



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

## *In this Issue:*

- **VIEWS ON THE PROPOSED 2020 BIODIVERSITY GOALS AND TARGETS FOR CANADA**
- **APPOINTMENT TO AMBIENT AIR QUALITY OBJECTIVES  
STAKEHOLDER ADVISORY COMMITTEE**
- **CANADA'S NORTH POISED TO CASH IN ON MINING BOOM**
- **DR. TOM NORTHCOTE: INLAND WATER STUDIES AND RESEARCH  
- A MULTI-DECADAL COVERAGE OF FISH AND FISHERIES**



# CSEB Newsletter Bulletin SCBE

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Webmaster: Shawn Martin • Email: [shmartin@eba.ca](mailto:shmartin@eba.ca)

## In this issue

National Executive & Regional Chapter Listings.....	1
CSEB Objectives/Objectifs de la SCBE .....	2
<i>National News</i>	
President's Report .....	3
Views on the Proposed 2020 Biodiversity Goals and Targets for Canada .....	3
Appointment to Ambient Air Quality Objectives Stakeholder Advisory Committee .....	5
<i>Regional News</i>	
British Columbia News.....	5
Alberta News .....	6

Saskatchewan News.....	7
Ontario News .....	8
Territories News.....	9
<i>Major Article</i>	
Inland Water Studies and Research - A Multi-Decadal Coverage of Fishes and Fisheries.....	12
Membership/Subscription Application .....	28

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**Front Cover:** North Pangnirtung Parks Canada emergency cabin, Auyuittuq National Park.

**Back Cover:** Owl River tributary, Auyuittuq National Park.

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### NATIONAL EXECUTIVE

#### President:

Robert Stedwill (2012)  
(Home) 306- 585-1854  
(E-mail) [rjstedwill@live.ca](mailto:rjstedwill@live.ca)

#### 1st Vice-President:

Anne Wilson (2012)  
(Home) 780-737-5522  
(Cell) 867-765-8480  
(E-mail) [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca)

#### 2nd Vice-President:

Dr. William (Bill) Paton (2012)  
(Work) 204-727-9783; (Fax) 204-728-7346  
(E-mail) [patonw@brandonu.ca](mailto:patonw@brandonu.ca)

#### Secretary/Treasurer:

Karen March (2012)  
(Home) 902-453-3115; (Fax) 902-454-6886  
(E-mail) [kmarch@dillon.ca](mailto:kmarch@dillon.ca)

#### Newsletter Editor:

Gary Ash  
(Work) 780-930-8666; (Fax) 780-483-1574  
(E-mail) [gash@golder.com](mailto:gash@golder.com)

#### Past-President:

Brian Free (2012)  
(Work) 780-427-7765; (Fax) 780-638-3187  
(E-mail) [bfree@cseb-scbe.org](mailto:bfree@cseb-scbe.org)

#### Membership:

Gary Ash  
(Work) 780-930-8666; (Fax) 780-483-1574  
(E-mail) [gash@golder.com](mailto:gash@golder.com)

### REGIONAL DIRECTORS

#### Atlantic:

Patrick Stewart (2014)  
(Work/Fax) 902-798-4022  
(E-mail) [enviroco@ns.sympatico.ca](mailto:enviroco@ns.sympatico.ca)

#### Québec: Vacant

#### Ontario: Vacant

#### Manitoba: Vacant

#### Saskatchewan:

Joseph Hnatiuk (Acting 2013)  
(Work) 403-524-1147; (Fax) 403-524-1148  
(E-mail) [hnaj@shaw.ca](mailto:hnaj@shaw.ca)

#### Alberta:

Joseph Hnatiuk (2014)  
(Work) 403-524-1147; (Fax) 403-524-1148  
(Cell) 403-332-1455  
(E-mail) [hnaj@shaw.ca](mailto:hnaj@shaw.ca)

#### Sheri Dalton (2012)

(Work) 780-479-9262; (Fax) 780-474-1933  
(E-mail) [sdalton@concordia.ab.ca](mailto:sdalton@concordia.ab.ca)

#### British Columbia:

Jim Armstrong (2016)  
(Work) 604-430-0671  
(E-mail) [jarmstrong@keystoneenvironmental.ca](mailto:jarmstrong@keystoneenvironmental.ca)

#### Territories: Anne Wilson (2012)

(Work) 780-951-8856  
(Cell) 867-765-8480  
(E-mail) [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca)

#### Paula C. Smith (2014)

(Work) 867-975-4631  
(E-mail) [paula.c.smith@ec.gc.ca](mailto:paula.c.smith@ec.gc.ca)

### REGIONAL CHAPTERS

#### Newfoundland & Labrador

Contact: Pat Ryan  
(Home) 709-334-2962  
(E-mail) [patrickr@mun.ca](mailto:patrickr@mun.ca)

#### Atlantic Chapter

Contact: Pat Stewart  
(Work/Fax) 902-798-4022  
(E-mail) [enviroco@ns.sympatico.ca](mailto:enviroco@ns.sympatico.ca)

#### Ontario: Vacant

#### Manitoba

Dr. William (Bill) Paton  
(Work) 204-727-9783; (Fax) 204-728-7346  
(E-mail) [patonw@brandonu.ca](mailto:patonw@brandonu.ca)

#### Saskatchewan

Chairperson: Robert Stedwill  
(Home) 306-585-1854  
(E-mail) [rjstedwill@live.ca](mailto:rjstedwill@live.ca)

#### Vice-chair:

Contact: Jeff Hovdebo  
(Work) 306-780-8107; (Fax) 306-780-8722  
(E-mail) [Jeffery.Hovdebo@dfo-mpo.gc.ca](mailto:Jeffery.Hovdebo@dfo-mpo.gc.ca)

#### Alberta

Contact: Sheri Dalton  
(Work) 780-479-9262; (Fax) 780-474-1933  
(E-mail) [sdalton@concordia.ab.ca](mailto:sdalton@concordia.ab.ca)

#### Contact: Joseph Hnatiuk

(Work) 403-524-1147; (Fax) 403-524-1148  
(Cell) 403-332-1455  
(E-mail) [hnaj@shaw.ca](mailto:hnaj@shaw.ca)

### Territories

Contact: Anne Wilson  
(Work) 780-951-8856  
(Cell) 867-765-8480  
(E-mail) [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca)

#### Paula C. Smith

(Work) 867-975-4631  
(E-mail) [paula.c.smith@ec.gc.ca](mailto:paula.c.smith@ec.gc.ca)

•Term of Directorship

**CSEB NEWSLETTER 2012**

Vol. 69, Number 3 Fall 2012

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](mailto:gash@golder.com)

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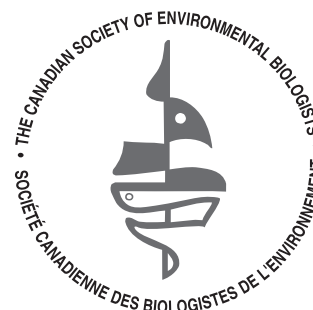
Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activités de la Société sur événements courant ainsi que les progrès qui font en sciences de l'environnement. Par un échange d'idées au niveau national, 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](mailto:gash@golder.com)

**Rédacteur en chef:** Gary Ash

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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 News

### PRESIDENT'S Report

#### Thoughts From the President

As I finish up my term as president of the CSEB, I think back over the course of the last two years and wonder at the many changes that have occurred in the world, and here in Canada. Headlines have certainly had their share of reports on armed conflicts, natural disasters, and elections fought on different themes, in municipal, provincial and federal politics. One subject that has struck home with me is the apparent contradiction between what we see, versus what our government leaders are doing, or not doing as the case may be, in preventing the changes we see. As I read about declining summer ice levels in the Arctic being the most severe ever, when it might be ice free in the summer of 2015, it doesn't sit well when I see governments minimizing environmental oversight on mega projects which will further cause our national and global environment to deteriorate.

Does financial success supersede the need to protect our environment and natural systems around us? Why does the GDP always need to grow? There must come a point where there is no possible way that the GDP can continue to grow, because the planet's ability to sustain it is gone. There are some that suggest that the tipping point has already been reached and surpassed with respect to CO<sub>2</sub> levels in the atmosphere and its impact on global warming. Arctic sea ice may be a harbinger of things to come. And yet our federal government muzzles scientists with respect to findings which are contrary to the financial agenda of the country. I know the current state of the economy affects all of us, but why was there a need to bury debilitating environmental law changes within the context of an omnibus bill (C-38), which was allegedly the budget this past spring?

I think it behooves all of us to stand up and convey our concerns to our government representatives, whether they be municipal, provincial or federal. Many Canadians, I'm sure, have their focus on the economy and how it affects their standard of living. Most governments govern based on what their constituents want. Unfortunately, in my view, our current government leaders cannot see the forest for the trees and the next election. Governing by public opinion is not an ideal solution to the environmental woes which face the planet.

Robert Stedwill  
National President

### Views on the Proposed 2020 Biodiversity Goals and Targets for Canada

Submitted by Wendy Thomson ([wendy@exworld.org](mailto:wendy@exworld.org))

By John Coombs and Leslie Adams, RCEN Biodiversity Caucus Steering Committee

On August 25th, 2012, Environment Canada requested comments on the proposed Canadian 2020 biodiversity goals and targets.

As Canada's largest Environmental Network, the Canadian Environment Network (RCEN) has over 600 member groups from rural and urban communities across the country. Having a strong interest in biodiversity, the RCEN requested input from its Biodiversity Subcommittee members and other interested individuals to generate a consolidated response to the online consultation.

It was agreed that this online response should be followed by an expanded set of comments, which will be directed to the Minister, Deputy Minister, and Assistant Deputy Minister to the line officer involved with the biodiversity file. Individuals were also invited to respond directly to Environment Canada.

**Do the proposed goals and targets adequately reflect the most important priorities and opportunities on which Canada should act to conserve biodiversity?**

No.

Collectively the Canadian proposals represent a rather remarkably modest response to the high aspirations for biodiversity as set out by the International Aichi Targets. The latter, although not without flaws, does represent a more comprehensive set of targets for the management of an extremely complex system, a set of intricate relationships between the drivers of biodiversity (habitat, exploitation patterns, climate change etc.) and biodiversity defined at three levels – ecosystem, species and genetic. An adequate set of biodiversity targets would focus on the key determinants of biodiversity, the status of biodiversity and targets for the impacts of biodiversity on economic, socio-cultural and physical environments.

The Canadian Target proposals do address, in part or whole, only half of Aichi Biodiversity targets. These targets are relevant to Canada as well as other countries.

Our comments include the following:

1. It was pointed out that the Canadian proposal abandons the goal of addressing the underlying causes of biodiversity loss and abandoned the most important targets related to this:

- 1a. Aichi Target 3 - Eliminated subsidies and incentives harmful to biodiversity;
  - 1b. Aichi Target 4 - Implement plans for sustainable production; and, consumption and keep impacts of natural resource use well within safe, ecological limits.
2. In non-protected areas, any meaningful targets and timelines to achieve progress have been abandoned in many areas such as:
- 2a. the cut in the rate of habitat lost in half by 2020;
  - 2b. the restoration of 15% of degraded ecosystems that will contribute to climate change mitigation and adaptation, and,
  - 2c. the reduction in nutrient loading to levels not detrimental to ecosystem function and biodiversity (beyond application to lakes in major drainage basins).
3. No mention is made of keeping the impacts of economic activities within safe, ecological limits; this and an ecosystem-based approach to management have been largely dropped. You will find no mention of ecological limits which was common to the CBD 2020 targets. (Aichi Target 4).
4. No mention is made of the preservation of traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected....with the full and effective participation of indigenous and local communities, at all relevant levels (Aichi Target 18).
5. The targets for mainstreaming of biodiversity have much less scope and probable impact than the Aichi Target 2, which calls for integration of biodiversity values into national and local development plans, poverty reduction strategies and national accounting systems. Such mainstreaming and awareness of biodiversity will be key in creating the conditions in which biodiversity can thrive.

Looked at in another way, as was pointed out in the 2010 document "ENGO Consultation on COP-10 Issues & Gap Analysis of the Canadian Implementation of the CBD Strategic Plan", authored by Canadian Environmental Network (RCEN), "The sustainable use of biodiversity, conservation of biodiversity and fair sharing of the benefits of biodiversity are the three underpinning goals of the CBD around, which all the work has, and continues, to evolve." Although there is evidence of limited consideration of this Chapeau, it does not seem to have been established as the central organizing principle that it legitimately should have been.

With respect to the adequacy of individual Canadian proposed biodiversity targets, many comments were made that reflect a desire for both strengthening the formulation and wording of the proposed Canadian targets.

These comments concerning the proposed Canadian targets can be generalized as follows.

**1. Targets should not generally focus on processes for programs but on specific outcomes.** Programs are important as a means to an end for example, enhancing the conditions that support biodiversity. However setting up a program or project may or may not accomplish the end objective.

**2. Targets should be specified with a specific date of completion.**

**3. Proposed targets should not be comprised of statements that propose a general improvement or enhancement.** They should contain specificity and metrics to allow audit of progress after the Strategic Plan completion date of 2020. For example, the target should not be built around phrases such as "Continued progress is made on the sustainable management of Canada's forests.." (Proposed Target 5.). Rather it should be more proactive as in the international Aichi target - "By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced." (Aichi Target 5) which also includes a target date and specific metrics as a goal.

**Do these proposed targets meet the criteria of being "ambitious but achievable"?**

The question can be broken into two parts – are the targets "ambitious" and are they "achievable."

The Oxford Dictionary has defined ambitious as "(of a plan or piece of work) intended to satisfy high aspirations and therefore difficult to achieve." Unfortunately, the proposed Canadian Biodiversity targets, as pointed out in the answer to Question #1 of this consultation, do not satisfy the high aspirations that are needed to deal with protecting a complex system such as biodiversity nor do they reflect the more comprehensive view of what targets should be as expressed in the International Aichi targets.

The Canadian targets as currently proposed would seem to be achievable. It could be argued that for some of them (given the wording) that they already have been achieved (although there is always room for further progress).

Some may be argued that the more ambitious Aichi Targets are not achievable. However, a great deal more work must be done, as is being done in many countries, on planning programs and projects which could be put into place to make substantial progress. Until such exploratory and planning work is undertaken, the "jury is out" and it is far too early to come to any competent conclusion about potential achievability and cost.

Before discarding more ambitious targets, it is recommended that Canada set the bar high in the spirit of Oxford and create a more comprehensive set of targets.

**Of the draft goals and targets identified above, which are most relevant to your organization?**

The Biodiversity Caucus of the Canadian Environmental Network has a vital interest in ALL of these targets, the topic of biodiversity and in the promotion and application of the Convention on Biodiversity and its 2010 Strategic Plan in Canada.

**How might your organization be able to contribute to achieving these draft goals and targets?**

The Caucus

- will play a major role of informing member organizations (approx. 600) of the importance of biodiversity and the targets, and sponsor, with third party support, activities in support of mainstreaming biodiversity in civil society and the Canadian population;
- will also provide the service of consolidating the views of civil society organizations on issues related to biodiversity, the biodiversity targets and their implementation throughout Canada;
- will act as a “broker” bringing organizations and individuals together to discuss issues of mutual interest in biodiversity and its many aspects; and,
- is open to discussion with Environment Canada on best ways to achieve these goals and capabilities of its member groups to support these objectives.

The Biodiversity Caucus Steering Committee will be providing Environment Canada with an expanded commentary on the proposed targets and goals in the near future.

**Interested in biodiversity?** Join us! The RCEN Biodiversity Caucus actively monitors biodiversity issues and news worldwide and responds to biodiversity issues impacting Canada. Join us to make sure your group is represented.

To learn more about the RCEN visit [www.rcen.ca](http://www.rcen.ca) or follow us on Twitter @RCEN\_Biodiv [www.twitter.com/RCEN\\_Biodiv](http://www.twitter.com/RCEN_Biodiv)

**Appointment to Ambient Air Quality Objectives Stakeholder Advisory Committee (AAQO SAC)**

Submitted By Joseph Hnatiuk, CSEB Regional Director

Joseph M. Hnatiuk has been appointed by the Alberta Environmental Network and approved by the Minister of Alberta Environment and Sustainable Resource Development (AESRD). The AESRD develops Ambient Air Quality Objectives (AAQOs) under section 14(1) and Ambient Air

Quality Guidelines under section 14(4) of the *Environmental Protection and Enhancement Act*, and in accordance with the consensus priorities of the Ambient Air Quality Objectives Priority Setting Workshop.

A third priority workshop was held in late 2009 to receive stakeholder input into prioritization of substances for objective development or review. The workshop was organized with the help of the Clean Air Strategic Alliance (CASA) and a stakeholder advisory committee on behalf of AESRD. A work plan has been developed by AESRD to address the priorities from the workshop.

The purpose of AAQO SAC is to review information on substances that have been identified as priorities for review of existing objectives or development of new ambient air quality ones. The AAQO SAC then provides advice to AESRD on proposed objectives.

Joseph Hnatiuk as a former employee of Saskatchewan Ministry of Environment, whose responsibilities included enforcing the *Provincial Clean Air Act*, hopes to provide advice to the AAQO SAC. The appointment is for 2 years with the possibility of extension. The AAQO SAC usually meet quarterly.

## REGIONAL News

## BRITISH COLUMBIA News

### Canadian Society of Environmental Biologists

Submitted By Jim Armstrong, R.P. Bio., CSEB Regional Director

Over the next decade there will be many large scale construction projects that may directly impact sensitive environmental ecosystems. Additionally, First Nations territorial land claim negotiations and environmental concerns will require consideration as an important component of the proponent's request to initiate these projects.

With the changes in the *Canadian Environmental Assessment Act* (CEAA) and *Fisheries Act* under Bill C-38, the interpretation of whether an environmental assessment is required, to what extent and when are questions that proponents are still trying to get interpretations on before submitting the necessary regulatory applications. In conjunction with the Federal staffing level reductions, this interpretation is currently unclear from both the regulatory and liability requirements that the proponents may face.

Since August, I have been attending various briefing sessions with the federal regulatory agencies to better understand the new requirements and how to apply them as a professional

biologist. I have learned that each project will require an individual review to determine what requirements apply, which regulatory agency will be the lead agency and what level of review is required. This process is ongoing and will continue into 2013 when the revised and new regulations will be provided.

As part of my role as the BC Director, I am also trying to make contact with other biologists who have an interest in becoming members of CSEB to provide an active BC Chapter. Later this fall, I will be meeting with several university leads to discuss the formation of student chapters at their university to promote the CSEB to both the environmental science and biology students. It would be great to be able to match practising biologists with students as a means of promoting our field of study and the CSEB.

## ALBERTA News

Submitted by Brian Free, CSEB Past President

*Research, planning and regulation are all key approaches to environmental management. Here are some recent Alberta developments along these lines....*

### 1. Grizzly Bear Research

A new, three-year research project has been announced by the Foothills Research Institute in Hinton, Alberta: Research to Support Recovery and Long Term Conservation of Grizzly Bears in Alberta. This project will focus on the establishment of current nutritional landscapes for grizzly bears, the development of carrying capacity estimates for different population units and the development of new models to link landscape resources with grizzly bear growth and reproduction.

