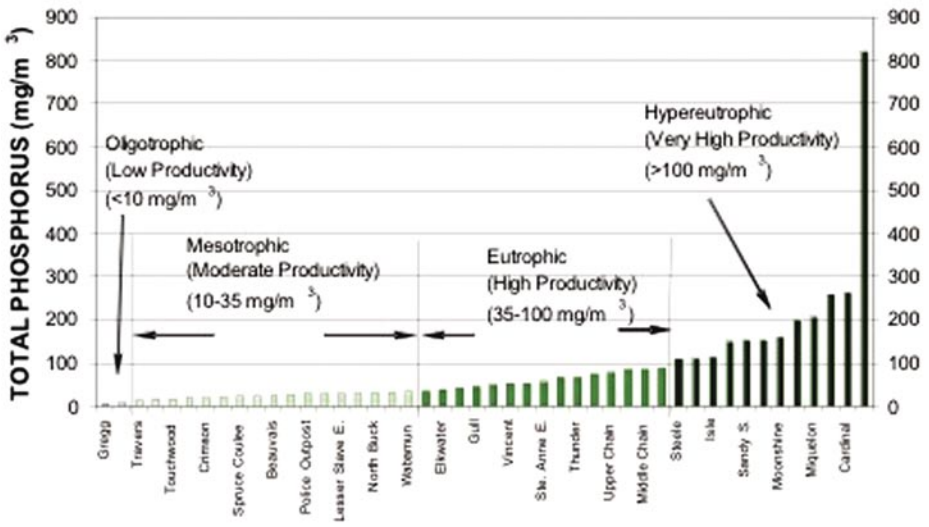


Figure 5. Eutrophic status of various Alberta lakes measured by chlorophyll a in algae.

Source: Alberta Environment

The other parameter frequently used to measure water quality is phosphorus. Phosphorus is a plant nutrient. Nutrients in a lake serve the same basic function of nutrients in a garden, that is, to promote the growth of plants. The amount of phosphorus determines the potential for plant and phytoplankton growth. The more phosphorus, the more productive the lake.

Figure 6 groups various Alberta lakes and their trophic status using phosphorus.



Stratification: Layers of a lake and Turnover

Water in North American lakes tends to stratify or form layers, especially during summer, because the density (weight) of water changes as its temperature changes (Figure 7).

Water is most dense at 4 degrees Celsius. Above and below that temperature, water expands and becomes less dense.

Spring Turnover

In spring, as ice melts, the surface waters warm and sink until the temperature and density of the water become similar from top to bottom. This allows surface water to mix completely with the deeper water, recharging bottom water with oxygen and bringing circulating nutrients up to the surface. This process is called spring turnover (Figure 8).

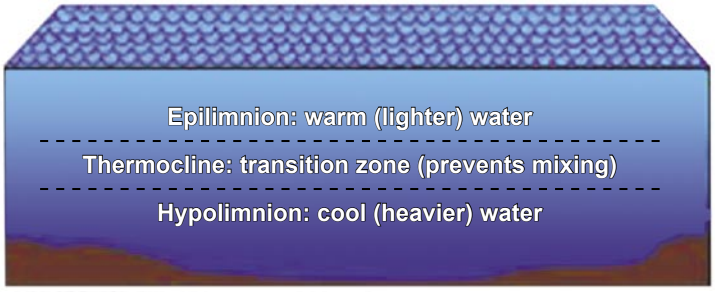


Figure 7. Lake Stratification.

Source: http://www.pca.state.mn.us/artwork/water/lakes/pic1.jpg

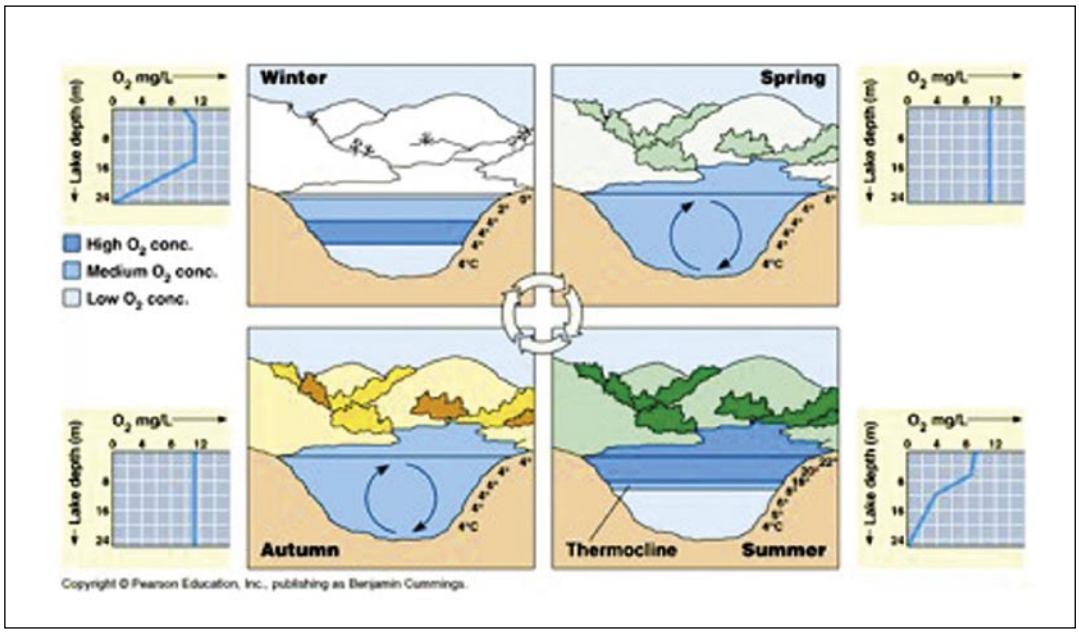


Figure 8. Lake Mixing and Turnover.

