



THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Newsletter / Bulletin

In this Issue:

- REGIONAL NEWS
- CARIBOU UNDERGOING MYSTERIOUS DECLINE
- BOOKS OF INTEREST
- OKANAGAN BASIN STUDY: PROBLEMS, PLANS, ACTIONS





CSEB Newsletter / Bulletin SCBE

VOLUME 65, NUMBER 4, 2008

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CSEB NEWSLETTER 2008

Vol. 65, Number 4 Winter 2008

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.

All business correspondence, changes of address, undeliverable copies and membership applications should be sent to: CSEB National Office, P.O.Box 962, Station F, Toronto, ON., M4Y 2N9. **Editorial correspondence:** Gary Ash, Editor, e-mail: gash@golder.com

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LE BULLETIN de la SCBE 2008

Vol. 65, Numbre 4 Hiver 2008

Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activités de la Société sur événements courant 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

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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: Brian Free, CSEB President

Greetings!

According to every report on radio, TV, newspapers and the corner coffee shop, the Canadian economy is in the tank. Many are concerned about their savings and investments (and can you believe it, I've heard that even some biologists have savings and investments!). Some may be concerned about job security and their next pay cheque. Students may be concerned as they prepare to begin a career in biology.

Is there any sunshine among all of this doom and gloom? Maybe there is! We in the CSEB recognize that government environmental policies and regulations are often too little, too late. There is a tendency to be reactive, not proactive. In parts of the country where the economy has been in overdrive for the past few years, this latest economic downturn does offer a brief respite. With industrial projects being delayed and some even cancelled, it gives us a bit more time to do better planning, environmental assessment and to allow our scientific studies to catch up with the need for a better understanding of our society's impact on our environment.

Now is the time to promote planning, environmental assessment and scientific studies to prepare us for the eventual resumption of positive economic growth (forgive me, I'm an optimist!) As biologists, we need to take every opportunity to maintain the pressure on key decision-makers in government and industry to support ongoing monitoring programs, environmental research and planning for better natural resource management. As budgets get cut and staff lay-offs are considered, it is important to ramp up our efforts to support these environmental programs. Every member should think about how they can influence the decisions being made during this period of "negative economic growth."

Our 2008 conference in Vancouver was cancelled. Although a great program had been organized about the successes and challenges facing waste management and a good venue had been secured at the BC Institute of Technology, registration was just too low to proceed. It was a difficult decision and I thank my fellow members of the Board of Directors for their support. I've since heard from several members that they would have attended, except there are new restrictions on travel and conferences during these tough economic times. I am also aware of some other conferences about waste management at that time that were drawing away our potential audience. A heartfelt thanks to BC Director Jim Armstrong for his leadership in organizing this event.

Looking forward to 2009, I want CSEB to increase its level of activity and remain an important voice for Canadian biologists. Keep your eyes and ears open for opportunities

for the CSEB. Write a short article for the newsletter. Simply getting together with other member biologists in your region can be a very rewarding experience! Please contact the Director in your region of the country and offer to get involved. We'd love to hear from you!

Brian Free
President □

British Columbia News

Submitted by: Jim Armstrong

It was unfortunate that the CSEB Annual conference could not be held in Burnaby, BC in November due to the lack of registrations. The planning for the next conference should examine the feasibility of holding bi-annual meetings due to the logistics involved and the economic climate that we are presently in.

Over the next several years, our goals within BC and overall as an association should be to expand our membership and relevance to the field of environmental biology. Starting at the university level, we may want to promote the creation of student chapters that may lead to further increases in the overall membership, with these members becoming regular members when becoming full-time biologists.

On a lighter note, I will not be seeking another term as the BC Regional Director due to the increased workload that I have created through the design and management of several new marine and freshwater monitoring programs. In February, 2009, I will be presenting the Boundary Bay Ambient Monitoring Partnership Program at the Puget Sound/Georgia Strait Ecosystem Management conference in Seattle, Washington, which is a program that has taken my time in 2008 to create. It is a new approach for my organization to monitoring whereby government agencies are partnering with NGOs and First Nations.

I wish all members of the CSEB the very best for 2009 and am sure that my replacement will ensure that BC becomes an active chapter. □

Alberta News

Submitted by: Brian Free, CSEB President

Alberta Regional Report

Fans of environmental policy have had lots of gristle to chew on, lately. The Alberta Government has announced two major policies related to natural resource management; one is new and one is a re-tread.

The new **Land Use Framework**, released last May in draft form, has now been finalized following a few months of public review and comment. This policy establishes seven major land-use regions in the province and sets the stage for regional land-use plans to be prepared. Regional advisory committees will be established to provide stakeholder input to these plans. The plans will guide provincial and municipal land-use planning and decision-making. The news release claims that "...the final Alberta Land-use Framework will ensure future land development considers cumulative environmental impacts as well as social and economic factors." Have we ever heard that from a government before? Anyway, it seems like they've established a reasonable direction, so it is up to organizations like ours to help them down that path. Early next year, the Alberta government will be announcing more details about the framework's implementation plan and the terms of reference for these regional plans.

In November, the Alberta Government re-affirmed its commitment to Alberta's main environmental policy regarding water management, called "**Water for Life**," originally adopted five years ago. The renewed strategy is based on three desired outcomes: a safe, secure drinking water supply; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy. The Alberta Water Council, an independent advisory body, had recently conducted an assessment of Alberta Government's progress with *Water for Life*. They found that, over the past five years, less emphasis had been placed on achieving the goal of Healthy Aquatic Ecosystems and, as a result, it is behind schedule. Surprised? With the renewed Gov't commitment, Alberta CSEB members will want to monitor progress towards this all-important goal.

Check out both policies via Alberta Environment's website: <http://www.environment.alberta.ca/index.html> □

Saskatchewan News

Submitted by: Joseph Hnatiuk, CSEB National Director, Saskatchewan Region

I have been involved with the National Canadian Environmental Network (RCEN), Environmental Caucus, providing input regarding numerous issues including uranium. In that regard, I attended the dialogue session "Moving Forward Together: Designing the Process for Selecting a Site." The session was sponsored by Nuclear Waste Management Organization and facilitated by Stratos Inc. I went as a representative of CSEB, Saskatchewan chapter. Other National tasks included attending a DFO/EC hosted two day workshop discussing "The Role of Science in Fisheries Habitat Management and Habitat Compliance Implications."

In addition, in the last several months, the RCEN environmental caucus that I am part of initiated a process

that will result in sponsoring a workshop in Alberta/Saskatchewan that will inform the public about the *Canadian Environmental Assessment Act* and solicit information on how participants feel the federal process is working from a public perspective. Secondly, the workshop will let the public know about the upcoming Seven Year Review, why they should be involved and how they may be able to participate.

Further, in the past year, I have also been on a conference planning committee that is organizing a Strategic Environmental Assessment conference planned for June 2009 at Mount Allison University in Sackville, New Brunswick.