The project will be led by Gord Stenhouse, Foothills Research Institute along with researchers, Dr. Scott Nielsen of the Department of Renewable Resources, University of Alberta, Dr. Marc Cattet with the Canadian Cooperative Wildlife Health Centre in Saskatoon, Dr. David Janz, Professor of Veterinary Biomedical Sciences at the University of Saskatchewan, and Dr. Nicholas Coops, Canadian Research Chair in Remote Sensing, University of British Columbia.

This project will have interrelated research themes of Habitat and Reproduction:

#### Habitat Theme:

- Establish current nutritional landscapes for grizzly bears,
- Develop carrying capacity estimates for different population units, and
- Develop new models to link landscape resources with grizzly bear growth and reproduction.

#### Reproduction Theme:

- New tools to assess reproductive performance of recovering grizzly bear populations,
- Enhanced understanding of the potential impact of long-term stress on reproduction, and
- New models to aid in linking changing landscapes to grizzly bear reproduction, stress, and demographics.

### 2. Lower Athabasca Regional Plan

In 2008, the Provincial Government released the Land Use Framework policy, which laid out a new approach for managing public lands, private lands and natural resources to achieve Alberta's long-term economic, environmental and social goals. The policy established seven large regions across the province and set the stage for the development of regional plans for each region. These regional plans are approved by Cabinet and are "senior" to other plans, such as municipal plans.

After three years, the first regional plan is out of the gate, the Lower Athabasca Regional plan. This region covers most of northeast Alberta, including the Athabasca oil sands and Cold Lake oil production regions.

Taking effect on September 1, this regional plan considers the cumulative effects of all activities on air, water and biodiversity. It is intended to support "robust growth, vibrant communities and a healthy environment within the region over the next 50 years". It establishes new environmental management frameworks that set limits to specific air quality and surface water parameters as resource development continues. If those limits are exceeded, then management plans will be developed in order to bring them back to acceptable levels. It also increases the total conserved land within the region to more than two million hectares or three times the size of Banff National Park.

It's a new approach to environmental management for Alberta. It acknowledges "cumulative effects" and attempts to set direction for economic development while managing regional social and environmental impacts. Is this a step in the right direction? Check out the Lower Athabasca Regional Plan (LARP) on the Alberta Government website and see what you think. <https://landuse.alberta.ca/RegionalPlans/LowerAthabascaRegion/Pages/default.aspx>

### 3. No Charges to be Laid in October 2012 Waterfowl Landings

*Independent report finds primary cause to be adverse weather*

Charges will not be laid in the incident that saw several hundred migratory birds land on tailings ponds at Syncrude and Suncor on October 25 and 26, 2010.

The decision was made after a thorough investigation and was based on expert advice provided by the University of



Alberta's Dr. Colleen Cassady St. Clair, a leading expert in North America on human-wildlife encounters and the deterrence methods used to mitigate that conflict.

Dr. St. Clair concluded that both Syncrude and Suncor could not have prevented the bird landings. She also determined that there were many factors leading to the incident where 551 birds were killed or euthanized after coming in contact with bitumen. The most significant factor was adverse weather conditions, including strong and variable winds, freezing rain and poor visibility. These factors forced migratory birds to land abruptly in large numbers in and around tailings ponds, as well as onto roadways and parking lots. To see the full report, please visit: <http://environment.gov.ab.ca/info/library/8679.pdf>

Based on the evidence gathered by provincial investigators and on St. Clair's expert opinion, the Crown prosecutor has found that there is no reasonable expectation of conviction in this case.

The investigation has, however, led to discoveries that may change the approach taken to bird deterrence in Alberta. In her report, St. Clair suggests that the position of deterrents and artificial lights may have influenced where the birds landed. Industry practice for bird deterrence had not previously accounted for the influence of light during poor weather. This important new information has been shared with oil sands operators.

A number of other improvements have also been implemented since the incident, including radar-based deterrent systems and standardized regional monitoring protocols. Industry and the University of Alberta are working collaboratively to implement electronic, field-based data recording, develop new technologies for automating bird monitoring, and testing new methods for bird deterrence. These efforts, together with the court-ordered research project resulting from an April 2008 Syncrude incident that resulted in waterfowl deaths, will identify best practices for preventing bird landings on tailings ponds in the oil sands and lead to innovation for other industrial developments.

## SASKATCHEWAN News

### Saskatchewan Continues Mountain Pine Beetle Fight

A media Release by Saskatchewan Ministry of Environment, 2012-08.

Saskatchewan will contribute \$450,000 to mountain pine beetle control efforts in Alberta as the two provinces work together to aggressively detect and remove infested trees at the leading edge of the infestation in eastern Alberta. The partnership agreement provides a framework for a

comprehensive regional strategy to combat the beetle before it gets established in Canada's jack pine forests and aims to stop or significantly slow the beetle's spread into Saskatchewan's north.

The mountain pine beetle outbreak has killed approximately 60 per cent of British Columbia's lodgepole pine forests. Six years ago, the infestation crossed the Rocky Mountains, spreading halfway across Alberta. Research has confirmed that mountain pine beetle can survive in jack pine which means that forests in northern Saskatchewan and across Canada are at risk.

"The mountain pine beetle represents a significant threat to Saskatchewan's pine forests and to the environmental, social and economic contributions they make to our quality of life," Environment Minister Ken Cheveldayoff said. "Working with Alberta provides our best chance of preventing this insect from becoming established in our majestic northern forest." "We appreciate Saskatchewan's recognition of the interprovincial implications of mountain pine beetle infestations in our boreal forest and how this impacts our environment, our communities and our economies," Alberta Environment and Sustainable Resource Development Minister Diana McQueen said. "This partnership is a great example of the many ways we work closely with our neighbours to strengthen our region."

The Government of Saskatchewan is contracting with Great Western Forestry Ltd. to survey forests in Saskatchewan's northwest and in the Cypress Hills for mountain pine beetle and to mark infested trees for removal. This is the second year the province has contracted with Great Western to a value of \$350,000.

"Jack pine makes up 40 per cent of Saskatchewan's softwood volume upon which a significant portion of our forest industry depends," Cheveldayoff said. "The mountain pine beetle program will help protect the long-term sustainability of Saskatchewan's forest and its industry, which currently accounts for more than 2,600 direct jobs and more than \$400 million in annual product sales."

Surveys will begin in September and be completed by November. Last year's surveys detected no mountain pine beetle in Saskatchewan outside of the known infestation in the Cypress Hills. The information provided by the insect and disease surveys is essential to the development of an effective provincial and regional response.

For more information, contact:

Jeanette Krayetski

Environment

Prince Albert

Phone: 306-953-2691

Email: [jeanette.krayetski@gov.sk.ca](mailto:jeanette.krayetski@gov.sk.ca)



## Saskatchewan Boom

Submitted by Robert Stedwill, CSEB Saskatchewan Chapter Chair

Saskatchewan is growing and it is not necessarily a good thing. Sure the economy is booming, the unemployment rate is one of the lowest in Canada, if not the lowest, and people are arriving on a daily basis to take jobs unavailable elsewhere in the country. As the premier has said;

*"Today in Saskatchewan, there are a lot more people moving in than moving out, thanks to our strong economy and tremendous quality of life. Saskatchewan has grown by more than 11,000 people in just the past six months. Our government will continue working hard to meet both the opportunities and the challenges created by our growing population."*

The challenges associated with a growing population with respect to the environment are considerable. Greater demands on water supply, providing necessary treatment of increased sewage, loss of arable land as suburbs grow as a result of the desire of single detached dwellings to live in, and the list goes on. As demands grow in addition to the aforementioned, the need for electrical power and natural gas grows as well. Although I have been retired now for over five years, my former colleagues at SaskPower, the provincial electrical utility tell me that they have never been busier as they plan for new power generation and transmission lines to move power around the province, all with associated environmental impacts, some greater than others. Power company environmental types are all too familiar with what these are.

Unfortunately, in these tough economic times across Canada and North America, the availability of good paying jobs in Western Canada makes Saskatchewan look like "the land of milk and honey", which from an unemployed person's perspective from elsewhere, is a godsend. As a province which was for so long a "have not" province, these heady times are a far cry from yesteryear.

As a now fortunate economic province, we need to be mindful of the inherent risks of not paying attention to the environment in which we live. We do not want to be seen as "knowing the cost of everything, but the value of nothing". The value of Saskatchewan's environment has drawn people from afar for decades because of its unspoiled air, land and water.

In the words of Crowfoot, a Blackfoot warrior and orator, "as long as the sun shines and the waters flow, this land will be here to give life to men and animals. May it ever be so."

## ONTARIO News

### Ontario Bee Incidents 2012- Update

Source: Health Canada website (updated 2012-09-12)

This spring, beginning in April 2012, incidents of bee mortality were reported by beekeepers across southern Ontario. Timing and location of these incidents appears to have generally coincided with corn planting. Health Canada's Pest Management Regulatory Agency (PMRA) has been working with the Ontario Ministry of the Environment (MOE) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) to evaluate the role pesticides may have played in these bee losses. Initial analyses of the circumstances surrounding the bee losses indicate that there was no pesticide misuse.

Samples of affected bees were taken at many incident locations and are being analyzed for specific pesticide residues by the PMRA laboratory services. To date, residue analysis has been completed for 104 bee samples, as well as some samples of pollen and vegetation. Analysis is currently underway for an additional set of bee samples. Preliminary residue results show that insecticides used to treat corn seed were detected in approximately 70% of the dead bee samples analyzed.

Based on the preliminary information evaluated to date, there is an indication that pesticides used on treated corn seeds may have contributed to at least some of the 2012 spring bee losses that occurred in Ontario, however, there is still additional information being collected for consideration and final conclusions have not been made. We are looking closely at the specific circumstances that may have contributed to the unusual number of bee mortalities this spring.

The PMRA (assisted by MOE) is continuing to gather information for the purpose of determining the role pesticides may have played in the bee losses, how exposure occurred, and to determine what steps can be taken to prevent future bee losses. Information is being collected from affected bee yard owners/operators to help in the evaluation. Furthermore, the PMRA and MOE staff are contacting owners/operators of agricultural land in the vicinity of certain affected bee yards to collect details on agricultural activities including: crops grown, seeding dates, seed treatments, planting equipment, planting practices used, pesticide applications, weather conditions at the time of planting and other factors that may have played a role in the bee losses.

Once all current samples have been analyzed and available details gathered from the affected bee yards and adjacent agricultural land owners, a final analysis of the results will be conducted. A report will be made available, which will include information on the findings of the evaluation as well as the PMRA's final conclusions.

In the interim, the PMRA will take additional steps to further protect pollinators from potential pesticide exposure, and is working with the United States Environmental Protection Agency (US EPA) and other Canadian and international regulatory partners towards this goal. Work is ongoing to ensure that additional safety measures and best management practices to reduce pollinator exposure to treated seed dust are developed and communicated to beekeepers, agricultural producers and other stakeholders prior to the next planting season.

## TERRITORIES News

### Greetings from your Territories Directors!

#### Nunavut Regional Update

Submitted by Paula Smith, CSEB Territories Director

##### Mining News

Most of the headlines for news in Nunavut this summer have involved Baffinland's Mary River project. The proposed iron ore mine is on north Baffin Island and the project description includes a railway and year-round shipping. After four years of assessment and consultation, the Nunavut Impact Review Board released their final report on the project. The report comes with 184 terms and conditions and is now before the federal minister of Aboriginal Affairs and Northern Development Canada for approval.

Other up-coming mining activity includes Agnico-Eagle's Meliadine gold project (the draft EIS is expected in early December), Sabina's Back River gold project (the proponent recently submitted their project description and are beginning community info sessions), and AREVA's Kiggavik uranium project (information request responses from the proponent are expected in early 2013 regarding the project's draft EIS). Meanwhile Agnico-Eagle's Meadowbank Gold Mine continues operation, while Hope Bay Mining's Doris North Gold Mine and Shear Diamond's Jericho Diamond Mine are both in suspended operations.

##### Other Resource News

Outside of mining, the territorial energy corporation, Quilliq Energy is going to complete a feasibility study for a \$450 million hydro project which would power Iqaluit and would offset the city's reliance on diesel power generation. At this point, the feasibility project is expected to be completed in 2014 and the dams built in 2019. This would be the first hydro electric project for the territory.

##### Environment News

Finally, the extent of Arctic sea ice is continuing to decrease. According to the Canadian Ice Service rapid ice loss occurred in July. The current sea ice extent is already 760,000 km<sup>2</sup> below the previously recorded minimum in 2007. This currently recorded extent is at nearly 50% less than the average minimums recording between 1979 through 2000.

Beyond these updates, it's been a busy season in the North for all the researchers, tourists and residents to make the most of the short summer season.



Mount Thor (left), Akshayuk Pass, Auyuittuq National Park, Nunavut.

#### NWT Regional Update

Submitted by Anne Wilson, CSEB Territories Director

Fall is here! The push is on to get all the field and outdoor work done before the season closes in. It has been a busy summer, with environmental assessment (EA) hearings for several projects, as well as technical meetings as other EAs unfold. Environmental Effects Monitoring (EEM) is being done by several of the mines, along with monitoring required by water licences, and that involves some field time as well as lots of reading of reports! I am also looking forward to attending the Aquatic Toxicity Workshop Oct. 1-3, 2012 – always a fantastic source of information as well as a chance to catch up with colleagues!

Although the economic outlook for mining in the North has been dampened slightly by lower commodities prices, there is still a lot of activity. In the NWT, in addition to the three operating diamond mines and one tungsten mine, there are the new mining projects undergoing environmental assessment (one gold project, one mixed precious/metal mine, a rare earth elements mine, and one diamond project). Energy sector exploration continues, including fracking proposals.

If you have flown over the NWT, it may have struck you how much water there is. Fifteen percent of the area is covered by water (compared to an average of 9% nationally). The NWT includes Canada's deepest lake – Great Slave Lake at 614 m – and its largest lake entirely in Canada – Great Bear Lake at 31,328 square kilometres. The longest Canadian River is the Mackenzie River, at 4,241 km from headwaters in BC flowing through Great Slave Lake to the Beaufort Sea. Water is valued for cultural, spiritual, social and economic reasons, and the typically pristine oligotrophic nature of Northern waters warrants the highest level of protection that

can be afforded. This has been evident at the various public hearings and technical meetings for various developments.

### Mining News:

The proposed mining developments in the NWT are at various stages of the environmental assessment (EA) processes.

- The Fortune Minerals Ltd. NICO proposed cobalt-gold-bismuth mine project environmental assessment went to public hearings the last week of August. The project is located about 50 km NNE of Whati, in the Tlicho territory, so the venues included Whati, Behchoki, and Yellowknife. Concerns with aboriginal Traditional Knowledge resulted in an extension of the process, with additional hearings scheduled for Oct. 10-11<sup>th</sup>.
- The Avalon Rare Metals Inc. Thor Lake Rare Earth Element Project involves a proposed mine located on the north side of Great Slave Lake, with processing to be done at a hydrometallurgical facility sited at the old Pine Point Mine. Technical sessions were held August 14-17, 2012 in Yellowknife, and following a second round of Information Requests to the proponent, there will be technical reports due from stakeholders Nov. 29<sup>th</sup> prior to hearings in February 2013.
- The Tyhee Yellowknife Gold Project review is still in the "Information Request" (IR) stage; but project details seem to be continually changing, with predictions not necessarily keeping up. Ideally, the Board would send the Proponent back to the drawing board to re-do (thoroughly this time) the Developer's Assessment Report. We'll see what comes in as an updated project description and answers to the information requests.
- The Giant Mine Remediation Project EA hearings were held the second week of September, and drew strong participation from residents and aboriginal groups. The project includes the containment of 237,000 tonnes of arsenic trioxide dust currently stored underground, generated over 6 decades of mine production. A decision from the Board would be expected early in the new year.
- The DeBeers Canada Inc. Gahcho Kue Diamond Project EIR has progressed through the second round of information requests. Technical reports are due to the Board Oct. 22, and hearings are scheduled for Dec. 4-7, 2012 and a decision in July of 2013. Water and sediment quality objectives were recently released, and are under discussion.

Full details for current environmental assessments are available on the Board's web site at <http://www.reviewboard.ca/registry/>.

### Regulatory Stage Projects:

- The Cantung Tungsten Mine has applied to modify their tailings and effluent management, moving from exfiltration to a surface treatment and discharge system. This is necessitated by geotechnical concerns with the existing tailings pond, and represents a leap into the 21<sup>st</sup> century for improving practices. Their licence is up for renewal in 2014, and will include a proposal for a new land-based engineered tailings pond, so there will be discussion about exfiltration vs surface discharge of treated effluent for the new system.
- The Prairie Creek Mine Project is proceeding to the regulatory stage for water licensing. This will involve another venue of hearings, and it will be interesting to hear the responses from concerned First Nations and ENGOs. Setting appropriate water quality objectives and effluent limits is a priority topic.
- The Ekati Diamond Mine water licence is up for renewal, with application materials available on the Wek'eezhii Land and Water Board web site. <http://www.mvlwb.ca/WLWB/Registry.aspx>.

### Closing:

I am grateful that my work keeps me involved with Northern projects, and have enjoyed regular travel to various northern communities. If you are doing work north of 60 that you would like to highlight in the newsletter, or running some seminars or other training opportunities, please let us know. The CSEB provides a valuable networking and communication forum, and a voice for biologists if there are any issues to be raised. There is also the option of instigating other CSEB activities – both of the fun and/or of the educational variety - with colleagues in the North. Please email your thoughts to [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca) or [paula.c.smith@ec.gc.ca](mailto:paula.c.smith@ec.gc.ca).

## Canada's North Poised to Cash in on Mining Boom

By Chantal Mack, Postmedia News March 15, 2012

Canada's North is poised to lead the country in economic growth over the next two years as a boom in mining projects takes hold, a new report predicts.

The economies of the three territories are expected to grow by more than seven per cent in both 2012 and 2013, says the Conference Board of Canada's Territorial Outlook-Winter 2012, released Wednesday. That easily surpasses the expected Canadian average of 2.1 per cent this year.

The demand for metals and non-metal resources is expected to remain high, regardless of the challenges facing the global economy, said Marie-Christine Bernard, associate director of forecasting and analysis for the Conference Board.



"The territories are well positioned to satisfy this demand," which is expected to keep prices elevated over the next few years, she said.

"That will encourage more exploration activity, more mine developments," said Bernard. "This is very positive because when there's construction and development of mines, it means there's a lot of jobs being created, then we see incomes go up and consumer demand goes up so the territories are going to be in a very good position."

Bernard said the immediate concern for northern mining industry development isn't finding a market, but rather finding workers capable of propelling these projects forward.

The economies of the Yukon and Nunavut had a strong year in 2011 and are expected to continue to improve.

The report says both are entering a period of sustained mining development, citing several large projects that have been proposed for the current decade. The Northwest Territories has yet to reach a point of sustained mining development as older mines are closing and are to be replaced by newer projects.

Real GDP for the Yukon is expected to grow by 2.9 per cent this year. That follows an estimated gain of 8.6 per cent in 2011. There will be a strong demand for workers in the Yukon, the report says.

Nunavut's economy grew by 6.8 per cent in 2011 and the territorial economy is forecast to grow by 16 per cent in 2012. Employment there is expected to surge by 6.4 per cent annually over the next three years.

The Northwest Territories' economy is expected to grow by 5.9 per cent this year.

Diamond mining, by far the territory's largest industry, is expected to benefit from global demand that continues to surpass supply, the re-port said.