Source: http://www.io.uwinnipeg.ca/~simmons/16cm05/1116/50-15-LakeStratification-L4.gif

In the Summer

As summer progresses, the temperature difference (and density difference) between surface and bottom water becomes more distinct, and most lakes of moderate depth (greater than 10 meters deep) form, or stratify, into three layers.

The upper layer, the **epilimnion**, is characterized by warmer (less dense) water and is the zone of light penetration. Here is where the bulk of productivity or biological growth occurs. In this layer wind and waves mix freely, oxygenating the water.

The next layer, the **metalimnion** (or **thermocline**), is a narrow band of rapidly declining temperature (and rapidly increasing density). It is colder than the upper water layer and warmer than the lower layer. This layer prevents mixing between the upper and lower layers of water.

The third, or bottom layer, the **hypolimnion**, has much colder water and usually has lower oxygen levels, because the oxygen-rich upper water is unable to mix below the thermocline.

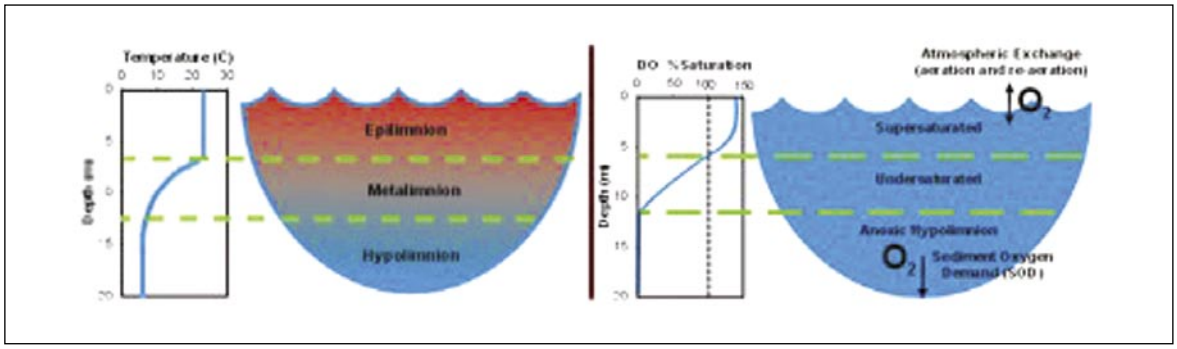


Figure 9. Temperature and Oxygen.

Source: www.ourlake.ord/html/termperature.html

Why There Are Fish Kills in the Summer

Dying plants, including phytoplankton, sink, accumulate, and decay in the stagnant bottom layer of lake water. The process of decomposition requires oxygen. The extensive and rapid decay of these plants can result in large reductions in the oxygen content of lakes. In small, shallow lakes this may lead to complete **anoxia** (absence of oxygen) and result in the death of large numbers of aquatic animals, including fish. This is known as "summerkill."

Fall Turnover

During the fall turnover, surface waters cool until they are as dense as the bottom waters and wind action mixes the lake so that water temperature from surface to bottom is the same. The eventual total mixing, or overturn, of the waters in a lake is of great importance because only then can nutrients and oxygen be uniformly distributed. This process of oxygenating the water before it freezes over is a huge deciding factor in whether a lake will have winterkill of fish. The more complete the fall turnover, the higher the oxygen levels in the water, and the better chance of fish surviving the winter.

During the fall turnover of water, cyanobacterial blooms can also occur when nutrients are mixed and brought to the surface and made directly available for algae growth.

Fish Kills in the Winter

Many lakes separate into layers in winter because ice covers the lake's surface and prevents wind from mixing the water. This also results in no new oxygen added to the water from the air. This problem may be aggravated when snow cover prevents light penetration and slows oxygen production through photosynthesis during the winter. Winterkills of fish can occur when levels of oxygen are depleted under the ice. Winterkill is common in shallow, productive lakes.

Figure 10 summarizes the seasonal changes in temperature and oxygen levels throughout the water column of a lake.

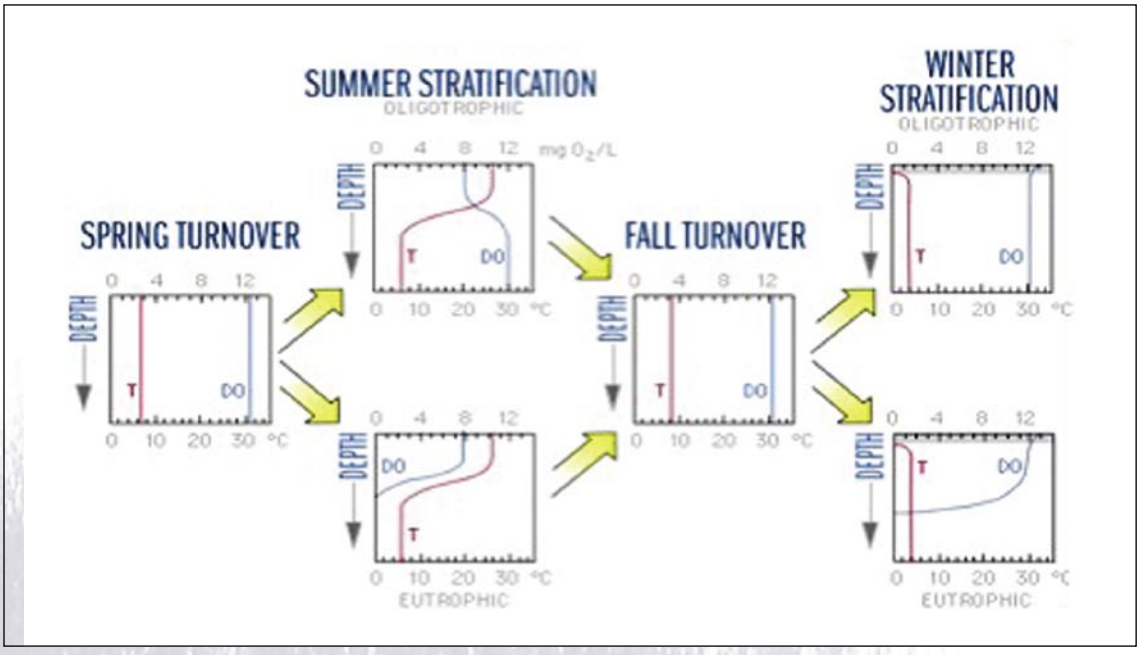


Figure 10. Seasonal Temperature and Oxygen Profiles.

