



# **THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Newsletter / Bulletin**

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TORONTO REGION  
SUSTAINABILITY PROGRAM

THE CASE AGAINST  
WIDESPREAD MALATHION  
FOGGING

THE PAUCITY OF ETHICS  
IN CANADIAN ENVIRONMENTAL  
AFFAIRS





# CSEB Newsletter / Bulletin SCBE

VOLUME 64, NUMBER 3, 2007

CSEB Website <http://www.cseb-scbe.org>

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**CSEB NEWSLETTER 2007**

Vol. 64, Number 3 Fall 2007

The Canadian Society of Environmental Biologists Newsletter is a quarterly publication. The Newsletter keeps members informed of the Society's activities and updates members on the current affairs and advances in the field of environmental biology. This publication draws together the widely diverse group of Canadian environmental biologists through a national exchange of ideas. Members are invited to contribute papers, photos or announcements that are of a national biological and environmental interest. Letters to the editor are welcome. This is a volunteer non-profit organization and we rely on your participation to make the newsletter a productive forum for ideas and discussion.

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**LE BULLETIN de la SCBE 2007**

Vol. 64, Nombre 3 L'Automne 2007

Le Bulletin de la SCBE est une publication trimestrielle de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activités de la Société sur événements courants ainsi que les progrès qui font en sciences de l'environnement. Par un échange d'idées au niveau national, cette publication intéresse un groupe très diversifié d'environnementalistes Canadien. Les membres sont invités à contribuer des articles, photos (noir et blanc) ou des messages qui sont d'intérêt nationale en sciences biologiques et environnementales. Les lettres à l'éditeur sont bienvenues.

**Tout la correspondance d'affaires, y compris les abonnements, les changements d'adresse, les exemplaires retournés et les formulaires:** CSEB National Office, P.O.Box 962, Station F, Toronto, ON, M4Y 2N9. **Les lettres à l'éditeur:** Gary Ash, Editor, courriel: [gash@golder.com](mailto:gash@golder.com)

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**The Canadian Society of Environmental Biologists****CSEB OBJECTIVES**

The Canadian Society of Environmental Biologists (CSEB) is a national non-profit organization. Its primary objectives are:

- to further the conservation of Canadian natural resources.
- to ensure the prudent management of these resources so as to minimize environmental effects.
- to maintain high professional standards in education, research and management related to natural resources and the environment.

**OBJECTIFS de la SOCIÉTÉ**

La Société Canadienne des Biologistes de l'Environnement (SCBE) est une organisation nationale sans but lucratif. Ses objectifs premiers sont:

- de conserver les ressources naturelles canadiennes.
- d'assurer l'aménagement rationnel de ces ressources tout en minimisant les effets sur l'environnement.
- de maintenir des normes professionnels élevés en enseignement, recherche, et aménagement en relation avec la notion de durabilité des ressources naturelles et de l'environnement, et cela pour le bénéfice de la communauté.

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## NATIONAL

### President's Report

Submitted by: Shawn Martin, President (2006-2007)  
Canadian Society of Environmental Biologists

At the time of writing, our 2007 National Conference is about to get underway due to the efforts of many volunteers, including Patrick Stewart, the Conference Coordinator and Karen March, the Conference Chair, with help from other local CSEB members. I'd like to thank these people for their hard work, we would not have had a conference without them! I would also like to thank Fundy Gypsum Company for their sponsorship.

In our next newsletter, I will be announcing the new Board of Directors for 2008-2009. If you are interested in helping CSEB as a Regional Director, please let me know, we'd be happy to put you to work in hosting local CSEB meetings and providing regional input to the newsletter!

### British Columbia News

Submitted by: Jim Armstrong  
British Columbia Chapter

The status of the BC Chapter of CSEB remains unchanged from 2006 as inactive.

With the busy schedules of the active membership, it has been difficult to schedule a date, time and location to have an annual meeting. With the AGM scheduled for Halifax, this may provide an opportunity for attendees from BC to meet and decide the direction that the BC chapter should take over the next few years.

As my 2007 schedule has been taken up with initiation of new programs and revision of existing ones, competition for time with writing a thesis and becoming a new grandfather, my available time to undertake the duties of Regional Director for BC has been limited. Contacting the various members who remain active has also presented a challenge due to the reasons given but I must give credit to Gary Ash for forwarding the membership list to me in a timely manner and attempting to keep it updated as new members joined.

Membership retention and recruitment should be the 2008 focus for BC. Difficult as it may seem, more biologists are taking a lead role in ecosystem management, contaminated site remediation and development of new bio-indicators that can be used to assess the overall health of the various ecosystems of BC. Membership recruitment can be directed to the various universities and colleges as a means of gaining the interest of the upcoming biologists. Retention may be better served by regionalizing the Province into smaller more manageable areas so that more members can feel connected to CSEB.

Current members can forward their comments to my attention at: [Jim.Armstrong@metrovancover.org](mailto:Jim.Armstrong@metrovancover.org).

### Alberta News

Submitted by: Lisa Maria Rusnac Howie

#### Reducing Greenhouse Gas Emissions Intensity in Alberta

New climate change regulations, effective July 1, 2007, require Alberta facilities that emit more than 100,000 tonnes of greenhouse gases a year to reduce emissions intensity by 12 per cent.

Companies have three ways to meet their reductions. They can make operating improvements, buy Alberta based credits or contribute to the Climate Change and Emissions Management Fund. For further information, see the link below: <http://www3.gov.ab.ca/env/Climate/>

#### Albertans Advised To Take Precautions Against Lyme Disease

Edmonton -- With the recent identification of ticks carrying Lyme disease in the Edmonton area, Dr. Karen Grimsrud, Alberta's Acting Chief Medical Officer of Health, is advising Albertans that there is a possibility the ticks that carry Lyme disease are now established in Alberta and to take precautions to avoid tick bites. Previous surveillance has not provided evidence in Alberta of the particular species of tick (*Ixodes pacificus*) known to carry Lyme disease. Recently, 10 specimens collected from dogs by veterinarians have been identified as *I. pacificus*, and two of those were infected with the bacterium which causes Lyme disease (*Borrelia burgdorferi*). No human cases have been identified in Alberta in 2007.

Lyme disease can be treated effectively with antibiotics. A full recovery is more likely when treatment begins in the early stages of the disease. Undiagnosed Lyme disease may develop into chronic illness that can be difficult to treat.

The first sign of infection is often a circular rash. This rash occurs in about 70-80 per cent of infected people and begins at the site of the tick bite after a delay of three days to one month. Additional symptoms may include fatigue, chills, fever, headache, muscle and joint pain, and swollen lymph nodes. If untreated, the disease progresses into more serious symptoms which can last several months - including migraines, weakness, multiple skin rashes, painful or stiff joints, abnormal heartbeat and extreme fatigue. If the disease continues to progress, symptoms such as chronic arthritis and neurological symptoms, including headaches, dizziness, numbness, and paralysis can result. Lyme disease is rarely fatal. However, if contracted during pregnancy, Lyme disease can pose serious health risks to the baby, including stillbirth. The greatest chance for people to become infected is when they walk through brush and tall grass in spring and summer when ticks are most active. Here are some precautions you can take:

- Don't walk bare-legged in tall grass, brush, or woods where ticks might be found;

- If you do go into such areas, cover up as much as possible. Wear light-coloured long-sleeved shirts, pants and a hat. The light colours will help you see whether there are any ticks on you. Tuck your shirt into your pants, and pull socks up over your pant legs. This will help keep ticks away from your bare skin;
- Wear shoes that cover your entire foot, rather than sandals or open shoes;
- Spray clothing and exposed skin with an insect repellent that contains DEET. Read and follow the manufacturer's directions for safe use.
- After finishing your outdoor activity, check your clothing and your entire body for any attached ticks. Some ticks are quite small - the size of a freckle; and
- Check children and pets after they have been outside. If you find a tick attached to your skin:
- Use tweezers to remove it. Grasp the tick's head and mouth parts as close to your skin as possible, and pull slowly until the tick is removed. Be careful not to twist, rotate or crush the tick during removal;
- After removing the tick, use soap and water to wash the spot where you were bitten. You may also disinfect the bite area with alcohol or antiseptic;
- Try to save the tick in an empty pill vial or a doubled zip-lock bag. If you develop any symptoms of Lyme disease, the tick can be sent to a laboratory for identification, and this may help diagnose your illness. It may also help public health workers identify areas of higher risk for Lyme disease; and
- Seek the advice of a health professional right away if you develop a rash or any other symptoms of Lyme disease after being bitten by a tick.

There have been 19 cases of Lyme disease in Alberta since 1992, all with a history of travel to areas outside Alberta known to have the disease.

The Provincial Health Office will be working with Agriculture and Food and Sustainable Resource Development to determine whether the species of tick known to carry Lyme disease is now established in Alberta.

For more information on Lyme disease, call Health Link Alberta at 943 LINK (5465) in Calgary, 408 LINK (5465) in Edmonton, or toll-free elsewhere in the province at 1 866 408 LINK (5465). Information is also available online at [www.health.gov.ab.ca](http://www.health.gov.ab.ca) under Health Information - Diseases and Injury.

## Saskatchewan News

### Easing Into Conservation

Submitted by: Art Jones

Making plans for the future is an important part of our lives. Whether it is planning for a holiday, an event or even retirement we spend time looking forward and deciding what we want to do and how we want to do it.

We also consider the future when we make decisions that affect our land and natural resources.

