



Annual Report 2008

Cooperative Freshwater Ecology Unit





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Awards and Recognition

Bill Keller is the 2008 recipient of the Frank H. Rigler Award, the highest honour given by the Society of Canadian Limnologists.

John Gunn was appointed to the Lake Simcoe Science Advisory Committee (MOE) and the Far North Science Advisory Committee (MNR) in 2008. John was also presented with the A.D. Latornell Conservation Pioneer Award for 2008.

George Morgan was appointed as the Academic Advisor to the Fisheries Management Zone 10 Council for the Ontario Ministry of Natural Resources beginning in 2008.

David Pearson was appointed to the Far North Science Advisory Panel in 2008.

Norm Yan was the Chair of Ecosystem-based management sessions at the Society of Canadian Limnologists Conference in 2008 and has been very active communicating science to the Muskoka Ratepayers Association, the Muskoka and Parry Sound Stewardship Council, the Public Forum on Lake Winnipeg and in the Muskoka Heritage Foundation summer lecture series.

Vale Inco Living with Lakes Centre Project Update

On January 28, 2008 Vale Inco announced a \$4.5 M contribution to the Living with Lakes Centre and kicked off Laurentian University's Next 50 capital campaign. Scott McDonald, is leading this campaign that will help to see the completion of the Living with Lakes Centre. The Living with Lakes centre has been officially named the Vale Inco Living with Lakes Centre in recognition of this lead donation. Feb. 28, 2008 was marked by an additional \$5M of support for the centre by the Honourable John Milloy, Minister of Training Colleges and Universities and August 29, 2008 saw the commitment of an additional \$2M from FedNor.

The Vale Inco Living with Lakes Centre won the Bronze Prize for North America in the Holcim Awards competition for sustainable design. The prize money of \$25,000 is being

put towards the construction of the Centre. The project now moves on to the global level of the competition and the entry submission was completed Feb. 2, 2009. A number of funding requests were submitted to foundations, some successful, some which we continue to refine to ensure success.

Total commitments to date are just over \$15 M, we are within \$1.5M of our capital construction goal and almost two thirds of the way to our total goal of \$23M for the building and research enhancement. A call for Tender for construction will close on Feb.19, 2009. Construction is expected to begin in early Spring.

Community Outreach

Once again, the Co-op Unit has been active in many community-based initiatives.

- **Greater Sudbury Lake Improvement Advisory Panel:** John Gunn, Bill Keller and David Pearson provide technical advice for this program. We also assisted in the development of a “lake quality report card” and reviewed the lake stewardship grant proposals.
- **Junction Creek Stewardship Committee:** John Gunn and Peter Beckett and Karen Oman, among others, provide considerable technical advice and other resources. This year supervisory and technical assistance with GPS, sampling, and electrofishing was provided by Jason Houle, Lee Haslam and Dan Dechaine during the field season for the re-survey of the fish community during the Junction Creek system. Vehicles and assistance with supplies were also provided when needed.
- **Sudbury Water Forum:** For the first time, the Nickel District Conservation Authority and its Source Water Protection Program, the Junction Creek Stewardship Committee, the City of Greater Sudbury’s Lake Water Quality Program, and the Sudbury District Health Unit collaborated on this event to inform the community about the state of its water resources. Bill Keller, Peter Beckett and John Gunn participated as panel members and fielded questions from the audience. The event was an outstanding success with over 150 people attending. We expect this partnership to continue and share resources for future events to inform and engage the community.
- **Picture our Lakes Photography Contest:** Following the success of last year’s competition, the Co-op Unit again took a lead role with Artists on Elgin, in a contest to celebrate the more than 330 lakes in the city’s boundaries. Other community partners included: Downtown Sudbury, the Chamber of Commerce, and the City of Greater Sudbury. We received media sponsorship from Northern Life and CTV. Vale Inco provided a major sponsorship for the contest. Over 300 photos were

submitted, from which citizens voted on their 40 favourite shots. A blue ribbon panel of judges selected the best from these to be featured in a 2009 calendar. The Co-op Unit has begun to generate a database of pictures of Sudbury's 330 lakes and continues to work toward its goal of promoting lake stewardship within the general public through contest related education.

- **VETAC:** Peter Beckett chairs this committee and participates in various subcommittees. (Note: VETAC was the winner of the 2008 Community Builders Award).
- **Water on Film:** The first annual "Water On Film" film festival showcasing films about water to celebrate World Water Day was organized by the Water Forum group. Three short films were shown: Water Detectives, Water Walkers and Tap. The "feature" film, Thirst, looks at the commercialization of water and was very well received. The evening was very successful with about 200 people in attendance. In addition nearly \$300 in donations was raised to support the Tap Project a UNICEF project.
- **Children's Water Festival:** Activities were organized by the staff from the Bughouse at the Co-op Unit for this innovative event which engages over 800 children from grades 3 & 4. Children learn about the use, consumption and protection of water through hands-on activities organized by different "water" groups.
- **Rainbow Routes:** Peter Beckett is an Environmental Advisor for Rainbow Routes and has led field trips and contributed to the development of curriculum for schools called "Learning with Trails". The Living with Lakes project has helped leverage support for ongoing trail development along the south shore of Ramsey Lake.
- **EarthDay:** The Co-op Unit participated once again in the Sudbury Earth Day Festival organized by the Greater Sudbury Environmental Network. Over 4000 people attended the event this year.
- **Greenspace Advisory Panel:** Peter Beckett is a technical resource person to assist in defining what areas should be conserved in Sudbury.