Source: http://waterontheweb.org/under/lakeecology/art/oxygenchart.gif (adapted from Figure 8-1 in Wetzel, R.G. 1975. Limnology. W.B. Saunders Company)

Water Movement: Waves, Currents and Littoral Drift/Transport

Winds (and boats) generate waves that interact with the shores and bank of a lake. These waves have energy and are able to change the landscape. If you have ever been knocked over when you were small from someone tossing a bucket of water at your body, you will understand the force that water can have. Waves have the power to erode lake banks and remove material from the shores of a lake. Modifying lake banks and shores can increase the potential for erosion.

Eroded material is carried by near-shore currents in the downwind direction along the shore and re-deposited elsewhere through a process known as **littoral drift** or **transport** (Figure 11). This is how natural beaches form and are maintained. It also explains how wave action can cause poorly constructed erosion protection projects to fail.

Any interference or interruption of this transport of material can have significant consequences to owners of waterfront property. The construction of breakwaters can trap sand in front of one property, but can also seriously erode adjacent banks, depriving neighbours of their naturally occurring lakeshore area as well as creating the potential for erosion of private property.

Additional Resources

Additional and more detailed primers on lakes are available on the following web-sites, or from the following documents:

- **A Citizen's Guide to Understanding and Monitoring Lakes and Streams**, Washington State Department of Ecology, 1991
- **Atlas of Alberta Lakes,** P. Mitchell and E. Prepas. 1990. University of Alberta Press. Edmonton, Alberta. ISBN 0-88864-214-8. Found on line at: http://sunsite.ualberta.ca/Projects/Alberta-Lakes/characteristics.php
- **A Citizen's Guide to Lake Management** http://www.shorelandmanagement.org/depth/citizen.pdf
- **Caring For Shoreline Properties; Changing the Way We Look at Owning Lakefront Property in Alberta,** P. Valastin. 1999. Alberta Conservation Association. P.O. Box 40027. Baker Centre Postal Outlet. Edmonton, AB T5J 4M9. Ph. 1-877-969-9091, or on line at: www.ab-conservation.com/about_us/reports_publications/Caring_for_Shoreline_Properties.pdf
- **Managing Lakes and Reservoirs**, Third Edition, North American Lake Management Society, 2001
- **Minnesota Shoreland Management Resource Guide** http://www.shorelandmanagement.org/index.html
- **The Lake Pocket Book (2000)** N. Phillips, M. Kelly, J. Taggart and R. Reeder. Produced by the Terrene Institute in cooperation with US Environmental Protection Agency Region 5. http://www.mwpubco.com/lakepocketbook.htm
- **Water On the Web: Understanding Lake Ecology Primer** http://www.waterontheweb.org/under/lakeecology/index.html

Appendix II –
Other Programs and Resources

Included below is a list of organizations that may offer information and/or assistance to Summer Village councillors as they consider lake stewardship matters.

Alberta Agriculture, Food and Rural Development (AFRD)

Alberta Agriculture, Food and Rural Development (AFRD) is involved in part with working towards improved environmental stewardship in Alberta. They work with farmers and ranchers, but also extensively with members of watershed or lake groups interested in stewardship issues across the province. The department has an excellent web-site that deals with many stewardship matters relating to air, soil and water.

Home page: http://www.agric.gov.ab.ca/app21/rtw/index.jsp

Stewardship link: http://www.agric.gov.ab.ca/app21/seltopcat?cat1=Soil%2FWater%2FAir

Alberta Chapter of The Wildlife Society (ACTWS)

The Alberta Chapter of The Wildlife Society (ACTWS) is a non-profit organization whose focus is wildlife biology and management. They are dedicated to the wise stewardship of Alberta's natural resources. The ACTWS works with Albertans, the government and industry to emphasize the value of wildlife and healthy ecosystems, and to promote proper land use practices.

Home page: http://www.albertadirectory.net/actws/

Alberta Conservation Association (ACA)

The Alberta Conservation Association (ACA) is a non profit, non government organization that promotes partnerships with both government and non government agencies to help conserve and enhance Alberta's wildlife, fisheries and natural habitat. They can provide information on good stewardship practices.

Home page: http://www.ab-conservation.com/

Alberta Environment (AENV)

Alberta Environment manages the use of Alberta's diverse landscapes. They have a mandate to protect the province's air, land, and water, while promoting a prosperous economy and strong communities. Alberta Environment is available to partner with any Alberta stewardship group interested in protecting and enhancing Alberta's natural environment. They have an extensive web-site that includes an excellent library of publications relating to environmental matters.

Home page: http://environment.gov.ab.ca/

Links to specific questions regarding lakes:

http://www3.gov.ab.ca/env/water/SWQ/faqs01.cfm

http://www3.gov.ab.ca/env/water/SWQ/faqs03.cfm

Alberta Lake Management Society (ALMS)

The Alberta Lake Management Society was formed to promote the understanding and comprehensive management of lakes and reservoirs and their watersheds. ALMS members and their partners continually collect information to increase our knowledge of lake functions and management options, and to share this information with the public. They organize and hold an annual workshop at one of Alberta's lake communities to provide a forum to discuss issues, technical aspects of lake and watershed management, and practical solutions to local problems. The Society also maintains a resource library of publications that is available for loan to its members.