All in all it has been a very busy and productive year, and the CSEB National and Saskatchewan Chapter have received very positive National and International exposure through my involvement. □

AGM for the CSEB Saskatchewan Chapter

Submitted by: R.J. Stedwill, CSEB Chair, Saskatchewan Chapter

The last AGM for the CSEB Saskatchewan Chapter was held in October 2008. Prior to that, the executive has met on a number of occasions, approximately four (4), to discuss issues germane to Saskatchewan, its environment and how best the Saskatchewan Chapter can address the issues.

Certainly, one of the foci has been how the new Saskatchewan Party will address the expanding resource activity in the Province, namely the development and exploitation of the province's oil sands in the northwest; how it compares with the extraction process used in Alberta, as we know these deposits are deeper and will not be accessed by strip mining as is done in Alberta. However, this activity may slacken off with the downturn in the economy and falling oil prices. Further, demand for the Province's potash continues to increase, which includes the development of a new mine; the continuing debate on uranium mining, and added value by refining and processing in the province because of the demand for the product, and the continuing issue of greenhouse gas emissions from the usual coal burning production of electricity. Although SaskPower continues to address CO₂ capture, I feel that a nuclear generator is still in Saskatchewan's future; although there still remain pockets of opposition.

We continue to monitor all of the issues identified above through our government sources and contacts, as well as published reports from the government itself and environmental issue think tanks, such as the Pembina and C.D. Howe Institutes.

We must encourage our local biologists and environmental types to become actively involved. And although there is reluctance by some because of their respective employers, there are a few of us who have retired and have no official association with potential conflicts of interest, or in some cases, "biting the hand that feeds us."

To summarize, although the province is now considered a "have" province, we must be diligent in our efforts to preserve the province's environment in the face of expanding exploitation of its natural resources and the giddiness associated with a seemingly expanding provincial coffer. We would be remiss in not learning from the missteps of other jurisdictions in similar circumstances, but in the absence of volunteer resources from within the Saskatchewan Chapter of the CSEB; I am concerned that we may not be terribly effective. □

Ontario News

Submitted by: Wendy Thomson

For this edition of the newsletter, I asked Ontario members to submit information on what they are working on right now, or just general input on what they consider important or interesting in Ontario's environment. Here are some responses.

From Fred Granek, Vice President Toronto Region Sustainability Program, Ontario Centre for Environmental Technology Advancement (OCETA) - A couple of items to note in Ontario from OCETA - North York General Hospital (a client of OCETA's Toronto Region Sustainability Program) won the Canadian Council of Ministers of the Environment Pollution Prevention Award for its demonstrated commitment to environmental sustainability through a number of initiatives. In addition the Ministry of the Environment has provided OCETA a \$150,000 grant for 2008/2009. This will allow OCETA to promote the reduction of toxics including the reduction of hazardous waste generated by small and medium-sized manufacturers in the Greater Toronto Area by embracing sound pollution prevention practices.

Douglas Kennedy is an Environmental Technologist with Green Side Up Environmental Services - an ecological contracting company specializing in natural resource management and the environmental science industry. Recent projects he has been working on include species at risk marsh bird monitoring for the Trent Severn Waterway, stream bank stabilization with root wads (consultation and supply of materials) for OFAH projects, several Environmental Impact Studies (EIS)/ Natural Heritage Evaluations (NHE) and native plant supply and installation for the Mississippi Valley Conservation Authority and Otonabee Region Conservation Authority stream bank restoration projects.

Wendy Thomson Ontario Director of CSEB notes - a recent report released by the David Suzuki Foundation has discovered that Ontario's Greenbelt contributes \$2.6 billion worth of non-market ecological services to the province each year, averaging \$3,487 per hectare. This figure should help remind decision makers to appreciate the value and natural benefits of the greenbelt to both the local economy and population. I am currently working on revitalizing the Womens Environmental Alliance in Ontario - a social

networking group for environmentally-minded women.

If you have a submission for the next edition please contact Wendy Thomson at wendy@exworld.org

Seasons Greetings and Happy Holidays to all CSEB Ontario members! □

Atlantic News

Submitted by: Pat Ryan, CSEB Newfoundland & Labrador Contact, Past President CSEB (1992-96, 2004-05)

Regional Report - Newfoundland and Labrador

The Newfoundland and Labrador membership has not met as a Chapter for quite some time. However, biologists here are active in a number of non-governmental organizations. These include the salmon preservation associations of eastern and western Newfoundland (SPAWN and SAEN), Newfoundland and Labrador Environment Network (a branch of the Canadian Environmental Network with 40+ member groups), Newfoundland and Labrador Environmental Industry Association, and a number of smaller groups across the province.

There appears to be an increasing number of important environmental problems in the province which suggests an increasing need for the input of professional biologists. For example, the recovery of the Atlantic cod continues to be of outstanding concern since the moratorium of 1992. The northern invasion of green crab (*Carcinus Maenas*) to the south coast of the island is becoming a significant topic for the fishing community. A dramatic decline in caribou herds across the island has been concurrent with the arrival and dispersion of coyotes from the mainland. Major resource developments, such as offshore oil collection and refining, mining and smelting with aquatic waste disposal, and the generation of hydro-electricity from the Lower Churchill River, all have major environmental costs. Climate change is here.

Atlantic Chapter News - Nova Scotia

Submitted By: Patrick Stewart, CSEB Atlantic Director

As Nova Scotia Director, I was involved in planning for the Vancouver conference and regular CSEB conference calls. CSEB still needs members in the area to take up the cause of expanding our membership and holding more meetings in the area. The National conference held in Halifax last year (2007) had a moderate success for very little effort and it should be possible to organize such meetings on a small scale with regularity. Any Nova Scotia members are encouraged to contact me or other members of the executive to help to get the local chapter moving.

Tidal Power Projects Progress

Tidal power demonstration projects in New Brunswick and Nova Scotia have proceeded through the initial stages since both provinces committed to supporting tidal energy projects early in 2008. New Brunswick recently (mid-November) released its Strategic Environmental



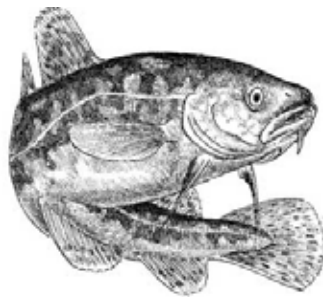
Assessment, including the text of comments made at public consultations. Nova Scotia's project has selected sites for up to three commercial demonstration turbines installations. A firm date for New Brunswick's project is unavailable while the Nova Scotia project may have turbines in the water as early as the end of 2009.

Merger of Two of Canada's Largest Environmental Consulting Firms

Stantec, an Edmonton-based national engineering and environmental firm purchased Jacques Whitford Environmental, one of Canada's largest environmental consulting firms based in Nova Scotia, with the deal to be finalized in January. Jacques Whitford is the largest environmental consulting firm in Atlantic Canada, and originated here. The company has 1,700 employees across Canada and internationally, many of whom belong to CSEB.