The Laurentian University / Science North Graduate Diploma in Science Communication

Interest in the program among students and potential employers and intern hosts remains very high but enrolment for 2008-2009 is only 5 full time students and 1 part time student. Applications are already being received for 2009-10 and an intensive recruitment effort for students with an Honours science degree or a BA with a good

background in science is underway. For more information see www.sciencecommunication.ca It remains the only program of its kind in North America.

Twenty seven students have now graduated from the program since 2006 and have jobs in places such as the Council of Canadian Academies, the Department of Foreign Affairs, Pollution Probe, the Royal Ontario Museum, Science North, the Sudbury Neutrino Observatory, several exhibit design companies, and as writers. Students have been interns during their program at Canadian Geographic, the Canadian Polar Commission, the Great Lakes Forest Centre, the "Science Time" in Beijing, and the "Discovery Channel" in Toronto as well as in Provincial Government Ministries, in science centres, and in exhibit design companies.

The Ministry of the Environment's Environmental Monitoring and Reporting Branch will host our program on February 12th for the 4th Science Communication in Government Workshop. David will lead workshop sessions on effective science communication and engaging audiences while MOE staff will present case studies involving communication in the Lake Simcoe Protection Project and the recent lead contamination in drinking water issue.

Climate Change

David Pearson's other hats include Co-Chair of the Ontario Government's Expert Panel on Climate Change Adaptation. The mandate of the Expert Panel is:

- To provide advice to government concerning issues related to climate change impacts and adaptation such as
 - actions, plans and best practices
 - adaptation policies
 - research needs
- To respond to requests for advice on impact and adaptation topics or issues as requested.

The Panel has focused on encouraging mainstreaming of climate change adaptation into government programs and policies and has met with almost all government Ministries in pursuit of that goal. The Panel will present a report to the Minister of the Environment in April.

David also leads the Ontario Centre for Climate Impacts and Adaptation Resources located at Laurentian. The centre holds workshops, especially for communities, that guide participants through a risk assessment and risk management process to prioritize climate change adaptation strategies and measures in the light of known vulnerabilities and modeled climate change scenarios.

Science Advisory Panel for the Far North Initiative

David has also recently been appointed chair of the Science Advisory Panel for the Far North Initiative of which John Gunn is also a member. The Panel will provide science advice to government and others involved in this strategic initiative to protect a large area of Boreal Forest at the same time as negotiating and developing economic opportunities and community development plans with First Nations in the Far North.

Aquatic Restoration Group

Sudbury Environmental Study Lakes

In 2008 the Ministry of the Environment at the Cooperative Freshwater Ecology Unit continued sampling lakes for the Sudbury Environmental Study (SES) under 2 main programs which complement each other: SES Extensive and SES Intensive.

The SES Extensive program is a set of 44 lakes, located within a 100 km zone around Sudbury. These lakes were all acidified to below pH 5.5 in the early 80s, but are now in various stages of recovery. They are sampled once annually during the period late June through early August. The data are intended to provide information on regional patterns in water quality and lake recovery in the lakes near Sudbury. During 2008 all 44 lakes in the SES Extensive lake set were sampled once for a set of standard water chemistry parameters.

The SES Intensive program is a set of lakes sampled monthly or twice-monthly through the ice-free season for a wide range of physical, biological and chemical parameters (water chemistry, Secchi disc transparency, oxygen/temperature profiles, zooplankton, phytoplankton), therefore giving a larger and more varied amount of data on a smaller group of lakes. In 2008 there were 12 lakes sampled monthly (May - October) and 1 lake sampled twice-monthly (Swan lake) under the SES Intensive program.

Recent MSc. projects have utilized the Extensive and Intensive data sets to examine the relative roles of metals and fish in the recovery of Sudbury lakes. The complementary nature of these programs allowed the students to complete both spatial (Amanda Valois) and temporal (Natalie Webster) analyses.

These Sudbury area monitoring programs continue to be a very important component of Canadian and international efforts to assess the effects of acid deposition and the responses of lakes to sulphur emission controls. In recent years these studies have also figured prominently in large-scale collaborations investigating the effects of other major environmental stressors including climate change, UV-B irradiation, changes in DOC concentrations and declines in calcium. These results have been widely published and have appeared in some of the world's most prestigious scientific journals including Nature and Science.