Agricultural producers rely on their land for a living. As a result they are often faced with trying to decide whether they should develop that special area they own or should they conserve it in its natural state. The same questions may be facing someone who owns an area that they use for other purposes such as recreation or industry.

"Conservation means different things to different people," says Conrad Olson, Saskatchewan Environment's Habitat Protection Manager. "Someone may see conservation as preserving natural habitat such as a marsh, a forested area or another natural area they treasure for personal reasons. To someone else conservation may mean preserving an area that has historic or archaeological value. Or it may mean protecting the quality of our land, air or water. Whatever the definition, Saskatchewan Environment is prepared to work with people to help them conserve these areas. One of the most effective tools is what are called conservation easements."

Although the details of each conservation agreement are worked out between the landowner and a conservation agency the basic idea is the same. A conservation easement is a formal agreement between a landowner and a conservation organization that allows the organization access to the land for conservation purposes while the landowner continues to own the land. While the holder of the easement is allowed access to the area in question, in most cases the landowner controls public access.

A conservation easement is registered on the land title and can be in place for a definite time or in perpetuity. That means if the land is sold the new owner must honour the easement.

Some conservation easements can also have financial benefits for the landowner. For example if someone donates an easement he or she can use the value of the land as a tax deduction. The landowner can also choose to sell the easement outright for a percentage of the fair market value of the land or choose to be paid part of the value and donate the rest. That donation can also be used as a tax deduction.

"The beauty of conservation easements is that they can be used to protect some of the best natural habitat left in the province while still allowing the landowner to control the land and to use it for some agricultural or other purposes that won't damage the protected area," says Environment's Olson. "Conserving these areas also adds to the health of our environment which, in turn, contributes to our health and well-being."

More details about conservation easements can be found on Saskatchewan Environment's website at: <http://www.se.gov.sk.ca/ecosystem/>.

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## The Boreal Forest - Helping the Earth Breathe

By Art Jones

If you were approaching Earth from space you might wonder about the green band that circles the northern part of the planet. This band of vegetation is called the "boreal forest," named after the Greek god of the north wind, Boreas.

The boreal forest is found in Canada, Alaska, Russia, China, Mongolia, Norway, Sweden and Finland. Collectively, the boreal forest covers 10 per cent of the earth's land surface and represents about one-third of the world's forested area.

The boreal forest is one of the largest ecosystems on the planet. It covers approximately one-half of Canada's landmass. Nearly 55 per cent of Saskatchewan is covered by forest.

Saskatchewan's boreal forest and the boreal forests around the world are important to the health of our planet.

"These forests have been called the lungs of the planet because of the role they play in filtering our air," says Michael McLaughlan, Saskatchewan Environment's Director of Forest Management. "An average tree in the boreal forest will absorb about a tonne of carbon dioxide over its lifetime. Trees in the boreal forest also produce a large amount of oxygen especially during the spring and summer when the trees are vigorously growing. During this time the amount of oxygen in the atmosphere around the world increases and the level of carbon dioxide drops."

In Canada, the boreal forest is home to about two-thirds of Canada's 140,000 species of plants, animals and other organisms, including timber wolves, caribou, gray jays, loons, black spruce, jack pine and trembling aspen.

Many mammals have evolved to make it easier to live in the boreal forest, which has short, cool, moist summers and long, cold, dry winters. For example, the caribou has hooves that are adapted for travel and digging in ice and snow in winter. They also have specialized digestion systems, making them the only member of the deer family that can live on lichens. Rabbits and some other animals change colour with the seasons so they can blend in with their surroundings and avoid predators; other species are able to hibernate. The beaver is one of the most important boreal forest animals. Its dams flood parts of the forest, creating ponds and wetlands that are used by fish, waterfowl and amphibians.

The boreal forest is often called North America's bird nursery. It is used by nearly half of the continent's birds, over 300 species, for nesting and raising their young.

In addition to providing habitat for birds and other wildlife, approximately 2.5 million Canadians live in communities that depend on the boreal forest. The boreal forest region supports about 900,000 direct and indirect jobs across Canada in industries such as forestry, mining, tourism, trapping and harvesting natural products.

"The boreal forest is a large and relatively resilient ecosystem but it is also under many pressures ranging from development

to climate change," says Environment's McLaughlan. "It's hard to imagine, but individual actions as simple as recycling and energy conservation can help by reducing climate change. Governments, industry and other partners are also working together to better understand how the boreal ecosystem works, how humans affect it and how we can make better decisions. Better understanding and using traditional knowledge will help us maintain the boreal forest for generations to come."

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## Fighting Forest Fires and Restoring the Environment

By Art Jones

Forest fires are a fact of life in Saskatchewan. Some of the fires, such as those in the observation/modified zones, are left to carry out the natural process of helping to renew the forest. Saskatchewan Environment fire-fighting crews put out others, especially those that threaten lives, communities or valuable resources.

Fighting forest fires and other wildfires often means getting staff and equipment into an area and, once they are in place, clearing a spot for a camp and a spot for helicopters carrying supplies and fuel to land. The landing zones are also often used as staging areas for helicopters that directly attack a fire. Fighting a fire can also mean cutting kilometres of fire control lines through the forest. Fire control lines are areas where vegetation has been cleared to create a break in the path of an advancing fire.

"A properly built fire control line will help stop a wildfire from spreading so it is a valuable tool for fighting forest fires. The campsites and landing zones are also crucial to fighting fires," says Paul Maczek, Saskatchewan Environment Fire Science Specialist. "However, sometimes building them can open up otherwise inaccessible areas, change or damage fish and wildlife habitat and remove valuable topsoil, vegetation and forest stands. While it is important to fight fires it is equally important to do as little environmental damage as possible."

In some cases it is critical to deal with wildfire promptly so equipment operators and other fire-fighting personnel do whatever needs to be done to get the situation under control. However, there is often time to make a detailed plan of how to attack a fire, avoid doing additional environmental damage and reclaim areas that do get disturbed or damaged during fire fighting.

"We will look at an area and decide on the most effective way to deal with the fire with the least amount of environmental damage," says Environment's Maczek. "We will use the natural terrain as best we can for building fire control lines. We will decide if we need to use heavy equipment in an area or if

we can accomplish our goals with firefighters who are using lighter equipment such as pumps or perhaps with aircraft. We also consider every waterbody to be fish-bearing so we try to avoid damage to it and its banks. We also try to avoid crossing them. If we have to we may install a temporary culvert or build a temporary bridge of logs and brush.”

Once the fire is out the disturbed areas such fire lines, landing pads and campsites will be reclaimed. That is done by methods such as replacing soil, re-establishing the slopes on hills and stream banks and preventing erosion by replanting vegetation.

If you would like to learn more about reclaiming areas that are disturbed while fighting forest fires Saskatchewan Environment's Reclamation Manual is available by going to [www.se.gov.sk.ca/fire/](http://www.se.gov.sk.ca/fire/)

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## Saskatchewan Research Could Mean Less Carbon Dioxide and More Oil

By Art Jones

It's a match resulting from a desire to retrieve more crude oil and the need to find a way to remove carbon dioxide from the atmosphere.

Aramco Services Company has signed on as a co-sponsor of a long-term, international, Enhanced Oil Recovery research project looking at methods of storing carbon dioxide underground. Aramco Services Company is owned by Saudi Aramco, the largest producer of crude oil in the world and manager of the world's largest proven reserves.

The Petroleum Technology Research Centre, located in the Regina Research Park, leads the Enhanced Oil Recovery research. It is being carried out in the Weyburn-Midale oil field, which is about an hour south of Regina.

“We are very pleased that one of the world's largest oil companies is getting involved in the project,” says Ray Knudsen, Project Manager, Petroleum Technology Research Centre. “This helps to raise the international profile of this project which shows that we can increase the amount of crude oil we can recover from the oil fields and reduce the amount of carbon dioxide in the atmosphere. This is a positive step towards improving the security of our future oil supplies and towards helping to deal with carbon dioxide, which is believed to be one of the leading contributors to climate change.”

The concept behind the enhanced oil recovery process is actually fairly straightforward. Inject water and carbon dioxide into oil fields that are no longer producing or are losing their productivity. This thins the oil that is still in the pores of the rocks and pushes it towards the surface. So far the process is paying off in increased production. For example, production in

an oil field owned by Encana has jumped from 10,000 barrels a day to 30,000 barrels a day. The projected life of the reservoir has also been extended by decades.

The potential to store carbon dioxide is staggering. Out in the Weyburn and Midale fields, operators EnCana and Apache plan to store more than 40 million tonnes of CO<sub>2</sub>. That's the equivalent of removing eight million cars from the road for a year. Some estimates say the worldwide carbon dioxide storage potential is 10,000 billion tonnes. That would be the same as eliminating 425 years of global carbon dioxide emissions.

“Climate change is one of the biggest challenges we face,” says Ron Zukowsky, Director, Climate Change Program, Saskatchewan Environment. “It could lead to things such as drought, more forest and prairie fires, changes to waterfowl, fish and plant populations and add stress to the agricultural economy and industrial users of water and municipal drinking water systems. Dealing with it will take innovation and commitment from government, industry and individuals. This kind of project is a good example of how that could work.”

The key question now is whether the carbon dioxide will stay underground. Tests to date indicate not only will it stay underground; it will do so for at least 5,000 years.

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## Manitoba News

### The Case Against Widespread Malathion Fogging – Part 1 The Health & Safety Question.

By Dr. Bill Paton, Ph.D. (Biology); CSEB Manitoba Regional Director.