When doing the territorial forecast, the statuses of several projects were taken into account, such as the announcement of the projects, their stage of development, whether or not there is a feasibility study.

"Then we evaluated each one of them and included the ones that we felt could likely go ahead in the next decade or so and included them in our forecast," explained Bernard.

The board also looked at other factors, such as how much the projects would produce once the development period was over.

Major projects and development costs for future mining operations

#### **Yukon:**

- Copper North's Carmacks project - \$150 million
- Victoria Gold's Eagle project - \$280 million
- North American Tungsten's Mactung project - \$400 million
- Selwyn Resources Selwyn project - \$800 million

#### **Northwest Territories:**

- Avalon's Nechalacho project - \$900 million
- DeBeer's Gahcho Kue project - \$650 million
- Fortune Minerals' NICO project - \$215 million
- Rio Tinto's Diavik mine expansion - \$250 million
- Government of NWT's Deh Cho bridge (in progress) - \$192 million

#### **Nunavut:**

- Agnico-Eagle's Meliadine project - \$300 million
- Baffinland's Mary River project, which is owned 70 per cent by ArcelorMittal and 30 per cent by Iron Ore Holdings LP - \$4 billion

Source: The Conference Board of Canada  
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## **2012 ANNUAL GENERAL MEETING**

The 2012 AGM will be held at the University of Regina this year on Thursday, December 13 at 6 PM EST. There will be a technical presentation, Society business and elections. Arrangements will be made for phone-in and web conferencing options. Take a few minutes away from your Christmas shopping and join us in Regina or on the Web Conference! Check the CSEB website for final details.

## **NOMINATIONS – EXECUTIVE OR REGIONAL DIRECTORS**

The CSEB is run by volunteers and the more members who get actively involved, the more things we can achieve. Please consider joining our team! If you have a nomination, including yourself, please contact Past-President Brian Free (bfree@cseb-scbe.org). If you are not sure which position would be suitable, please contact Brian and I'm sure we can find you a place.

## Inland Water Studies and Research - A multi-Decadal Coverage of Fishes and Fisheries

Submitted by T.G. Northcote

*Editor's Note: This is a life story and chronological summary of much of the fisheries and aquatic work accomplished by Dr. Northcote over his distinguished career. Dr. Northcote is a long-time member of CSEB and has published numerous articles in the CSEB Newsletter/Bulletin over the years. Dr. Northcote is currently retired and living in Summerland BC.*



*Tom Northcote preparing to obtain a lake bottom sample with an Ekman dredge, summer 1949, Arrow Lakes, BC.*

I grew up in Mission, B.C., a village on the north side of the lower Fraser River about 60 km east of Vancouver. Through discussions with my father, a keen sport fisherman and likewise my mother, I soon developed an interest in many of the nearby streams and lakes that contained trout and other freshwater fish populations.

On completing Mission High School, I took some correspondence courses at Mission before going to Vancouver and the University of British Columbia to start course work towards a B.A. degree in general biology. In the spring of 1949, I heard that Dr. Peter Larkin at U.B.C. might be hiring students for field work on B.C. inland waters from May to the end of August, so I and my colleague Charles Lyons went to his office to find out more about this possibility. After a good discussion, he said that you both are hired so keep in touch for details.

These turned out to be first a recheck on a series of small lakes north of Princeton, B.C. that Dr. Clemens and some U.B.C. students had studied over the summer of 1948, installing fish traps on several of the streams entering and draining the short chain of Allison, Borgeson, Dry, and Laird lakes from the uppermost to the lowermost. Unfortunately many of the traps in the system had been severely damaged by a flood, so in the time available, there was little we could do except to make limnological checks on the lakes.

We then moved on east to Castlegar and then north-east to Nelson on the lower west arm of Kootenay Lake, where we assembled our gear for our work on Lower Arrow Lake. There we focussed on basic lake surveys and fish studies, setting up a field camp at Deer Park, for Craig McPhee, Charles Lyons, and myself. [ See TGN references #1, #2; & TGN slides # 1-9-13, 14, 15 & 4, if some of these could be added.

From this camp we conducted basic lake surveys that included series of cross-sectional depth soundings along with zooplankton, bottom fauna, and fish sampling at a series of stations throughout Lower Arrow Lake. Later we moved all gear and equipment in a canoe and boat up to St. Leon on the Upper Arrow Lake, where we completed another series of lake transects for depths, zooplankton, and bottom fauna sampling, as well as fish seining and netting throughout this then separate large lake. Both were later joined as a single long impounded lake with the construction of the Hugh Keenleyside dam near Castlegar.

Back at UBC in the autumn, I worked under the further direction and support of Dr. Peter Larkin who suggested my field work and further studies on lake bottom fauna (Northcote 1952, #3), and on lake surveys (TGN 1953, #4), as well as a publication on comparative ecology of two species of cottid fishes (Northcote 1954, #5). These were followed by Northcote and Larkin (1956, #6) on indices of B.C. lake productivity, as well as other studies (Northcote 1957-#7 on mountain whitefish, and #8 on fish diseases and parasites). In our publication on B.C. lake typology (Larkin and Northcote 1958, #9), we reviewed the interplay of factors involved in determining lake productivity throughout 10 large areas of British Columbia, covering some 100 lakes in all. Lake dissolved solid content and mean depth effects seemed to be the most important controls, along with a few other factors that seemed to be involved, including wind exposure, evaporation rates, and littoral zone-shallows development. See also Northcote 1958 #10; Northcote and Hartman 1959-#11.

In mid 1950s, the B.C. Fisheries Research Division at UBC was chaired by Dr. C.C. Lindsey who directed its early focus on adult rainbow trout reproductively homing to lake inlet and outlet spawning streams, a suggestion of mine having made a series of limnological studies on lakes with such stream systems. See Lindsey et al. 1959 #12, Northcote 1960 # 14, Hartman et al. 1962 # 16, Northcote 1962 # 17, as well as on such movements also by redbreast shiners (Lindsey and Northcote 1963 #21).

For my doctoral thesis, developed in its first part by my research under Professor Sir James Gray, Head of the Zoology Department, University of Cambridge U.K. from summer 1955 on to summer 1956, I made a series of experiments on young rainbow trout fry reared at a series of controlled temperatures and light. Then back at the U.B.C. Zoology Department under Professor W.S. Hoar, I carried out further series of field and laboratory studies on the control mechanisms for upstream and downstream migration of juvenile rainbow trout from B.C. lake systems (late 1956 to 1959). See Northcote (1958, #10, & 1960 #14) for photo-periodism effects on the response of juvenile rainbow trout to water currents, as well as Hartman, Northcote, and Lindsey (1962, #16) for a comparison of their adult spawning runs to a lake inlet and outlet, and also their lakeward juvenile migration from such stream systems (Northcote 1962, #15, 17). Gee and Northcote #18 compare the ecology of two sympatric

dace species in the Fraser River system. See Northcote and Wilkie #19 for underwater census of stream fish populations. Lindsey and Northcote (1963 #21) reported on redbreasted sunfish movements in and out of lake tributary streams as part of their life history features.

Towards the mid-1960s, I reported on B.C. coastal lake ecology (Northcote et al. 1964, #22; 1964 #23), as well as continuing studies on inland lake ecology and diel vertical movement of fishes therein (Northcote et al. 1964 #25). Also see Northcote (1965, #26, #28) for research needs on aspects of freshwater sport fishing. Furthermore, we examined mechanisms fish used in spawning stream location (Lorz and Northcote 1965 #27), as well as other research requirements that included seasonal and diel changes in kokanee feeding habits (Northcote and Lorz 1966 #29), catostomid fish inlet stream spawning (Geen, Northcote, et al. 1966 #30), and the relation of freshwater fish movements and migrations to their production (Northcote 1967 #32). Geen and Northcote 1968 #34 made a long term study of catostomid fish migration using a small coloured latex injection beneath the fish skin as a marking system.



*Charles Lyons screening an Ekman dredge sample, summer 1949, Arrow Lakes, BC.*

In 1969, Larkin and Northcote examined the use of fish as indices of inland water enrichment (eutrophication) (#35). Also that year I was the editor for a book (#37) coming from a "Symposium on Salmon and Trout in Streams", along with its preface, published by the University of British Columbia. Included was my 1969 report on patterns and mechanisms in the lakeward migratory behaviour of juvenile trout; see Northcote 1969a #38; 1969b #39 on patterns and mechanisms in lakeward migration of young rainbow trout in the upper Lardeau River, B.C.

Dill and Northcote (1970) noted effects of some environmental factors on survival, condition and timing of emergence of chum salmon fry (#41). Andrusak and Northcote (1970) reviewed the management implications of spatial distribution and feeding ecology of cutthroat trout and Dolly Varden in coastal B.C. lakes (#42).

Dill and Northcote (1970) reported the effects of gravel size, egg depth, and egg density on intragravel movement and emergence of coho salmon alevins (#43). I reviewed the advances made in

fish management (#44) for a series of natural lakes in western North America (Northcote 1970). We published in the American Fisheries Society on environmental survival, condition, and emergence timing of chum salmon fry (Dill and Northcote 1970a), as well as effects of gravel size, egg depth, and egg density on the intragravel movement and emergence of coho salmon (Dill and Northcote 1970b). I covered the advances in fish management of western North America (Northcote 1970 #44); we noted the management implications of spatial distribution and feeding ecology of cutthroat trout and Dolly Varden cohabiting a coastal B.C. lake (Andrusak and Northcote 1970), and with two colleagues examined meristic and lactate dehydrogenase genotype differences in stream populations of rainbow trout below and above a waterfall (Northcote, Willisroft, and Tsuyki 1970 #46). I also reported on spatial distribution and interaction of two pelagic fish species in a large Swedish lake where I had worked for several months with a colleague there (Northcote and Rundberg 1970).

In 1971, Andrusak and Northcote reported on spatial segregation of adult cutthroat trout and Dolly Varden in several small coastal B.C. lakes (#47). I then reviewed man's effects on the ecology of Kootenay Lake salmonoids (#49), noting similar problems we shared from my limnological coverage of Soviet regions (#48). I extended this in 1972, noting effects of mysid introduction and nutrient enrichment there (#50). See also #51, which reviewed these for an international meeting.

Also in 1972, an experimental study by Schutz and Northcote was published on feeding behaviour and interaction between coastal cutthroat trout and Dolly Varden (#52). We then examined the use of fish as water quality indicators in a series of Okanagan Basin lakes (Northcote, Halsey, and MacDonald 1972 #55). I reviewed aquatic pollution problems in Russia, with some even at the large and world deepest (1620 m) Lake Baikal, which I had reported on (Northcote 1972 #53). Study of the B.C. high elevation Garibaldi Lake was a very exciting event (#54), noted in my 1972 review of it. I then reported more fully on some impacts of man on Kootenay Lake and its salmonoid fishes (Northcote 1973 #56). I also covered eutrophication effects on recreational fishes in large B.C. lake basins-Okanagan and Kootenay (Northcote 1973 #57 and #59). See also the #58 review on lower Fraser River biology.

In the 1970s, the University of British Columbia gained the excellent organizational and publication work of Irving Fox, Tony Dorcey, and others in the Westwater Research Centre established there. Although I was working and teaching in the UBC Department of Zoology, as well as the UBC Faculty of Forestry to undergraduates and graduates there and elsewhere (see my #61 symposium), and was becoming further involved in studies on Okanagan Basin lakes (see Stockner and Northcote 1974 #62), apart from other research at UBC (see Slaney and Northcote 1974 #63), I wanted to become more actively involved with the Westwater Research Centre on the UBC campus (see Northcote 1974a #58). See also the further work in 1974 that I was involved in that year-TGN publication numbers 59, 61, 62, 63, as well as with limnological studies of Okanagan Basin lakes (#64) and on some coastal B.C. lakes (#65).



The next year (1975) saw me becoming actively involved in research on Westwater Research Centre studies, with several more publications coming out with its support - # 66 on trace metal concentrations in lower Fraser River fish, and #68 on chlorinated hydrocarbon residues in fishes, crabs, and shellfish of the lower Fraser River, its estuary, and locations in nearby Georgia Strait, and #69 noting such contaminants in fishes of the lower Fraser River alone. Also in 1975, I and R. Clarotto published on macrozooplankton and fish predation in some coastal B.C. lakes (#65), funded by my own research support.



Tom Northcote, summer 1949, lifting a gillnet set in the Arrow Lakes, BC.

In 1976, I summarized the biology of the lower Fraser River, focussed on ecological effects of pollution for a review on the uncertain future of that very important region (#70), then supporting a commercial fishery valued at \$45 million. Also that year, a large report with two of my colleagues, Tom Johnston and Kanji Tsumura, was published on the benthic, epibenthic, and drift fauna of the lower Fraser River (#71), out of the UBC Westwater Research Centre. I then conducted research on the large Swedish lake Malaren, which was subsequently published there by its Institute of Freshwater Research, as well as a guide for its cyclopoid copepod identification (#72). In 1978 I was a co-author on the major importance of the lower Fraser River marshes for salmon (# 73) with the Westwater Research Centre. I, Dr. Chapman from New Zealand, and students covered the special value of Deer Lake near Vancouver (#74). I reviewed migratory strategies and production in freshwater fishes (#75), and made a regional comparison of the lower Fraser River fishes (species distribution, abundance, size, and other characteristics-#76) with the Westwater Research Centre. Also, I examined the initial impacts of experimental fish introductions on the macrozooplankton of some small oligotrophic lakes in the UBC Research Forest (#77).

In 1979, I made a presentation to an annual meeting of the B.C. Truck Loggers Association dealing with fisheries / forestry interactions, noting that with good information and care, they need not be negative (#78). Then a detailed review was published on juvenile salmon use of Fraser River estuarine tidal channels (Levy, Northcote, and Birch 1979). Also the United Nations Food and Agricultural Organization contacted me in 1979 to review our work on large B.C. lakes (#79), and then to make a literature review of the large Lake Titicaca system in Peru, along with coverage of the adjoining Bolivian portion (see Northcote publications #80 and 81). This started a productive long-term and two way research effort with exchange between Canadian, Peruvian, Bolivian, as well as Brazilian limnologists.

Nevertheless our lower Fraser River studies on feeding and food web structure of fishes continued (Northcote et al. 1979), showing their use of 21 major prey categories (#82). Furthermore the high densities of salmon fry resident in its tidal channels confirmed a strong dependency of Fraser River salmon runs on continued integrity of its estuarine marsh habitats (Levy, Northcote, and Birch 1979 #83). Furthermore, that year I covered some of the difficulties in evaluating B.C. fish resources, at a Latin American Economic System Seminar held in Guayaquil, Ecuador (# 79). Also in 1979, I reviewed the hydrobiological resources of the Lake Titicaca system with Peru and Bolivia coverage based in part on our studies there with United Nations Food and Agriculture Organization (UN-FAO) support (see # 80, 81). Then we reported on feeding relationships and food web structure of lower Fraser River fishes (Northcote et al. 1979 #82); see also Levy, Northcote and Birch 1979 #83 on the importance of the lower Fraser River estuary.

My requested 1980 report to the UN-FAO organization on methods and recommendations for fish and limnological sampling in Lake Titicaca's littoral zone #85 was completed, providing special methods and means for fish and limnological sampling in the littoral zone of Lake Titicaca. I also reviewed in 1980 the effects of forest fire on aquatic systems of Canadian north temperate-arctic regions for the Canada Department of Indian and Northern Affairs, Ministerial Fire Review Panel (# 86).

Several publications came out in 1981: two on responses to water current by young rainbow trout (#87, #88), another on such responses as well as growth and maturity of above and below waterfall stocks of this species stages (# 89), one on the detailed distribution and abundance of juvenile salmon in marsh habitats of the Fraser River estuary by Levy and myself (#90), one on a report to CIDA on our Peruvian training project (#91), with another on rainbow and cutthroat trout interactions in coastal B.C. lakes (#92), as well as one on genetic and environmental effects on rainbow trout responses to water current (#93) with Brian Kelso, one of my graduate students as first author, and myself, as well as with Dr. Wehrhahn from U.B.C. Zoology. Also in 1981, an update to the Canadian International Development Agency (CIDA) was made on our UBC / UNTA training project in management of water quality and aquatic resources at Puno, Peru (# 92).

In 1982, juvenile salmon residency in a marsh area of the Fraser River estuary was covered (#94). Furthermore, in 1982, we introduced our seminar on physical, chemical and biological conditions relating to water quality in Puno Bay of Lake Titicaca, held at the Universidad Nacional del Altiplano, Puno, Peru, in Spanish and in English (#95). It was very well attended by contributors and attendants from many regions around that whole lake area, as well as others from government agencies elsewhere in both Peru and Bolivia. Also in 1982 our report on sequential feeding patterns of juvenile rainbow trout in the large lake-fed Lardeau River, B.C., was published (#96). Effects of estuarine log storage in tidal marsh areas of several arms of the lower Fraser River (#98) indicated that the feeding of juvenile salmon and sticklebacks could be altered there, which also was confirmed by experimental laboratory tests.

In 1983, interactions within the fish community of a Brazilian reservoir indicated that caudal fins of several species of fish were extensively fed upon by piranha (#99). Puno Bay of the high elevation Lake Titicaca in the Peruvian portion was further investigated in 1983 as an inter-university training programme in its aquatic resources management, with eutrophication effects related to consequences for local food supply as well as health (#100). Also in 1983 we studied the selection of rainbow trout in simulated stream environments for live and dead prey of different sizes (#103).

In 1984 the NATO Advanced Research Institute supported our extensive study of fish migration in rivers (#104); see also the #105 report pointing out future directions for fish migration studies. In 1984 our centre for training and research on Lake Titicaca and other aquatic ecosystems of the Peruvian Altiplano were made better known to worldwide limnologists (#106), as did a publication on experimental fishing in littoral areas of "black water" from pollution and "clear water" portions of Puno Bay, Lake Titicaca (#108). Previously in 1984 Jonsson, Hindar, and Northcote published on optimal age of sexual maturity of sympatric and experimentally allopatric cutthroat trout and Dolly Varden charr (#107), based on our UBC Research Forest work, which attracted limnologists from several regions of the world.

In 1985 Northcote, Arcifa, and Froelich covered impoundment and drawdown effects on the fish community of a Brazilian South American river (#109), where around Sao Paulo the human population had mushroomed to over 13 million, and then with many tributary rivers being impounded for hydro-electrical power generation, human water supply use, and agricultural irrigation (Northcote, Arcifa, and Frohlich 1985). Hume and Northcote (1985) noted initial changes in use of space and food by experimentally segregated populations of Dolly Varden and cutthroat trout (#110), and Henderson and Northcote (#111) reported on visual prey detection and feeding of these two species. Berg and Northcote (#112) showed changes in territoriality, gill flaring, and feeding following short pulses of suspended sediment experimentally for juvenile coho salmon. Northcote and Ward (1985 #113) reported their work on lake resident and migratory smelt of the Waikato River system in Zealand. Also in 1985, the UBC-UNA-CIDA training project in water pollution control and aquatic resource management at Lake Titicaca, Puno, Peru was given full coverage in a report by the Westwater Research Centre, UBC, Vancouver; see Northcote (#115).