Home page: http://www.alms.ca/

Alberta Stewardship Network (ASN)

Community-based stewardship groups have long expressed the need for a provincial stewardship network. Stewards indicated they needed better access to funding sources, technical and scientific information, and training in recruiting and keeping volunteers. The Alberta Stewardship Network (ASN) was established as one tool to address these needs. The ASN is a provincial stewardship initiative, with partners from government agencies, non-government organizations, community stewardship groups, and Aboriginal communities. Services currently offered by the ASN include directing stewards to existing resources. Through building partnerships and sharing resources the ASN strives to reduce the duplication of services and increase the efficiency of stewardship activities in Alberta.

Home page: http://www.ab.stewardshipcanada.ca/

Alberta Sustainable Resource Development (ASRD)

Alberta Sustainable Resource Development (ASRD) works with all Albertans to ensure a balance between the economic, environmental and social values of the province, for now and the future. The Department includes the Fish and Wildlife Division and the Public Lands and Forests Division. Fish and Wildlife Division is involved with protecting and managing Alberta's fish and wildlife. The Public Lands and Forests Division has information on using and managing public land, as well as geographic information about public lands.

Home page: http://www3.gov.ab.ca/srd/index.html

Home page for Fish and Wildlife Division: http://www3.gov.ab.ca/srd/fw/index.html

Home page for Public Lands and Forests Division: http://www3.gov.ab.ca/srd/land/index.html

Alberta Wilderness Association (AWA)

The Alberta Wilderness Association (AWA) is the oldest wilderness conservation group in the province. The focus of the association is to conserve wilderness throughout the province. They are working towards the completion of a network of protected areas including wilderness lands and waters throughout Alberta. They have a large outreach component that includes information and education and advocacy on matters relating to wildlife conservation and the establishment of protected areas.

Home page: http://albertawilderness.ca/

Bow River Basin Council (BRBC)

The Bow River Basin Council (BRBC) is a multi-stakeholder charitable organization that was formed to work towards the protection and improvement of the waters of the Bow River Basin. Areas of concern include riparian zones, aquatic ecosystems, the quality and quantity of water, and the effects of land use on surface and groundwater within the basin. Their web-site contains information about their projects, as well as education/awareness material.

Home page: http://www.brbc.ab.ca/

Cows and Fish

Alberta's Cows and Fish program aims to promote the improvement of riparian areas through partnerships and proactive community-based actions. Using education and awareness about management options for livestock producers and their communities, they hope to foster a better understanding of how improvements in grazing management on riparian areas can enhance landscape health and productivity, for the benefit of producers and others who use and value riparian areas. They are available to work with all stewardship groups to help them understand riparian area functions and values, examine and monitor the health of their riparian areas, and evaluate and suggest management strategies.

Home page: http://www.cowsandfish.org/

Department of Fisheries and Oceans Canada (DFO)

The Department of Fisheries and Oceans Canada (DFO) "is the lead federal government department responsible for developing and implementing policies and programs in support of Canada's economic, ecological and scientific interests in oceans and inland waters." They are responsible for the conservation and sustainable use of Canada's fisheries resources, and for providing safe, effective and environmentally sound marine services to Canadians. DFO promotes good stewardship practices, and works with all Canadians to make responsible decisions with regard to conserving, protecting and enhancing Canada's fish habitats and oceans.

DFO's Fish Habitat Management Program plays a pivotal role in the conservation and protection of fish habitat in Canada. Staff are involved in reviews of works and undertakings in or near water; monitoring compliance and enforcing the habitat protection provisions of the Fisheries Act; watershed and coastal zone planning; habitat enhancement; public education and stewardship. The Program works closely with provinces, territories, industry, and conservation and Aboriginal groups on protecting and conserving fish habitat, and has responsibility to report to Parliament annually on the administration and enforcement of the habitat protection and pollution prevention provisions of the Fisheries Act.

DFO home page: http://www.dfo-mpo.gc.ca/

Canadian Waters home page: http://www.dfo-mpo.gc.ca/canwaters-eauxcan/index_e.asp

Stewardship page: http://www.dfo-mpo.gc.ca/canwaters-eauxcan/getinvolved-prendrepart/index_e.asp

Habitat page: http://www.dfo-mpo.gc.ca/canwaters-eauxcan/habitat/index_e.asp

Ducks Unlimited Canada (DUC)

Ducks Unlimited Canada (DUC) is a national, private, non-profit organization. They have been committed to wetland and wildlife conservation for more than 65 years. DUC's conservation efforts take many forms. DUC scientists are actively involved in field research on wetland and environment-based projects. DUC works to change government policy in favour of wetland and habitat conservation. DUC also delivers wetland and environmental education programs to teach Canadians about wetlands and the need to conserve them.

Home page: http://www.ducks.ca/

Federation of Alberta Naturalists (FAN)

The Federation of Alberta Naturalists' (FAN) was formed in1970 when six natural history clubs joined together. FAN has a province-wide focus on promoting the enjoyment, conservation and study of Alberta's natural history. They aim to encourage all Albertans to increase their knowledge and understanding of natural history and ecological processes. FAN has educational material available to any group seeking to increase their understanding and appreciation of nature and natural history in Alberta.

Home page: http://www.fanweb.ca/

Living By Water

The Living By Water Project is a national partnership initiative that supports local community groups with programs, services and materials aimed at protecting, conserving and restoring shorelines. They provide services and materials to promote the value of keeping all types of shorelines healthy. Living By Water helps groups develop tools and the capacity to carry out shoreline awareness and outreach programs. They also occasionally sponsor or initiate special activities to help bring people together, or provide communities with customized tools to help care for shorelines. They are committed to helping shoreline residents obtain information to prevent problems like erosion, and protect water quality, fish and wildlife habitat.

Home page: http://www.livingbywater.ca/

North Saskatchewan Watershed Alliance (NSWA)

The North Saskatchewan Watershed Alliance (NSWA) is a non-profit society "whose purpose is to protect and improve water quality and ecosystem functioning in the North Saskatchewan Watershed within Alberta." They promote the sustainable use of all the natural resources within the North Saskatchewan watershed. The society advocates an ecosystem (watershed level) approach to environmental responsibility. Membership is diverse and includes industry, government, agriculture, research, and municipalities. NSWA believes in improving the community's ability to make informed decisions about the value of watershed protection and the integrated stewardship of land and water resources.