As humans, we have a biased and somewhat exaggerated view of our status in the animal kingdom. Pride in our swollen fore-brain and its associated mental capabilities may blind us to our very strong links to other species. Despite all the evidence for evolutionary unity at the cellular and physiological levels, everyone expected that genes regulating animal development would differ greatly from one animal group to the other. After all, insects and fish and humans look so different. We must have many unique proteins to create a brain like ours... or must we? The results of research in developmental genetics show that insects and humans, which have a common ancestor about half a billion years ago, possess many similar development-regulating genes. For instance, certain proteins involved in eye development in insects are closely related to proteins regulating eye development in mammals. The same is found for development of the heart, gut, lungs and capillaries and for the placement of body parts along the head-to-tail and back-to-front body axes.

The molecular targets of organophosphate pesticides like malathion are cholinesterases, particularly acetylcholinesterase,

an enzyme that controls the transmission of nerve impulses at synapses. Cholinesterase-inhibiting pesticides can cause fatalities by skin contact, as well as by inhalation and ingestion. Organophosphate compounds cause accumulation of acetylcholine in the brain causing sensory and behavioural disturbances, incoordination, etc. Malathion has also been associated with allergic contact dermatitis. It is also known to be an endocrine disruptor.

Despite the dogma that malathion is rapidly detoxified and excreted, recent measurements have documented the presence of malathion and its derivatives in the bloodstream of adults in the City of Winnipeg. Although the association between acute exposure to pesticides and neurotoxic effects is well known in studies on pesticide applicators, agricultural workers and their families, the potential effects of chronic low-level exposure has received much less attention. This is because the symptoms are often non-specific, and resemble other illnesses such as flu, heat exhaustion, alcohol toxicity, or simple fatigue. Repeated absorption of organophosphates at subacute concentrations can cause persistent anorexia, weakness and malaise. The U.S. Institute of Medicine stresses that despite the lack of distinct symptomology, it is important for environmental health practitioners to aggressively investigate all suspected cases of chronic pesticide poisoning because such cases may represent sentinel events, indicating other populations may also be at risk. Unlike many other North American jurisdictions there is no legal requirement to report acute or chronic pesticide poisonings in Manitoba.

In humans, infants under six months of age have incompletely developed acetylcholinesterase systems and immature livers with reduced ability to breakdown malathion and hence this group and developing mammalian fetuses have much increased susceptibility to cholinesterase-inhibiting pesticides like malathion. Other persons who are known to have adverse effects from organophosphate pesticides include a small percentage of the population who have an atypical variant of plasma cholinesterase. This genetic abnormality decreases the amount of cholinesterase available and renders these individuals vulnerable to poisoning when cholinesterase activity is likely further depressed by malathion exposure. Low plasma cholinesterase levels are also exhibited by long-distance runners; women in early pregnancy or using birth control pills; and persons who have advanced liver disease, chronic alcoholism, malnutrition, or dermatomyositis. Persons who have asthma and are exposed to malathion may be at increased risk because these insecticides cause narrowing of the airways, which can exacerbate breathing difficulties.

In the body and in the environment, organophosphates can be converted from the -thion form to the more toxic -oxon form; rates of conversion vary greatly in the population but are much more rapid in the body than in the environment. This conversion is brought about chiefly in the liver. Ultimately, both the -thion and the -oxon forms are usually metabolized to alkyl phosphates and other products that are of relatively low toxicity and are excreted rapidly in the urine. Maloxon and the technical or commercial grade malathion have been found to cause chromosomal damage in a wide variety of organism cell types

including humans. It should be noted that the required test results submitted by a malathion manufacturer for registration to PMRA are carried out with the pure chemical not the commercial product which contains other ingredients.

Results of experimental animal studies and human epidemiologic studies suggest an association between organophosphate compounds and cancer. A proposed mechanism of action is altered cellular immunity. However, the pure compounds have not been demonstrated to be carcinogenic.

## **The Case Against Widespread Malathion Fogging – Part 2 Does Adulticiding Work?**

In 1982, the new Pawley government and his Minister of the Environment, Jay Cowan held Manitoba Clean Environment Commission Hearings on this very question. Expertise was consulted from all over North America and the conclusion at the end of the day was that adulticiding was not an effective approach to mosquito control and in that period, the protection of the Manitoba public from Western Equine Encephalitis. The best way to protect the public was the use of repellents, the wearing of appropriate clothing and the avoidance of the periods when the mosquitoes were most active, dusk through the night. Evidence gathered here in Brandon following adulticiding at the Rec Centre with malathion and throughout the province after aerial spraying with Baygon was that mosquito populations increased following the adulticiding and this was attributed to more negative impact on the much larger predators, dragonflies, etc. The Winnipeg Free Press in the 1980s published graphical data showing the same phenomenon occurring in Winnipeg following malathion fogging. The potential for mosquitoes to develop resistance to malathion, particularly with the fogging methodologies being used, was also highlighted and of course impacts on human health and other biota were reviewed.

Following this experience, Brandon focused on larviciding, first with chemical pesticides and now with biological larvicides. Larvicides have a number of advantages over adulticides. Their use can be targeted to mosquito breeding sites, which avoids a wide application over an entire neighbourhood or city. They can be applied in solid form (pellets, granules and sand), which limits human exposure. The new biological larvicidal agents, also available to the public in garden centres, are specific to mosquitoes when used according to directions and have relatively little impact on the environment and human health. Formulations are available that can prevent the emergence of adult mosquitoes for up to one month, which decreases labour costs.

The results over the past 25 years or so have been very impressive and when monitoring traps were maintained in Brandon neighbourhoods, the records indicate clearly how effective the control program was. Members of the public as individuals also have the option of fogging their own backyards with chemical pesticides, using biological or physical methods, trapping devices etc. Even those within buffer zones in Brandon have the option of using the biological pyrethrins, now being used by jurisdictions that still favour adulticiding. The



variety of personal repellent products now includes biological products as a safer option. My own experience and the shared experience of many other citizens has been that the mosquito population up until the fogging had been extremely low in many neighbourhoods of Brandon. Unfortunately, we no longer have traps in the city proper to verify this fairly widely held opinion. Now I am advised that we only have two much more efficient carbon dioxide generating traps, one at the Rec Centre and the other by Westbran. Two others are apparently located outside the city boundary, one at the airport.

As someone who has for many years through the summer sampled the Assiniboine River from the Curran Park Ferry all the way to the rapids at East Richmond, I have noted that – the mosquitoes have always been much more evident along the riverbank as opposed to in the City proper. This is also confirmed by the fact that students involved in Dutch Elm Disease control along the river wear hats with nets and very protective clothing. It is also of note that the Rec Centre traditionally was also an area with high counts and hence this was the area being regularly fogged in the 1970s and early 1980s.

On both evenings when fogging was carried out in my neighbourhood, at dusk I put out some large plastic drop-sheets on the edge of my property to determine what dropped from the air, under a Manitoba maple and a shrub after the event. Early in the morning, I collected my catch – there were no mosquitoes, but there were a variety of ants, which made up the majority of the catch, a moth, two or three aphids, three spiders, two plant bugs and two interesting moderately sized beetles. This did not surprise me as I indicated the mosquito activity in my yard had been almost non-existent and therefore the chance of an extremely small droplet hitting a *Culex tarsalis* in flight was extremely low. The area with most activity, the back lane was not fogged. A large drop sheet protecting my fish pond in my backyard had no insect corpses on it at all.

The biology of the mosquito *Culex tarsalis*, the major vector of the West Nile Virus (WNV) in our region, is also important in assessing the validity of adulticiding as practiced in Manitoba allegedly to control WNV. The virus is transmitted by these mosquitoes and birds serve as the main reservoir (amplifying hosts) of the disease. These mosquitoes move in the trees and shrubs feeding on roosting and brooding birds and hence traps of different types placed in the tree canopy have been found to trap more *Culex tarsalis* than traps in the open or on the ground. Significantly larger numbers of WNV infected *Culex* spp. were also found in the canopy versus ground traps. Resistance to several organophosphate insecticides, including malathion has been reported for *Culex* species. Controlled studies in the U.S. have also demonstrated that ground spraying from roads did not significantly impact the tree canopy inhabiting mosquito species like *Culex tarsalis*.

A continuing criticism of adulticides are their transient effect: in Winnipeg mosquito numbers return to pretreatment levels within a few days without repeat applications.

Since the Clean Environment Commission report in 1982, there has been a huge volume of epidemiological, medical, scientific, entomological and specifically WNV related articles and

reviews published. My preliminary assessment of many of these articles suggests that the decision of 1982 is strengthened and therefore I will personally, and encourage those really interested in this question to write our provincial politicians and request a new environmental assessment with all of the provincial data gathered in recent years open to critical assessment. As pointed out by myself and others, the City and the province should hold a review on the communication process in Brandon to adequately alert the public because clearly there were many who particularly on the first evening were totally unaware as to what was happening. This review exercise would also serve for future emergencies some of which might have less lead time than the malathion fogging initiative.

### The Case Against Widespread Adulticiding with Malathion - Part 3 The Disease and the Risk.

West Nile virus (WNV) is a mosquito-borne flavivirus and human, horse and bird neuropathogen. The virus is indigenous to Africa, Asia, Europe, and Australia.

The British Journal, Lancet Infectious Diseases, in a 2002 article reports:

“Most human West Nile virus infections are subclinical but clinical infections can range in severity from uncomplicated WN fever to fatal meningoencephalitis; the incidence of severe disease and death increase with age... Prevention depends on organized, sustained vector mosquito control, and public education.”