In 1986, a gabion weir placement was used to enhance salmonid production in a logged watershed subject to debris torrents (Klassen and Northcote #116). Also that year, Arcifa, Northcote, and Froehlich published on fish-zooplankton interactions and effects on water quality in a tropical Brazilian reservoir (#117). See also Kistritz, Morales, and Northcote (1986 #120) on application of an aquatic plant-wastewater lagoon system for water treatment at Puno on Lake Titicaca. Northcote et al. (1986) reported on water quality conditions associated with littoral macrophyte stands of inner Puno Bay, Lake Titicaca (#121), with UNESCO support to the Westwater Research Centre.

In 1987, effects of recent environmental changes in Lake Waahi, New Zealand, and their effects on two forms of common smelt and other biota, were reviewed (Ward, Northcote, and Chapman #126). Also fin-feeding by piranha, as cropping of a novel renewable resource, was noted by Northcote, Arcifa, and Froehlich in 1987 (#127). Fish can also pick up asbestos from asbestos-rich sediments (#129).

Dorcey and Northcote (1988) reviewed interagency cooperation in training for water resources management in the Peruvian altiplano (#130). See Henderson and Northcote (1988) for retinal structure of cutthroat trout and Dolly Varden in relation to their spatial distribution in lakes of the UBC Research Forest (#131). Also in 1988, I had the audacity to put forward, in a title question, was the undammed Fraser River the world's greatest salmonid producer? Well, was it historically, and is it in the late 1980s? First historically it was, with an abundance over some 14 thousand average annually, with next largest the Amur just over 11 thousand, and most of the other rivers considered (Sacramento / San Joaquin barely over 1 thousand, the Columbia not much over 3 thousand, the Skeena 2.4 thousand, the Yukon 1.1 thousand, and the Mackenzie barely over 100. By 1988, the Fraser had dropped nearly two fold, the Sacramento / San Joaquin nearly 10 fold, the Columbia over two fold, and the Amur 5.5 fold; with the Skeena, Yukon, and Mackenzie staying about the same. See also Northcote 1998 (#132) - "The undammed Fraser River-is it the world's greatest salmonid producer?" Also Moorhouse (2012), in the Penticton Herald, July 30 suggests that up to 300,000 sockeye salmon spawners may reach Osoyoos Lake this year via the Columbia River system.

Also in 1988, Hindar and others including myself reviewed the resource utilization of sympatric and experimentally allopatric cutthroat trout and Dolly Varden (#133). Northcote (1988) covered meristic variation in New Zealand smelt as a new questions for an old problem (#134). Klassen and Northcote (1988 #135) reported on use of gabion weirs to improve spawning habitat for pink salmon in a small logged watershed. In 1988, I put forward the ascent of experimental approaches in trout stream research and its challenge (#136). Northcote and Hartman (1988) considered the biology and significance of stream trout populations living above and below stream waterfalls (#137). I discussed the structure and function of fish in freshwater ecosystems: a "top-down" view (#138). Also in 1988, Arcifa, Froelich, and myself, reported on the distribution and feeding ecology of fishes in a tropical Brazilian reservoir (#142)-main text in English.

In 1989, Northcote and Larkin reported on the Fraser River as a major salmonine production system (#143). Northcote, Peden, and Reimchen (1989) covered fishes of coastal marine, riverine, and lacustrine waters of the Queen Charlotte Islands in B.C. (#144). Beamish and Northcote (1989) noted the extinction of an anadromous parasitic lamprey population upstream of an impassible dam (#145).

Also in 1989, I and my team from the Westwater Research Centre at UBC assembled a 262 page report (#146) covering the pollution problem that was developing in Lake Titicaca, Peru.



Tied into this was coverage by myself and Pedro Morales, our onsite director of the Puno project there, along with an overview for appropriate development of aquatic resources: training, research, and management (#147), an overview of conclusions and recommendations (#148), a review of eutrophication effects on physical conditions (#149), as well as on chemical conditions (#150), the effects of eutrophication on zooplankton (#150), and also on zoobenthos (#152), and on fish (#153), and, as well, the water supply of Puno (#154)-overall a broad assembly of information and help hopefully to bring about further correction of the serious pollution problem that was developing in part of Lake Titicaca. See also Ward et al. (1989) re smelt in the N.Z. Waikato River system (#155). Nelson, Northcote, and Hendy (1989) reported on potential use of oxygen and carbon isotopic composition of fish otoliths to identify migratory and non-migratory stocks of the New Zealand common smelt (#156). Also in 1989, Levy, Northcote, Hall, and Yesaki covered juvenile salmonid responses to log storage in littoral habitats of the Fraser River, as well as in Babine Lake, B.C. (#159).

In 1990, Northcote, Arcifa, and Munro published on an experimental study of the effects of fish zooplanktivory on the phytoplankton of a Brazilian water reservoir (#160). Also that year, Rempel and Northcote reported on winter feeding and spatial distribution of some B.C. lacustrine Dolly Varden and cutthroat trout populations (#166).

In 1991, a 278 page report was published on contamination in Lake Titicaca, Peru-investigation and management of the increasingly serious aquatic pollution problem in the area of Lake Titicaca close to Puno, Peru (#168); also see reports #169, 170, 171, 172, 173, 174, 175, and 176-all in Spanish to make these more readily available to Peruvian officials in Puno and elsewhere in Peru to help bring about effective control action. See #177 re migration of trout (Northcote #177). Also in 1991, Martin and Northcote published a report (#179) indicating that Kootenay Lake was an inappropriate model for mysid introduction into north temperate lakes. Arcifa, Northcote, and Froehlich (1991) reported on the interactive ecology of two cohabiting species of characin fishes in a eutrophic Brazilian reservoir (#180). Heggenes, Northcote, and Peter (1991) covered spatial stability of cutthroat trout in a small coastal B.C. stream (#181). Also in 1991, Power and Northcote examined effects of log storage on the food supply and diet of juvenile sockeye salmon (#182). Heggenes, Northcote, and Peter (#184) studied the seasonal habitat selection and prey preferences of cutthroat trout in a small coastal B.C. stream (#184). Northcote and Burwash (1991) reviewed fish and their habitats in the Fraser River basin as a contribution to water in sustainable development there (#185), and I covered the possible effects of climate change and variability on freshwater fisheries in B.C. (#186). Also in 1991, Rivera et al. assessed use of aquatic plants for wastewater treatment in the high elevation tropical Lake Titicaca in Peru (#187), and I made a synthesis of the work going on there for meetings in La Paz, Bolivia and in Paris, France (#188). In 1991, I gave an invited report to the Institute of Freshwater Research at Drottningholm, Sweden on headwater salmonid stocks as a largely overlooked source of endangered species (#190).



*Moving campsite to Upper Arrow Lake, summer 1949.*

In 1992, Andrew and four associates including myself reported on changes in use of lake habitat by segregated populations of cutthroat trout and Dolly Varden (#191). Also Fausch and Northcote (1992) reported on large woody debris and salmonid habitat in a small coastal B.C. stream (#192). I then covered some of the ecological considerations and evolutionary consequences of migration versus residency in stream salmonids (#193). I also noted a series of eutrophication and pollution problems in Lake Titicaca (#194) and made an invited review of "Comparative analyses of ecosystems: patterns, mechanisms, and theories" in 1992, published in *The Quarterly Review of Biology* 67 (#195). In the spring 1992 issue of "Trout", I provided a report on "Life as a trout wanderer" (#196). Also I was the symposium organizer and editor for the Pacific Science Association Congress in Hawaii, reporting myself on "Prediction and assessment of potential effects of global environmental change of freshwater sport fish habitat in British Columbia" (#198). In 1992, I covered major environmental change processes affecting freshwaters of the northwestern Pacific coastal zone (#199) in the Pacific Science Association Information Bulletin 44 (3-4). I was a contributor for "Review of models for climate change and impacts on hydrology, coastal streams, and fisheries in B.C. (#200), and also reported on the restoration and environmental sustainability of a small B.C. lake near Vancouver (#201). Northcote et al. (1992) developed tests for migratory history of the New Zealand common smelt using otolith isotopic composition (#202). I reported on "Getting the message across to foresters", given at the Fisheries / Forestry Conference 1992 in Christchurch, New Zealand (#204).

In 1993 I, C.J. Bull and two of our sons (G.B.N & R.G.N) reported on counting shore-spawning rainbow trout redds by helicopter and also shoreline observation at the high elevation Joe Lake in B.C. (#205). Borgstrom, Heggenes, and Northcote (1993) covered cyclic oscillations in an allopatric brown trout population (#206). Also McDowall and three others including myself reported on the cause of cucumber odour in osmerid and retropinnid smelts (#207). Gregorey and Northcote (1993) studied surface, planktonic, and benthic foraging by juvenile chinook salmon in turbid laboratory aquatic conditions (#208). Also Mitchell, Smith, and Northcote in 1993 published on genetic differentiation among populations of New Zealand common smelt (#209), and I reviewed management and enhancement options for Arctic grayling with special reference to the Williston Reservoir watershed in B.C. (#212).



In 1994, I and G.L. Ennis reported on mountain whitefish biology and habitat use in relation to compensation and improvement possibilities (#214). Also I covered the habitat, fish, and fisheries of the large Fraser River basin in B.C., asking if they were sustainable (#217).

In 1995, I made a synthesis of limnological knowledge on Lake Titicaca (#219). I also covered the comparative biology and management of Arctic and European grayling (#220). Then I reviewed my "four decade affair" with Dolly Varden: a synthesis and critique of experimental tests for interactive segregation between it and cutthroat trout in B. C. (#221). I also summarized the habitat requirements of B. C. salmonids for a B. C. Coastal Fish Habitat and Rehabilitation Workshop (#222).

In 1996, I and my wife Heather published on shoreline marshes of the large Okanagan Lake, asking if they were habitats of high productivity, diversity, scarcity, and vulnerability? (#223). This study was presented at the International Conference on the Conservation and Management of Lakes, held in Kasumigaura, Japan, 1995. Also in 1996 I was editor for "Population growth-and fresh water?" with contributions going to Kluwer Academic Publishers of GeoJournal for publication. My editorial (#225) on effects of human population growth was published in GeoJournal 40, as was my paper (#226) on such effects for the Fraser and Okanagan river systems in Canada: a comparative inquiry. Also in 1996, Slaney, Hyatt, Northcote, and Fielden reviewed the status of anadromous salmon and trout in British Columbia and the Yukon (#227), and I published on impacts of impoundment: a comparative experience with fish communities, their food webs, productivity, and problems in Canadian and Brazilian hydroelectric reservoir ecosystems (#228).

In 1997, Pacific salmon abundance trends in the Fraser River watershed were compared with other British Columbia watershed systems (#230). Also Arcifa and Northcote (1997) emphasized the use of holistic approaches for food web experiments and biomanipulations in tropical lakes, using their experiences in several tropical lake systems (#232). The migratory / residency spectrum of coastal cutthroat trout also were examined in 1997 (#234), as was the status of B.C. anadromous cutthroat trout (#235) by four workers including myself (#235). See also Northcote (1997) for coverage of potamodromy in Salmonidae (#236). The attempt at integration of biological and cultural diversity in ancient Lake Titicaca, Peru (#237) was reported at the International Conference on Ancient Lakes held in Japan.. Also in 1997, Northcote and Atagi reported on ecological interactions in the flooded littoral zone of reservoirs, noting the importance and role of submerged terrestrial vegetation with special reference to fish, fish habitat, and fisheries in the Nechako Reservoir of B.C., Canada (#242). Northcote (1997) noted some hard lessons learned from studies on two large inland water systems of British Columbia, the Kootenay Lake system, and also the Fraser River system, draining a quarter of British Columbia and supporting one of the largest populations of salmonids in the world (#243).

Recovery of cutthroat trout and their habitat in a small B.C. stream 25 years after riparian logging (#243) was given at a Canadian Conference for Fisheries Research at Kingston, Ontario, by Young, Hinch, and Northcote (1998); see also #246. In April

1998, Northcote covered the importance of submerged terrestrial vegetation as fish habitat for the inland water continuum for an invited presentation at a Log Salvage Workshop at Stokely Creek, Ontario (#247). See also Northcote (1998 #248)) for coverage of the migratory behaviour of fish and its significance to their movement through riverine fish passage facilities.

Potential impacts of climate change on fisheries resources in the upper Columbia Basin of B.C. was given by Northcote in an invited presentation at "Toward ecosystem-based management in the upper Columbia River Basin", an international conference and workshop at Castlegar, B.C. in April 1998 (#249). Schreier, Brown, and Northcote (1998) made an invited contribution (#252) at The Commission on Sustainable Development in Switzerland on the Fraser River as a highly productive ecosystem for salmonids. Northcote (1998) covered a research biologist's perspective on Kootenay and Arrow lakes: reservoirs, fishes, and fisheries (#254) for an invited presentation to "The state of fisheries in Kootenay Lake and Arrow Reservoir" held in Nelson, B.C. in October 1998. Also in 1998, (Northcote #255) attempted to integrate international aid for solution of the severe eutrophication of the inner Puno Bay portion of Lake Titicaca, Peru. Northcote (1998) covered "Inland waters and aquatic habitats" for assessment of species diversity in the Montane Cordillera Ecozone (I.M. Smith and G.G.E. Scudder, Editors, #256).

Northcote and Chapman (1999) published on "Dietary alterations in resident and migratory New Zealand common smelt in the lower Waikato lakes after two decades of habitat change" (#259). In 1999, Vienott, Northcote, Rosenau, and Evans reported concentrations of strontium in pectoral fin rays of white sturgeon by laser ablation sampling-inductively coupled plasma-mass spectrometry, as an indicator of marine migrations (#261). Northcote (1999) covered graylings and the Grayling Society in spring 1999 (#263). In 1999, seven authors (TGN the last one) reported on kokanee decline in Okanagan Lake: fish-habitat- land use interactions (#264). Young, Hinch, and Northcote (1999) reported on the status of resident coastal cutthroat trout and their habitat 25 years after riparian logging (#265).

Hartman, Groot, and Northcote (2000) covered science and management in sustainable salmonid fisheries: the ball is not in our court (#266). Northcote (2000) discussed ecological interactions among an oreostiid species flock in the littoral zone of Lake Titicaca (#267), and also provided an updated review of grayling biology, impacts and management (#268). Richardson, Lissmore, Healey, and Northcote (2000) published on the fish communities of the lower Fraser River and a 21-year contrast (#269).

In 2001, I made an invited presentation on sustainable development and environmental restoration at the Kelowna Okanagan Lake Basin Conference and Strategic Planning Session (#273). Also T.G. Northcote and K.E. Northcote made a review and evaluation of agricultural drainage / water quality / fish habitat problems, reports, and jurisdictions in the Agassiz-Harrison areas of the lower Fraser Valley area, British Columbia (#274).

In 2002, I reported on the need for limnologists to make presentations in schools, and also conducted a field trip for the students (# 276). Also I reviewed "Migration of Freshwater Fishes" in 2002-see #277 by Lucas and Baras.

In 2003, I gave an invited keynote address at the Okanagan Basin Technical Working Group International Conference in Penticton, B.C. entitled "The news: past and present and suggestions into the future on managing the Okanagan Basin's aquatic ecosystems" (#279). Also in 2003, I made a review of "Forest Dynamics and Disturbance Regimes" for the Canadian Society of Environmental Biologists Bulletin 60 (3) (#280), and made a reconnaissance of water quality conditions in the upper Bridge River systems with suggestions for monitoring potential effects of forestry activities in the Gun Lake watershed of that area (#282).

In 2004, Northcote and Hartman (#283) reviewed the book "Fishes and Forestry. Worldwide Watershed Interactions and Management", Blackwell Science Oxford, UK. 789 pages, but as editors, it was difficult not to be biased, as we also were authors as well as coauthors for many of the contributions. For Northcote alone see Chapters 4 – "Fundamentals of lake ecology relevant to fish-forestry interactions"; and Chapter 6 – "Fish life history variation and stock diversity in forested watersheds"; for Northcote and Hartman see Chapter 1 – "An overview of fish-forestry interactions", and Chapter 34 – "Towards a new fish-forestry interaction in the world's watersheds"; for Northcote and Healey, see Chapter 5 – "Fundamental aspects of estuarine ecology relevant to fish forestry interactions"; for Northcote and Hinch, see Chapter 15 – "Fish migration and passage in forested watersheds"; for Northcote, Rask, and Leggett, see Chapter 14 – "Effects of forestry on the limnology and Fishes of lakes"; for Levings and Northcote, see Chapter 15 – "Effects of forestry on estuarine ecosystems supporting fishes"; for Northcote and Hall, see Chapter 33 – "Better and broader professional, worker, and Public education in fishes and forestry".

In 2005, I contributed to a publication on New Zealand common smelt biology and ecology (Ward, Northcote, and Boubee #293). See also Hartman and Northcote (#295) "Economic growth and fish conservation: we need more emphasis on the population component"; Northcote and Bull (# 296) "Managing shore-spawning rainbow trout in two Canadian alpine lakes"; Northcote (#297) "Man and Kootenay Lake salmonids: an overview of effects up to the periods of major European influx and development"; Northcote and Hartman (#298) Fishes and Forestry: worldwide watershed interactions and management (#298); Northcote and Hartman (#299) "Reconciling fisheries and forestry interactions in watersheds: a worldwide overview and assessment"; Sambook and Northcote (#300) Estuarine interactions between threespine stickleback and juvenile chinook salmon".

For 2006, see Northcote and Hammar (#304) "Feeding ecology of *Coregonus albula* and *Osmerus eperlanus*"; Northcote and Hartman (#306) "Reconciling fisheries and forestry interactions in watersheds: a worldwide overview and assessment"; Cruz, Moreno, Terrazas, and Northcote (#308) "Worsening water quality conditions at Inner Puno Bay, Lake Titicaca, Peru, and

their effects on *Lemna* spp. biomass"; Hartman, Northcote, and Cederholm (#309): "Human numbers-the alpha factor affecting the future of wild salmon"; Northcote (#310) "Bridging gaps in fish biology and fisheries management: hard lessons and warnings from two large inland water systems in British Columbia".

Then in 2007, Northcote and Bull (#312) published the "Successful shoreline spawning of rainbow trout in two Canadian alpine lakes"; Northcote and Hartman (#313) on "Reconciling fisheries and forest interactions in watersheds: a worldwide overview and assessment"; Northcote (#314) noting the causes for little public recognition of limnological science and the needs for improvement; Salter and Northcote (#315) documenting needs for the present of an endangered small but biotically rich marsh-pond complex near Summerland at Okanagan Lake shoreline; Magnhagan, Northcote, and Gregory (#316) covering diet differentiation in three species of juvenile Pacific salmon in estuarine tidal channels and laboratory experiments; and Northcote, Gregory, and Magnhagen (#317) showing the contrasting use of space and food among three species of juvenile Pacific salmon cohabiting tidal marsh channels of a large estuary.

In 2008, Northcote (#318) made a synthesis of the long-term studies on the interactive, ecology of cutthroat trout and Dolly Varden populations in near-coastal B.C. lakes. Northcote and Lobon-Cervia (#320) then showed the increasing experimental approaches that were developing in stream trout research from 1987 to 2006. Northcote (2008) reviewed the inland waters and aquatic habitats of the Canadian Montane Cordillera Ecozone (#321). Also that year, Jonsson, Jonsson, Hindar, Northcote, and Engen (#322) showed how asymmetric competition drives lake use of coexisting salmonids. Okanagan Basin Studies were reviewed by Northcote (2008), covering problems, plans, and actions (#324).