Northern Ontario Benthic Invertebrate Reference Condition Approach (RCA)

Biomonitoring Network

The Northern Ontario Benthic Invertebrate Reference Condition Approach Biomonitoring Network (Northern Ontario RCA Network) was designed to assist the metal mining industry in locating suitable reference sites to meet the Environmental Effects Monitoring (EEM) requirements of the Fisheries Act. The objective of this project is to develop a large network of reference and test sites to assess and monitor mining effects on surface waters by detecting any impairment in benthic invertebrate community structure.

The Northern Ontario RCA network began in 2003, with a large field effort generating data for 214 reference and test sites from 4 mining centers including Red Lake, Hemlo, Sudbury and Timmins. Additional sites were sampled in 2004 (N= 44) with these data also added to the project database which is housed on Environment Canada's (EC) Canadian Aquatic Biomonitoring Network (CABIN) website. Using these data, preliminary and refined models were created which in turn were used by mining partners to evaluate impacts at their discharge sites as part of their EEM reporting to EC.

In 2005 (N=56) and 2006 (N=80), the RCA project focused on increasing sample size to evaluate database variability including temporal, spatial, replication and methodological factors. The database was also expanded to include more urban and historically impacted reference sites. These confounding factors may prove to be important in enabling better interpretation of benthic monitoring results as some discharge sites are in urban areas or in locations that are also impacted by historical mining activity. Multivariate multiple regression (redundancy analysis) was used to partition variation from these sources.

The focus of the 2007 (N=70) and 2008 (N=58) sampling efforts was to continue to document yearly temporal variation. If yearly variation is a significant factor in determining invertebrate communities, year of sampling could have implications to how a discharge site is evaluated. In 2008, all but one sample were from sites sampled in earlier years. Sampling was undertaken from September 22th to October 30th, 2008 with a total of 52 stream and 6 lake sites sampled, some of them for a sixth consecutive year.

# of years sampled	1	2	3	4	5	6
# sites	233	44	32	9	8	10

The Northern Ontario RCA Network now includes data for 336 sites with over 1150 entries (replicates, multiple years, and various methods). This large database is currently being used to refine models used to assess mining discharge areas, to explore streamlining of site assessments (various sampling / processing methods and new modeling techniques) and to tease apart the confounding factors of urbanization and historical impacts. An MOE funded project to evaluate the effects of temporal variation,

and different sampling methods on benthic invertebrate assessment is nearing completion. We have also initiated collaborations with a number of university researchers to explore relationships between benthic invertebrate communities and metal speciation (Ed Tipping in the UK; Jim McGreer at Laurier) and examine the effects of dispersal abilities on regional community structure (Karl Cottenie at Guelph). Due to the versatility of this network and the potential application to other industrial sectors, there is considerable potential for the Northern Ontario RCA Network to serve as a reference database for many stakeholders.

Streams	# sites	Lakes	# site
Reference	105	Reference	138
Urban	34	Urban	14
Historically impacted	10	Historically impacted	7
Impacted	15	Impacted	13
	164		172

NSERC CRD Program- Barriers to Biological Recovery

2008/2009 marks the final year of 4 year research partnership program between the Co-op Unit (J.Gunn, W. Keller, C. Ramcharan, G. Morgan), York University (N. Yan), and our industrial partners Vale Inco. (G. Watson, L. Lanteigne, C. Brereton) and Xstrata (M. Butler, L. Leger) designed to determine the factors that affect recovery of urban industrial lakes. In 2008/2009 most of the graduate student projects were in the data analysis and writing stages with theses completed by Amanda Valois (spatial patterns in zooplankton recovery) and Ashley Tremblay (genetic changes in perch populations), and nearing completion by Natalie Webster (temporal trends in zooplankton), Brian Wesolek (benthic invertebrate recovery) Erik Szkokan-Emilson (watershed effects) and Martha Celis-Salgado (metal toxicity to zooplankton). Andreas Luek's project (food web interaction) is proceeding well, but probably has one more field sampling season before completion.

Major field projects in 2008:

1. Collection and use of ambient water samples for toxicity testing by Martha Celis-Salgado
2. Completion of fish stocking (smallmouth bass) on 2 additional lakes (Lohi, Crowley) by G.Morgan and Andreas Luek to tests the effects of predator induced fish community changes on benthic invertebrate communities
3. Completion of stable isotope studies to assess food web changes during fish community manipulation (by A. Luek, C. Ramcharan, And G. Morgan)
4. Completion of water sampling and vegetation surveys in the experimental catchment areas of Daisy Lake (by Erika Genrich and Brian Wesolek).

ATW Symposium

The final symposium for the CRD project was held October 5-8, 2008 in Saskatoon, SK with excellent attendance. A review panel of industry, government and academic scientists provided constructive input to the session.

SCL Conference 2009

Four additional presentations on CRD results were presented in Ottawa, ON (Jan 5-7) by G. Morgan, A. Luek, B. Wesolek, and E. Szokan-Emilson

Northern Fisheries Research Program

This program improves our understanding and aids the management of the fish populations that support the recreational, commercial and subsistence fisheries of northeastern Ontario. The program is led by Tom Johnston (OMNR) and has included a variety of projects examining the biology, ecology, and ecotoxicology of northern fish populations.