The U.S. Centre for Disease Control advised doctors in 2002:

“Prevention (of WNV infection) rests on elimination of mosquito breeding sites; judicious use of pesticides; and avoidance of mosquito bites, including mosquito repellent use.”

The Canadian Family Physician journal in June 2005 published a “West Nile virus primer for family physicians.” The main message was as follows:

“The mosquito-borne virus that first appeared on this continent in 1999 is now prevalent throughout North America. Most infections are asymptomatic. Fewer than 1% of those infected develop severe illness; 3 to 15% of those with severe illness die. While methods for controlling the mosquito population are available, we lack evidence that they reduce infection in the general human population. ... CONCLUSION the general population is at low risk of West Nile virus infection.”

Human population studies in the U.S. have determined potential other risk factors for developing encephalitis from WNV infection. In a Texas study it was found that homeless patients were more likely to be hospitalized from WNV when compared with the general population. Other risk factors identified were age, people older than 50 years are at highest risk of severe disease, a history of high blood pressure, including those that take hypertension-inducing drugs, and a history of cardiovascular disease. Chronic renal disease, hepatitis C and immunosuppression were identified as risk factors for death from WNV infection. A 13 state study published in 2006 reported that the

probability of a fatal outcome depends on the poverty rate for a county in which the infected person lives. The authors highlight the vital need for educational and control measures in poverty-stricken areas.

That pesticides kill mosquitoes (with varying levels of effectiveness depending on the product and species) when applied as larvicides to small, well-defined breeding sites is supported by findings from controlled studies. Reports of before-after studies also provide evidence that larviciding lowers the numbers of mosquitoes in a given neighbourhood or city. However, randomized controlled trials of the effectiveness of mosquito control using human arboviral disease, like WNV as an end point are not possible for practical reasons (e.g., the wide variety of local environmental conditions, the variety of mosquito species and the usually small number of human cases identified). This lack of evidence, especially as it concerns prevention of human disease, is supported by many researchers. Nevertheless, larviciding is a recommended response to WNV in most jurisdictions.

Currently there is no specific drug treatment or vaccine for humans. There is a vaccine available for horses. All medical and government authorities say that the best way to protect against any disease carried by mosquitoes is to avoid bites. Indeed, the government is running the ad "DON'T BE A TARGET." Applying an appropriate mosquito repellent is part of that advice. In studies of population repellent use in Connecticut (sample size 730) 44% used repellent. Using mosquito repellent was associated interestingly with age under 50, English as primary language, being worried about WNV, being a little worried about pesticides, finding a dead bird on the property and finding mosquitoes frequently in the home. In a 2003 study in Colorado, two adjacent cities had severe outbreaks of WNV. Unexpectedly, disease rates were higher in Loveland (38.6 vs. 15.9/100,000), which had a more extensive mosquito control program and fewer mosquitoes. Telephone surveys indicated that Loveland citizens were more likely to avoid personal protective practices than citizens of Fort Collins. These data certainly suggest that personal protection does indeed directly influence disease outcomes.

## Ontario News

CSEB has been fairly quiet in Ontario over the past few months, so there is nothing new to report.

### Toronto Region Sustainability Program - Fostering Innovative Solutions

By Fred Granek, Vice President, Toronto Region Sustainability Program

Environmental concerns are now considered to be a top priority by Canadians. Newspapers report daily on global warming, the dangers to human and ecological health posed by toxics, the impact of smog on the health of children and the elderly, the increased demands for clean drinking water, and the rising costs associated with safe treatment and disposal of wastes.

Many people in environmental agencies and industry are grappling with fundamental questions of how to protect the environment and community without undermining the financial viability of government and industrial operations. Environmental advocates argue for stronger regulations, rigorous enforcement, and more comprehensive reporting. Environmental visionaries are challenging society to find ways of being sustainable on both the production and consumption cycles. However, government and industry alike are facing the need to deliver more and better programs with fewer resources.

How can we get out of this conundrum of needing to do more, with less? How can we improve our environmental performance while reducing our costs? Pollution prevention provides a practical framework and discipline.

The Toronto Region Sustainability Program provides pollution prevention technical assistance for small to medium sized manufacturers throughout the Greater Toronto Area. Our clients come from a variety of industries: printing, packaging, metal finishing, chemical manufacturing, auto parts, food, paint, among others. We are striving to grow the program by increasing the number of clients and number of participating municipalities.

The results are positive. Each manufacturer that has gone through the program has found innovative and effective solutions that reduce its ecological footprint while reducing its on-going operational costs. Most of the pollution prevention solutions are practical, relatively low cost, and result in positive benefits to the environment and workplace.

For information on the program, and insights about the experiences of our program clients in reducing wastes, reducing costs, and reducing regulatory exposure, please check out our website at <http://www.oceta.on.ca/TORSUS/>. The stories contained therein are about true pollution prevention leaders.

## Quebec News

Not much has been happening regarding CSEB in Quebec. Claude Delisle, longtime CSEB Director for Quebec has been over in Viet Nam working as a guest lecturer at the university in Ho Chi Min City. Claude has contributed an article on his Viet Nam experiences, which appears later in this issue.

### Quebec Environmental Board Opposes Danford Lake Dump

Source: CBC News

Construction of a proposed major landfill site in western Quebec's Outaouais region should not receive government approval, says the province's environmental review board.

The Bureau d'audiences publiques sur l'environnement (BAPE) made the recommendation on the Danford Lake project in a report that was recently released.

The report stated that:

- The eight megatonne capacity of the landfill is too large for the area's needs.

- Building the site would slow down the search for more environmentally friendly alternatives to traditional landfill sites.
- The landfill would increase truck traffic on Highways 105 and 301.

Quebec Environment Minister Line Beauchamp is awaiting her ministry's report on the Danford Lake project before making her own recommendation to cabinet.

Outaouais currently sends its garbage east to the Laurentian region.

Danford Lake is about 60 kilometres north of Gatineau.

**The Vietnam Fluorosis Fund:  
Impacts on Human Health of an  
Underground Water Contamination by  
Natural Fluoride in Central Vietnam**

A critical drinking water contamination from natural fluoride (over 20 mg/L vs. 1.5 mg/L accepted by most countries) is causing severe dental and bone problems in Central Vietnam population, mainly comprised of children. We estimate that around 12,000 children are exposed daily to these high concentrations of fluorides.

The problem has been known for years by the health authorities, but no remedial measures (water treatment...) have been implemented.

As a guest lecturer on water ecotoxicology at Ho Chi Minh City University of Technology (Faculty of Environmental Engineering), I was a witness of the problem and the research on water treatment in their laboratories to remove the fluoride excess in the drinking water. The method is now known and the column developed by the HCMUT removes up to 90% of the fluoride in the drinking and cooking water. Now the challenge is:

- Making 3,000 columns at a cost of \$50 each (\$150,000). Dispatching the columns to the affected families (\$30,000).
- Organizing a training and a yearly replacement program of the fluoride adsorbent (\$20,000).

A total of \$200,000 is needed to achieve our objectives. The average annual family revenue being around \$30 US per month in this area, it is useless to count on the population resources to solve their health problem. One fast solution to cure or stop this endemic disease is to make a DONATION.

Please send your cheque to:  
FONDATION de POLYTECHNIQUE  
c/o VN FLUOROSIS FUND  
2500, Ch. POLYTECHNIQUE, BUREAU C-521  
Montréal (Québec) Canada H3T 1J4

An Income Tax Receipt will be sent to you. A French and Vietnamese version of this text is also available. Sincere thanks for your attention to this pathetic human cause.

For more information, send an e-mail to the project leader at [www.claude.e.delisle@polymtl.ca](mailto:www.claude.e.delisle@polymtl.ca)



*Very Mild/Mild Fluorosis*



*Mild Fluorosis*



*Severe Fluorosis*



*Severe Fluorosis*

*Photos by Hardy Limeback, DDS*

## Atlantic News

By Gary Ash, CSEB Newsletter Editor

CSEB held a successful Conference on “Habitat: Challengers & Solutions” on Oct. 4 in Halifax. Many thanks to Karen March (conference chair), Patrick Stewart (conference coordinator), and Jackie Spry for their efforts in pulling together the conference. The field trip on Oct. 5 took the group to view a stream restoration program at Dartmouth Crossing, at a mall developed in a quarry, and to a stream liming project on the West River System, where lime is being metered into the stream to counter the effect of acid rain. The day was concluded with a stop at the scenic Taylor Heads Provincial Park.

## Territories News

By Anne Wilson, CSEB Director

As the open-water field season winds up and day length shortens, many of us are grudgingly coming to terms with the changing seasons and the long winter ahead. Even though ice is starting to form along the lake shores, it doesn't seem likely that the pace will slow down, as activity continues unabated in the NWT and Nunavut!

I would welcome information to include from any Yukon colleagues, or from researchers working in the North. My work is primarily with environmental assessment and municipal wastewater, so you hear about the various development projects underway, but I'd be very interested to know about and report on other work going on north of 60. I would also appreciate hearing from northern members with ideas about what we can initiate by way of CSEB activities along with information on activities to include in the newsletter. Please email your thoughts to me at [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca).

The three main areas of activity are mineral exploration and mining (gold and base metal), ongoing work in connection with the Canada-wide Strategy for Municipal Wastewater Effluent, and of course, the Mackenzie Gas Pipeline. For the MGP, hearings are scheduled to wind up in late November, and thus put the project before Canada's National Energy Board for action in mid- to late 2008.