Home page: http://www.nswa.ab.ca/

Trout Unlimited Canada (TUC)

Trout Unlimited Canada (TUC) was founded in 1972. Goals of the organization include conserving and protecting Canada's freshwater fish and their ecosystems, restoring Canada's freshwater habitat and their watersheds to a healthy and productive state, and educating communities about their watersheds. The Alberta Council is the Alberta branch of Trout Unlimited Canada, and is dedicated to the conservation and wise management of cold water resources in Alberta. The Alberta Council's conservation program includes research, habitat restoration and enhancement, management, and public education.

Home page: tuc@tucanada.org

Home page of the Alberta Chapter: http://www.tucanada.org/alberta/index.htm

Vincent Lake Work Group (VLWG)

The Vincent Lake Work Group was comprised of a group of representatives from various conservation agencies and local and provincial government departments in 1999. Their goal was to bring about environmentally friendly land use practices in riparian areas and the overall watershed. Their mission is, "Healthy and functioning riparian areas and watersheds in Northern Alberta that provide communities with sustainable recreation and agriculture benefits." They wanted to achieve this goal through a community-based approach and they set out to design a 'model process.' Today, the VLWG offers tools that will help communities with their present and future needs in managing riparian areas and their watersheds.

Home page: http://www.healthyshorelines.com/index.asp

Water for Life: Alberta's Strategy for Sustainability

Water for Life: Alberta's Strategy for Sustainability is the Government of Alberta's response to develop a new water management approach, and outline specific strategies and actions to address the province's water issues. The Water for Life strategy is based on three key goals including safe, secure drinking water supplies, healthy aquatic ecosystems, and reliable, quality water supplies for a sustainable economy. This is a multi-year project and will include input from Watershed Stewardship groups. One of the deliverables will be the development of an Alberta Water Information Centre.

Home page: http://www.waterforlife.gov.ab.ca/

Appendix III –
Provincial Legislation Regulating Activities In and Around Lakes

The Alberta Queen's Printer is the official source for Government of Alberta laws and publications. It can be found on the Internet at: http://www.qp.gov.ab.ca/index.cfm.

Legislation	Adminstered by	Background	Regulated Lake Activities
Environmental Protection and Enhancement Act	Alberta Environment	This Act sets up the regulatory framework to ensure problems are identified and addressed before a development project is given approval, that conditions are applied to operations where required, and that activities are monitored to stringent environmental standards. It takes an integrated approach to the protection of Alberta's air, land, and water. It guarantees public participation in decisions affecting the environment.	• Aquatic vegetation control (using chemicals). • Cyanobacteria blooms (chemical control). • Depositing harmful material into the water, or where it may harm fish. • Storage and application of fertilizers. • Regulation of stormwater drainage systems. • Regulation of municipal wastewater treatment facilities. • Regulation of septage disposal.
Fisheries Act (Alberta)	Alberta Sustainable Resource Development	This Act provides a mechanism to enter into agreements with the federal government regarding the licensing of the use of fish for different purposes, and the culture, use, and marketing of fish for commercial purposes within the province. While it does not manage water directly, the management of fisheries can impact how we manage for in-stream flow and other ecological needs of our water bodies.	• Aquatic vegetation control. • Setting catch limits on fish.

Legislation	Adminstered by	Background	Regulated Lake Activities
Municipal Government Act/Land Use Policies	Alberta Municipal Affairs	This Act provides the primary statute governing the affairs of Municipalities. Pursuant to the Act, the Land Use Policies identify those matters that the Province feels that municipalities should address in their land-use planning decisions. Each municipality is expected to incorporate the Land Use Policies into its planning documents and planning practices. A goal of the Policies is to contribute to the protection and sustainable use of the province's water resources.	• Use of municipal and environmental reserve lands.
Public Health Act/Regulations	Regional Health Units	This legislation provides for the protection of public health including issues related to protection of potable water supplies.	• Cyanobacteria/algae blooms (health information). • Inappropriate disposal of wastewater or septage material.
Public Lands Act	Alberta Sustainable Resource Development	This Act governs the administration and use of all public lands. This legislation regulates development and activities that might affect the bed and shore of crown water bodies.	• Aquatic vegetation control. • Beach development / sand placement. • Placement of boat docks. • Any project on the bed or shore of a lake. • Dredging / in-filling. • Shoreline development (erosion control works, permanent structures).

Legislation	Adminstered by	Background	Regulated Lake Activities
Safety Codes Act	Alberta Municipal Affairs	This Act sets out the codes and standards relating to building, fire, electrical, gas, plumbing, private sewage treatment systems, elevators, boilers and pressure vessels, amusement rides, and ski lifts. The Act allows for permit systems. Qualified municipalities can carry out some responsibilities under thus Act. One example would be the role of a municipality issuing certain permits. The Safety Codes Council oversees this Act.	• Regulation of onsite sewage disposal systems. • Accreditation of municipalities. • Private sewage system permits and inspections (if accredited).
Water Act	Alberta Environment	This Act supports and promotes the conservation and management of water, including the wise allocation and use of water to sustain the environment and quality of life in the present and the future. This legislation regulates all developments and activities that might affect streams, rivers, lakes, wetlands, and aquifers.	• Aquatic vegetation control. • Beach development / sand placement. • Stormwater management works. • Dredging / in-filling. • Any project on the bed or shore of the lake. • Shoreline development (erosion control works, permanent structures).

Appendix IV –
Federal Legislation Regulating Activities In and Around Lakes

Federal legislation can be found on the Department of Justice Canada website at: http://laws.justice.gc.ca/en/index.html.