Work on this program in 2008 was primarily directed at two fields of research:

i) Reproductive ecology of northern fishes. Broad-scale analyses of variation in reproductive traits, particularly egg quality, are conducted to assess how environmental factors and fisheries management practices may affect the reproductive success of fish populations. Studies on Ontario lake trout and rainbow trout populations wrapped up this year and provided new insights into their reproductive ecologies. Results demonstrated the roles of both maternal effects and environmental conditions on reproductive potential in both species, and the potential effects of long-term captive rearing on egg quality in lake trout. The rainbow trout study was the core of a B.Sc. thesis project (Micale Prévost, Laurentian University). A study on the reproductive ecology of burbot expanded in 2008 as new techniques were developed for efficient sampling during the burbot's winter spawning period. This work, in addition to studies of burbot trophic ecology, is part of a collaborative research project with Fisheries and Oceans in Yellowknife, NT (Ph.D. thesis project of Pete Cott, Laurentian University). This research is funded by the OMNR Aquatic Research and Development Section and NSERC.

ii) Mercury bioaccumulation in northern fish populations. A study of gender-based differences in mercury bioaccumulation by a variety of northern fish species was completed in 2008 as part of a B.Sc. thesis project (Kyla Standeven, Laurentian University). Results demonstrated that significant sex-based differences exist in some species, that the nature of the difference (i.e., which sex had the higher concentration) varied among species, and that the trends were not attributable to sex-based differences in growth rate. A temporal analysis of mercury bioaccumulation in northern Ontario sportfish populations was launched in 2008 and a new graduate student has been recruited to the project (Rex Tang, M.Sc., Laurentian University). Contemporary

mercury concentrations (2007 to present) will be compared with historic mercury concentrations (1977-1981) for selected fish populations across the boreal zone of northern Ontario to determine how mercury bioaccumulation has changed in this region over the past 30 years. The study will use data archived by the Sportfish Contaminant Monitoring Program as well as data gathered from a new sampling program starting in 2009. This work is funded by the OMOE Environmental Monitoring and Reporting Branch, and the OMNR Aquatic Research and Development Section.

TIMEX Project (Solar Bee) Thermocline Induced Mixing Experiment

This project is in its second year and is a collaboration of Laurentian University, Dr. John Gunn, L'Université du Québec à Montréal (Drs. B. Beisner; Y. Prairie) and L'Université de Montréal (Dr. M. Amyot). In 2009 Dr. J. Winter (MOE) and Dr. H. Cyr (U of T) also have expressed interest in joining the team. The project is a study of the effects of changing winds on the limnology and Hg dynamics of Boreal Shield Lakes. The study lake is Lac Croche, an 18 ha three basin lake (max. depth 12m) at the L'Université de Montréal field station in the Laurentians. In Nov. 2007 the upstream basin was separated by the installation of a 120m wide by 6m deep limnological curtain, after a year of pre-treatment monitoring (water, zooplankton, phytoplankton, benthic invertebrates, fish) was completed. In the winter of 2008 the Co-op Unit provided a Solar Bee lake mixer to begin manipulations in the western basin in the spring of 2008. J., Gunn (LU) and A. Cantin (UQAM) presented preliminary findings at the 2009 SCL meeting in Ottawa. This project is gaining considerable interest and we plan to continue it for several years.

Field Courses

Ontario Universities Field Courses in Biology (OUPFB)

In 2008 Laurentian joined OUPFB to provide our students with access to 37 new field courses offered by 14 universities. The field course program covers a broad range of topics, from behavioural energetics, to methods in ecotoxicology, to arctic, marine, desert, alpine and tropical reef ecology.

Instructors: P. Beckett, G. Spiers, and J. Gunn offered the Watershed Restoration course on Aug.24-Sept. 6, 2008 and attracted 12 students from 6 different universities (Guelph, Laurentian, McMaster, Queen's, Western, Wilfred Laurier). It was an intensive 14 day course with 10 days in Sudbury and 4 in Killarney Park.

The students participated in two major research projects were 1) Effects of the diversion of acid mine drainage water on the benthic invertebrates of Junction Creek and 2) Effects of watershed reclamation on vegetation recovery in the Daisy Lake area. Chris Jones and Chantal Sarrazin-Delay again participated in this course and instructed a 2 day Ontario Benthic Biomonitoring Network Participant Certification Course as part of the OUPFB field

course on September 2-4, 2008. Graduate students Erik Szkokan-Emilson and Brian Wesolek served as very able teaching assistants throughout.

In 2009 the Cooperative Freshwater Ecology Unit will again be participating in the OUPFB program offering the course "Methods in Aquatic Biodiversity Assessment".