Among the Nunavut mining projects we have seen some progress with the Doris North gold project in the West Kitikmeot region obtaining their water licence (pending signature by the federal minister). This marks the end of a regulatory process that started in 2002, so I imagine there were some celebrations! Next in line is a gold property north of Baker Lake, Cumberland's Meadowbank project, which will be applying for permits now it has completed its environmental assessment. Also in Nunavut is Zinifex's High Lake base metal property, which is currently undergoing an environmental assessment. And of course, exploration and feasibility work continues for uranium targets and on an iron ore property.

In the NWT there are several smaller but interesting projects on the table. Currently my favorite one is a proposed hydroelectric

expansion on the Taltson Lake system (think northeast of Fort Smith) which will potentially supply power to the diamond mines to the north. The idea of displacing the use of diesel fuel is attractive for several reasons: reduced greenhouse gas emissions, reduction in truck traffic on the already stretched winter road, and lowering the potential for spills both in transit and at mine sites. This project is undergoing an environmental assessment.

The one-million-tonne bulk sample (which looks more like a mine all the time) which Tamerlane proposes to extract from the Pine Point area was the subject of public hearings in October as part of their environmental assessment. Nothing further from the folks proposing to take the Prairie Creek mine to production; we are expecting a water licence application any month now.

I've also been enjoying the work being done to prepare the North for the Canada-wide Strategy for the Management of Municipal Wastewater Effluent. The latest draft is now available, with another round of public consultation commencing in November. Under the proposed Strategy, the North is being given a five year period to determine how treatment systems, which face challenges of extreme climatic conditions, infrastructure limitations, and logistics, can meet national performance standards. This summer the Northern working group ran a fairly extensive program looking at some of the existing systems and their performance, so we can determine what standards would be reasonable for our infrastructure as well as protective of the pristine northern receiving environments. The next steps will be to look at potential pilot studies using treatment enhancement methods, to see if we can move closer to the proposed national standards. Did I mention that things are never dull around here?! Further information on the Strategy is available on the CCME website at: [http://www.ccme.ca/ourwork/water.html?category\\_id=81](http://www.ccme.ca/ourwork/water.html?category_id=81).

I'd like to put forward an idea for a future newsletter theme. Would others be interested in a “monitoring” issue that looks at the role of monitoring at various stages of a project, and how various requirements can be efficiently met (such as MMER, other regulatory, internal management)? Would you be willing to provide your two-cents-worth on a given topic? My focus tends to be aquatic, but this would cover all biological monitoring of course! I wish you all a great fall, and a productive and interesting time at our National Conference in Halifax October 4-5th!

## Other News

### Canada Slashes Spending on Wildlife Protection: Report

*Reprinted from Reuters. Wednesday, September 19, 2007*

OTTAWA -- Canada has slashed spending on wildlife protection and monitoring of ecosystems because of budget problems at the federal Environment Ministry, CBC reported Wednesday.

The cuts mean the Canadian Wildlife Service -- responsible for studying and protecting wildlife in Canada -- has been forced to halt all its scientific field and survey work.



In addition, a program monitoring the health of bird populations lost half its budget, while the budget for an operation that protects significant habitats for wildlife and birds was reduced to zero. The network observing changes in ecosystems lost 80% of its budget. CBC said the cuts would be in place until the current fiscal year ended in early 2008.

Sandy Baumgartner of the nonprofit Canadian Wildlife Federation -- which cooperates with the environment ministry on some programs -- said the spending reductions could have long-term consequences.

"A lot of it [the cuts] is actually research-based, which is alarming because if nobody is out there studying the health of the environment, how do we know where there are problems?" she told Reuters.

The press spokesman for Environment Minister John Baird did not respond to repeated requests for comment.

Critics regularly accuse Canada's minority Conservative government of ignoring the environment, particularly over the question of climate change. Although Ottawa ratified the Kyoto climate change protocol, Prime Minister Stephen Harper says Canada has no chance of meeting its targets under the agreement.

CBC said that despite the spending cuts, the environment ministry would spend \$60,000 on a consultant to study why employee morale was so bad.

*Submitted by: Pat Ryan, CSEB Past-President.*

*[Editors Note: CSEB executive has sent a letter to the federal Environment Minister to request the minister reinstate CWS funding immediately. See the letter under "What's New" on the CSEB Website.]*

## Conferences & Courses

*Submitted by: Pat Ryan, CSEB Past-President.*

### Course: Design and Analysis of Mark-Recapture Studies

November 20–22, 2007, Coast Hillcrest Hotel, Revelstoke, British Columbia. Sponsored by the Columbia Mountains Institute of Applied Ecology.

This course will examine common mark-recapture methods. While the focus will be on methods commonly used in fisheries management, the methodology presented is suitable for many other situations as well (i.e., "statistics is statistics"). The course will consist of theory and worked examples, using mostly MARK. Aspects of study design, the analysis of final results, and an overview of methods coming in the future will be presented. There will be an opportunity for participants to work through their own projects. The instructor is Dr. Carl Schwarz of Simon Fraser University (<http://www.stat.sfu.ca/~cschwarz/>). Class size is limited to 16 people.

Cost: \$650 plus GST (does not include meals or hotel). Details and registration are at [www.cmiae.org](http://www.cmiae.org)

### Conference: Managing Environmental Impacts of Linear Corridors and Infrastructure Workshop

November 7 – 8, 2007, Revelstoke, British Columbia.

Sponsored by the Columbia Mountains Institute of Applied Ecology. A list of speakers and registrations now available at [www.cmiae.org](http://www.cmiae.org).

## Call for Nominations

The CSEB Board of Directors has placed a call for nominations for the Officers of the Society whose terms will end on January 1, 2008. In accordance with the CSEB bylaws, "the Officers of the Society shall be elected by the Regular Members of the Society with the exception of the Newsletter Editor and Membership Secretary, who are appointed by the Board of Directors. The Board of Directors shall appoint an Election Committee to nominate a slate of candidates, and to conduct the election. Election shall be by simple majority. Voting may be done by fax, e-mail, or written notification within 30 days of the initial notice of such a vote."

#### **Positions open for nominations include:**

**President:** The President of the Society shall preside at meetings of the Board of Directors, and of the Membership as a whole, exercise general supervision over the business and affairs of the Society, and provide leadership in achieving the purposes of the Society.

**First Vice-President:** The First Vice-President of the Society shall assist the President, and carry out the duties of the President if that officer is unable to do so. The duties are to coordinate committee assignments and other functions as requested by the President.

**Secretary-Treasurer:** The Secretary-Treasurer of the Society shall keep the accounts of the Society, provide annual financial reports to the Board of Directors, process the correspondence of the Society, keep the minutes of the Society's and Board of Directors' meetings,

have custody of the minutes, and administer special funds under the direction of the Board of Directors. These duties may be delegated under such contractual arrangements as may be, from time to time, approved by the Board of Directors. Contracts and documents issued by the Society shall be certified by the Secretary/Treasurer and the President of the Society.

The position of Newsletter Editor is also available, with Gary Ash as the Acting Newsletter Editor. If you are interested in this position, please let us know via the contact information below.

The following nominations were received at the 4 October 2007 Board of Directors meeting:

President – Brian Free (accepted)  
First Vice President – Anne Wilson (accepted)  
Secretary/Treasurer – Karen March

Nominations will remain open for all positions until October 31, 2007. Nominations can be sent via:

Email – Shawn Martin ([smartin@gartnerlee.com](mailto:smartin@gartnerlee.com)), copied to Jackie Spry ([sprytech@ns.synmpatico.ca](mailto:sprytech@ns.synmpatico.ca))  
Fax – 403.264.8412 (Attention: Shawn Martin)  
Phone – 403.262.4299 Extension 5440 (Shawn Martin)

Once all nominations are received, the voting procedure will be outlined and communicated to members. It is anticipated that voting will be complete by December 4, 2007.

## The Paucity of Ethics in Canadian Environmental Affairs

**R. J. Gibson**<sup>1</sup>, *Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, A1C 5S7, Canada.*

**P. Gallagher**, *Simon Fraser University, Vancouver, British Columbia, V5A 1S6, Canada.*

**R.L. Haedrich**, *Memorial University of Newfoundland, St. John's, Newfoundland and Labrador, A1C 5S7, Canada.*

### Abstract

Canadian natural resources are recognized as deteriorating or being lost, without adequate replacements. Although environmental regulations for conservation are in place, these frequently fail in practice. Socio-economic factors generally influence political decisions, overriding scientific evidence and democratic processes, at the expense of the natural environment, leading to losses in biodiversity and collapse of ecosystems. Recent examples of such failures at the federal, provincial and municipal levels are given. Major changes in priorities are needed at political levels.

Keywords: Canadian natural resources depletion; conservation regulation failures; democracy failure.

### Introduction

“Sustainability” has increasingly become an important issue in light of the continued erosion of natural ecosystems, and with realization of the essential services these ecosystems provide for human health and survival. The attrition and deterioration of the Canadian environment has long been recognized (e.g., New Scientist 1992), but emphasis remains on economic growth at the expense of the natural environment, an unsustainable situation. Historically civilizations have collapsed as their ecological base deteriorated, and such collapse could become global if present trends continue (e.g., Wright 2005).

Theoretical and empirical studies have shown that democracy and corruption influence environmental policies (Pellegrini and Gerlagh 2006). A true democracy should have greater effect at the political level than do corporations. Nevertheless, despite Canada being a “developed” democratic country, we have found that democracy has an insignificant impact on environmental conservation, and market economies have greater influence on environmental policies, allowed through weak or corrupt government officials. We provide examples of perversion of science and ineffectual democracy in environmental policy, leading to deterioration of natural resources, a situation which appears to be a general problem at all levels in Canada, and requires a revision of priorities in implementations at the political level.