Legislation	Adminstered by	Background	Regulated Lake Activities
Fisheries Act (Canada)	Fisheries and Oceans Canada	This Act provides for the protection of fish and fish habitat of all waters frequented by fish. The Act includes provisions for habitat protection and provides for the establishment of regulations for pollution prevention and control. Federal Fisheries and Alberta Fish and Wildlife Officers, designated by the Minister of Fisheries and Oceans, can enforce the Act.	• Aquatic vegetation control. • Beach development / sand placement. • Dredging / in-filling. • Any project on the bed or shore or a lake, including shoreline erosion control. • Depositing harmful material into the water, or where it may harm fish. • Destruction of fish habitat.
Navigable Waters Protection Act	Transport Canada	This Act ensures a balance between the public right of navigation and the need to build works, such as bridges, dams or docks in navigable waters. Navigable water is any body of water capable of being navigated by any type of floating vessel for the purpose of transportation, recreation, or commerce.	• Shoreline development (erosion control works, placing of permanent structures).
Fertilizer Act	Canadian Food Inspection Agency	This Act controls the composition of fertilizers in Canada. It regulates what fertilizers and supplements are manufactured and sold in Canada. It regulates against any component known to be harmful to plants or the environment. "Fertilizer" refers to any substance or mixture of substances, containing nitrogen, phosphorus, potassium or other plant food, manufactured, sold or represented for use as a plant nutrient.	• Regulates what fertilizers are used by the agriculture industry in Canada. • Regulates how manure is used in non-agricultural fertilizers.

Appendix V –
Provincial and Federal Department Contact Information

Note: When calling a Government of Alberta office, dial 310-0000 first for a toll free connection.

Summer Village	Department	Office Location	Phone Number
Argentia Beach (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Betula Beach (Wabamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development	Sherwood Park	(780) 464-7955
	Public Lands and Forests Division	Spruce Grove	(780) 960-8190
		Edmonton	(780) 407-1000
	Fish and Wildlife Division	Edmonton	(780) 495-4220
	Public Health Authority		
	Federal Fisheries and Oceans		
Birch Cove (Lac La Nonne)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development	Barrhead	(780) 674-8231
	Public Lands and Forests Division	Barrhead	(780) 674-8236
	Fish and Wildlife Division	Onoway	(780) 967-4440
	Public Health Authority	Edmonton	(780) 495-4220
	Federal Fisheries and Oceans		
Birchcliff (Sylvan Lake)	Alberta Environment	Red Deer	403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Red Deer	(403) 340-5142
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160

Summer Village	Department	Office Location	Phone Number
Bondiss (Skeleton Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Lac La Biche	(780) 623-5240
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Bonnyville Beach (Moose Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Bonnyville	(780) 826-4297
	Fish and Wildlife Division	Bonnyville	(780) 826-3142
	Public Health Authority	Bonnyville	(780) 826-3381
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Burnstick Lake (Burnstick Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Sundre	(403) 638-3805
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Castle Island (Lac Ste. Anne)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Crystal Springs (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160

Summer Village	Department	Office Location	Phone Number
Ghost Lake (Ghost Reservoir)	Alberta Environment Sustainable Resource Development	Calgary	(403) 297-7602
	Public Lands and Forests Division	Calgary	(403) 297-8800
	Fish and Wildlife Division	Canmore	(403) 678-2373
	Public Health Authority	Canmore	(403) 678-5656
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Golden Days (Pigeon Lake)	Alberta Environment Sustainable Resource Development	Spruce Grove	(780) 960-8600
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Grandview (Pigeon Lake)	Alberta Environment Sustainable Resource Development	Red Deer	(403) 340-7052
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Gull Lake (Gull Lake)	Alberta Environment Sustainable Resource Development	Red Deer	(403) 340-7052
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Ponoka (am only)	(403) 783-7093
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Half Moon Bay (Sylvan Lake)	Alberta Environment Sustainable Resource Development	Red Deer	(403) 340-7052
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Red Deer	(403) 340-5142
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160

Summer Village	Department	Office Location	Phone Number
Horseshoe Bay (Vincent Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Bonnyville	(780) 826-4297
	Fish and Wildlife Division	St. Paul	(780) 645-6313
	Public Health Authority	St. Paul	(780) 645-3396
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Island Lake (Island Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Island Lake South (Island Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Itaska (Pigeon Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Jarvis Bay (Sylvan Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Red Deer	(403) 340-5142
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160