Partners and Collaborators

Industry

Vale Inco Ltd. Xstrata Nickel

Government Funding Partners

City of Greater Sudbury	CFI/OIT	Industry Canada
NSERC	FedNor/MNDM	DFO Can. Wildlife Service
	Environment Canada	

Scientist Collaborators

Laurentian	Cambrian College	York	Queen's
Guelph	Toronto	Regina	Lethbridge
Alberta	Indiana	Dartmouth College	UBC
Wisconsin	Bergen, Norway	Wilfred Laurier	New Brunswick
OMOE	OMNR	University of Turku, FI	
UQAM	U of M	Centre for Ecology and Hydrology, UK	

Others

Friends of Killarney
Ontario Power Generation

Reports and Publications

Co-op Unit Members authored or co-authored numerous publications:

Adrian, R., O'Reilly, C., Zagarese, H., Baines, S., Hessen, D., Keller, W., Livingstone, D., Sommaruga, R., Straile, D., Van Donk, E., Weyhenmeyer, G. and Winder, M. 2008. Lakes and reservoirs as sentinels of present climate change. *Limnol. Oceanogr.* Under review

Ashforth, D. and Yan, N.D. 2008. The interactive effects of falling Ca concentrations and rising temperatures on *Daphnia pulex* life table parameters at low and high food concentrations. *Limnol. Oceanogr.* **53**(2): 420-432.

Belzile, N., Lang, C.Y., Chen, Y.-W. and Wang, M. 2008. The competitive role of organic carbon and dissolved sulfide in controlling the distribution of mercury in freshwater lake sediments. *Science of the Total Environment*, 405, 226-238.

Bowman, M. F, Ingram, R. Reid, R.A., Somers, K.M., Yan, N.D., Paterson, A.M., Morgan, G.E., and Gunn, J.M. 2008. Temporal and spatial concordance in community composition of phytoplankton, zooplankton, benthic macroinvertebrate, crayfish, and fish on the Precambrian Shield. *Can. J. fish. Aquat. Sci* 65: 919-932.

Celis-Salgado, M.P., Cairns, A., Kim, N., and Yan, N.D. The FLAMES medium: a new, soft-water culture and bioassay medium for Cladocera. *Verh. Internat. Verein. Limnol.* In press

Fairn, E., Schulte-Hostedde, A., and Alarie, Y. 2007. Water mite parasitism is associated with body condition and sex of the whirligig beetle *Dineutus nigrior* Roberts (Coeoptera: Gyridae). *Ecoscience*. In press

Fram, K., Sarrazin-Delay, C.L. and Snucins, E. 2008. Evaluation of the Northern Ontario Benthic Invertebrate Reference Condition Approach (RCA) database for use in the Porcupine River Watershed. Best in Science Agreement #6701 Final Report. Sudbury, Ontario. 45 pp.

Helmus, M.R., Rusak, J.A., Paterson, M.J., Keller, W. and Yan, N.D. 2008. Communities contain closely related communities during ecosystem disturbance. In prep. *Ecology Letters*

Holmes, S.B., Fick, W.E., Kreutzweiser, D.P., Ebling, P.M., England, L.S. and Trevors, J.T. 2008. Persistence of naturally occurring and genetically modified *Choristoneura fumiferana* nucleopolyhedroviruses in outdoor aquatic microcosms. *Pest Manag Sci.* 64(10):1015-23

Jeziorski, A., Yan, N.D., Paterson, A.M., DeSellas, A.M., Turner, M.A., Jeffries, D.S., Keller, W., Weeber, R.C., McNicol, D.K., 2008, Palmer, M.E., McIver, K., Arseneau, K., Ginn, B.K., Cumming, B.F. and Smol, J.P. 2008. The widespread threat of calcium decline in fresh waters. *Science.* 322:1374-1377.

Jeziorski, A., Paterson, A.M., Yan, N.D., and Smol, J.P. 2008. Calcium levels in *Daphnia ephippia* cannot provide a useful paleolimnological indicator of historical lakewater Ca concentrations. *J. Paleolimnol.* 39: 421-425

Johnston, T.A., Wiegand, M.D., Mittermuller, S., Casselman, J.M., Pyle, G.G., and Leggett, W.C.. 200x. Metal provisioning of ova in walleye and lake whitefish. Submitted to *Aquaculture*, November 2007. Under review

Johnston, T.A., Wiegand, M.D., Mittermuller, S., Casselman, J.M., Pyle, G.G. and Leggett, W.C. 2008. Metal provisioning of ova in walleye and lake whitefish. *Aquaculture* 281: 131-137.

Johnston, T.A., Kaufman, S.D., Moles, M.D., Wiegand, M.D. and Leggett, W.C. 2008. Effects of delayed fertilization on embryo viability in walleye: the role of maternal effects. *Journal of Fish Biology* 72: 2634-2644.

Johnston, T.A., Lysack, W. and Leggett, W.C. 2008. Comparative abundance, growth and life history characteristics of walleye (*Sander vitreus*) and sauger (*S. canadensis*) in Lake Winnipeg, Manitoba, 1979 - 2003. *Transactions of the American Fisheries Society*. Under Review

Kaufman, S.D., Morgan, G.E., and Gunn, J.M. 2009. The role of large bodied prey species for maximum growth potential in walleye (*Sander vitreus*). *N. Amer. J. Fish. Man.* In press

Kaufman, S.D., Snucins, E., Gunn, J.M. and Selinger, W. 2009. Impacts of road access on lake trout (*Salvelinus namaycush*) populations: Regional scale effects of overexploitation and the introduction of smallmouth bass (*Micropterus dolomieu*). *Can. J. Fish. Aquat. Sci.* 66: 1-12.