Outlook Grim for Cod in Gulf of St. Lawrence

Atlantic cod will disappear from the southern Gulf of St. Lawrence within 20 years if fishing continues at current rates. Even if fishing were entirely curtailed, the cod in this area would die out within 40 years. These are the findings of a new study of cod stocks' vulnerability under several scenarios by scientists with Fisheries and Oceans Canada, published by Douglas P. Swain and Ghislain A. Chouinard of the Department of Fisheries and Oceans in the Canadian Journal of Fisheries and Aquatic Sciences [Can. J. Fish. Aquat. Sci. 65(11): 2315–2319 (2008)].



Following is an abstract of their research works:

Abstract: Atlantic cod (*Gadus morhua*) was the dominant demersal fish and most important predator in the southern Gulf of St. Lawrence ecosystem as recently as the 1980s. However, productivity of southern Gulf cod has declined,

and the population is no longer viable even in the absence of fishing. We conducted population projections taking into account uncertainty in current abundance-at-age and uncertainty or variability in each of the components of population productivity (i.e., rates of recruitment, individual growth, and adult natural mortality). We defined extirpation as a spawning stock biomass less than 1000 t (<0.3% of historical levels). Based on these projections, at its current level of productivity, this population is certain to be extirpated within 40 years in the absence of fishing and in 20 years with fishery removals at the level of the total allowable catch in 2007 and 2008 (2000 t). Elevated natural mortality of adult cod (M) is the main factor contributing to the low productivity of this stock. Because M appears to be increasing, our projections are likely overly optimistic. □

The CSEB offers members reduced rates for printed copies of the NRC Research Press scientific journals including the Canadian Journal of Fisheries and Aquatic Sciences, Canadian Journal of Zoology, Canadian Journal of Forest Research and several others. The Society rates are generally \$150 to \$200 cheaper than the general subscription rate.

If you are interested in knowing more about the reduced rates for these journals, please check the web site at www.cseb-sceb.org

Territories News

By Anne Wilson, CSEB 1st Vice President

Territories Director's Report

Greetings all!

In the North we have seen some drop in the pace of development recently, and that affects the level of attention that is focused on environmental work and issues. In contrast to a year ago, prices for oil and metals have dropped considerably, and in some cases proponents are simply parking the projects until economics improve. That said, there are some interesting environmental assessments underway, which will keep us busy over the winter!

Project Updates:

Mining:

There are two mining projects in the scoping stage of environmental assessment: Tyhee NWT Corp.'s Yellowknife Gold Project, and Canadian Zinc Corp.'s Prairie Creek Mine. Both sites have considerable history associated with them.

The Tyhee property is adjacent to the historic Discovery Mine site, and the company proposes to develop two open pits in the area. The Prairie Creek Mine was constructed in the early 1980s, but abandoned just before completion and commissioning when the owners went bankrupt when silver prices collapsed. It sat as a time capsule for many years, until the current proponent purchased the leases in the 1990s. Development of the property is highly controversial, as it is located just north of the current Nahanni National Park site. On the other end of mine life, the Giant Mine site is in the remediation phase, and this environmental assessment is also in the scoping stage.

The Gahcho Kue Diamond project environmental assessment seems to have stalled out, with the Developer's Assessment Report now postponed to late 2009.

Fortune Minerals has applied to develop the NICO cobalt-gold-bismuth property, which lies 160 km northwest of Yellowknife, and should be referred to environmental assessment in the near future.

Tamerlane Ventures Inc. has received land use permits for their zinc/base metal project near Pine Point, NWT, but is still awaiting their water licence to start construction.

In Nunavut, the Meadowbank Gold Mine has been under accelerated construction, and has had turbidity issues to deal with in connection with dyke construction. Agnico-Eagle Mines Ltd. explored a range of options for in-lake settling, and tried an innovative method with some success.

The Doris North gold project has been sent back to the drawing board by new owner Newmont Mining Corp. A regional mining approach is being developed, and this makes much more sense than proceeding with a 24 month mine life.

The environmental assessment has started for Sabina Silver Corp.'s proposed Hackett River Mine (lead, silver, copper, lead, and gold) in Nunavut, although commodity prices may delay this going forward. The assessment is currently in the scoping phase.

Activity has slowed down at Zinifex's High Lake base metal property, as the company turns its focus to the more economic Izok Lake property (now as OZ Minerals following a merger with Oxiana). However, with depressed zinc prices, we do not expect project submissions in the foreseeable future.

Things are similarly quiet at Baffinland Iron Mines Corp. iron ore property at Mary River (north Baffin Island), as they work up feasibility estimates.

Exploration and feasibility work continues for uranium targets near Baker Lake, and a project description has been submitted for mine development at the Kiggavik uranium property.

Taltson Hydro Expansion

The NWT Energy Corporation proposes to increase electricity production on the Taltson River system, with expansion of the existing facility plus construction of a 435 km long transmission line to the diamond mines. The environmental assessment is underway, with the Developers Assessment Report expected late 2008.

Transportation:

The proposed Bathurst Inlet Port and Road has been withdrawn from environmental assessment by the proponent, given a slowdown in activity in the North and the fact that one of the potential clients has decided to build their own road.

Oil & Gas:

Hearings for the Mackenzie Gas Project wound up over a year ago, and the Joint Review Panel's report is long overdue. Industry and stakeholders are uniformly unhappy with the recent announcement by the panel that the report would be released in Dec. 2009.

Municipal:

Work progresses on the Canada-wide Strategy for the Management of Municipal Wastewater Effluent. Under the proposed Strategy, the North is being given a five year period to determine how systems, which face challenges of extreme climatic conditions, infrastructure limitations, and logistics, can meet national performance standards. This summer the Northern Working Group again 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. Further information on the Strategy is available on the CCME website at: http://www.ccme.ca/ourwork/water.html?category_id=81

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 here, but I'd be happy to learn 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.

No northern notes would be complete without comments on the weather. Just so you don't feel sorry for us as the coldest, darkest time of the year draws near, I'll note that November temperatures were 4.3°C above normals, but we received over twice the normal precipitation amounts! I wish each of you a restful and joyous Christmas, and all the very best for 2009! ☐

Caribou Undergoing Mysterious Decline

*Submitted By Anne Wilson, CSEB 1st Vice President
Reprinted From CBC, 2 Dec. 2008*

A new study of one of Canada's largest caribou herds seems to confirm fears that it is joining other such herds in the western Arctic by undergoing a steep and mysterious population decline.

The massive Beverly herd, which roams the tundra from northern Manitoba and Saskatchewan and well into the Northwest Territories and Nunavut, once numbered about 276,000 animals. But a just-released survey suggests the number of caribou cows on the calving grounds of the massive Beverly herd have fallen by a stunning 98% over the last 14 years.

NUMBERS DECLINING

Aerial spotting teams found only 93 cows as they flew their transect lines over the calving grounds on the tundra west of Baker Lake, Nunavut, this summer.

In 1994, crews counted 5,737 cows on those same lines. The numbers have been declining ever since: 2,639 in 2002 and 189 in 2007.