Lake whitefish biology in Okanagan Basin lakes was reviewed in 2009 by T.G. Northcote and number one son Gordon (#325) along with field help from high school students of the latter. Northcote and E. Moreno Terrazas (#326) reviewed some of earlier up to more recent studies on the Peruvian Lake Titicaca system in the Peruvian / Bolivian Altiplano.

In 2010, Northcote examined controls for trout and char migratory/resident behaviour (#328) mainly in streams above and below waterfalls and barriers in a multi-decadal (1950 to 2000) and geographically broad review for North America, UK, Europe, and Japan.

Northcote (2011) covered inland waters and aquatic habitats of the Montane Cordillera Ecozone. See his abstract, text of 13 pages, and over 5 pages of references (#329). See also the 30 July 2012 edition of the Penticton Herald with the article by John Moorhouse – "Sockeye return making big splash". My comment ("Opinion") published in the UK-FBA Newsletter, spring 2011 issue (#331), dealt with the 25% reduction in funding over the next four years by the UK's programme of forthcoming decline in overall funding for its Department of Environment, Food and Rural Affairs.

## REFERENCES

1. Northcote, T.G. 1950 a. Some notes on the structure and habits of the prickly and torrent sculpins as found in the Arrow lakes, British Columbia. Fisheries Management Report 5, British Columbia Game Department, Vancouver. Canada. 7 pages.
2. Northcote, T.G. 1950 b. Some aspects of the comparative morphology and ecology of *Cottus asper* and *Cottus rhotheus* (Rosa Smith). B.A. Thesis. Department of Zoology. University of British Columbia, Vancouver, Canada. 46 pages.
3. Northcote, T.G. 1952. An analysis of variation in quantitative sampling of bottom fauna in lakes. M.A. Thesis, Department of Zoology, University of British Columbia, Vancouver, B.C., Canada. 95 pages.
4. Northcote, T.G. 1953. Four years of lake surveys. Proceedings of the 7th Game Convention, British Columbia Game Department, 112-115.
5. Northcote T.G. 1954. Observations on the comparative ecology of two species of fish, *Cottus asper* and *Cottus rhotheus*, in British Columbia. Copeia, 1954 (1): 25-28.
6. Northcote, T.G. and P.A. Larkin. 1956. Indices of productivity in British Columbia lakes. Journal of the Fisheries Research Board of Canada 13 (4): 515-540.
7. Northcote, T.G. 1957. A review of the life history and management of the mountain whitefish, *Coregonus williamsoni* Gerard. Fisheries Management Report 26: 6 pages.
8. Northcote, T.G. 1957. Common diseases and parasites of freshwater fishes in British Columbia. Management Publication of the British Columbia Game Commission. 25 pages.
9. Larkin, P.A. and T.G. Northcote. 1958. Factors in lake typology in British Columbia, Canada. Verhandlungen Internationale Vereinigung fur theoretische und angewandte Limnologie. 13: 252-263.
10. Northcote, T.G. 1958. Effects of photoperiodism on response of juvenile trout to water currents. Nature 181: 1283- 1284.
11. Northcote, T.G. and G.F. Hartman. 1959. A case of "schooling" behavior in the prickly sculpin, *Cottus asper* Richardson. Copeia, 1959 (2): 156-158.
12. Lindsey, C.C., T.G. Northcote and G.F. Hartman. 1959. Homing of rainbow trout to inlet and outlet streams at Loon Lake, British Columbia. Journal of the Fisheries Research Board of Canada 16 (5): 695-719.
13. Northcote, T.G. and R.J. Paterson. 1960. Relationship between number of pyloric caeca and length of juvenile trout. Copeia 1960 (3): 248-250.
14. Northcote, T. G. 1960. Migratory behaviour of juvenile rainbow trout in inlet and outlet streams of lakes. Ph.D. Thesis, Department of Zoology, University of British Columbia, Vancouver, Canada. 146 pages.
15. Northcote, T.G. 1962. Lakes of British Columbia. How many, how large, how deep. Wildlife Review 9 (2): 5-8.
16. Hartman, G.F., T.G. Northcote and C.C. Lindsey. 1962. Comparison of inlet and outlet spawning runs of rainbow trout in Loon Lake, British Columbia. Journal of the Fisheries Research Board of Canada 19 (2): 173-200.
17. Northcote, T.G. 1962. Migratory behaviour of juvenile rainbow trout, *Salmo gairdneri*, in outlet and inlet streams of Loon Lake, British Columbia. Journal of the Fisheries Research Board of Canada 19 (2): 201-270.
18. Gee, G.H. and T.G. Northcote 1963. Comparative ecology of two sympatric species of dace (*Rhinichthys*) in the Fraser River system, British Columbia. Journal of the Fisheries Research Board of Canada 20 (1): 105-118.
19. Northcote, T.G. and D.W. Wilkie. 1963. Underwater census of stream fish populations. Transactions of the American Fisheries Society 92 (2): 146-151.
20. Northcote, T.G. and P.A. Larkin. 1963. Western Canada. Pages 451-485. In: D.G. Frey [Editor] Limnology in North America. University of Wisconsin Press, Madison, Wisconsin, U.S.A.
21. Lindsey, C.C. and T.G. Northcote. 1963. Life history of reidside shiners, *Richardsonius balteatus* with particular reference to movements in and out of Sixteen Mile Lake streams. Journal of the Fisheries Research Board of Canada 20 (4): 1001-1081.
22. Northcote, T.G., M.S. Wilson and D.R. Hurn. 1964. Some characteristics of Nitinat Lake, an inlet on Vancouver Island, British Columbia. Journal of the Fisheries Research Board of Canada 21 (5): 1069-1081.
23. Northcote, T.G. and W.E. Johnson. 1964. Occurrence and distribution of sea water in Sakina Lake, British Columbia. Journal of the Fisheries Research Board of Canada 21 (5): 1321-1324.
24. Northcote, T.G. 1964. Use of a high-frequency echo sounder to record distribution and migration of *Chaoborus* larvae. Limnology and Oceanography 9 (1): 87-91.
25. Northcote, T.G., H.W. Lorz and J.C. McLeod. 1964. Studies on diel vertical movement of fishes in a British Columbia lake. Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie 15:940-946; & Fig.8, Plate 9.
26. Northcote, T.G. 1964. An inventory and evaluation of the lakes of British Columbia with special reference to sport fish production. Transactions of the 15th British Columbia Natural Resources Conference. Pages 575-582.
27. Lorz, H. W. and T.G. Northcote. 1965. Factors affecting stream location, timing, and intensity of entry by spawning kokanee (*Oncorhynchus nerka*) into an inlet of Nicola Lake, British Columbia. Journal of the Fisheries Research Board of Canada 22 (3) 665-687.
28. Northcote, T.G. 1965. Some research requirements in freshwater sport fishing. Canada Department of Fisheries, Canadian Fisheries Reports Number 4:91-102.
29. Northcote, T.G. and Lorz, H.W. 1966. Seasonal and diel changes in food of adult kokanee (*Oncorhynchus nerka*) in Nicola Lake, British Columbia. Journal of the Fisheries Research Board of Canada 23 (8): 1259-1263.
30. Geen, G.H., T.G. Northcote, G.F. Hartman and C.C. Lindsey. 1966. Life histories of two species of catostomid fishes in Sixteenmile Lake, British Columbia, with special reference to inlet stream spawning. Journal of the Fisheries Research Board of Canada 23 (11): 1761-1788.
31. Teraguchi, M. and T.G. Northcote. 1966. Vertical distribution and migration of *Chaoborus* larvae in Corbett Lake, British Columbia. Limnology and Oceanography 11:164-176.
32. Northcote, T.G. 1967. The relation of movements and migrations to production in freshwater fishes. In: S.D. Gerking [Editor]. The biological basis of freshwater fish production. Blackwell Scientific Publications, Oxford. Pages 315-344.
33. Northcote, T.G. 1967. An investigation of summer limnological conditions in Chain Lake, British Columbia, prior to introduction of low nutrient water from Shinish Creek. British Columbia Fish and Wildlife Branch, Fisheries Management Report 55, 19 pages.
34. Geen, G.H. and T.G. Northcote. 1968. Latex injection as a method of marking large catostomids for long term study. Transactions of the American Fisheries Society 97 (3): 281-282.
35. Larkin, P.A. and T.G. Northcote. 1969. Fish as indices of eutrophication. Pages 256-273. In: Eutrophication: causes, consequences, correctives. Proceedings of the International Symposium on Eutrophication. Madison, Wisconsin. 1967. National Academy of Sciences, Washington, D.C. U.S.A.
36. Northcote, T. G. 1969. Limnology. Forum 3 (1): 8-10. Publication of the Faculty of Notre Dame, University of Nelson, at Nelson, B.C.
37. Northcote, T.G. 1969. Editor and Preface; pages 1- 2; Symposium on Salmon and Trout in Streams. University of British Columbia, Vancouver, Canada. 388 pages.
38. Northcote, T.G. 1969. Patterns and mechanisms in the lakeward migratory behaviour of juvenile trout. Pages 183-203 In: T.G. Northcote [Editor] Symposium on Salmon and Trout in Streams. H.R. MacMillan Lectures in Fisheries. University of British Columbia, Vancouver, Canada.
39. Northcote, T.G. 1969. Lakeward migration of young rainbow trout (*Salmo gairdneri*) in the upper Lardeau River, British Columbia. Journal of the Fisheries Research Board of Canada 26 (1): 33-45.
40. Northcote, T.G. and T.G. Halsey. 1969. Seasonal changes in the limnology of some meromictic lakes in southern British Columbia. Journal of the Fisheries Research Board of Canada 26 (7): 1763-1787.
41. Dill, L.M. and T.G. Northcote. 1970. Effects of some environmental factors on survival, condition and timing of emergence of chum salmon fry (*Oncorhynchus keta*) Journal of the Fisheries Research Board of Canada 27 (1): 196-201.



42. Andrusak, H. and T.G. Northcote. 1970. Management implications of spatial distribution and feeding ecology of cutthroat trout and Dolly Varden in coastal B.C. British Columbia Fish and Wildlife Branch, Fisheries Management Publication 13:14 pages.
43. Dill, L.M. and T.G. Northcote. 1970. Effects of gravel size, egg depth and egg density on intra gravel movement and emergence of coho salmon (*Oncorhynchus kisutch*) alevins. Journal of the Fisheries Research Board of Canada 27(7):1191-1199.
44. Northcote, T.G. 1970. Advances in management of fish in natural lakes of western North America. Pages 129-139. In: N.G. Benson [Editor]. A century of fisheries in North America. Special Publication of the American Fisheries Society Number 7.
45. Northcote, T.G. and H. Rundberg. 1970. Spatial distribution of pelagic fishes in Lambarfjärden (Malaren, Sweden) with particular reference to interaction between *Coregonus albula* and *Osmerus eperlanus*. Report of the Institute of Freshwater Research, Drottningholm, Sweden 50:133-167.
46. Northcote, T.G., S.N. Willisicroft and H. Tsuki. 1970. Meristic and lactate dehydrogenase genotype differences in stream populations of rainbow trout below and above a waterfall. Journal of the Fisheries Research Board of Canada 27 (11): 1987-1995.
47. Andrusak, H. and T.G. Northcote. 1971. Segregation between adult cutthroat trout (*Salmo clarki*) and Dolly Varden (*Salvelinus malma*) in small coastal British Columbia lakes. Journal of the Fisheries Research Board of Canada 28 (9): 1259-1268.
48. Northcote, T.G. 1971. Collected comments on common problems from a visit to Soviet regions to attend the 18th congress of the International Society of Theoretical and Applied Limnology, with a post-congress trip to the Lake Baikal Limnological Institute as well as other research laboratories in Sweden, Germany and Italy. Report, Department of Zoology, University of British Columbia, Vancouver, Canada. 13 p.
49. Northcote, T. G. 1971. Man and the ecology of Kootenay Lake salmonids. Report to the Department of Zoology, University of British Columbia, Vancouver, Canada. 25 pages.
50. Northcote, T.G. 1972. Kootenay Lake: man's effects on the salmonid community. Journal of the Fisheries Research Board of Canada 29(6): 861-865.
51. Northcote, T.G. 1972. Some effects of mysid introduction and nutrient enrichment on a large oligotrophic lake and its salmonids. Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie 18: 1096-1106. [Kootenay Lake]
52. Schutz, D.C. and T.G. Northcote. 1972. An experimental study of feeding behaviour and interaction of coastal cutthroat trout (*Salmo clarki clarki*) and Dolly Varden (*Salvelinus malma*). Journal of the Fisheries Research Board of Canada 29(5): 555-565.
53. Northcote, T.G. 1972. Pollution in Russia: a look at Lake Baikal. Canadian Conservationist. Summer 1972: 22-24.
54. Northcote, T.G. 1972. Lakes of British Columbia: Garibaldi. Wildlife Review 6 (4) 44-47.
55. Northcote, T.G., T.G. Halsey and S.J. MacDonald. 1972. Fish as indicators of water quality in the Okanagan Basin lakes, British Columbia. British Columbia Okanagan Basin Agreement, Report 22. 80 pages.
56. Northcote, T.G. 1973. Some impacts of man on Kootenay Lake and its salmonids. Great Lakes Fishery Commission, Technical Report 25. 46 pages.
57. Northcote, T.G. 1973. Eutrophication and recreational fishes in two large lake basins in British Columbia. Pages 175-188. In: E.R. Reinelt, A.H. Laycock and W.M. Schultz. [Editors] Proceedings of Symposium on the lakes of western Canada. University of Alberta, Edmonton.
58. Northcote, T.G. 1974. Biology of the lower Fraser River: a review. University of British Columbia, Westwater Research Centre, Vancouver, Canada. Technical Report 3, 94 pages.
59. Northcote, T.G. 1974. Sampling of fish populations for evaluation of water quality conditions in large British Columbia lakes and rivers. United Nations Food and Agricultural Organization, Contribution Number 37, European Inland Fisheries Commission Symposium, Aviemore, Scotland. 18 pages.
60. Northcote, T.G. Review of "Inland waters and their ecology" by I.A.E. Bayly and W.D. Williams-Longman. In: Transactions of the American Fisheries Society 103: 651-653.
61. Northcote, T.G. 1974. Salmonids as elements in the ecology of British Columbia streams. Symposium on stream ecology for foresters. Parksville, British Columbia. Pages 1-16.
62. Stockner, J.G. and T.G. Northcote. 1974. Recent limnological studies of Okanagan Basin lakes and their contribution to comprehensive water resource planning. Journal of the Fisheries Research Board of Canada 31 (5): 955-976.
63. Slaney, P.A. and T.G. Northcote. 1974. Effects of prey abundance on density and territorial behavior of young rainbow trout (*Salmo gairdneri*) in laboratory stream channels. Journal of the Fisheries Research Board of Canada 31 (7): 1201-1209.
64. Northcote, T.G., T.G. Halsey and S.J. MacDonald. 1974. Mainstem fisheries and fishes. Pages 111-119. In: M.E. Pinsent and J.G. Stockner [Editors] The limnology of major Okanagan Basin lakes. Canada-British Columbia Okanagan Basin Agreement, Technical Supplement V to the Final Report of 261 pages.
65. Northcote, T.G. and R. Clarotto. 1975. Limnetic macrozooplankton and fish predation in some coastal British Columbia lakes. Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie 19: 2378-2393.
66. Northcote, T.G., N.T. Johnston and K. Tsumura. 1975. Trace metal concentrations in lower Fraser River fishes. University of British Columbia. Westwater Research Centre, Vancouver. Technical Report 7: 41 pages.
67. Northcote, T.G., G.L. Ennis and M.H. Anderson. 1975. Periphytic and planktonic algae of the lower Fraser River in relation to water quality conditions. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report No. 8: 61 pages.
68. Albright, L.J., T.G. Northcote, P.C. Oloffs and S.Y. Szeto. 1975. Chlorinated hydrocarbon residues in fish, crabs, and shellfish of the lower Fraser River, its estuary, and selected locations in Georgia Strait, British Columbia, 1972-73. Pesticides Monitoring Journal 9: 134-140.
69. Johnston, N.T., L.J. Albright, T.G. Northcote, P.C. Oloffs and K. Tsumura. 1975. Chlorinated hydrocarbon residues in fishes from the lower Fraser River. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report 9: 31 pages.
70. Northcote, T.G. 1976. Biology of the lower Fraser and ecological effects of pollution. Pages 85-119. In: A.H.J. Dorsey [Editor] The uncertain future of the lower Fraser River. University of British Columbia Press, Vancouver, Canada.
71. Northcote, T.G., N.T. Johnston and K. Tsumura. 1976. Benthic, epibenthic and drift fauna of the lower Fraser River. University of British Columbia, Westwater Research Centre, Technical Report 11. 227 pages.
72. Sandercock, G.A. and T.G. Northcote. 1977. A practical guide to the identification of common cyclopoid copepods in Lake Malaren, Sweden. 39 pages. Manuscript.
73. Dorsey, A.H.J., T.G. Northcote and D.V. Ward. 1978. Are the Fraser marshes essential to salmon? University of B.C., Westwater Research Centre, Lecture Series #1, 29 pages.
74. Northcote, T.G., M.A. Chapman and 10 U.B.C. zoology students, 16 March 1978. Deer Lake-a product of its watershed. Pages 37-69. Proceedings of the Citizens Committee, Okalla Lands Guinn-Wilson Reporting Services, Burnaby, B.C.
75. Northcote, T.G. Migratory strategies and production in freshwater fishes. Pages 326-359. In: S.D. Gerking [Editor]. Ecology of freshwater fish production. Blackwell Scientific Publications, Oxford. 520 pages.
76. Northcote, T.G., N.T. Johnston and K. Tsumura. 1978. A regional comparison of species distribution, abundance, size and other characteristics of lower Fraser River fishes. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report 14. 38 pages.
77. Northcote, T.G., C.J. Walters and J.M.B. Hume. 1978. Initial impacts of experimental fish introductions on the macrozooplankton of small oligotrophic lakes. Verhandlungen Internationale Vereinigung fur theoretische und angewandte Limnologie 20: 2003-2012.
78. Northcote, T.G. 1979. Fisheries / forestry interactions in British Columbia: need they be negative? Presentation to the British Columbia Truck Loggers Association, Annual Meeting, January 1979. 12 pages.