Keller, W. 2008. Book review: Acid Rain in the Adirondacks an Environmental History. *Env. Rev.* 16: 1-2.

Keller, W., Heneberry, J., MacPhee, S., Snucins, E., and Gunn, J.M. 2008. Aurora Trout Lakes Ecosystem Data Report: 1976-2005. Technical Report, Cooperative Freshwater Ecology Unit, Sudbury, ON, 127 p.

Keller, W. 2008. Limnology in northeastern Ontario: from acidification to multiple stressors. *Can. J. Fish. Aquat. Sci.* Under review

Keller, W., Paterson, A., Somers, K., Dillon, P., Heneberry, J., and Ford, A. 2008. Relationships between dissolved organic carbon concentrations, weather, and acidification in small Boreal Shield lakes. *Can. J. Fish. Aquat. Sci.* 65: 786-795.

Kreutzweiser, D.P., Hazlett, P.W. and Gunn, J.M. 2008. Logging impacts on the biogeochemistry of boreal forest soils and nutrient export to aquatic systems: A review *Environ. Rev./Dossiers environ.* 16: 157-179

Kreutzweiser, D.P, Thompson, D.G. and Scarr, T. A. 2008. Imidacloprid in leaves from systemically treated trees may inhibit litter breakdown by non-target invertebrates. *Ecotoxicol.Environ.Saf.*(2008),doi:[10.1016/j.ecoenv.2008.09.017](https://doi.org/10.1016/j.ecoenv.2008.09.017)

Kreutzweiser, D.P, Good, K.P., Chartrand, D. T., Scarr, T. A., Holmes, S.B. and Thompson, D.G. 2008. Effects on litter-dwelling earthworms and microbial decomposition of soil-

applied imidacloprid for control of wood-boring insects. *Pest Management Science*. 64(2):112-118

Kreutzweiser, D.P, Good, K.P., Chartrand, D. T., Scarr, T. A., and Thompson, D.G. 2008. Toxicity of the Systemic Insecticide, Imidacloprid, to Forest Stream Insects and Microbial Communities. *Bulletin of Environmental Contamination and Toxicology*. 80(3): 211-214.

Kreutzweiser, D.P, Good, K.P., Chartrand, D. T., Scarr, T. A., and Thompson, D.G. 2008. Are Leaves that Fall from Imidacloprid-Treated Maple Trees to Control Asian Longhorned Beetles Toxic to Non-target Decomposer Organisms? *J Environ Qual* 37:639-646

Mahaney, W.C., Kalm, V., Dirszowsky, R.W., Milner, M.W., Sodhi, R., Beukens, R., Dorn, R., Tricart, P., Schwartz, S., Chamorro-Perez, E., Boccia, S., Barendregt, R.W., Krinsley, D.H., Seaquist, E.R., Merrick, D. and Karpan, B. 2008. Hannibal's trek across the Alps: Geomorphological analysis of sites of geoarcheological interest. *Journal of Mediterranean Archaeology and Archaeometry*, 8: 39-54.

Mahaney, W.C., Milner, M.W., Kalm, V., Dirszowsky, R.W., Hancock, R.G.V., and Beukens, R.P. 2008. Evidence for a Younger Dryas glacial advance in the Andes of northwestern Venezuela. *Geomorphology*, 96: 199-211.

Mahaney, W.C., Kalm, V. and Dirszowsky, R.W. 2008. The Hannibalic Invasion of Italia in 218 B.C.: Geological/Topographical Analysis of the Invasion Routes. In Nathanail, C.P., Abrahart, R.J. and R.P. Bradshaw (eds.) *Military Geography and Geology: History and Technology*, Land Quality Press, Nottingham, pp. 76-86.

Martin, A.J., Wallschläger, D., London, J., Wiramanaden, C.I.E., Pickering, I.J., Belzile, N., Chen, Y.-W., & Simpson, S. 2008. The biogeochemical behavior of selenium in two lentic environments in the Elk River Valley, British Columbia. *British Columbia 32nd Annual Mine Reclamation Symposium*, Kamloops, B.C. 12 pp.

McQueen, D.J., Hyatt, K.D., Ramcharan, C.W., and Rankin, P. 2006. Changes in algal species composition affected juvenile sockeye salmon production at Woss Lake, British Columbia: a lake fertilization and food web analysis. *North Amer. J. Fish. Manag.* In press

Michat, M. and Alarie, Y. 2007. Morphology and chaetotaxy of larval *Hypodessus cruciatus* (Régimbart) (Coleoptera: Dytiscidae: Hydroporinae), and analysis of the phylogenetic relationships of the Bidessini based on larval characters. *Studies on Neotropical Fauna and Environment*. In press

Moles, M.D., Johnston, T.A., Robinson, B.W., Leggett, W.C., and Casselman, J.M. 2008. Is gonadal investment in walleye (*Sander vitreus*) dependent on body lipid reserves? A multipopulation comparative analysis. *Can. J. Fish. and Aquat. Sci.* 65:600-614.