Summer Village	Department	Office Location	Phone Number
Kapasiwin (Wabamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Lakeview (Wabamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Larkspur (Long Island Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Barrhead	(780) 674-8231
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Ma-Me-O Beach (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Mewatha Beach (Skeleton Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Lac La Biche	(780) 623-5240
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
Nakamun Park (Nakamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8231
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Norglenwold (Sylvan Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Red Deer	(403) 340-5142
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Norris Beach (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Parkland Beach (Gull Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Ponoka (am only)	(403) 783-7093
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Pelican Narrows (Moose Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Bonnyville	(780) 826-4297
	Fish and Wildlife Division	Bonnyville	(780) 826-3142
	Public Health Authority	Bonnyville	(780) 826-3381
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
Point Allison (Wabamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Poplar Bay (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Rochon Sands (Buffalo Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Stettler (am only)	(403) 742-7510
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Ross Haven (Lac Ste. Anne)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Sandy Beach (Sandy Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
Seba Beach (Wabamun Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Silver Beach (Pigeon Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Silver Sands (Isle Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Evansburg	(780) 727-3635
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
South Baptiste (Baptiste Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
South View (Isle Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Evansburg	(780) 727-3635
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
Sunbreaker Cove (Sylvan Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Red Deer	(403) 340-5142
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Sundance Beach (Pigeon Lake)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Wetaskiwin	(780) 361-1250
	Public Health Authority	Edmonton	(780) 407-1000
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Sunrise Beach (Sandy Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Spruce Grove	(780) 960-8190
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Sunset Beach (Baptiste Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Sunset Point (Lac Ste. Anne)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
Val Quentin	Alberta Environment	Spruce Grove	(780) 960-8600
(Lac Ste. Anne)	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Waiparous	Alberta Environment	Calgary	(403) 297-7602
(Waiparous River)	Sustainable Resource Development		
	Public Lands and Forests Division	Calgary	(403) 297-8800
	Fish and Wildlife Division	Canmore	(403) 678-2373
	Public Health Authority	Canmore	(403) 678-5656
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
West Baptiste	Alberta Environment	Edmonton	(780) 427-7617
(Baptiste Lake)	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
West Cove	Alberta Environment	Spruce Grove	(780) 960-8600
(Lac Ste. Anne)	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
Whispering Hills	Alberta Environment	Edmonton	(780) 427-7617
(Baptiste Lake)	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-8224
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Summer Village	Department	Office Location	Phone Number
White Gull (Baptiste Lake)	Alberta Environment	Edmonton	(780) 427-7617
	Sustainable Resource Development		
	Public Lands and Forests Division	Athabasca	(780) 675-4277
	Fish and Wildlife Division	Athabasca	(780) 675-2419
	Public Health Authority	Westlock	(780) 349-8705
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220
White Sand (Buffalo Lake)	Alberta Environment	Red Deer	(403) 340-7052
	Sustainable Resource Development		
	Public Lands and Forests Division	Red Deer	(403) 340-5451
	Fish and Wildlife Division	Stettler (am only)	(403) 742-7510
	Public Health Authority	Red Deer	(403) 341-8622
	Federal Fisheries and Oceans	Calgary	(403) 292-5160
Yellowstone (Lac Ste. Anne)	Alberta Environment	Spruce Grove	(780) 960-8600
	Sustainable Resource Development		
	Public Lands and Forests Division	Sherwood Park	(780) 464-7955
	Fish and Wildlife Division	Barrhead	(780) 674-8236
	Public Health Authority	Onoway	(780) 967-4440
	Federal Fisheries and Oceans	Edmonton	(780) 495-4220

Glossary

Algae: Simple single-celled or multicellular, primarily aquatic plants that usually contain chlorophyll, but lack roots, stems, and leaves.

Alkaline: Refers to water with high dissolved carbonate and bicarbonate concentrations, usually derived from the natural weathering of calcite-rich (limestone and dolomite) bedrock, surficial deposits, and soils within a watershed.

Anoxia: The absence of oxygen.

Aphotic Zone: The deep unlit layer in the lake. Also know as the Profundal Zone.

Aquatic Ecosystem: An aquatic area where living and non-living elements of the environment interact, including, but not limited to rivers, lakes, wetlands, and the variety of plants and animals associated with them. (Source: the Alberta government's *Water for Life* program).

Aquatic Environment: The components of the earth related to living in or located in or on water, or the beds or shores of a water body, including, but not limited to:

a. All organic or inorganic matter, and
b. Living organisms and their habitat including fish habitat and their interacting natural systems. (Source: Alberta *Water Act*).

Bank: The legal boundary of a water body or watercourse as defined by Section 17 of the *Surveys Act* (Alberta). The term is synonymous with the meaning of the "ordinary high-water mark." The bank separates the shore and bed of a lake from "terrestrial" land. The location of the bank is not affected by drought or flooding.

Bed and Shore: The land covered so long by water as to wrest it from vegetation or as to mark a distinct character on the vegetation where it extends into the water or on the soil. The bed and shore lies below the ordinary high-water mark or bank, and may or may not be covered by water. (Source: the Alberta *Surveys Act*). The **bed** is the land upon which the water sits. The **shore** is that part of the lake below the bank, but above the present water level. It is the part of the lakebed that is exposed when water levels are low. The bed and shore of the lake are public lands that are owned by the Crown.

Benthic Zone: The bottom sediment of a lake.

Benthos: The bottom of the lake, and the organisms living on the bottom of the lake.

Bloom: The mass reproduction or accumulation of cyanobacteria and/or algae to the surface of a water body.

Chemical Algaecide: The chemical compounds used to either suppress the growth, or kill off algae and cyanobacteria in aquatic environments, similar to herbicides used in terrestrial environments to kill weeds.

Chlorophyll: The green pigment of plants (and cyanobacteria) necessary for photosynthesis.

Cultural Eutrophication: The accelerated transition and change to the natural ecosystem of a lake caused by human activities.

Cumulative Impact: The environmental impacts of a proposed action in combination with the impacts of other past, existing, and proposed actions. Each increment from each action may not be noticeable, but cumulative impacts may be noticeable when all increments are considered together.

Cyanobacteria: A group or category of "true" bacteria that possess plant or algae-like characteristics (i.e., have chlorophyll-*a* pigment for photosynthesis).

Deleterious Substance: In part, "any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it

is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man or fish that frequent that water." (Source: Section 34(1) of the federal *Fisheries Act*).

Detritus: Fine particulate material suspended in the water. Organic detritus comes from the decomposition of the broken down remains of organisms. Inorganic detritus includes settleable mineral materials.

Dissolved Oxygen: Oxygen that exists in a liquid state as opposed to gaseous form. It is required by most living aquatic organisms for life.

Dock: Any pier, wharf or other structure constructed or maintained in a water body, whether floating or not, used for the purposes of mooring watercraft.

Epilimnion: The turbulent superficial (upper) layer of a lake lying above the metalimnion, which does not have a permanent thermal stratification. This layer has at least some light penetration, and is where the majority of productivity or biological growth occurs.

Eutrophic: Waters with a good supply of nutrients and thus a rich organic production.

Eutrophication: The natural gradual aging process of lakes, and the process by which lakes become more biologically productive. Human activities can accelerate the rate of eutrophication of a lake.

Fish: Parts of a fish and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine mammals. (Source: Section 2 of the federal *Fisheries Act*).

Fish Habitat: The "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes." (Source: Section 34(1) federal *Fisheries Act*).

Floodplain: The land adjacent to any body of water that is subject to flooding. The extent of the floodplain is defined by the one in 100 year flood event, and includes the land that has a one per cent chance of being flooded in any given year. (Source: *Guidebook to Water Management*).