79. Northcote, T.G. 1979. Problems in evaluation of fish resources in some large inland waters of British Columbia. Proceedings of the Latin American Economic System (SELA) Seminar on Methods of Evaluating Fish Resources. Guayaquil, Ecuador. 10 pages.
80. Northcote, T.G. 1979. A review of literature on the Lake Titicaca system and its hydrobiological resources. United Nations Food and Agricultural Organization (UN-FAO Report). 61 pages. (Peru & Bolivia coverage).
81. Northcote, T. G. 1979. Investigation and recommendations on the hydrobiological resources of the Lake Titicaca system. United Nations Food and Agriculture Organization Report 76 / 022. 156 pages.
82. Northcote, T.G., N.T. Johnston and K. Tsumura. 1979. Feeding relationships and food web structure of lower Fraser River fishes. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report 16. 73 pages.
83. Levy, D.A., T.G. Northcote and G.J. Birch. 1979. Juvenile salmon utilization of tidal channels in the Fraser River estuary, British Columbia. Westwater Research Centre, Vancouver, B.C. Technical Report 23. 70 pages.
84. Northcote, T.G. 1980. Morphometrically conditioned eutropy and is amelioration in some British Columbia lakes. Pages 305-315. In: J. Barica and L. R. Mur [Editors]. Developments in Hydrobiology. Volume 2.
85. Northcote, T.G. 1980. Methods and recommendations for fish and limnological sampling in the littoral zone of Lake Titicaca. Report to the United Nations Food and Agriculture Organization, PER / 76 / 022. 30 pages.
86. Northcote, T.G. 1980. A review of the effects of forest fire on aquatic ecosystems with particular reference to fish in north-temperate-arctic regions. Report to Canada Department of Indian and Northern Affairs, Ministerial Fire Review Panel. 24 pages.
87. Northcote, T.G. and B.W. Kelso. 1981. Differential response to water current by two homozygous LDH phenotypes of young rainbow trout (*Salmo gairdneri*). Canadian Journal of Fisheries and Aquatic Sciences 38: 348-352.
88. Kelso, B.W. and T.G. Northcote. Current response of young rainbow trout from inlet and outlet spawning stocks of a British Columbia lake. Verhandlungen Internationale Vereinigen fur theoretische and angewandte Limnologie 21: 1214-1221.
89. Northcote, T.G. 1981. Juvenile current response, growth and maturity of above and below waterfall stocks of rainbow trout, *Salmo gairdneri*. Journal of Fish Biology 18: 741-751.
90. Levy, D.A. and T. G. Northcote. 1981. The distribution and abundance of juvenile salmon in marsh habitats of the Fraser River estuary. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report 25. 117 pages.
91. Northcote, T.G. 1982. Report to the Canadian International Development Agency (CIDA) on the UBC/UNTA training project in management of water quality and aquatic resources at Puno, Peru. January 1981. 20 pages of text plus 25 colour prints.
92. Nilsson, N.A. and T.G. Northcote. 1981. Rainbow trout (*Salmo gairdneri*) and cutthroat trout (*S. clarki*) interactions in coastal British Columbia lakes. Canadian Journal of Fisheries and Aquatic Sciences 38 (10): 1228-1246.
93. Kelso, B.W., T.G. Northcote and C.F. Wehrhahn. 1981. Genetic and environmental aspects of the response to water current by rainbow trout (*Salmo gairdneri*) originating from inlet and outlet spawning streams of two lakes. Canadian Journal of Zoology 59: 2177-2185.
94. Levy, D.A. and T.G. Northcote. 1982. Juvenile salmon residency in a marsh area of the Fraser River estuary. Canadian Journal of Fisheries and Aquatic Sciences 39 (2): 270-276.
95. Northcote, T.G. and P. Morales. 1982. Introduction to the seminar on physical, chemical and biological conditions relating to water quality in Puno Bay, Lake Titicaca. Universidad Nacional del Altiplano, Puno, Peru. [English 29 pages and Spanish 31 pages].
96. Irvine, J.R. and T.G. Northcote. 1982. Significance of sequential feeding patterns of juvenile rainbow trout in a large lake-fed river. Transactions of the American Fisheries Society 111: 446-452.
97. Green, J.D. and T.G. Northcote. 1982. The naupliar instars of *Diaptomus kenai* (Copepoda, Calanoida) and their distinctions from those of four other diaptomids. Canadian Journal of Zoology 60(9): 2162-2172.
98. Levy, D.A., T.G. Northcote and R.M. Barr. 1982. Effects of estuarine log storage on juvenile salmon. University of British Columbia, Westwater Research Centre, Vancouver. Technical Report 26. 101 pages.
99. Northcote, T.G. and M. Arcifa. 1983. Ecological interactions within the fish community of a Brazilian reservoir. Proceedings of the 15<sup>th</sup> Pacific Science Congress, Freshwater Fisheries, Session C. Dunedin, New Zealand. [Abstract] 1 page.
100. Morales, P., T. G. Northcote, D. Choquehuanca and D.A. Levy. 1983. Cultural eutrophication and fish in Puno Bay, Lake Titicaca, Peru. Proceedings of the 15<sup>th</sup> Pacific Science Congress, Freshwater Fisheries, Session C, Dunedin, New Zealand. [Abstract] 1 page.
103. Irvine, J.R. and T.G. Northcote. 1983. Selection of young rainbow trout (*Salmo gairdneri*) in simulated stream environments for live and dead prey of different sizes. Canadian Journal of Fisheries and Aquatic Sciences 40 (10): 1745-1749.
104. Northcote, T.G. 1984. Mechanisms of fish migration in rivers. Invited review. NATO Advanced Research Institute. Pages 317-355. In: J.D. McCleave et al. [Editors] Mechanisms of migration in fishes. Plenum Press, New York & London.
105. McCleave, J.D., F.R. Harden Jones, W.C. Leggett, and T.G. Northcote. 1984. Fish migration studies: future directions. Pages 545-554. In: J.D. McCleave et al. [Editors] Mechanisms of migration in fishes. Plenum Press, New York and London.
106. Morales, P., T.G. Northcote and D.A. Levy. 1984. A centre for limnological training and research on Lake Titicaca and the aquatic ecosystems of the Peruvian Altiplano. Verhandlungen Internationale Vereinigen fur theoretische and angewandte Limnologie 22: 1335-1339.
107. Jonsson, B., K. Hindar and T.G. Northcote. 1984. Optimal age at sexual maturity of sympatric and experimentally allopatric cutthroat trout and Dolly Varden charr. Oecologia (Berlin) 61: 319-325.
108. Trevino, H., J. Torres, D.A. Levy and T.G. Northcote. 1984. Pesca experimental en aguas negras y limpias del litoral de la Bahía de Puno, Lago Titicaca, Peru. Bolitin Instituto del Mar del Peru. 8 (6): 1-28 (Spanish), 29-36 (English): Experimental fishing in littoral areas of the "black water" and "clear water" of Puna Bay, Lake Titicaca, Peru.
109. Northcote, T.G., M.S. Arcifa and O. Froehlich. 1985. Effects of impoundment and drawdown on the fish community of a South American river. Verhandlungen Internationale Vereinigen fur theoretische and angewandte Limnologie 22: 2704-2711.
110. Hume, J.M.B. and T.G. Northcote. 1985. Initial changes in use of space and food by experimentally segregated populations of Dolly Varden (*Salvelinus malma*) and cutthroat trout (*Salmo clarki*). Canadian Journal of Fisheries and Aquatic Sciences 42 (1): 101-109.
111. Henderson, M.A. and T.G. Northcote. 1985. Visual prey detection and foraging in sympatric cutthroat trout (*Salmo clarki clarki*) and Dolly Varden (*Salvelinus malma*). Canadian Journal of Fisheries and Aquatic Sciences 42 (4): 785-790.
112. Berg, L. and T.G. Northcote. 1985. Changes in territoriality, gill flaring, and feeding behaviour in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42 (8): 1410-1417.
113. Northcote, T.G. and F.J. Ward. 1985. Lake resident and migratory smelt, *Retropinna retropinna* (Richardson), of the lower Waikato River system, New Zealand. Journal of Fish Biology 27: 113-129.
114. Chapman, M.A., J.D. Green and T.G. Northcote. 1985. Seasonal dynamics of *Skistodiaptomus pallidus* Herrick and other zooplankton populations in Deer Lake, S. W. British Columbia. Journal of Plankton Research 7 (6): 867-876.
115. Northcote, T.G. 1985. The UBC-UNA-CIDA training project in water pollution control and aquatic resource management at Lake Titicaca, Puno, Peru. University of British Columbia, Westwater Research Centre, Vancouver. 35 pages. See also Verh. Internat. Verein. Limnol. 22 1335-1339.
116. Klassen, H.D. and T.G. Northcote. 1986. Stream bed configuration and stability following gabion weir placement to enhance salmonid production in a logged watershed subject to debris torrents. Canadian Journal of Forestry Research 16: 197-203.

117. Arcifa, M.S., T.G. Northcote and O. Froehlich. 1986. Fish-zooplankton interactions and their effects on water quality of a tropical Brazilian reservoir. *Hydrobiologia* 139: 49-58.
118. Lasenby, D.C., T.G. Northcote and M. Fiirst. 1986. Theory, practice and effects of *Mysis relicta* introductions to North American and Scandinavian lakes. *Canadian Journal of Fisheries and Aquatic Sciences* 43 (6): 1277-1284.
119. Hall, K.J. and T.G. Northcote. 1986. A novel terrestrial-freshwater linkage: robin predation on damselfly nymphs. *Discovery* 15 (3): 107-109.
120. Kistritz, R.U., P. Morales and T.G. Northcote. 1986. Proposed application of an aquatic plant-wastewater lagoon system in a high elevation environment (Lake Titicaca, Peru). Conference on research and application of aquatic plants for water treatment and resource recovery, Orlando, Florida, U.S.A. [Abstract]. 1 page.
121. Northcote, T.G., R.U. Kistritz, P. Morales and S. Rivera. 1986. A summary of research conducted on water quality conditions associated with littoral macrophyte stands, Inner Puno Bay, Lake Titicaca, Peru, under UNESCO support. Westwater Research Centre, The University of British Columbia, Vancouver, Canada. 8 pages.
122. Northcote, T.G., R.G. Northcote and M.S. Arcifa. 1986. Differential cropping of the caudal fin lobes of prey fishes by the piranha, *Serrasalmus spilopleura* Kner. *Hydrobiologia* 141: 199-205.
123. Hall, K.J. and T.G. Northcote. 1986. Conductivity-temperature standardization and dissolved solids estimation in a meromictic saline lake. *Canadian Journal of Fisheries and Aquatic Sciences* 43 (12): 2450-2454.
124. Walters, C.J., E. Krauss, W.E. Neill and T.G. Northcote. 1987. Equilibrium models for seasonal dynamics of plankton biomass in four oligotrophic lakes. *Canadian Journal of Fisheries and Aquatic Sciences* 44 (5): 1002-1017.
125. Schreier, H. and T.G. Northcote. 1987. Monitoring trace metal toxicity in the Sumas River sediments. *Canadian Society of Environmental Biologists Bulletin* 44 (1): 10-16.
126. Ward, F.J., T.G. Northcote and M.A. Chapman. 1987. The effects of recent environmental changes in Lake Waahi on two forms of the common smelt *Retropinna retropinna*, and other biota. *Water, Air, and Soil Pollution* 32: 427-443.
127. Northcote, T.G., M.S. Arcifa and O. Froehlich. 1987. Fin-feeding by the piranha (Kner): the cropping of a novel renewable resource. Pages 133-143 in *Proceedings of the 5<sup>th</sup> Congress of European Ichthyologists, Stockholm 1985, Symposium on Systematics and Evolutionary Ecology of Neotropical Fishes*.
128. Giguere, L. and T.G. Northcote. 1987. Ingested prey increase risks of visual predation in transparent *Chaoborus* larvae. *Oecologia* (Berlin) 73: 48-52.
129. Schreier, H., T.G. Northcote and K.J. Hall. 1987. Trace metals in fish exposed to asbestos rich sediments. *Water, Air, and Soil Pollution* 35: 279-291.
130. Dorsey, A.H.J. and T.G. Northcote. 1988. Interagency cooperation in training for water resources management: Canadian experiences in the Peruvian altiplano. *Canadian Water Resources Journal* 13 (1): 43-51.
131. Henderson, M.A. and T.G. Northcote. 1988. Retinal structure of sympatric and allopatric populations of cutthroat trout (*Salmo clarki clarki*) and Dolly Varden char (*Salvelinus malma*) in relation to their spatial distribution. *Canadian Journal of Fisheries and Aquatic Sciences* 45 (7): 1321-1326.
132. Northcote, T.G. 1988. The undammed Fraser River: is it the world's greatest salmonid producer? Pages 55-67 In: D.W. Wilkie [Editor] *The Water Cycle Symposium*. Scripps Institute of Oceanography, La Jolla, California, U.S.A.
133. Hindar, K., B. Jonsson, J.H. Andrew and T.G. Northcote. 1988. Resource utilization of sympatric and experimentally allopatric cutthroat trout and Dolly Varden charr. *Oecologia* (Berlin) 74: 481-491.
134. Northcote, T.G. 1988. Meristic variation in the New Zealand smelt, *Retropinna retropinna* (Richardson): new questions for an old problem. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 23: 1797-1804.
135. Klassen, H.D. and T.G. Northcote. 1988. Use of gabion weirs to improve spawning habitat for pink salmon in a small logged watershed. *North American Journal of Fisheries Management* 8: 36-44.
136. Northcote, T.G. 1988. Catching the rise: the ascent of experimental approaches in trout stream research and its challenge. *Polskie Archiwum Hydrobiologii* 35 (3-4): 231-265.
137. Northcote, T.G. and G.F. Hartman. 1988. The biology and significance of stream trout populations (*Salmo* spp.) living above and below waterfalls. *Polskie Archiwum Hydrobiologii* 35 (3-4): 409-442.
138. Northcote, T.G. 1988. Fish in the structure and function of freshwater ecosystems: a "top-down" view. *Canadian Journal of Fisheries and Aquatic Sciences* 45 (2): 361-379.
139. Murphy, T.P., K.J. Hall and T.G. Northcote. 1988. Lime treatment of a hardwater lake to reduce eutrophication. *Lake and Reservoir Management* 4 (2): 51-62.
142. Arcifa, M.S., O. Froehlich and T.G. Northcote. 1988. Distribution and feeding ecology of fishes in a tropical Brazilian reservoir. *Memoria Sociedad de Ciencias Naturales La Salle, Venezuela*. Tomo XLVIII, Suplemento 1988: 301-326. (Main text in English)
143. Northcote, T.G. and P.A. Larkin. 1989. The Fraser River: a major salmonine production system. *Canadian Special Publication of Fisheries and Aquatic Sciences* 106: 172-204.
144. Northcote, T.G., A.E. Peden and T.E. Reimchen. 1989. Fishes of the coastal marine, riverine and lacustrine waters of the Queen Charlotte Islands. Pages 147-174. In: G.G.E. Scudder and N. Gessler [Editors] *The Outer Shores. Proceedings of the Queen Charlotte Islands First International Symposium*, University of British Columbia, August 1984. 327 pages.
145. Beamish, R.J. and T.G. Northcote. 1989. Extinction of a population of anadromous parasitic lamprey, *Lampraea tridentata*, upstream of an impassable dam. *Canadian Journal of Fisheries and Aquatic Sciences* 46 (2): 420-425.
146. Northcote, T.G., P. Morales S., D.A. Levy and M.S. Greaven [Editors] 1989. *Pollution in Lake Titicaca, Peru: training, research and management*. University of British Columbia, Westwater Research Centre, Vancouver, Canada, and Instituto de Aguas Alto Andinas, Universidad Nacional del Altiplano, Puno, Peru. 262 pages.
147. Northcote, T.G. and P. Morales S. 1989. Appropriate development of aquatic resources: training, research, and management. Chapter 1: Pages 1-10. In: T. G. Northcote et al. (as above in #146).
148. Northcote, T.G., P. Morales S. and A.H.J. Dorsey. 1989. Overview of conclusions and recommendations. Chapter 2; Pages 11-17. In: T.G. Northcote et al. (as above in #146).
149. Morales, S. P., T. G. Northcote, W. Zea F., and M.E. Vasquez E. 1989. Effects of eutrophication on physical conditions. (Chapter 3) ; Pages 19-31 In: T.G. Northcote et al. (as above in #146).
150. Miranda Z.N., K.J. Hall, T.G. Northcote, A.A. Hinojosa G., A. Sarmiento M., and M.H. Mollocondo H. 1989. Effects of eutrophication on chemical conditions. Pages 33-56 In: T.G. Northcote et al. (Chapter 4), (as above in # 146).
151. Muniz D., B.V., M.A. Chapman, B.Chino C., E. Azurin D., and T.G. Northcote. 1989. Effects of eutrophication on zooplankton. (Chapter 7), Pages 81-100 In: T. G. Northcote et al. (as in #146).
152. Morales S., P., E. Cornejo E., D.A. Levy, D. Challico M., A.C. Medina C., and T.G. Northcote. 1989. Effects of eutrophication on zoobenthos. (Chapter 8) Pages 101-113 In: T.G. Northcote et al. (as above in # 146).
153. Trevino, H., J. Torres, D.J. Choquehuanca P., D.A. Levy and T.G. Northcote. 1989. Effects of eutrophication on fish. (Chapter 9). Pages 115-128 In: T.G. Northcote et al. (as above in #146).
154. Pacoricona V., F., C. Luna C., K.J. Hall and T.G. Northcote. 1989. (Chapter 15) *The water supply of Puno*. Pages 219-228 In: T.G. Northcote et al. (as above in # 146).
155. Ward, F.J., J.A.T. Boubee, A.S. Meridith and T.G. Northcote. 1989. Characteristics of the common smelt, *Retropinna retropinna* (Richardson), of the Waikato River system. *New Zealand Journal of Marine and Freshwater Research* 23: 345-355.
156. Nelson, C.S., T.G. Northcote and C.H. Hendy. 1989. Potential use of oxygen and carbon isotopic composition of otoliths to identify migratory and non-migratory stocks of the New Zealand common smelt: a pilot study. *New Zealand Journal of Marine and Freshwater Research* 23: 337-344.