Worse, the herd's birth rate is now less than one-fifth its traditional levels. Spotters counted only 15 calves for every 100 cows instead of the usual 80.

"It's a very, very sharp downward trend," said Ross Thompson of the Beverly and Qamanirjuaq Caribou Management Board, which oversees the herd. "It is a concern that the herd has shown that few numbers."

The survey wasn't intended to provide a population count, but does provide an index of herd health. The Beverly herd now appears to have almost certainly joined the other five of the eight main western Arctic eight herds that appear to be in serious, long-term decline.

The Bathurst herd, 472,000 strong in 1986, has lost about three-quarters of its strength since then. Since 1989, the 178,000-animal Porcupine herd has fallen off by 30 to 40%.

The smaller Cape Bathurst, Bluenose East and Bluenose West herds have all fallen by at least a third. Studies are now being completed on the Qamanirjuaq and Ahik herd.

Nobody has a good explanation, said Thompson. "There isn't any one factor that anybody can identify," he said. "Something has happened over the years."

Some suggest climate change, by altering the delicate timing of spring thaw and calving, is playing a role. Others point to increasing industrial activity on the tundra, noting the Beverly and Qamanirjuaq's calving grounds are home to nearly 1,000 mineral leases.

And some say modern hunting methods are crimping the ability of the herds to recover.

The N.W.T. conducted surveys on herds adjacent to the Beverly herd and found no evidence that large numbers of animals were simply shifting from one herd to the next, said Thompson. □



Books of Interest

How to Write and Illustrate a Scientific Paper, 2nd Edition, Björn Gustavii. Cambridge University Press. 2008.

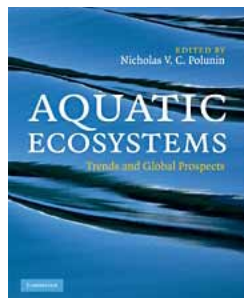


This second edition of *How to Write and Illustrate a Scientific Paper* will help both first-time writers and more experienced authors, in all biological and medical disciplines, to present their results effectively. While retaining the easy-to-read and well-structured approach of the previous edition, it has been broadened to include comprehensive advice on writing

comprehensive theses for doctoral degrees, and a detailed description of preparing case reports. Illustrations, particularly graphs, are discussed in detail, with poor examples redrawn for comparison. The reader is offered advice on how to present the paper, where and how to submit the manuscript, and finally, how to correct the proofs. Examples of both good and bad writing, selected from actual journal articles, illustrate the author's advice - which has been developed through his extensive teaching experience - in this accessible and informative guide.

Origins--Selected Letters of Charles Darwin, 1822–1859. Anniversary edition. Frederick Burkhard, ed. Cambridge University Press. 2008.

Charles Darwin changed the direction of modern thought by establishing the basis of evolutionary biology. This fascinating selection of letters, offers a glimpse of his daily experiences, scientific observations, personal concerns and friendships. Beginning with a charming set of letters at the age of twelve, through his university years in Edinburgh and Cambridge up to the publication of his most famous work, *On the Origin of Species* in 1859, these letters chart one of the most exciting periods of Darwin's life, including the voyage of the Beagle and subsequent studies which led him to develop his theory of natural selection. Darwin's vivid writing style enables the reader to see the world through his own eyes, as he matures from grubby schoolboy in Shropshire to one of the most controversial thinkers of modern times. This is a special Anniversary Edition of the best-selling Burkhardt book.



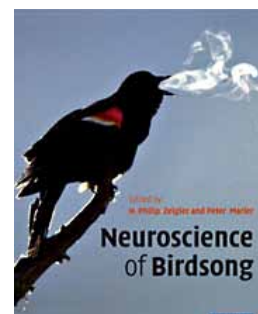
Aquatic Ecosystems Trends and Global Prospects Nicholas V. C. Polunin. Cambridge University Press. 2008.

Concern about future supplies of fresh water to meet the full range of human needs now comes very high on the priority list of global societal issues. An overarching

issue, which this book addresses, is whether global climate change is a dominant driver of change in the structure and function of all natural water-based ecosystems, or whether direct human population growth and accelerated consumption are playing an equal or greater role. This book divides the whole aquatic realm into 21 ecosystems, from those on land (both saline and fresh water) to those of the open and deep oceans. It draws on the understanding of leading ecologists to summarize the state and likely condition by the year 2025 of each of the ecosystems. Written for academic researchers and environmental professionals, the aim is to put the climate change debate into a broader context as a basis for conservation science and planning.

Neuroscience of Birdsong. H. Philip Zeigler and Peter Marler. Cambridge University Press. 2008.

Speech has long been thought of as a uniquely defining characteristic of humans. Yet songbirds, like humans, communicate using learned signals (song, speech) that are acquired from their parents by a process of vocal imitation. Both song and speech begin as amorphous vocalizations (subsong, babble) that are gradually transformed into an individualized version of the parent's speech, including dialects. With contributions from giants of the field, as well as up-and-coming researchers who represent the future of this field, this book provides a comprehensive summary of birdsong neurobiology, and identifies the common brain mechanisms underlying this achievement in both birds and humans. Written primarily for advanced graduates and researchers, *Neuroscience of Birdsong* gives an introductory overview covering song learning, the parallels between language and birdsong and the relationship between the brains of birds and mammals, and provides information on producing, processing, learning and recognizing song, as well as with hormonal and genomic mechanisms.

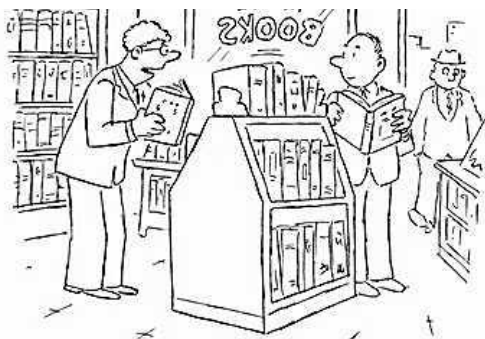


The Algal Bowl - Overfertilization of the World's Freshwaters and Estuaries. David W. Schindler, John R. Vallentyne. University of Alberta Press, 2008.