Paterson, A.M., Winter, J.G., Nicholls, K.H., Clark, B.J., Ramcharan, C.W., Yan, N.D., and Somers, K.M. 2008. Long-term changes in phytoplankton composition in seven Canadian Shield lakes in response to multiple anthropogenic stressors. *Can. J. Fish. Aquat. Sci.* 65: 846-861.

Polack, R., Chen, Y.-W. and Belzile, N. 2009. Behaviour of Sb(V) in the presence of dissolved sulfide under anoxic aqueous conditions. *Chemical Geology*. Accepted

Ramcharan C.W., Keller, W., Yan, N.D. and Paterson, A. 2008. Ecosystem function of crustacean zooplankton grazers in perturbed and recovering lakes. *Oikos*. In prep

Ramcharan, C.W., Linley R.D., and Wissel B. 2008. Diet and trophic position of zooplankton, *Chaoborus*, and yellow perch as determined by stable isotopes. *Int. Ver. Theor. Agnew. Limnol. Verh.* Accepted

Ramcharan, C.W., Keller, B., and Yan, N.D. A review of allometric models used for estimating zooplankton weight and clearance rate. To be submitted to *J. Plank. Res.* In prep

Ramcharan, C.W., McQueen, D.J., and Yan, N.D. Planktivory by fish and macro-invertebrates: intra-guild predation in lake food webs. To be submitted to *Ecology*. In prep

Rasmussen, J.B., Gunn, J.M., Sherwood, G., Iles, A., Gagnon, A., Lacroix, A., Campbell, P.G.C., and Hontela, A. 2008. Direct and Indirect effects of metal exposure on the growth of yellow perch (*Perca flavescens*); Implications for Ecological Risk Assessment. *Journal of Human and Ecological Risk Assessment*. 14(2):317-350

Rusak, J.A., Yan, N. D. and Somers, K.M. 2008. Regional climatic drivers of synchronous zooplankton dynamics in north-temperate lakes. *Can. J. Fish. Aquat. Sci.* 65: 878-889.

Sarrazin-Delay, C. and Keller, W. 2008. The Northern Ontario Benthic Invertebrate Reference Condition Approach (RCA) Biomonitoring Network. Northern Ontario RCA Network Partner's Update, Sudbury, Ontario. 8 pp.

Strecker, A.L., Milne, R., and Arnott, S. E. 2008. Patterns of zooplankton species richness and community composition in freshwater lakes and ponds, Ellesmere Island, Canada. *Can. J. Fish. Aquat. Sci.* Accepted pending minor revisions

Szkokan-Emilson, E., Wesolek, B., Gunn, J., Sarrazin-Delay, C., Bedore, J., Chan, F., Garreau, D., O'Grady, A. and Robinson, C. Recovery from acidification of benthic invertebrate communities in Killarney Park lakes. Environmental Monitoring and Assessment. Submitted Nov. 2008

Tanentzap, A.J., Yan, N.D., Keller, W. (B.), Girard, R., Heneberry, J., Gunn, J. M., Hamilton, D.P., and Taylor, P.A. 2008. Cooling lakes while the world warms: Effects of forest growth and increased dissolved organic matter on the thermal regime of a temperate, urban lake. Limnol. Oceanogr. 53(1): 404-410.

Tremblay, A., Lesbarreres, D., Merritt, T., Wilson, C. and Gunn, J.M. 2008. Genetic Structure and Phenotypic Plasticity of Yellow Perch (*Perca Flavescens*) Populations Influenced by Habitat, Predation, and Contamination Gradients. Integrated Environmental Assessment and Management 4(2):264-266.

Truong, Y.T.H., Chen, Y.-W. and Belzile, N. 2009. Abiotic formation of elemental selenium and role of iron oxide surfaces. Chemosphere. In press – on-line

Venturelli, P.A., Murphy, C.A., Johnston, T.A., van Coeverden de Groot, P.J., Boag, P.T., Casselman, J.M., Leggett, W.C., Montgomerie, R., Wiegand, M.D., and Shuter, B.J. 200x. Female spawner quality affects the dynamics of collapsing and recovering fish stocks. Submitted to Proceedings of the National Academy of Sciences, November 2007. Under review

Venturelli, P.A., Murphy, C.A. Shuter, B.J. Johnston, T.A. van Coeverden de Groot, P.J. Boag, P.T. Casselman, J.M. Montgomerie, R. Wiegand, M.D. and Leggett, W.C. 2008. Maternal influences on population dynamics: evidence from an exploited freshwater fish. Ecology. Under review

Walseng, B., Yan, N.D., Pawson, T.W., and Skarpaas, O. 2008. Acidity versus habitat structure as regulators of littoral microcrustacean assemblages. Freshwater Biol. 53: 290-303.