157. Ward, P.R.B., E.A. Cousins, K.J. Hall, T.G. Northcote and T.P. Murphy. 1989. Mixing by wind and penetrative convection in small lakes. Proceedings of the International Association of Hydraulic Research, 23<sup>rd</sup> Congress, Ottawa, Canada. Pages D331-338.
158. Johnston, N.T. and T.G. Northcote. 1989. Life-history variation in *Neomysis mercedis* Holmes (Crustacea, Mysiacea) in the Fraser River estuary, British Columbia. Canadian Journal of Zoology 67 (2): 363-372.
159. Levy, D.A., T.G. Northcote, K.J. Hall and I. Yesaki. 1989. Juvenile salmonid responses to log storage in littoral habitats of the Fraser River estuary and Babine Lake. Canadian Special Publication of Fisheries and Aquatic Sciences 105: 82-91.
160. Northcote, T.G., M.S. Arcifa and K.A. Munro. 1990. An experimental study of the effects of fish zooplanktivory on the phytoplankton of a Brazilian reservoir. Hydrobiologia 194: 31-45.
161. Walters, C.J., D.C.E. Robinson and T.G. Northcote. 1990. Comparative population dynamics of *Daphnia rosea* and *Holopedium gibberum* in four oligotrophic lakes. Canadian Journal of Fisheries and Aquatic Sciences 47 (2): 401-409.
162. Comin, F.A. and T.G. Northcote. 1990. [Editors] Saline lakes. Kluwer Academic Publishers. Dordrecht/Boston/London. 308 pages. (Editors Preface, vii-viii).
163. Northcote, T.G. and K.J. Hall. 1990. Vernal microstratification patterns in a meromictic saline lake: their causes and biological significance. Hydrobiologia 197: 105-114.
164. Hall, K.J. and T.G. Northcote. 1990. Production and decomposition processes in a saline meromictic lake. Hydrobiologia 197: 115-128.
165. Ward, P.R.B., K.J. Hall, T.G. Northcote, W. Cheung and T. Murphy. 1990. Autumnal mixing in Mahoney Lake, British Columbia. Hydrobiologia 197: 129-138.
166. Rempel, R. S. and T. G. Northcote. 1990. Winter feeding and spatial distribution of lacustrine Dolly Varden charr and cutthroat trout populations. Physiological Ecology Japan, Special Publication Volume 1: 323-336.
167. Bodkin, J., T.G. Northcote and P. Thomas. 1991. Celgar expansion review panel final report. Canada Federal Environmental Assessment and Review Process and British Columbia Major Project Review Process. 98 pages.
- 168-176. Northcote, T.G., P. Morales S., D.A. Levy and M.S. Greaven. 1991. [Editors] Contaminacion en el Lago Titicaca, Peru: capitacion, investigacion y manejo. University of British Columbia, Westwater Research Centre, Vancouver, Canada y Instituto de Aguas Alto Andinas, Universidad Nacional del Altiplano, Puno, Peru. 278 pages. [In Spanish]. TGN first author of chapters 1, 2 and co-author of chapters 3, 4, 7, 8, 9, 15.
169. Northcote, T.G. and P. Morales S. 1991. Capitulo 1. Desarrollo adecuado de los recursos de los recursos acuaticos: capitacion, investigacion y manejo. 11 paginas.
170. Northcote, T.G., P. Morales S. y A.H.J. Dorsey. Capitulo 2. Resumen de las conclusiones y recomendaciones. 8 paginas.
171. P. Morales S., T.G. Northcote, W. Zea F., y M.E. Vasquez E. Capitulo 3. Efectos de la eutroficion sobre las condiciones fisicas. 14 paginas.
172. Miranda N, K.J. Hall, T.G. Northcote, A.A. Hinosa G., A. Sarmiento M., y M.H. Mollocondo H. Capitulo 4. Efectos de la eutrophicsion sobre los condiciones quimicas. 26 paginas.
173. Muniz, B.V., M.A. Chapman, B. Chino C., E. Azurin D., y T.G. Northcote. Capitulo 7. Efectos de la eutrofication sobre el zooplancton. 21 paginas.
174. Morales, P.S., E. Cornejo E., D.A. Levy, D. Chalco M., A.C. Medina., y T.G. Northcote. Capitulo 8. Efectos de la eutrophication sobre el zoobentos. 14 paginas.
175. Trevino, H., J. Torres, D.J. Choquehuanca P., D.A. Levy, y T.G. Northcote. Capitulo 10. Eutrofication y la economia de los recursos acuaticos. 27 paginas.)
176. Pacoricona, F.V., C. Luna C., K.J. Hall, y T.G. Northcote. Capitulo 15. Abastecimiento de agua potable en Puno. 11 paginas.
177. Northcote, T.G. 1991. Migration (of trout). Pages 84-95 In: J. Stolz and J. Schnell [Editors] Trout. Stackpole Books, Harrisburg, PA 17105, U.S.A.
178. Northcote, T.G. 1991. Success, problems, and control of introduced mysid populations in lakes and reservoirs. American Fisheries Society Symposium 9: 5-16.
179. Martin, A.D. and T.G. Northcote. 1991. Kootenay Lake: an inappropriate model for *Mysis relicta* introduction in north temperate lakes. American Fisheries Society Symposium 9: 23-29.
180. Arcifa, M.S., T. G. Northcote and O. Froehlich. 1991. Interactive ecology of two cohabiting characin fishes (*Astyanax fasciatus* and *Astyanax bimaculatus*) in a eutrophic Brazilian reservoir. Journal of Tropical Ecology 7: 257-268.
181. Heggenes, J., T.G. Northcote and A. Peter. 1991. Spatial stability of cutthroat trout (*Oncorhynchus clarki*) in a small coastal stream. Canadian Journal of Fisheries and Aquatic Sciences 48 (5): 757-762.
182. Power, E.A. and T.G. Northcote. 1991. Effects of log storage on the food supply and diet of juvenile sockeye salmon (*Oncorhynchus nerka*). North American Journal of Fisheries Management 11: 413-423.
183. Overmann, J., J.T. Beatty, K.J. Hall, N. Pfennig and T.G. Northcote. 1991. Characterization of a dense, purple sulfur bacterial layer in a meromictic salt lake. Limnology and Oceanography 36 (5): 846-859.
184. Heggenes, J., T.G. Northcote and A. Peter. 1991. Seasonal habitat selection and preferences by cutthroat trout (*Oncorhynchus clarki*) in a small, coastal stream. Canadian Journal of Fisheries and Aquatic Sciences 48 (8): 1364-1370.
185. Northcote, T.G. and M.D. Burwash. 1991. Fish and fish habitats of the Fraser River basin. Pages 117-141 In: A.H.J. Dorsey and J. Grigg [Editors]. Water in sustainable development: exploring our common future in the Fraser River Basin. Part II: Natural Systems and Interactions with Human Systems. University of British Columbia Press, Vancouver, Canada.
186. Northcote, T. G. 1991. Effects of climate change and variability on freshwater fisheries in British Columbia. Pages 64-80. Canadian Climate Centre Report 91-11, National Hydrology Research Centre, Saskatoon, Saskatchewan, Canada. In: Review of Models for Climate Change and Impacts on Hydrology, Coastal Currents and Fisheries in British Columbia: prepared by G.A. McBean, O. Slaymaker, T. Northcote, P. LeBland and T.S. Parsons.
187. Rivera R., C., R.U. Kistritz, P. Morales S., J. Garnica P., W. Zea F. and T.G. Northcote. 1991. Assessing the use of aquatic plants for wastewater treatment in a high elevation tropical lake. Verhandlungen Internationale Vereinigen fur theoretische and angewandte Limnologie 24: 1178-1182.
188. Northcote, T.G. 1991. Eutrofizacion y problemas de polucion. Pages 563-572. In: C. Dejoux y A. Iltis [Editors]. El Lago Titicaca: sintesis del conocimiento limnologico actual. ORSTOM, La Paz, Bolivia; Paris, France.
189. Chapman, M.A., J.D. Green and T.G. Northcote. 1991. The enigma of *Diaptomus connexus* (Copepoda) in Mahoney Lake: one or two populations? Verhandlungen Internationale Vereinigen fur theoretische and angewandte Limnologie 24: page 2820. [Abstract].
190. Northcote, T.G. 1991. Headwater salmonid stocks: an overlooked source of endangered species. Invited Report to the Institute of Freshwater Research, Drottningholm, Sweden. 4 pages.
191. Andrew, J. H., N. Jonsson, B. Jonsson, K. Hindar and T. G. Northcote. 1992. Changes in use of lake habitat by experimentally segregated populations of cutthroat trout and Dolly Varden char. Ecography 15: 245-252. Copenhagen 1992.
192. Fausch, K.D. and T.G. Northcote. 1992. Large woody debris and salmonid habitat in a small coastal British Columbia stream. Canadian Journal of Fisheries and Aquatic Sciences 49 (4):682-693.
193. Northcote, T.G. 1992. Migration and residency in stream salmonids-some ecological considerations and evolutionary consequences. Nordic Journal of Freshwater Research 67: 5-17.
194. Northcote, T.G. 1992. Eutrophication and pollution problems. Pages 551-561 In: C. Dejoux and A. Iltis [Editors] Lake Titicaca. Kluwer Academic Publishers. Dordrecht / Boston / London.
195. Northcote, T.G. 1992. Review of: Comparative analyses of ecosystems: patterns, mechanisms, and theories. J. Cole, G. Lovett and S. Findlay [Editors]. Springer Verlag, New York. Invited Review In: The Quarterly Review of Biology 67, Number 3:387-388.

196. Northcote, T.G. 1992. Life as a trout wanderer. In "Trout", Spring 1992: 58-67.
197. Northcote, T.G. 1992. Freshwater ecosystems; climate change. TGN Symposium organizer and editor for the Pacific Science Association, Congress, Hawaii. *GeoJournal* 28 (1): 5-6.
198. Northcote, T.G. 1992. Prediction and assessment of potential effects of global environmental change on freshwater sport fish habitat in British Columbia. *GeoJournal* 28 (1): 39-49.
199. Northcote, T.G. 1992. Major environmental change processes affecting freshwaters of the northwestern Pacific coastal zone. *Pacific Science Association Information Bulletin* 44 (3-4): 11-12.
200. McBean, G.A., O. Slaymaker, T. Northcote, P. LeBlond and T.S. Parsons. 1992. Review of models for climate change and impacts on hydrology, coastal currents and fisheries in B.C. *Climate Change Digest* CCD 92-02. Environment Canada. Pages 1-15.
201. Northcote, T.G. and B. Luksun. 1992. Restoration and environmental sustainability of a small British Columbia urban lake. *Water Pollution Research Journal of Canada* 27 (2):341-364. (Deer Lake near Vancouver).
202. Northcote, T.G., C.H. Hendy, C.S. Nelson and J.A.T. Boubee. 1992. Tests for migratory history of the New Zealand common smelt (*Retropinna retropinna* (Richardson)) using otolith isotopic composition. *Ecology of Freshwater Fish* 1: 61-72.
203. Northcote, T.G. 1992. Project environment [aquatic]. Pages 3-1 to 3-11; 6-1 to 6-3. In *Windy Craggy Project Qualitative Risk Assessment*. Prepared for: British Columbia Commission on Resources and Environment, Victoria, Canada, by Rescan Consultants Inc., Vancouver, Canada.
204. Northcote, T.G. 1992. Getting the message across to foresters. Pages 70-74 In: J.W. Hayes and S.F. Davis [Editors]. *Proceedings of the Fisheries/Forestry Conference*, 27-28 February 1990, Christchurch, New Zealand. New Zealand Freshwater Fisheries Report No. 136.
205. Northcote, T.G., C.J. Bull, G.B. Northcote, and R.G. Northcote. 1993. Counting shore-spawning rainbow trout redds by helicopter and shoreline observation at Joe Lake, south-central British Columbia. B.C. Ministry of Environment, Lands and Parks, Penticton, B.C. 7 pages.
206. Borgstrom, R., J. Heggenes and T.G. Northcote. 1993. Regular, cyclic oscillations in cohort strength in an allopatric population of brown trout, *Salmo trutta* L. *Ecology of Freshwater Fish* 2: 8-15.
207. McDowall, R.M., B.M. Clark, G.L. Wright and T.G. Northcote. 1993. Trans-2-cis-6-nonadienal: the cause of cucumber odour in osmerid and retropinnid smelts. *Transactions of the American Fisheries Society* 122: 144-147.
208. Gregory, R.S. and T.G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions. *Canadian Journal of Fisheries and Aquatic Sciences* 50 (2): 233-240.
209. Mitchell, C.P., P.J. Smith and T.G. Northcote. 1993. Genetic differentiation among populations of the New Zealand common smelt, *Retropinna retropinna* (Richardson), from the Waikato basin. *New Zealand Journal of Marine and Freshwater Research* 27: 249-255.
210. Overmann, J., G. Sandmann, K.J. Hall and T.G. Northcote. 1993. Fossil carotenoids and paleolimnology of meromictic Mahoney Lake, British Columbia, Canada. *Aquatic Sciences* 55/1: 31-39.
211. Effer, R., M. Halleran and T.G. Northcote. 1993. Report to B.C. Hydro by the Environmental Review Board re Revelstoke Right Bank Protection Project. 33 pages.
212. Northcote, T.G. 1993. A review of management and enhancement options for the Arctic grayling (*Thymallus arcticus*) with special reference to the Williston Reservoir watershed in British Columbia. British Columbia Ministry of Environment, Lands and Parks, Fisheries Management Report No. 101, 69 pages.
213. Northcote, T.G. 1994. Review of possible effects of a small breakwater at Nicola Lake on salmonid fry habitat, migration and predation. Report to J.G. Rose, Quilchena Cattle Company, Quilchena, British Columbia. 4 pages.
214. Northcote, T.G. and G.L. Ennis. 1994. Mountain whitefish biology and habitat use in relation to compensation and improvement possibilities. *Reviews in Fisheries Science* 2 (4) 347-371.
215. Northcote, T.G. and C.H. Northcote. 1994. Lakeshore change: a local contribution to a global issue. *The Summerland Towne Crier* 2 (21): 2 pages 1, 6.
216. Northcote, T.G. 1994. Limnology of mountain lakes - a brief review. *GeoJournal*. 1 page.
217. Northcote, T.G. 1994. The habitat, fish and fisheries of the Fraser River basin: are they sustainable? Invited presentation, Canadian Aquatic Resources Section, American Fisheries Society Annual Meeting, Halifax, August 1994. 30 pages.
218. Northcote, T.G. 1994. Kitsault Lake Project; On-site Review. Report to Rescan Environmental Services Ltd., Vancouver, B.C. 9 pages.
219. Northcote, T.G. 1995. The highest large lake in the world: a limnological synthesis. Invited review of: "Lake Titicaca: a synthesis of limnological knowledge" by C. Dejoux and A. Iltis 1992 [Editors]. In: *Environmental Biology of Fishes* 42: 103-104.
220. Northcote, T.G. 1995. Comparative biology and management of Arctic and European grayling (Salmonidae, *Thymallus*). *Reviews in Fish Biology and Fisheries* 5 (2) : 141-194.
221. Northcote, T.G. 1995. Confessions from a four decade affair with Dolly Varden: a synthesis and critique of experimental tests for interactive segregation between Dolly Varden char (*Salvelinus malma*) and cutthroat trout (*Oncorhynchus clarki*) in British Columbia. *Nordic Journal of Freshwater Research* 71: 49-67.
222. Northcote, T.G. 1995. Habitat requirements of British Columbia salmonids. Invited paper presented to the B.C. Pilot Watershed Restoration Program, Coastal Fish Habitat Assessment and Rehabilitation Workshop, 28 August 1995. 17 pages.
223. Northcote, T.G. and C.H. Northcote. 1996. Shoreline marshes of Okanagan Lake. Are they habitats of high productivity, diversity, scarcity and vulnerability? *Proceedings of the 6<sup>th</sup> International Conference on the Conservation and Management of Lakes - Kasumigaura 1995, Japan, Lakes & Reservoirs: Research and Management* 2: 157-161.
224. Northcote, T.G. 1996. [Editor] *Population growth - and fresh water?* *GeoJournal* 40, Issues 1 & 2. Kluwer Academic Publishers, Dordrecht / Boston / London. 248 pages.
225. Northcote, T.G. 1996. Editorial: Effects of human population growth on freshwater quality, quantity and biotic systems. *GeoJournal* 40: pages 1-2.
226. Northcote, T.G. 1996. Effects of human population growth on the Fraser and Okanagan river systems, Canada: a comparative inquiry. *GeoJournal* 40 : 127-133.
227. Slaney, T.L., K.D. Hyatt, T.G. Northcote, and R.J. Fielden. 1996. Status of anadromous salmon and trout in British Columbia and Yukon. *Fisheries (American Fisheries Society)* 21, No. 10: 20-35.
228. Northcote, T.G. 1996. Impacts of impoundment: comparative experience with fish communities, their food webs, productivity, and problems in Canadian and Brazilian hydroelectric reservoir ecosystems. Invited presentation to the Seminario sobre fauna aquatica e o setor eletrico Brasileiro. 10-12 Abril, Rio de Janeiro. 46 pages.
229. Northcote, T.G. and D.Y. Atagi. 1997. Pacific salmon abundance trends in the Fraser River watershed compared with other British Columbia systems. Pages 199-219 In: D.J. Stouder, P.A. Bisson and R.J. Naiman [Editors] "Pacific salmon and their ecosystems". Chapman & Hall, International Thomson Publishing, New York.
230. Northcote, T.G. 1997. Abundance and diversity of epibenthic invertebrates in contrasting shoreline habitat of a large British Columbia lake. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 26: 564-568. (Invited presentation at the International Congress XXV I of Theoretical and Applied Limnology, Sao Paulo, Brazil.)
231. Arcifa, M.S. and T.G. Northcote. 1997. Need for holistic approaches in food web experiments and biomanipulation in tropical lakes: a Brazilian reservoir experience. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 26: 661-665.
232. Lowe, D.J., J.D. Green, T.G. Northcote and K.J. Hall. 1997. Holocene fluctuations of a meromictic lake in southern British Columbia. *Quaternary Research* 48: 100-113.