The greatest threat to water quality worldwide is nutrient pollution. Cultural eutrophication by nutrients in sewage, fertilizers, and detergents is feeding massive algal blooms, choking out aquatic life



and outpacing heavy metals, oil spills, and other toxins in the devastation wrought upon the world's fresh waters. Renowned water scientists, David W. Schindler and John R. Vallentyne, share their combined 80 years of experience with the eutrophication problem to explain its history and science, and offer real-world solutions for mitigating this catastrophe in the making. For those who have lost sight of Vallentyne's 1974 first edition, Schindler's fully revised and expanded edition is an unambiguous road map for change. Alanna Mitchell, Literary Review of Canada says: "Schindler and Vallentyne describe in minute detail how and why this 'cultural' eutrophication, or human-caused plant-food glut, has come to be, giving a satisfying nod to the scientists who began working on the phenomenon during the last century. There is a lucid examination of several bodies of water that are slimed with algae and some attempts at recovery, as well as a beautiful description of several lakes where these authors and other ecologists have performed whole-lake experiments to understand better how the whole works. It is impeccable empirical science, written with vigour and precision. Among its other charms, this is an excellent textbook. But this is a cloak of many colours. The Algal Bowl is also a work of scientific poetry.... Even more compelling, though, is the book's touching show of faith in *Homo sapiens* and our ability to face up to the disastrous changes we have wrought to the Earth's capacity to support life. The final chapter puts the issue of lake eutrophication into the larger puzzle of planetary change and avers that if we can tackle this piece, we can tackle the whole thing. It is a prescription for hope. It is touching because few planetary diagnosticians know the full state of the illness better than Schindler. He may be a world expert on lakes and their algal colonies, but he is also one of the world's experts on how the planet works as a whole. From the lake system to the planetary system is not such a big leap for someone of Schindler's intellect.... And when Schindler tells us, as he does in the penultimate paragraph of this book that the time to begin considering the social changes necessary to protect freshwater is 'NOW' (his emphasis), I think we had better listen." □



"Read any good book reviews lately?"

INVITATION TO JOIN THE ASSOCIATION FOR ENVIRONMENTAL STUDIES AND SCIENCES

Faculty, students, and education-minded environmental professionals are encouraged to join the newly formed Association for Environmental Studies and Sciences (AESS; <http://aess.info>). A major aim of AESS will be to fill an important gap in our ability to facilitate understanding of environmental science, policy, management, ethics, and history, by providing a professional association that supports professionals involved in interdisciplinary environmental research, teaching, and problem-solving. AESS is an independent faculty-and-student-based professional association in higher education, designed to provide its members with the latest knowledge and tools to create better courses, strengthen research, develop more satisfying careers, harness the power of a collective voice for the profession, and enjoy each other's company at national and regional meetings. AESS facilitates the sharing of knowledge and experience in ways that enhance professional development of its members and add value and visibility to their contributions within higher education and environmental decision-making.

The annual membership fee is \$30; \$15 for students. A quarterly electronic newsletter has already been established, and a flagship journal will be launched in 2009. The next annual meeting will take place next year in Madison, Wisconsin (Oct 8- 11, 2009); a call for proposals will be distributed shortly.



**"I was going to get you an iceberg
for Christmas...but it melted."**

Okanagan Basin Studies: Problems, Plans, Actions

*Dr. T.G. Northcote, Professor Emeritus,
The University of British Columbia*

INTRODUCTION

The Okanagan-Similkameen Basin lies mostly in south-central British Columbia (Fig. 1) with a small extension into the state of Washington, U.S.A. Compared with other major basins in B.C. containing large lake watersheds, such as the Fraser and Kootenay basins, that of the Okanagan system is not large but it has generated much limnological and public interest for well over eight decades. During early deglaciation some eight thousand years ago, the Okanagan Basin

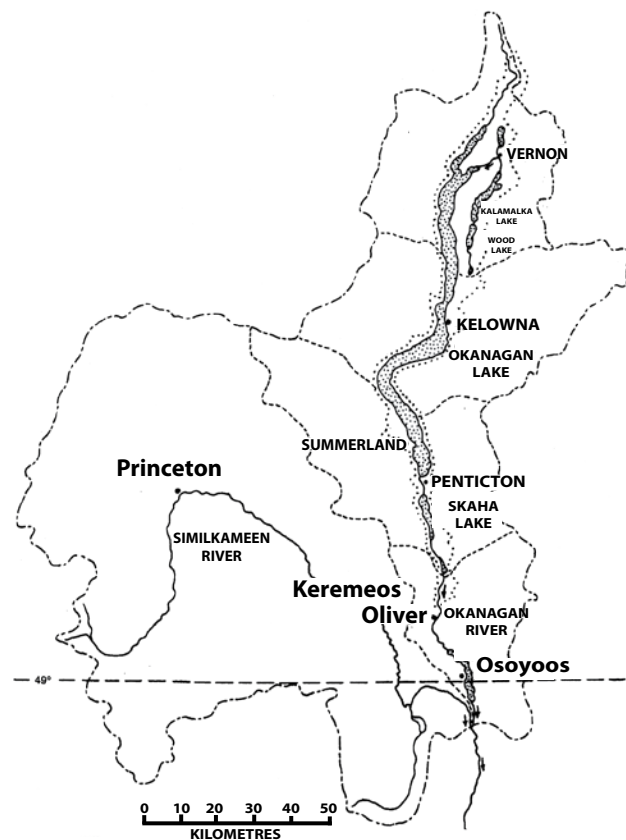
contained much larger Lake Okanagan, ice-blocked near the south end of Vaseux Lake to an elevation of about 500m above present day and extending north to near the city of Armstrong. Furthermore another large ice-dammed lake on the middle Fraser River system near Spences Bridge at one period probably joined that of Lake Okanagan at its northern end, forming an even larger early post-glacial lake. Over the following centuries it periodically dropped in elevation forming a series of lowering lake shorelines (terraces) still evident today in some locations (Nasmith 1962). See also Vidmanic and Ashley (1998) for Okanagan Lake paleolimnology. Obviously the Okanagan - Similkameen Basin of today had a complex history dating back several thousand years before sizeable human colonization. In recent decades, rapidly increasing populations in some parts of the Basin have resulted in many problems.

PHYSIOGRAPHY AND HUMAN POPULATION TRENDS IN THE BASIN

The Okanagan River system arises at small Ellison Lake about 15 km northerly of Kelowna, B.C. Flowing north it then enters Wood and Kalamalka lakes before turning westerly near Vernon, B.C. to enter an arm of large Okanagan Lake (Fig. 1). At its Penticton outlet it flows south in a highly straightened and deepened channel about 5 km into Skaha Lake. Attempts to connect oxbow remains of the former convoluted river with highly productive marshlands in this section would be difficult and costly because they are perched above the deepened channel. South of Vaseux Lake it again flows through a partially channelized section into the north end of Osoyoos Lake whose southern third lies in Washington, U.S.A. Thereafter it is called the Okanagan

River and flows some 185 km southwesterly into the Columbia River near Wenatchee. About 67 km south of its exit from Osoyoos Lake, the Okanagan River is joined by the Similkameen River, most of whose drainage lies in B.C. (Fig.1). The six major Okanagan-Similkameen Basin lakes vary greatly in their morphometric features, which combine to give a wide range in their theoretical water residence times (Table 1).

Fig.1



By far the largest lake in surface area, maximum and mean depth is Okanagan, followed by Kalamalka with these features interacting in an overall low rainfall region to give long water residence times – over 70 years for Kalamalka Lake and nearly 60 years for Okanagan Lake; on the other hand for Vaseux and Osoyoos lakes, their residence times are well under a year, a result mainly of their low mean depths. There is only one sizable lake in the U.S.A. watershed, that of Palmer Lake with a small drainage basin and surface area so its water residence time would at most be a few years.