<sup>1</sup> Member of Canadian Society of Environmental Biologists. Note: The views expressed in this article are those of the authors, and do not necessarily represent those of the Canadian Society of Environmental Biologists.

In Canada, Environmental Impact Studies (EIS) are mandated where harmful alteration or destruction of habitat or the environment is possible by an activity. Boyd (2003) in a review of the Canadian Environmental Assessment Agency (CEAA) ‘examines the theory of Environmental Assessment (EA), the federal and provincial EA laws, and the court cases that have interpreted and shaped the laws’. He notes that ‘despite paying lip service to the concept of sustainable development, CEAA appears to be implemented in a manner that favours development over sustainability. According to the CEAA, approximately twenty-five thousand projects were reviewed between 1995 and 2000. More than 99.9% of proposed projects were approved.’ Public consultation is mandatory for comprehensive studies, although it is limited to receiving notice about a project and being given an opportunity to provide written comments. For review panels the public has an opportunity to take part in public hearings by presenting evidence and questioning the proponent’s experts. ‘Like the CEAA, provincial laws may mention sustainable development but development dominates. Few projects are ever turned down as a result of provincial EA processes.’ A tremendous gulf exists between the theory of EA and the reality of on the ground practices in Canada. A report prepared for the federal government concluded that the main weakness of EA in Canada is at the implementation stage. Canada is faring poorly in comparison to the rest of the industrialized world in terms of protecting the environment, and Canada’s record, on the majority of environmental indicators is getting worse (Boyd 2003). Major changes in governmental attitudes are required to improve Canada’s environmental standing, and to conserve biodiversity and ecological health.

We give examples from national, provincial and municipal situations, from across the country, where corporate and political pressures decide outcomes for decisions on environmental methods in industrial developments, even when strong public pressures and scientific knowledge should decide otherwise. They are projects that we were involved in, but they further illustrate a general problem with governmental lack of environmental responsibility in Canada.

### Methods

Our examples are: two lakes in central Newfoundland, in the Exploits River basin, (1) Star Lake, converted to a hydroelectric generating reservoir, and (2) Trout Pond, a lake converted to a waste dump for mine tailings; (3) a marine example from British Columbia in which industry lobbyists and federal government scientists deny evidence of high densities of sea lice generated from aquacultured salmon having negative effects on wild salmon; (4) a terrestrial example Eagleridge Bluffs, North Vancouver, British Columbia, where wetland and old growth forest were destroyed to widen a road for the 2010 winter Olympics; and (5) a municipal situation, a super store development in a historical park in St. John’s, Newfoundland. In all

these cases, scientific and public concerns were subjugated in favour of socio-economic pressures.

## Results

### 1. Star Lake

Star Lake was a large (15.7 km<sup>2</sup>) lake in west central Newfoundland. Two species only of fish were present, a race of brook trout (*Salvelinus fontinalis*) that matured late, was relatively long lived (6+), and grew to a large size (> 486 mm in fork length), and a very small Arctic char (*Salvelinus alpinus*) (< 157 mm in fork length), which was a major prey item for the brook trout. In 1997 the lake was transformed into a fluctuating (8 m over winter) reservoir for hydroelectric (15 MW) generation. The impoundment was projected to cover 25 km<sup>2</sup>, but by mistake an extra 2.2 km<sup>2</sup> was flooded. Spawning and rearing areas, at the lake outlet for the large trout, and littoral areas for the Arctic char, were lost. The fish habitat compensation agreement (January 1998) to mitigate for this habitat loss committed the Star Lake Hydro Partnership (Abitibi-Consolidated Inc. and CHI Hydroelectric Company Inc.) to use artificial propagation and rearing of Star Lake fish, with the hatchery designed for stocking up to 100,000 fingerlings annually, and "for long-term maintenance of the genetic variability in the wild fish populations of Star Lake." Hatcheries have failed elsewhere to conserve unique genetic stocks (Vøllestad and Hesthagan 2001), and frequently result in reduction or loss of wild stocks (Myers et al. 2004). Therefore such management measures are unsuitable for maintaining genetic integrity. In Newfoundland and Labrador it is likely that numerous but so far unquantified evolutionary significant units or stocks remain (Adams and Hutchings 2003; van Zyll De Jong et al. 2004), and Star Lake represented a unique fish community, with possibly the largest brook trout on the island.

The Environmental Impact Statement (EIS) predicted that effects on fish would be minor, mitigable, and in fact positive. The international scientific literature illustrating the consequences of water level regulation - the oligotrophication process, the loss of littoral invertebrates, and the indirect loss of benthic and large salmonid fish - is monumental (e.g., Stockner et al. 2000), but these principles were not acknowledged or treated as highly likely consequences. Based on the projected increase in flooded area and in a "trophic upsurge" from increased dissolved nutrients, a theoretical net gain of productive habitats was emphasised. However it was ignored that after some original "trophic upsurge," scientific studies have shown that productivity of reservoirs declines after several years to below original productivity of the lake. In addition the littoral areas of a lake are the most productive for plant, algal, littoral plankton and benthic invertebrates, and have the highest biodiversity of the lake, and these food items are impoverished and some eliminated by fluctuating water regimes (e.g., Smith et al. 1987). It is known that with new reservoirs over acidic rocks, as in Precambrian formations, mercury is released to be accumulated up the food chain and can reach levels in piscivorous fish to make them unhealthy as food, lasting for more than twenty years (Anderson et al. 1995); nevertheless it was stated that "mercury content

in sport fish will remain unchanged." In fact since 2000 both the brook trout and the Arctic char have acquired high levels of mercury, restricting them for consumption (annual advisories by Health Canada). The actual levels of mercury are not publicly available. New roads increased access and angling pressure, so that a decreased season and reduced bag limits are now imposed. Sticklebacks (*Gasterosteus aculeatus*) appeared and have become abundant, probably introduced in nets used for an annual monitoring programme. An annual monitoring programme, "to determine the suitability and success of the brook trout breeding programme, the long term survival of the fingerlings, and the assessment of the status of brook and Arctic char in Star Lake" is carried out by the proponent, the Star Lake Hydro Partnership, on behalf of DFO.

Recent assessments submitted to DFO by the Partnership have shown collapse of the Arctic char population, and that few large brook trout remain (Jacques Whitford 2006a). The report documents that: angling effort has declined in the past two years (2004 and 2005) and success rates have fallen off considerably over the same period. The Catch per Unit Effort (fish/h) from standardised deeply set gill net sets for brook trout declined from 2.50 to 0.00, and for Arctic char this CPUE in the same period declined from 3.50 to 0.00. Insufficient broodstocks were collected in 2004 and 2005, in spite of greatly increased levels of effort in time spent and gear deployed in both years. In 2005 only 14,560 trout eggs were collected (collection target 100,000 eggs). The mean length at age of the trout increased from 1999, but subsequently there has been a decrease in mean lengths. For the three year and four year old trout in 2003, mean (fork) lengths were 217 mm for the 3+ and 285 mm for the 4+ fish. There was a decrease after this time, and in 2005 the fork lengths were 172 mm for 3+ and 219 mm for 4+ trout. In addition, annual mean Fulton's condition factor of both species (weight related to length) has declined significantly, indicating that oligotrophication has now followed any trophic upsurge. The condition factor for brook trout declined from 1.09 in 1999 to 0.88 in 2005. Arctic char condition factors declined from 1.09 in 1999 to 0.68 in 2004. Thus, the lack of adequate forage is now quite clear. Over half the broodstock now collected are from the artificial rearing programme.

The degradation of a formerly pristine area, and elimination of the valuable trophy trout fishery, are seen as a sad losses to local communities (Byrne 2002).

The example of Star Lake is a classical example of the changes to be expected by conversion of a lake into a fluctuating reservoir. At the stage of the Environmental Impact Study, several scientists, including one who had done research in the lake, and many local people (local ecological knowledge, LEK) expressed concern about the negative changes that would probably occur. However, Federal and Provincial authorities accepted an inadequate study, despite considerable criticism from scientists and public groups (Gibson et al. 1999), who predicted the present outcome. A large amount of data was collected for the EIS, but not presented or collected in a scientific manner to answer the important scientific questions. An EIS is conducted and financed by the proponent, which appears fair, but may not be the best solution, since frequently the science

is poor, and biased in favour of the project proceeding, often claiming falsely, as in this example at Star Lake, that in fact the resource would be improved (Campbell and Parrong 2000).

Environmental law and policy were bent and interpreted to agree with a conclusion reached before any studies were undertaken. A political decision was made at an early stage to proceed with the project, scientific advice was ignored, and the later "compensation" plan in reality was a public relations strategy. The Environmental Impact Assessment for Star Lake was regarded as a bureaucratic formality.