234. Northcote, T.G. 1997. Why sea-run? An exploration into the migratory / residency spectrum of coastal cutthroat trout. Pages 20-26. In: J.D. Hall, P.A. Bisson and R.E. Gresswell [Editors] Sea-run cutthroat: biology, management and future conservation. Oregon Chapter, American Fisheries Society, Corvallis, U.S.A.
235. Slaney, T.L., K.D. Hyatt, T.G. Northcote and R.J. Fielden. 1997. Status of anadromous cutthroat trout in British Columbia. Pages 77-79 in J.D. Hall, P.A. Bisson and R.E. Gresswell. [Editors] Sea-run cutthroat: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.
236. Northcote, T.G. 1997. Potamodromy in Salmonidae - living and moving in the fast lane. North American Journal of Fisheries Management 17: 1029-1045.
237. Northcote, T.G. 1997. Attempts at integration of biological and cultural diversity in ancient Lake Titicaca, Peru. Invited presentation at the International Conference on Ancient Lakes, Lake Biwa Museum, Japan. Abstract and text. 22 pages.
238. Northcote, T.G., P.T. Northcote and M.A. Chapman. 1997. A brief reconnaissance of the limnology of Chatham and Pitt Islands, New Zealand. 9 pages.
239. Northcote, T.G. and R.D. McMullen. 1997. The Eneas Creek - marsh system and its ecological value as an educational reserve for the Municipality of Summerland, B.C. 13 pages.
240. Northcote, T.G. 1997. Limnological sampling data: 1994 - 1996 at Paradise Lake, headwaters of Quilchena Creek, south-central British Columbia. 4 pages.
241. Northcote, T.G., J.B. Hopkins, and J. Millar. 1997. A limnological reconnaissance of Divide and Baker lakes in Okanagan Mountain Park, British Columbia, July 1996. 8 pages.
242. Northcote, T.G. and D.Y. Atagi. 1997. Ecological interactions in the flooded littoral zone of reservoirs: the importance and role of submerged terrestrial vegetation with special reference to fish, fish habitat and fisheries in the Nechako Reservoir of British Columbia, Canada. B.C. Ministry of Environment, Lands and Parks, Skeena Fisheries Report SK-111, 64 pages.
243. Northcote, T.G. 1997. Bridging the gaps: hard lessons from two large inland water systems of British Columbia. Invited keynote address, Ecophysiology Symposium, 1997 Annual Meeting of the American Fisheries Society, 28 August, Monterey, CA. 26 pages.
244. Lowe, D.J., J.D. Green, T.G. Northcote and K.J. Hall. 1997. Fluctuations of a meromictic lake in southern British Columbia: evidence for holocene climatic flickering? Geological Society of New Zealand Conference, Wellington, 1997. [Abstract only; 1 page ; text published in Quaternary Research 48: 100 - 113.
245. Northcote, T.G. 1997. Mahoney Lake - changes and fluctuations. Newsletter of the South Okanagan Naturalists Club. November 1997. Pages 5-6.
246. Young, K.A., S.G. Hinch and T.G. Northcote. 1998. Recovery of cutthroat trout and their habitat in a small B.C. stream 25 years after riparian logging. [Abstract] Presentation at the Canadian Conference for Fisheries Research. Kingston. Ontario. January 1998.
247. Northcote, T.G. 1998. Aquatic log salvage = aquatic habitat sacrifice? The importance of submerged terrestrial vegetation as fish habitat for the inland water continuum. Abstract of an invited presentation at the Log Salvage Workshop, Stokely Creek, Ontario, 17-19 April 1998.
248. Northcote, T.G. 1998. Migratory behaviour of fish and its significance to movement through riverine fish passage facilities. Chapter 1, pages 3 - 18. In: M. Jungwirth, S. Schmutz and S. Weiss [Editors] "Fish migration and fish bypasses". Fishing News Books, Blackwell Science, Oxford.
249. Northcote, T.G. 1998. Potential impacts of climate change on fisheries resources in the upper Columbia Basin of British Columbia. Abstract. Invited presentation at "Toward ecosystem-based management in the upper Columbia River Basin: an international conference and workshop, Castlegar, B.C., 27-30 April 1998. 9 pages.
250. Lowe, D.J., J.D. Green, T.G. Northcote and K.J. Hall. 1998. Fluctuations of a meromictic lake containing Mazama Ash: evidence for Holocene climate flickering? Symposium Inter-INQUA at Inter-UISPP "Tephrochronologie et Coexistence Homme-Volcans", Le Puy, France, 24-29 August 1998. 4 pages. Mahoney Lake core.
251. Northcote, T.G. 1998. A survey of the upper Eneas Creek system, Summerland, B.C. to evaluate its potential for minor aquatic habitat improvement. 12 pages.
252. Schreier, H., S. Brown and T.G. Northcote. 1998. The Fraser River of the Rocky Mountains: a highly productive ecosystem for salmonids. In: Mountains of the World; water towers for the 21<sup>st</sup> century". Invited contribution, The Commission on Sustainable Development (CSD), Switzerland, 1998 Spring Session on "Strategic Approaches to Freshwater Management", Berne, Switzerland. Page 26; case study # 11.
253. Northcote, T.G. 1998. Midsummer water quality conditions at Hatheum Lake, British Columbia. 3 pages.
254. Northcote, T.G. 1998. A research biologist's perspective on Kootenay and Arrow lakes; reservoirs; fishes and fisheries, British Columbia. Invited presentation to "The state of fisheries in Kootenay and Arrow Lakes". 24 October 1998, Nelson, B.C. 10 pages.
255. Northcote, T.G. 1998. Assessment of an attempt to integrate international aid in solution of severe cultural eutrophication of the inner Puno Bay portion of Lake Titicaca, Peru. Manuscript. 20 pages.
256. Northcote, T.G. 1998. Inland waters and aquatic habitats. 40 pages. In: Smith, I.M. and G.G.E. Scudder, Editors. Assessment of species diversity in the Montane Cordillera Ecozone. Burlington: Ecological Monitoring and Assessment Network, 1998.
257. Overmann, J., K.J. Hall, T.G. Northcote, W. Ebenhoh, M.A. Chapman and T. Beatty. 1999. Structure of the aerobic food chain in a meromictic lake dominated by purple sulphur bacteria. Archiv für Hydrobiologie 144: 127-156. (Mahoney Lake).
258. Overmann, J., K.J. Hall, T.G. Northcote and J.T. Beatty. 1999. Grazing of the copepod *Diaptomus connexus* on purple sulfur bacteria in a meromictic salt lake. Environmental Microbiology 1 (3): 213-221.
259. Northcote, T.G. and M.A. Chapman. 1999. Dietary alterations in resident and migratory New Zealand common smelt (*Retropinna retropinna*) in lower Waikato lakes after two decades of habitat change. New Zealand Journal of Marine and Freshwater Research 33, Number 3, Sept. 1999: 425-436.
260. Northcote, T.G., K.J. Hall and S.P. Salter. 1999. Bimeromixis - a new important limnological phenomenon or an insignificant happenstance? Invited presentation to the Society of Canadian Limnologists, January 1999, Edmonton, Alberta. [Abstract]
261. Vienott, G., T. Northcote, M. Rosenau and R.D. Evans. 1999. Concentrations of strontium in the pectoral fin rays of the white sturgeon (*Acipenser transmontanus*) by laser ablation sampling-inductively coupled plasma-mass spectrometry as an indicator of marine migrations. Canadian Journal of Fisheries and Aquatic Sciences 56 (11), pages 1981-1990.
262. Northcote, T.G., D.B. Fillion, S.P. Salter and G.L. Ennis. 1999. Interactions of nutrients and turbidity in the control of phytoplankton in Kootenay Lake, British Columbia, Canada, 1964 to 1966. Report to the Columbia Basin Fish and Wildlife Compensation Program, Nelson, B.C. 102 pages.
263. Northcote, T.G. 1999. Graylings and the Grayling Society. The Grayling Society Journal, Spring 1999. Pages 7-9.
264. Wong, C., H. Schreier, K. Hall, D. Smith, D. Sebastian, K. Ashley and T. Northcote. 1999. Kokanee decline in the Okanagan Lake: fish-habitat-land use interactions. CD-ROM, Institute for Resources and Environment, University of British Columbia, in conjunction with the B.C. Ministry of Environment, Lands and Parks, Fisheries Branch and the B.C. Ministry of Fisheries.
265. Young, K.A., S.G. Hinch and T. G. Northcote. 1999. Status of resident coastal cutthroat trout and their habitat twenty-five years after riparian logging. North American Journal of Fisheries Management 19: 901-911.
266. Hartman, G.F., C. Groot and T.G. Northcote. 2000. Science and management in sustainable salmonid fisheries: the ball is not in our court. Pages 31-50. In: E.E. Knudsen et al. (Eds.) Sustainable fisheries management, Pacific salmon. CRC Lewis Publishers, Boca Raton, New York.
267. Northcote, T.G. 2000. Ecological interactions among an oreitid (Pisces: Cyprinodontidae) species flock in the littoral zone of Lake Titicaca. Advances in Ecological Research 31: 399-420.



268. Northcote, T.G. 2000. An updated review of grayling biology, impacts and management. Peace / Williston Fish and Wildlife Compensation Program Report No. 211. 24 pages.
269. Richardson, J.S., T.J. Lissmore, M.C. Healey and T.G. Northcote. 2000. Fish communities of the lower Fraser River (Canada) and a 21-year contrast. *Environmental Biology of Fishes* 59: 125-140.
270. Northcote, T.G. 2000. Review of "Estuaries of South Africa". [B. Allanson and D. Baird. Editors]. Cambridge University Press, UK, New York. 1999. 340 pages. In: Canadian Society of Environmental Biologists Bulletin 57 (4): 6-8.
271. Hall, K.J. and T.G. Northcote. 2000. Long-term (millennial, centurial) changes in the limnology of a saline lake: causes and consequences. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 27: 2628-2632. (Mahoney Lake)
272. Northcote, T.G. and K.J. Hall. 2000. Short-term (decadal, annual, seasonal) changes in the limnology of a saline uni- / bimeromictic lake: causes and consequences. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 27: 2652-2659. (Mahoney Lake)
273. Northcote, T.G. 2001. Sustainable development and environmental restoration: chasing unrealistic or impossible goals in the Okanagan Basin? Invited presentation, Okanagan Lake Basin Conference Strategic Planning Session, Kelowna, B.C., 4 March 2011.
274. Northcote, T.G. and K.E. Northcote. 2001. A review and evaluation of agricultural drainage / water quality / fish habitat problems, reports and jurisdictions in the Agassiz-Harrison areas of the lower Fraser Valley, British Columbia. 36 pages. Unpublished manuscript.
275. Northcote, T.G. 2001. What is a limnologist? Acceptant speech by T.G. Northcote on receiving the Naumann-Thienemann Medal of the Societas Internationalis Limnologiae, 28th Congress, Melbourne, Australia, 5 February 2001. *SIL News* 34, September 2001; page 9.
276. Northcote, T.G. 2002. Limnologists in Schools-SIL possibilities. *SIL News* 37: 1-3; 5.
277. Northcote, T.G. 2002. Review of "Migration of Freshwater Fishes". Martyn C. Lucas and Etienne Baras. 420 pages. 2001. Blackwell Science, Oxford, UK. *SIL News* 37: 9.
278. Hall, K.J. and T.G. Northcote. 2002. Bimeromixis sharply intensifies primary production processes in a normally unimeromictic small saline lake. *Verhandlungen Internationale Vereinigen fur theoretische und angewandte Limnologie* 28: 1304-1310. (Mahoney Lake)
279. Northcote, T.G. 2003. The news, past and present, and into the future on managing the Okanagan Basin's aquatic ecosystems. Invited keynote address, Okanagan Basin Technical Working Group International Conference, 22-24 June 2003, Penticton, B.C. 21 pages.
280. Northcote, T.G. 2003. Review of "Forest Dynamics and Disturbance Regimes" Frelich, L.E. 2002. Cambridge University Press, Cambridge University Press, Cambridge, U.K. In: Canadian Society of Environmental Biologists, Bulletin 60 (3): 29-30.
281. Northcote, T.G. 2003. Review of "Empire Forestry and the Origins of Environmentalism" Barton, G.A. 2002. Cambridge University Press, Cambridge, U.K. In: Canadian Society of Environmental Biologists, Bulletin 60 (4): pages 21-22.
282. Northcote, T.G. 2003. Reconnaissance of water quality conditions in the upper Bridge River system and suggestions for monitoring potential effects of forestry activities in the Gun Lake watershed. 10 pages.
283. Northcote, T.G. and G.F. Hartman. 2004. [Editors] "Fishes and Forestry. Worldwide Watershed Interactions and Management". Blackwell Science Oxford, UK. 789 pages.
284. Northcote, T.G. and G.F. Hartman. 2004. Chapter 1. An overview of fish-forestry interactions. Pages 3-15. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
285. Northcote, T.G. 2004. Chapter 4. Fundamentals of lake ecology relevant to fish-forestry interactions. Pages 67-91. In: T.G. Northcote and G.F. Hartman [Editors]. *Fishes and Forestry*. Blackwell Science Oxford, UK.
286. Northcote, T.G. and M.C. Healey. 2004. Chapter 5. Fundamental aspects of estuarine ecology relevant to fish-forestry interactions. Pages 92-105. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
287. Northcote, T.G. 2004. Chapter 6. Fish life history variation and stock diversity in forested watersheds. Pages 109-122. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
288. Northcote, T.G. and S.G. Hinch. 2004. Chapter 7. Fish migration and passage in forested watersheds. Pages 123-142. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science, Oxford, UK.
289. Northcote, T.G., M. Rask and J. Leggett. 2004. Chapter 14. Effects of forestry on the limnology and fishes of lakes. Pages 303-319. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
290. Levings, C.D. and T.G. Northcote. 2004. Chapter 15. Effects of forestry on estuarine ecosystems supporting fishes. Pages 320-335. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
291. Northcote, T.G. and J.D. Hall. 2004. Chapter 33. Better and broader professional, worker and public education in fisheries and forestry education. Pages 746-758. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
292. Northcote, T.G. and G.F. Hartman. 2004. Chapter 34. Towards a new fish-forestry interaction in the world's watersheds. Pages 759-782. In: T.G. Northcote and G.F. Hartman [Editors] *Fishes and Forestry*. Blackwell Science Oxford, UK.
293. Ward, F.J., T.G. Northcote and J.A.T. Boubee. 2005. The New Zealand common smelt: biology and ecology. *Journal of Fish Biology* 66: 1-32.
294. Northcote, T.G., F.R. Pick, D.B. Fillion and S.P. Salter. 2005. Interaction of nutrients and turbidity in the control of phytoplankton in a large western Canadian lake prior to major watershed impoundments. *Lake and Reservoir Management* 21 (3): 261-276.
295. Hartman, G.F. and T.G. Northcote. 2005. Economic growth and fish conservation: we need more emphasis on the population component. *Fisheries* 30 (10): 36-38.
296. Northcote, T.G. and C.J. Bull. 2005. Managing shore-spawning rainbow trout populations in two Canadian alpine lakes. Province of British Columbia Fisheries Management Report No. 118, 17 pages.
297. Northcote, T.G. 2005. Man and Kootenay Lake salmonids: an overview of effects up to the periods of major European influx and development. Report to the Nelson offices of the Columbia Basin Fish and Wildlife Compensation Program, & the B.C. Ministry of Environment. 25 pages.
298. Northcote, T.G. and G.F. Hartman. 2005. *Fishes and Forestry: worldwide watershed interactions and management*. Book Review. Canadian Society of Environmental Biologists Bulletin 62 (2): 19.
299. Northcote, T.G. and G.F. Hartman. 2005. Reconciling fisheries and forestry interactions in watersheds; a worldwide overview and assessment. American Fisheries Society 4th World Fisheries Congress, Vancouver, B.C., Canada. 5 May 2004.
300. Sambrook, R.J. and T.G. Northcote. 2005. Estuarine interactions between threespine stickleback and juvenile chinook salmon. Canadian Society of Environmental Biologists Newsletter/Bulletin 62 (4): 6-8. (Winter 2005).
301. Northcote, T.G. and K.J. Hall. 2006. Effects of water-level change on morphometric production indicators in two meromictic lakes. *Verh. Internat. Verein. Limnol.* 29: 1492-1496.
302. Northcote, T.G. 2006. More notes on the limnological features of "Dry Lake", a small ephemeral water body / marsh near Summerland, B.C. 2 pages.
303. Griffiths, R.W. and T.G. Northcote. 2006. Are autumn-growing detritivorous stoneflies most productive? *Verh. Internat. Verein. Limnol.* 29: 1925-1931.
304. Northcote, T.G. and J. Hammar. 2006. Feeding ecology of *Coregonus albula* and *Osmerus eperlanus* in the limnetic waters of Lake Malaren, Sweden. *Boreal Environment Research* 11: 229-246.

306. Hartman, G.F., T.G. Northcote and C.J. Cederholm. 2006. Human numbers-the factor affecting the future of wild salmon. Pages 261-292 in R.T. Lackey, D.H. Lach and S.L., Duncan, editors. Salmon 2100: the future of wild Pacific salmon. American Fisheries Society. Bethesda. Maryland. U.S.A.
307. Northcote, T.G. 2006. Vertical distribution and abundance of zooplankton in Corbett Lake, B.C. and the potential for increased production by early spring artificial aeration. 6 pages.
308. Cruz, M.A., E.G. Moreno Terrazas, and T. Northcote. 2006. Worsening water quality conditions at Inner Puno Bay, Lake Titicaca, Peru, and their effect on *Lemna* spp. biomass. Freshwater Forum 26 of the British Freshwater Biological Association: 46-57.
309. Northcote, T.G. and J. Hammar. 2006. Feeding ecology of *Coregonus albus* and *Osmerus eperlanus* in the limnetic waters of Lake Malaren, Sweden. Boreal Environment Research 11 229-246.
311. Northcote, T.G. 2006. Vertical distribution and abundance of zooplankton in Corbett Lake, B.C., and its potential for increased production by early spring artificial aeration. Manuscript 6 pages.
312. K.J. Hall and T.G. Northcote. 2006. Meromictic lakes. In: Encyclopedia of lakes and reservoirs. 12 pages.
313. Northcote, T.G., and C.J. Bull. 2007. Successful shoreline spawning of rainbow trout in two Canadian alpine lakes. Journal of Fish Biology. 71: 938-941.
314. Northcote, T.G. 2007. Causes for the little public recognition of limnological science and needs for improvement. Bulletin of the Canadian Society of Environmental Biologists 64 (1) 3 -7.
315. Salter, S.P. and T.G. Northcote. 2007. Preservation (for the present) of an endangered small, but biotically rich marsh-pond complex, near Summerland, B.C. on Okanagan Lake shoreline. Bulletin of the Canadian Society of Environmental Biologists 64 (1): 13-20.
316. Magnhagen, C., T.G. Northcote and R.S. Gregory. 2007. Diet differentiation in three species of juvenile Pacific salmon in estuarine tidal channels and laboratory experiments. Canadian Technical Report of Fisheries and Aquatic Sciences No. 2758: 20 pages.
317. Northcote, T. G., R. S. Gregory and C. Magnhagen. 2007. Contrasting space and food use among three species of juvenile Pacific salmon (*Oncorhynchus*) cohabiting tidal marsh channels of a large estuary. Canadian Technical Report of Fisheries and Aquatic Sciences No. 2759: 24 pages.
318. Northcote, T.G. and G.F. Hartman. 2009. "Reconciling fisheries and forestry interactions in watersheds: a worldwide overview and assessment". Presented orally at American Fisheries Society World Fisheries Congress, Vancouver, B.C., 5 May 2004. [26 MS pages.] Published copy: American Fisheries Society Symposium 49: 1881-1893.
319. Northcote, T.G. 2008. Synthesis of long-term studies on the interactive ecology of cutthroat trout and Dolly Varden char populations in near-coastal lakes of British Columbia. Bulletin of the Canadian Society of Environmental Biologists 65 (1): 11-15.
320. Northcote, T.G. and J. Lobon-Cervia. 2008. Increasing experimental approaches in stream trout research-1987-2006. Ecology of Freshwater Fish 2008: 349-361.
321. Northcote, T.G. 2008. Inland waters and aquatic habitats of the Canadian Montane Cordillera Ecozone.
322. Jonsson, B., N. Jonsson, K. Hindar, T.G. Northcote and S. Engen. 2008. Asymmetric competition drives lake use of coexisting salmonids. Oecologia 157: 553-560.
323. Northcote, T.G. and K.J. Hall. 2008. Small saline lakes provide excellent systems for limnological teaching and research. Society of International Limnology News 53: 18-19.
324. Northcote, T.G. 2008. Okanagan Basin Studies: Problems, Plans, Actions. Bulletin of the Canadian Society of Environmental Biologists, Vol. 65 (4): 11-19.
325. Northcote, T.G. and G.B. Northcote. 2009. Lake whitefish biology in Okanagan Basin lakes. Bulletin of the Canadian Society of Environmental Biologists, Vol. 66 (1): 14-19.
326. Northcote, T.G. and Edmundo Moreno Terrazas. 2009. Some earlier and more recent studies on the Lake Titicaca system in the Peruvian/Bolivian Altiplano, South America. Bulletin of the Canadian Society of Environmental Biologists 66 (4): 12-15.
327. Northcote, T.G. and K.J. Hall. 2010. Salinity regulation of zooplanktonic abundance and vertical distribution in two saline meromictic lakes in south central British Columbia. Hydrobiologia 2010/638: 121-136.
328. Northcote, T.G. 2010. Controls for trout and char migratory/resident behaviour mainly in stream systems above and below waterfalls/barriers: a multidecadal and broad geographic review. Ecology of Freshwater Fish 2010: 487-509.
329. Northcote, T.G. 2011. Inland waters and aquatic habitats of the Montane Cordillera Ecozone. In: Assessment of Species Diversity in the Montane Cordillera Ecozone. Edited by G.G.E. Scudder and I.M. Smith. Royal British Columbia Museum. Pages 1-37.
330. Northcote, T.G. and K.J. Hall. 2011. Long-term vertical distribution and abundance of the phytoplankton community of meromictic Mahoney Lake in south-central British Columbia, with some recent coverage on nearby Blue Lake. Canadian Society of Environmental Biologists Newsletter/Bulletin Volume 68 (1):11-17.
331. Northcote, T.G. 2011. Comment on the "Opinion" piece in the FBA News, 2010 by Anne Powell's note in the previous issue of the FBA Newsletter. "Opinion", Spring 2011 Issue p. 13.

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