Table 1. Morphometric Features of the Mainstem Okanagan River Basin Lakes

Lake	Surface area km ²	Maximum depth metres	Mean depth metres	Water residence line years ^b
Wood	9	34	22	19.8
Kalamalk ^a	26	142	59	71.3
Okanagan	348	242	76	59.7
Skaha	20	57	26	1.2
Vaseux	3	27	6	0.03
Osoyoosa	23	63	14	0.7

^a B.C. plus U.S.A parts,

^b theoretical; calculated from total lake volume & mean annual inflow (Stockner & Northcote 1974)

In addition (Table 2), there are nearly 200 small lakes in the Okanagan River basin, and over 100 small flowing waters (creeks, streams, rivers) that are not included in Table 1 or shown in Figure 1.

In the early 1800s, the native First Nation people had an Okanagan area population of about five thousand, which did not increase appreciably until the late 1800s when the major influx of mainly European and North American origin people came into the area. Thereafter, total population of the region slowly reached over 100 thousand by the 1950s, over 200 thousand by 1990 (Northcote 1996, Fig. 2), and with just three cities (Kelowna, Vernon and Penticton) accounting for about 175,000 people by 2006 (latest census data available) with sharply increasing growth rates for the first two cities. Furthermore, in summer their populations and that of surrounding areas could almost double. Nevertheless, over 250,000 people must now reside in the Okanagan-Similkameen Basin, with numbers very soon approaching 300,000.

Table 2. Number of Small Okanagan – Similkameen Basin Lakes and Streams

Region	Lakes	Streams
B.C.	189	107
U.S.A.	7	3
Total	196	110

THE BASIN STUDIES AND THEIR MAIN FOCI

The first major study on Okanagan Lake and some of its tributary systems was conducted in the mid 1930s, organized by two outstanding Canadian limnologists, Drs. W.A. Clemens and D.S. Rawson. Though focused mainly on Okanagan Lake itself, some studies were also made on several tributary lake systems (Clemens, Rawson, and McHugh 1939). Even then there were problems arising in the system, some in part from poor results of hatchery-reared rainbow trout stocking.

In 1948 Dr. Clemens initiated a large-scale experimental study on effectiveness of rainbow trout stocking in a chain of small lakes in a tributary (Allison Creek) to the Similkameen River system northwest of Princeton (Fig. 1). Some of the lakes were treated with rotenone to remove all fish species and later stocked with rainbow trout, while others were kept as quasi-controls containing several species of cyprinids, suckers, and sculpins in addition to rainbow trout. Unfortunately, that year a severe late spring flood washed out many of the fish movement barriers between the study lakes in the chain, greatly damaging effectiveness of the study. I was involved during late spring of 1949 and 1950 in attempts to salvage some results from this experiment but little of value could be obtained. As a follow-up study, the interrelations among fish populations of Skaha Lake and their significance in the production of rainbow trout there were examined (Ferguson 1949).

In 1949 the B.C. Game Commission started a province-wide several year survey of lakes and their tributaries to better direct fish and fisheries management practices then being used. Some 200 lake systems were surveyed (15 in the Okanagan Basin) mainly during late spring to early autumn, collecting a broad set of basic physical, chemical, and biological data useful in directing their production processes as well as developing better fisheries management practices (Northcote and Larkin 1956; Larkin and Northcote 1958).

In the summers of 1960 and 1961, census techniques for stream fish populations by skin diver teams were developed in the Similkameen River and accuracy evaluated there in one of its side channels as well as elsewhere by diver, shoreline, and helicopter counts of large rainbow trout adults (Northcote and Wilkie 1963).

General features of Okanagan southern interior plateau lowland and highland waters were reviewed by Northcote and Larkin (1963). In the early 1970s, problems of

eutrophication and pollution in major Okanagan Basin lakes were becoming more severe resulting in setting up a large series of task forces via the Canada – British Columbia Basin Agreement to evaluate problem severity and develop solutions for rectification. I was assigned to “Task 115 – fish populations and analysis,” which was to (1) use fish to assess severity of eutrophication and pollution in the major Okanagan Basin lakes; (2) estimate present abundance of kokanee (non-sea going sockeye salmon) spawning stocks; (3) check selected fish species for presence of chlorinated hydrocarbons, heavy metals and other possible contaminants, following up on the recent use of fish as eutrophication indicators (Larkin and Northcote 1969).

By 1971 plans were completed for a large-scale and long-term study of water quality and related problems in the Okanagan Basin, with funding and other support coming from both federal Canada and provincial B.C. agencies. This resulted in a long series of relevant studies (see Anonymous 1971a, b; O’Riordon 1971; Prince and Marr 1971; Blanton 1972; Blanton and Ng 1972; Leach and O’Riordon 1972; Anonymous 1972a, b, c, d, e, f, g, h, i; Hall 1972; Koshinski 1972a, b; Koshinski and Andres 1972; Northcote et al. 1972; Stockner et al. 1972a, b; Willcocks 1972; Anonymous 1973; Blanton 1973; Williams 1973; Anonymous 1974 a, b, c, d, Northcote et al. 1974; Stockner and Northcote 1974. See also Henry 1978, Marr 1979, Truscott and Kelso 1979, Bryan 1990, and Harvey 1995 for later relevant contributions to this series).

Differential effects of phosphate loading and subsequent eutrophication were compared in large Okanagan Lake, intermediate-sized Skaha Lake, and much smaller Wood Lake, all in the same drainage basin (Fig. 1). There were only minor effects in Okanagan Lake, some characteristic eutrophication effects in Skaha Lake, and most intense eutrophication in Wood Lake (Northcote 1973).

Because of still intensifying eutrophication and pollution problems, a series of task forces were set up to evaluate problem severity and develop solutions for correction. I was assigned to “Task 115 – fish population and analysis,” which was to:

- (1) use fish to assess severity of eutrophication and pollution in the major Okanagan Basin lakes
- (2) estimate present abundance of kokanee (non-seagoing sockeye salmon) spawning stocks
- (3) check selected fish species for presence of chlorinated hydrocarbons, heavy metals, and other possible contaminants, following up on the use of fish as eutrophication indicators (Larkin and Northcote 1969).

Fish relative abundance, average length, weight-length regression, growth rate, and a few other of their characteristics were used as eutrophication indices in the Okanagan basin lakes (Northcote et al. 1972). All pointed to Skaha Lake being most eutrophic, followed by Osoyoos and Vaseux lakes, with Kalamalka and Okanagan lakes being least eutrophic. Fish characteristics suggested a marked increase in eutrophication of Skaha Lake since 1948, but little change in Okanagan Lake since 1935. Approximately half a million kokanee in 1971 spawned in Okanagan basin streams (77% in Okanagan, 12% in Kalamalka, and 7% in Skaha), with about another half million spawning along special sections of Okanagan Lake shores, but not in other basin lakes. High DDT concentrations (15 – 50 ppm) were found in Kalamalka Lake rainbow trout and mountain whitefish, as well as in Okanagan Lake rainbow trout, with 5 ppm being the then allowable limit for human consumption. Furthermore high mercury concentrations (0.5 to 1.8 ppm) occurred in some rainbow trout and the piscivorous squawfish (now called northern pikeminnow) from Okanagan, Skaha, and Osoyoos lakes. Additional information during this period on eutrophication of several Okanagan Basin lakes is given by Saether (1970), Stein and Coulthard (1971), Saether and McLean (1972), St., John (1972), Northcote (1973), Patalas (1973), Patalas and Salki (1973), St. John et al. (1973); see also Northcote (1974), Pinsent and Stockner (1974), Stockner and Northcote (1974), Northcote et al. (1974), Parchomchuk (1978), Northcote (1979, 1980), Anonymous (1985), and Nordin et al. (1990).