## 2. Trout Pond

A similar example is the case of Trout Pond in central Newfoundland (Coumans 2006; Paquet et al. 2006). Aur Resources are developing a copper-zinc mine near Buchans (Duck Pond project). They requested use of Trout Pond (37 ha) and a smaller adjacent lake (2 ha) as the "Tailings Management Area." Aur enlisted the help of the Mining Association of Canada in steering the Duck Pond project through new federal legislation for depositing tailings in a natural pond. The lakes and their outlet streams contain brook trout and Atlantic salmon (*Salmo salar*), three spine sticklebacks and possibly eels (*Anguilla rostrata*), which species will be killed by the toxic mine wastes. Since there would be 'harmful alteration, disruption or destruction of fish habitat,' to comply with the *Fisheries Act* Section 35 (2), losses of habitat caused by the project would have to be compensated by gains elsewhere. As in the case of Star Lake, the industry was given permission to proceed, with the compensation strategy to be devised later. The 'compensation' plans were based on weakly designed impact studies that presented very crude and preliminary estimates of fish biomass and productive capacity of the habitat in question. The 'compensation' agreed to consists of removal of old logging debris downstream in a slow water section of Harpoon Brook (Harpoon Brook Steady), a tributary of the Exploits River, a major salmon river, and placement of some gravel areas for spawning (Jacques Whitford 2006b). Loss of 291,032 m<sup>2</sup> of lacustrine habitat would be compensated with 2800 m<sup>2</sup> of riverine habitat. The biomass in the lost lakes was estimated to be 124 kg. The 124 kg of target production (the terms 'production,' 'standing stock' and 'biomass' were used interchangeably) would be met with 1,078 stream units (a 'unit' being 100 m<sup>2</sup>) in Harpoon Brook Steady, using an average fluvial salmonid production (they mean biomass) on the island of 115 g/unit. Harpoon Brook Steady had been dammed to hold pulp wood in the days when pulp wood was driven downriver in the annual high spring river discharge, resulting in numerous drowned logs. A fishway for anadromous Atlantic salmon around the dam had been present, but the dam was later removed, so no obstruction to fish migration is present.

The compensation plan is in fact scientifically unsound. It was "assumed that Harpoon Brook Steady has nil fish production at present," despite no fish estimates being made or water chemistry assessed. No reasons were given for this unlikely assumption, and it makes future monitoring of the effects of the enhancement (removing logging debris and placing spawning substrate) invalid. Juvenile salmon can migrate many kilometres

both upstream and downstream, and there is no evidence that spawning substrate is limiting and therefore should be installed. The annual planned monitoring by electrofishing would adjust the standing stock estimates upwards to include smolt (juveniles salmon migrating to sea) that had migrated, plus estimates of large fish that had escaped the electrofishing, which is fallacious since the smolt (plus their overwinter mortality) would have been estimated as large parr (juvenile freshwater stage of salmon) the previous year, and in fact it is possible to estimate large fish present by using appropriate methods.

Compensation plans should take into account the true value of the full range of uses and services provided by intact ecosystems, not just units of fish and fish habitat. The present enhancement could not compensate for loss of a unique ecosystem, and in reality is an excuse to allow the lake (plus a smaller adjacent one), to be destroyed (Glynn 2006; also an article on the web: [http://www.dominionpaper.ca/environment/2006/12/05/where\\_have.html](http://www.dominionpaper.ca/environment/2006/12/05/where_have.html)). The fish community would have evolved life history tactics to cope with their ecosystem, and the fish are likely to be genetically distinct from fish of neighbouring systems (Adams and Hutchings 2003). Lakes provide important services to the ecosystem, hydrologically, physically, chemically and biologically (Gibson 2002), which were not taken into consideration for compensation. The loss of wildlife habitat was not taken into consideration. The proposed compensation for lost lake habitat by fluvial habitat in Harpoon Brook Steady is a sham because this habitat is presently fish habitat already, and in fact no new habitat is being created to compensate for that being destroyed. The present enhancement could be done under the goals of the policy of 'net gain' of productive capacity of fish habitats, and such work is done by DFO and local groups outside of any "compensation" (e.g., Scruton et al. 1998).

Tailings impoundments can be constructed, but are more expensive than using an existing lake. The destruction of the two lakes was not an 'unavoidable loss,' alternatives exist but were not adequately explored. The legal obligation of the proponent and of local Environment Canada authorities to explore alternative mine waste disposal options was not taken seriously. Recently Trout Pond was re-scheduled in the metal mining effluent regulations to go into Schedule 2, which allows a pristine lake to be polluted, previously illegal under the *Fisheries Act*, and without scientific support, and contrary to much public opposition (Paquet et al. 2006). Trout Pond is the first pristine lake to be so re-scheduled. This is a major weakening of the *Fisheries Act*, as mining companies across the country can now apply for the same treatment. Two formerly pristine lakes have been turned into permanent toxic waste dumps, legalized by federal and provincial authorities, for the economic benefit of a mining company. Scientific information and biological wealth have been lost, and future angling, hunting and recreational opportunities destroyed.

## 3. Effects of Sea Lice on Salmonids

Sea lice have always affected wild salmon, but intensive marine farming has increased the size of the problem. In Europe, where there is aquaculture of salmonids in the marine environment (Ireland, Scotland, Iceland and Norway), governments





have recognized that salmon farms can be hazardous to the environment. An ICES workshop in Europe concluded that in Europe where there are salmon farms, there are more sea lice (Hansen and Windsor 2006). In

central British Columbia, there are more sea lice, primarily *Lepeophtheirus* spp, on juvenile wild fish near farms, and the weight of evidence suggests a negative impact of salmon farms on pink salmon (*Oncorhynchus gorbuscha*) in the Broughton Archipelago (Gallaughier et al. 2004; Routledge et al. 2007). In Europe it has been accepted that location of salmon farms had negative effects on local stocks of wild Atlantic salmon and anadromous brown trout (*Salmo trutta*), so that plans are implemented to reduce the problem (e.g., fallowing of the area, re-location of cages, etc.). In British Columbia, the risks to pink and chum (*O. keta*) salmon are exacerbated by their small size at emergence into the marine environment. The short term mortality of juvenile pink and chum salmon is increased by one – three lice. Despite evidence that fish farms may negatively affect wild salmon, there are high densities of salmon farms in the Broughton Archipelago, where pink salmon stocks have declined. The Broughton Archipelago has higher sea lice levels than adjacent regions in central British Columbia where there are no salmon farms (Morton et al. 2004). Both the Provincial and Federal governments refuse to accept that fish farms in British Columbia could negatively affect wild salmon stocks, arguing that sea lice and wild salmon can co-exist, and concur with statements such as ‘however, while higher sea lice infestations tend to occur in areas of BC with salmon farms, this correlation cannot be used to conclude that salmon farms are, in fact, the cause of more intense infestations’ (Butterworth et al. 2006). Again, federal and provincial authorities ignore science and the precautionary principle in favour of ‘the economy.’ Wild salmon stocks, and the preferred life time careers and cultures of local people are sacrificed for the benefit of corporate gains.

#### 4. Eagleridge Bluffs

In British Columbia the 2010 Winter Olympic Games are to be held at Whistler. A short piece of highway on the Sea to Sky corridor to Whistler going through North Vancouver is presumed to be inadequate for the predicted extra traffic, and therefore is being widened. The area for this work is the Eagleridge Bluffs and Larsen Creek Wetlands, a rare and biodiverse ecosystem of great natural beauty ([www.eagleridgebluffs.ca](http://www.eagleridgebluffs.ca)). The area is close to the city and provides enjoyment for naturalists and walkers, and study sites for scientists. The ecosystem was not logged, has an old growth *Arbutus* forest, and is the best example of temperate rain forest along this coast. Temperate rain forests are among the world’s rarest forests, covering only 0.2% of the Earth’s surface. The wetlands provide essential habitat for a number of species, including some that are endangered, and a nature park was planned. Professional scientists

have pointed out that due to the local geology and climate, Eagleridge Bluffs was a unique remnant of old growth forest in the lower mainland, and extremely precious. It included a huge wetland, and was a very special area for plants, amphibians, reptiles, mammals, eagles and many species of songbirds, and providing nesting habitat for migratory bird species. Besides the direct loss of habitat by a highway, three times that area for habitat is lost due to edge effects, and habitats are fragmented. Dispersal of species is reduced, and species diversity is reduced due to fragmentation of habitat, and species extinction could follow. The original EIS by federal and provincial government agencies recognized these features, and recommended a tunnel through this area, a common construction project in BC, and in similar terrain, such as in Norway. However, an alternative plan of widening the road by destroying the bluffs and wetlands was accepted. The distance of the overland highway is 2.4 km, compared to 1.4 km of tunnel. The four lane divided tunnel would have been 1 km shorter, safer, and considering all costs, cheaper, and would have been in accord with these Winter Olympics being promised as environmentally sustainable, now negated. Public and scientific opposition to the loss of the Bluffs by a highway rather than building a tunnel was very widespread, and included national TV coverage. Nevertheless, there was rationalization of the degradation of the Bluffs and wetlands, possibly because the overland road is conducive to developments of housing and a golf course, now planned for the area, which will destroy a unique ecosystem with its attributes of outstanding recreation and natural beauty, and degrade ecosystem services on water quality. Again we see government authorities succumbing to corporate interests, to the detriment of natural amenities and ecosystem services, contrary to the will of the people, and to government policy of conserving biodiversity.