Flotsam: Detritus and other organic debris that floats on the surface of a water body.

Groundwater: All water under the surface of the ground, whether in liquid or solid state.

Harmful Alteration, Disruption or Destruction (HADD): Any change in one or more fish habitat component that causes a reduction in the capacity of the habitat to support the life requirements of fish. (Source: Department of Fisheries and Oceans).

Hypereutrophic: Waters with very high nutrient levels, and thus very high amount of organic production. These lakes can have water that is green with algae during most of the summer.

Hypolimnion: The deep layer of water in a lake lying below the metalimnion (thermocline) and removed from surface influences.

Impervious Surfaces: Land surfaces such as roads, parking lots, buildings, etc., that prevent rainwater from soaking into the soil. Stormwater moves over impervious surfaces with greater velocity than it does over pervious surfaces.

Inorganic Nutrients: Nutrients composed of mineral rather than carbon origin.

Lake: A body of standing water entirely surrounded by land with no sustained directional flow detectable to the naked eye.

Lake Stewardship: An attitude that recognizes the vulnerability of lakes and the need for citizens, both individually and collectively, to take action and assume responsibility for the care of those lakes.

Limnetic Zone: The well mixed surface water layer beyond the influence of the shoreline. Also known as the Pelagic Zone.

Littoral Drift: The sedimentary material that is transported in the water along the shoreline by waves and current.

Littoral Transport: Eroded material carried by near-shore currents in the downwind direction along the shore and re-deposited.

Littoral Zone: The shallow area near the shore of a body of water. It includes that portion of a body of water extending from the shoreline lake ward, to the limit of occupancy of rooted aquatic plants.

Macrophytes: Large plants. In a water body they include the large floating, emergent, or submerged plants often referred to as "weeds," including cattail, reed grass, bulrush, duckweed, water lily, coontail, water buttercup, and common pondweed.

Mesotrophic: Waters with a moderate supply of nutrients, and thus a moderate amount of organic production.

Oligotrophic: Waters with a small supply of nutrients and hence, a low amount of organic production.

Ordinary High Water Mark (OHWM): The legal boundary of a water body or watercourse as defined by Section 17 of the *Surveys Act* (Alberta). The term is synonymous with the meaning of "bank."

Pier: A platform extending from a shore over water and supported by piles or pillars, used to secure, protect, and provide access to ships or boats.

Phosphorus (Dissolved): Phosphorus-containing substances existing in a liquid state.

Phosphorus (Particulate): Phosphorus-containing substances existing in a solid state.

Photic Zone: The layer of lake water from the surface down to the depth where light levels become too low for photosynthesis to occur. Also known as the Euphotic Zone.

Photosynthesis: The creation of organic matter (carbohydrates) from carbon dioxide and water, with the aid of the energy of light (generally from the sun).

Phytoplankton: Microscopic floating plants, mainly algae, that live suspended in bodies of water and that drift with the current. The plant portion of the plankton.

Private Sewage: Human excreta, and the water-carried waste from drinking, bathing, laundering, and food preparation.

Profundal Zone: The deep region of a body of water below the light-controlled limit of plant growth.

Resident Time: The average time required to completely replace the total volume of water within a lake.

Riparian Vegetation: All plants including natural grasses, shrubs, and trees that border or surround surface waters.

Secchi Disk: A disk with a four to six inch radius that is divided into four quadrates of alternating black and white colour. It is lowered into the lake in shaded water until it can no longer be seen, and then lifted back up to the surface until it can again be seen. The Secchi disk is a measuring device to determine the depth of light penetration in water.

Sedimentation: The addition of soils and organic material to lakes, a part of the natural aging process of a lake that makes the water shallower. Human activities can accelerate this process.

Shorelands: The area of land 1000 feet from the ordinary high water mark. (Source: Minnesota Extension Service: *Protecting Minnesota waters*).

Spring Turnover: In spring, as the ice melts, the surface waters in a lake become warmer and sink and the temperature and density of the water becomes similar from top to bottom. This allows surface water to mix with bottom water, recharging bottom water with oxygen and circulating nutrients to the surface.

Stewardship: The responsible use of a resource.

Stormwater Runoff: Rainfall and snowmelt that accumulates during storm events and drains overland to a receiving water body.

Surface Water: Water in a watercourse.

Thermocline: Also known as the metalimnion. The layer of water in a lake between the epilimnion and hypolimnion in which the temperature exhibits the greatest difference in a vertical direction. Characterized by a narrow band of rapidly declining temperature and rapidly increasing density in the water strata. This band is colder than the surface waters and warmer than the bottom waters, preventing mixing between the upper and lower strata.

Trophic Status: The level of nourishment, or degree of fertility (plant, algae and cyanobacteria production), within a water body. It is the extent to which a water body can support plant, algae, and cyanobacterial growth.

Watercourse: Is (a) the bed and shore of a river, stream, lake, reek, lagoon, swamp, marsh, or other natural body of water, or (b) a canal, ditch, reservoir, or other man-made surface feature, whether it contains or conveys water continuously or intermittently.

Watershed: The surrounding land area that drains into a lake, river, or river system.

Wharf: A structure extending along the shore of a navigable water body, generally connected to the adjoining upland throughout its length, built or maintained for the purpose of providing a berth for water craft, or for loading or unloading passengers onto, or from a water craft.

Winterkill: The death of large numbers of fish that can occur when the dissolved oxygen in the lake is depleted.

Zooplankton: Microscopic animals in the water. The animal portion of the plankton.

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Disclaimer

This Reference Guide was prepared by the Lake Stewardship Steering Committee of the Association of Summer Village of Alberta (the "Authors") and is intended to provide general information about lake stewardship issues to members of the Association of Summer Villages of Alberta. Information focuses on creating a better understanding of lake stewardship issues and enhancing awareness about resources that may assist Summer Village councillors and administrators to help encourage residents to become lake stewards in their communities now, and in the future.

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