The effects of mysid introductions into several Okanagan Basin lakes to enhance kokanee growth and production was at least temporarily positive in Okanagan and Skaha (Lasenby et al. 1986).

Although the UBC Westwater Research Centre focus on water and sustainable development dealt mainly with the Fraser Basin in B.C., its approach and coverage were relevant to the Okanagan Basin as well. See Dorcey (1976, 1987, 1991), Northcote and Burwash (1991).

Nearly two decades of data on the Okanagan Lake kokanee fishery were reviewed (Northcote 1991) covering their stream and shore spawning escapement, the gradual decline in angler catch per unit effort, and the gradual increase in average weight (up to about 200 g) of angler caught kokanee over the first 10 years (1971 – 1981), and a later sharp increase to over 600 g. See also Sebastian et al. (1995).

Effects on planktonic and benthic invertebrate abundance by human alteration on sections of Okanagan shoreline

near Summerland for swimming beach, highway, and boat anchorage were compared with that of natural lakeshore marsh area and found to be three to four times more abundant in the later (Northcote and Northcote 1994, 1996; Northcote 1996).

In 1995 T.G. Northcote and S. Zhang (Institute of Geography, Chinese Academy of Sciences) organized the Freshwater Sciences Session of the 18th Pacific Science Congress in Beijing around the theme "Effects of Human Population Growth on Freshwater Quality, Quantity and Biotic Systems". Some 70 papers with abstracts were set up for a five day session and 28 were assembled for external peer review and publication (*GeoJournal* 40 (1 – 2)); October 1996. Relevant here was my paper comparing effects of human population growth on the Okanagan and Fraser River systems (Northcote 1996), but several other presentations examined such effects and problems in China, Nepal, Hong Kong, Japan, Philippines, Malaysia, New Zealand, Australia, and North America.

HARD ATTEMPTS AT ACTIONS, NOT JUST "ACTION PLANS"

A major new Okanagan Lake action plan came to light as a result of the meeting in June 1995 in North Kelowna to review recent changes in Okanagan Lake nutrient loading, water quality, plankton, and salmon abundance, to develop hypotheses to explain recent decline in kokanee abundance, and to form options for their restoration (Ashley & Shepherd 1996), with a phased 20-year action plan for approval. Also relevant to this period is the report by Luecke et al. (1995).

Okanagan Lake kokanee populations, both stream and shore spawners, declined through the 1980s–1990s focussing attention on mysid harvesting, stream restoration proposals, and gaining information on their lake-shore spawning (Ashley et al. 1998), as well as an exploration of benefits, impacts and uncertainties on sockeye salmon re-introduction to Okanagan Lake (Peters et al. 1998).

In 2000, the city of Penticton organized a "Waterfront 2000 Program" with the goal to develop a coherent vision of its waterfront, which would emphasize public access to the water's edge of southern Okanagan Lake. The program had seven objectives:

- (1) Develop an action plan to integrate local waterfront initiatives and resources;
- (2) Have Penticton and the local Aboriginal Community work jointly on the program;

- (3) Have the program contribute to tourism and recreation;
- (4) Protect local environment and enhance Penticton's quality of life;
- (5) Regain the waterfront as part of the public trust;
- (6) Reach a consensus among residents, businesses, governments, advocacy groups, and visitors on the future look of Penticton's waterfront;
- (7) Commemorate Penticton waterfront as a rare historical time symbol at the start of a century and millennium.

I gave an invited presentation to the Program organizers and interested people on the importance of lakeshore areas with special reference to Penticton's waterfront. I have tried repeatedly to find out something about the present status of the Program but still have not been successful.

In early 2001 an Okanagan Lake Conference and Strategic Planning Session was held in Kelowna at which I gave an invited presentation "Sustainable development and environmental restoration: chasing unrealistic or impossible goals in the Okanagan Basin?" – which prompted active discussion along with some heated comments! Some of my opening remarks noted that we seemed to have been here before, back in the early 1970s, and that a recent announcement boasting that the Okanagan annual rate of population growth was 2.5%, the highest anywhere in B.C., surely didn't fit well with what I thought was really needed to meaningfully address the areas problems! As a result of this conference a 5 year blueprint was developed for an Okanagan Lake Action Plan (Andrusak & McGregor 2001).

In mid-March 2001 I gave an invited public address in Vernon on Okanagan Lake and river shorelines, noting their natural high productivity where undeveloped and the effect of long term human "development" elsewhere in the world and especially China and Japan where I recently had the opportunity to examine this in detail with local limnologists. Of 1066 lakes in Hubei, "the province of a thousand lakes" China, 757 had been completely drained in the 1960s and 1970s for agricultural land! Poyang Lake, the largest in China, lost over 1000 km² (nearly three times the area of Okanagan Lake) by agricultural draining. In Japan there is now great concern over loss of natural lake shoreline with millions being spent to restore lakeshores and even to create artificial offshore islands in such lakes to increase their shoreline productivity!

In June 2001 the Okanagan Nation Fisheries Commission submitted a large-scale evaluation on an experimental re-introduction of sockeye salmon into Skaha Lake (Year 1 of

3) to the Colville Confederated Tribes (Evelyn & Hammell 2001), focused on disease risk assessment. This was followed in 2002 by a year 2 of 3 report with several major objectives and references (Anonymous 2002). Also that year the Okanagan Lake Action Plan, Year 6 (2001) Report came out (Andrusak et al. 2002) covering results from 1996 – 2001 and showing that mysid biomass in 2001 was similar to that in 1999, so a 30 % harvest rate (four-fold increase) on the population would be required to bring about a significant impact on their abundance. Although stream spawning kokanee number increased in 2001 to 67,000 (highest since 1992), the shore spawning numbers decreased by over 50 % compared to those observed in 1997.

Early in 2003 a workshop was held at UBC reviewing the nitrogen to phosphorus ratio adjustment project (Andrusak et al. 2003).

The year 3 of 3 evaluation of experimental introduction of sockeye salmon into Skaha Lake, covering 14 different contributions, came out in 2003, as did the Okanagan Lake Action Plan, Year 7 report (Andrusak et al. 2003) including 13 different subject areas.