#### 5. Superstore Development

A superstore development was undertaken in a historic recreational park, in St. John’s, capital city of Newfoundland and Labrador. Although this situation is municipal, we give it as an example of where pressure from a national corporation was able to overcome strong public sentiments, and subjugate democracy. The major recreational park in central St. John’s surrounds a 42 ha lake, Quidi Vidi Lake, where an annual regatta, the oldest sporting event in Canada, is held. The history of the park, and the loss of a heritage area to a supermarket, is detailed in Bambrick (2004). The land around the lake was purchased in 1908 ‘to safeguard it for the people and future generations of St. John’s.’ On June 25, 1936, St. John’s City Council decided to rename the surroundings of Quidi Vidi Lake ‘The King George V Memorial Park.’ The lake is a natural lake, has a healthy population of trout, and is a popular site for bird watching, walkers, etc., and supports two rowing clubs. At the western end of the lake is an internationally standard soccer pitch, and adjacent to this are green spaces, used for basketball, baseball games, etc. A river, Rennie’s River, flows into the western end of the lake, and alongside the river is a popular linear park traversing the city. On the side of the river opposite the soccer pitch was a stadium and ice skating rink, Memorial Stadium, dedicated as a memorial to war veterans, and an outdoor parking lot, part of which was a roller skating, skateboard and cycling park. From

1950 – 1953, citizens of the city pulled together to raise funds to build Memorial Stadium at the head of the lake, and the stadium was opened in 1954. However, after a larger ice rink was built downtown, at a non-public meeting of the City Council on July 14, 1999, Memorial Stadium was sold for \$1.00 to the Civic Centre Corporation, a corporation with the Government of Newfoundland and Labrador. In January 2001, the 'Discovery Group Inc.,' who apparently was representing Loblaws, a national superstore business, although the connection is unclear, bought the property, and the same month assigned the rights of the property to Loblaws Properties Ltd., who bought it for \$2 million. The deals were behind closed doors, and the general public was unaware of these deals until they were completed. In March of 2001, Loblaws applied to have the site rezoned from Parks and Recreational to Commercial so that they could build a supermarket. On March 5, 2001, the City Council rejected Loblaws' proposal to rezone by a unanimous vote. There was alarm and enormous public opposition to the proposal for rezoning, and the potential loss of Memorial Stadium and this recreational part of the park. A number of groups and neighbourhood committees formed, such as: St. John's Citizens Coalition; Save Our Stadium Committee; Say No to Loblaws Citizens' Committee; and Say No to Commercialization Citizens' Committee (Bambrick 2004). A vigorous campaign was led by the War Veterans' Committee. In June 2001 a 'Spirit of St. John's Parade' was held to oppose this supermarket, re-enacted on the anniversary of a 'Childrens' Parade' in June 1952 to raise funds for the original stadium. In March, 2002, 129 houses in the vicinity were visited, and 88% were against rezoning. Again, in February 2004, 585 houses, were visited, with 688 respondents, and 83% were against rezoning. A large rally was held at the head of the lake. There were many letters to the local paper protesting against rezoning, including one from James A. McGrath, former member of Parliament and former Lieutenant Governor of the Province, saying that 'City Council does not have the moral or legal rights to rezone the Stadium site' (McGrath 2004). The district MHA, Jack Harris, advised against the Loblaws proposal and suggested that the site remain in public hands. Many groups publicly opposed the rezoning proposal, including the Quidi Vidi Rennie's River Development Foundation, The Royal St. John's Regatta Committee, and the Joint Veteran's Committee of the Royal Canadian Legion. A petition against rezoning was made with over 12,000 names, the largest ever in the Province. In April 2003 the City Council advertised for possible uses for the Memorial Stadium. There were several sporting bodies seeking new venues who showed interest, such as the YM-YWCA; a sporting complex; and an indoor soccer stadium; all of whom are now looking elsewhere. There were many other suggestions, such as a public market, roller skating, hockey and ice skating, museum site, memorial gardens, etc. A study was commissioned by the City to suggest alternatives, undertaken by Sandy Gibbons & Associates, presented publicly on February 11, 2004, ([www.stjohns.ca/cityhall/pdfs/stadiumreuse.pdf](http://www.stjohns.ca/cityhall/pdfs/stadiumreuse.pdf)), and this report showed that the Stadium could be financially viable as a recreational centre, and that aesthetically the proposed commercial centre, with widened roads for the increase in traffic, etc., was not suitable for this site. A packed public meeting held at City Hall showed overwhelming opposition to rezoning. A second application

to Council for rezoning in 2004 was turned down. In October 2004 another public hearing was held with a Commissioner (John Roil) appointed by the City, with a huge turnout, overwhelmingly opposing the rezoning, and a number of briefs presented. The Commissioner's report recommended against rezoning the property. Strangely, the Mayor became an official spokesperson and advocate for Loblaws, sending out letters in favour of rezoning. On February 23, 2005, Council voted six to five in favour of the rezoning, some of these councilors previously having publicly taken a stand against such rezoning. The value of the site was thereby considerably increased for the company, to about \$7 million, providing Loblaws with a gift of \$5 million, and a large commercial development now dominates the head of the lake. Twelve professional experts provided briefs alerting the short term, long term and cumulative negative effects on the environment if the immense supermarket went ahead, related to the widening of roads and bridges, increase in traffic, removal of trees and vegetation, and the increased runoff rates from larger roofs, roads and parking lots, collated in a document with supporting articles (Gibson 2005). (In fact Loblaws has ignored any treatment for the stormwater, which runs off into Rennie's River and Quidi Vidi Lake, and deterioration of the water and ecosystem can be expected. The authorities neglected to have an Environmental Impact Assessment undertaken, or recommend remediation measures. In addition the parking area, in the flood plain, has been built up several feet, contrary to Provincial environmental regulations). The Appeal Board of the City of St. John's agreed to a hearing, and a number of citizens prepared documents (Gibson 2005) for that Board. However, at the meeting, with about 60 citizens present, the Board decided not to hear the appeal. There was considerable resentment about loss of this recreational and heritage area. For example, a Memorial University Professor Emeritus, in an article to the local paper (O'Flaherty 2006), writes "Cabinet ministers (Provincial Government) must have seen how powerful the feeling against the Loblaws proposal was, especially among citizens in the vicinity of Quidi Vidi Lake. The Cabinet has the means at hand to stall or stop any dubious proceeding of a dysfunctional or incompetent council. They chose to turn a blind eye. .... So now we have it – a superstore is being built in what was in effect a park in the heart of the city's east end. It will further clog traffic in an already heavily congested complex of streets, threaten and perhaps contaminate the lake – no environmental impact study has been done – restrict parking, obstruct recreational activity, and be a generally obnoxious, superfluous, and intrusive feature of the area."

## Discussion

The overall objective of the Policy for the Management of Fish Habitat (DFO 1986) is a net gain of the productive capacity of fish habitats for Canada's fisheries resources, and conservation of fish habitat is implemented through the *Fisheries Act*. The policy is intended to: "increase the natural productive capacity of habitats for the nation's fisheries resources to benefit present and future generations of Canadians." Key to this policy is the principle of 'no net loss' with regard to works and undertakings. Under this principle, DFO strives to "balance unavoidable habitat losses with habitat replacement on a project-by-project

basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented." Harper and Quigley (2005) attempted to determine success of 124 authorizations under the *Fisheries Act* Section 35 (2) for compensation of impacted habitats. The compensation most often selected was the creation of in-kind habitat, which, in theory, should be the most effective option in maintaining or increasing the productive capacity of the affected habitat type. However, they were unable to determine whether proponents were compliant with mitigation and compensatory requirements since file quality and record keeping was generally poor, so that determination of 'no net loss' could only be made in 14% of the cases. Our first two examples, where compensation was not 'in-kind', illustrate where the Policy can fail. The other (three) examples illustrate negative effects on the environment, but which were not taken seriously.

All of the above cases, representing federal, provincial and municipal authorities, display trivialization of the environmental effects, in favour of political and socio-economic factors. Democracy is subjugated by pressures from corporate sources on these authorities, with compliance and misinformation from governmental authorities. Continuation of this attitude can only lead to further erosion of natural capital. Biodiversity and ecosystem functions enrich human lives, aesthetically, intellectually, recreationally and generally for human health. Furthermore, civilization depends on ecosystem services, which are rapidly being eroded, leading perilously close to ecosystem collapses (Lovelock 2006). Angermeier (2007) believes that progress toward sustainability hinges on enhancing ecological and economic literacy among all resource consumers and policy makers. Nevertheless, the examples above illustrate that despite public literacy and demands, and despite strong regulations, corporate social irresponsibility and economic growth are paramount. Pellegini and Gerlagh (2006) declare that increasing democratic standards has to be matched with low levels of corruption to induce stricter environmental policy and that democracy per se is insufficient. Higher standards of ethical behaviour of Canadian government officials are required, with radical changes needed in implementation of environmental assessments. For example, rather than the proponent preparing the EA, the regulatory authority should prepare scientifically based guidelines, the assessment should be done at "arm's length" by independent experts, including from academia, public participation should be honestly considered, and there should be active enforcement of regulations, without interference from industry lobbyists.

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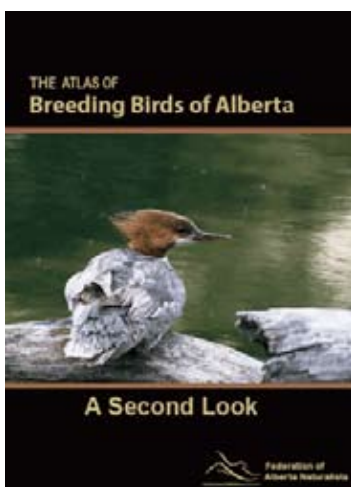
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CSEB needs to set up a network of regional newsletter contributors to gather newsworthy information and solicit regional based articles for inclusion in the quarterly CSEB Newsletter/Bulletin. If you are interested, please contact Gary Ash at [gash@golder.com](mailto:gash@golder.com).

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The second edition of the Atlas of Breeding Birds of Alberta was released on September 19, 2007 by the Federation of Alberta Naturalists. Copies of the Atlas are available online at [www.fan-web.ca](http://www.fan-web.ca). The price is \$64.95 CAD + GST; Visa, MasterCard and Amex are accepted. For further information, contact FAN at



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