In June 2003 I gave an invited keynote address on managing the Okanagan Basin's aquatic ecosystems, including those from the past, the present, and speculating on into the future, to the Okanagan Basin Technical Working Group International Conference in Penticton. In part this showed an almost linear sequential increase in numbers of irrigation dams and diversions from 1913 to 1993 in the B.C. Okanagan Basin as well as sharply rising human population growth curves.

The Okanagan Nation Fisheries Commission compiled three comprehensive reports on evaluation of experimental re-introduction of sockeye salmon into Skaha Lake, years 1, 2, 3 (June 2001, April 2002, May 2003), as well as that by Rae (2005) on the state of fish and fish habitat in the Okanagan and Similkameen Basins.

In 2004 (Andrusak et al. 2004), the Okanagan Lake Action Plan, Year 8 report (2003) came out covering 13 different topic areas in six chapters (priority remedial measures, monitoring programs, functional studies, large scale experiments, long-term applied research, and public communications). In addition the subject of stakeholder consultation for the Okanagan Lake Action Plan came out separately (Rae and Andrusak 2004).

In February 2005 a report covering the state of fish and fish habitat in the Okanagan-Similkameen Basin was prepared

for the Canadian Okanagan Basin Technical Working Group (Rae 2005) dealing with headwater lakes and tributary streams north of Penticton, the main valley lakes (Okanagan, Skaha, Osoyoos), tributary streams south of Okanagan Lake (Vaseux and Inkaneep creeks), and three of the Okanagan River dams (Penticton, McIntyre, Drop Structure #13), as well as the Similkameen Basin lakes, tributary streams, and the river itself. The year 9 (2004) Okanagan Lake Action Plan Report also was published (Andrusak et al. 2005).

The Year 10 of the Okanagan Lake Action Plan Report was available (Andrusak et al., 2006), including priority remedial measures, seven major areas of the monitoring program work, main functional studies – (a) the Okanagan Lake experimental commercial mysid fishery, and (b) shore spawning kokanee fry contribution for the brood year 2004; other functional studies; and also public communications. In 2006 a large informative colour map of the whole Okanagan Basin Waterscape (Turner et al. 2006) became available and was widely distributed to the public as well as many schools throughout the basin.

Then the Okanagan Water Stewardship Council, an ad hoc technical committee to the Okanagan Basin Water Board was formed, with the Council goal of capitalizing on local water management expertise to improve long-term decision making in the light of current trends toward rapid growth, climate change, and uncertain water supplies in the Okanagan Basin. This Council published in 2008 the Okanagan Sustainable Water Strategy Action Plan 1.0, a 104 page main document, opening with a 16 page Executive Summary. Surprisingly I could not find anywhere direct reference to the many previous studies and some actions on Okanagan Basin water problems, except for a couple by Rick Norden and one by Rowena Rae. So here we go again probably into a further series of strategies and action plans. These are all very well if followed up by strong series of effective actions!

Most recently, the 2008 report on the Okanagan Lake Action Plan Years 11 (2006) and 12 (2007) came out (Andrusak et al. 2008), representing the final one in a long series of such reports started in 1996, and largely focused on why there was the sharp decline in the lake kokanee population from the 1970s to 1990s.

It is encouraging to see in this report the steps that have been taken and the progress made in water recovery for Mission Creek, the largest tributary to Okanagan Lake, and to some extent for Trout Creek, the second largest one and that

apparently with the highest potential for the lake's kokanee populations. But I have seen very low autumn discharge in it during recent autumns with water temperatures approaching upper lethal for kokanee. The report does note that during the 2003 – 2006, high temperature and low early autumn discharge period, domestic and agricultural use of several small streams caused them to be nearly dry at kokanee spawning time. Also the in-lake problem of N:P nutrient imbalance problem is discussed at length, but remains problematic and evidently is irresolvable. Research and action is now focused on mysid removal as a possible in-lake means of increasing kokanee populations.

The report also notes that kokanee shore spawning numbers have been the highest since the late 1980s but well below those of the 1970s. Indeed numbers for 2008 were nearly half those for 2007, though year to year spawner counts are subject to considerable variation. In-lake Kokanee estimates for 2006 and 2007 by acoustic and trawl surveys indicated numbers of about 10 million, showing an increasing trend since the year 2000.

In total over the seven decades since the mid 1930s, there have been more than 100 studies that attempted in several ways to gain better information on emerging problems in the Okanagan Basin, and that would help in part to bring about their effective resolution. During that long period nearly ten thousand pages were assembled, explaining where and how corrections were suggested by "action plans", and some followed up by actions. Those involved (myself included) have been very long on wordy plans and suggestions but rather short on carrying these out in the waters and over the landscapes in need! And the other Action Plan recently out – called 1.0 – indicates, I presume, more to follow. From the very beginning decades ago and continuing up to the present day, many informed and conscientious people have been involved who put forward relevant information on the Okanagan – Similkameen Basin, along with many suggestions after considerable study, as to what should be done to effect lasting corrections to the problems in this large basin, parts of which were undergoing almost exponential growth in human numbers and attending landscape modification. And thereby, not only in my opinion but in that of others with better perspectives, lies the basic key to much of the problem. Its resolution need not demand many more action plans, but instead much more strong action – difficult to bring about in the face of continued and escalating population growth being pushed in many areas of the Basin by the developer faction!

CONCLUDING COMMENTS

My association with Okanagan Basin waters began late in the 1940s and early 1950s when starting limnological studies on Okanagan Basin waters and some of their higher elevation headwaters, as well as a little later on the tributary Similkameen River.

Thereafter, I had the good fortune to join with the Westwater Research Centre forming on the UBC Campus under excellent direction of Professor Irving Fox and focusing attention first on the Lower Fraser River, close to where I grew up. See especially Dorsey (1976, 1987, 1991) who covers the uncertain future of that river and more generally the rise and fall of great expectations regarding water resource management in Canada.

Since then also my expectations for bringing about significant positive improvement for management of inland and estuarine waters in many ways have declined, as have those of some of my long-term colleagues. See especially Hartman, et al. (2000), Hartman and Northcote (2005), and Hartman (2008).

Without adding now still more literature coverage to support the need to bring scientific research closer to the many important questions being identified by policy makers, and to effecting a global revolution in conservation practice, I recommend reading the brief interview with Bill Sutherland, Miriam Rothschild Professor of Conservation Biology, University of Cambridge (see Planet Earth, Autumn 2008, pages 28-29). On being asked to explain the need for evidence-based conservation in this article, the first paragraph of his reply was: "There is a serious gap between science and practice. We have great ecological research, but most decisions are made independently of the science, while we learn little from our successes and failures. When visiting conservation projects I often pose two questions: "Why did you decide to carry out this particular intervention" and "How can others learn from your experience?" It's almost always a depressing exercise. We have also carried out research showing that few conservation management decisions are based upon the scientific literature and almost nothing is documented in a manner that is accessible to others."

A further basic causal factor of concern, especially evident around basin lakes of the Okanagan, is the continuing push by developers for higher human population growth, which often brings with it an attendant need for greater water use and serious local environmental modification.

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