Wesolek, B.E., Genrich, E.K., Gunn, J.M. and Somers, K. M. Use of littoral benthic invertebrates to assess factors affecting biological recovery of acid and metal damaged lakes. Journal of the North American Benthological Society. Submitted Jan. 2009

Winter, J.G., Keller, W., Paterson, A.M., and Yan, N.D. 2008. Three decades of recovery of the phytoplankton community in Clearwater Lake (Sudbury, Canada) from acid and metal contamination. Verh. Internat. Verein. Limnol. 30: Part 2, 247-252.

Yan, N.D., Paterson, A.M, Somers, K.M. and Scheider, W. A. 2008 (Organizers, special

editors). Thirty years of aquatic science at the Dorset Environmental Science Centre: transforming understanding of factors that regulate aquatic ecosystems on the Southern Canadian Shield. *Can J. fish. Aquat. Sci.* 65 number 5, May 2008: 781-944.

Yan, N.D., Paterson, A.M, Somers, K.M. and Scheider, W. A. 2008. An introduction to the Dorset Special Issue: Transforming understanding of the factors that regulate aquatic ecosystems on the southern Canadian Shield. *Can. J. Fish. Aquat. Sci.* 65: 781-785.

Yan, N.D., Somers, K.M., Girard, R.E., Paterson, A., Keller, B., Ramcharan, C., Rusak, J., Ingram, R., Morgan, G., and Gunn, J. M. 2008. Long-term trends in zooplankton of Dorset, Ontario lakes: the probable interactive effects of changes in pH, TP, DOC and predators. *Can. J. Fish. Aquat. Sci.* 65: 862-877.

Yang, D.Y., Chen, Y.-W., Gunn, J.M. and Belzile, N. 2008 Selenium and mercury in organisms: interactions and mechanisms. *Environmental Reviews.* 16:71-92.

Yang, D.Y., Chen, Y.-W., Truong, Y.T.H. and Belzile, N. 2009. Improvement of the reliability of methylmercury determination in environmental samples. *Analytica Chimica Acta.* In press – on-line

Young, J. D. and Yan, N.D. 2008. Modification of the diel vertical migration of *Bythotrephes longimanus* by the cold-water planktivore, *Coregonus artedii*. *Freshwater Biol.* 53: 981-995.

Young, J.D., Yan, N.D. and Loew, E.R. 2008. Examination of direct daytime predation by *Coregonus artedii* on *Bythotrephes longimanus*: No evidence for the refuge hypothesis. *Can J. Fish. Aquat. Sci.* In press

Conference and Workshop Presentations

Baker, S. and Yan, N.D. 2008. The effect of accumulated organic debris on the efficacy of methoprene to control emergence of mosquitoes in storm water catch basins. Mosquito Control Association Conference, March 2008. Poster

Belzile, N., Yang, D.-Y., Chen, Y.-W. and Ye, X. 2008. Mercury – selenium antagonism in fish and fish organ tissues. *16th International Conference of Environmental Bioindicators.* Orlando, USA.

Belzile, N. 2008 Redox geochemistry of antimony: field and laboratory results. CANMET Mining and Mineral Sciences Laboratories. Ottawa, Canada

Belzile, N., Truong, T.H.Y., Polack, R. and Chen, Y.-W. 2008. Abiotic reduction of selenite and antimonate under controlled oxygen conditions. American Geophysical Union 2008 Fall Meeting, San Francisco, USA

Cantin, A., Beisner, B., Gunn, J.M., Prairie, Y.T. 2009. Artificial Deepening of a Lake Thermocline: Effects on the Plankton. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.

Celis-Salgado, M. and Yan, N.D. 2008. Assessment of the potential for recovery of Daphnia species from copper and nickel impacts in soft water. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Gunn, J.M. and Sarrazin-Delay, C. 2008. Confounding effects of drought on the recovery of benthic invertebrates in a mining impacted stream. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Gunn, J.M., Keller, W., Ramcharan, C., Morgan, G. and Yan, N.D. 2008. Barriers to biological recovery in urban metal-contaminated lakes: Symposium introduction. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Gunn, J.M., Cantin, A., Beisner, B., Prairie, Y.T. Chételat, J., and Amyot, M. 2009. Artificial deepening of a lake thermocline: A simulation of the impacts of changing surface winds. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.

Filella, M., Barres, O., Belzile, N., Bihannic, I., Chanudet, V., Chen, Y.-W., Philippo, S., Quentel, F. and Webb, S. 2008. Solubility and adsorption in antimony environmental fate: the case of the Goesdorf mine, Luxembourg. 13th International Symposium on Solubility Phenomena and Related Equilibrium Processes. Dublin, Ireland.

Johnston, T.A. 2008. Egg quality variation in wild and hatchery stocks of lake trout. 138th Annual Meeting of the American Fisheries Society, Ottawa, ON, Canada, August 17-21, 2008. Poster

Keller, B. Presented the 2008 Rigler Lecture, "Limnology in Northeastern Ontario: from Acidification to Multiple Stressors" Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Keller, B., Gunn, G.M., Heneberry, J., and Yan, N.D. 2008. Recovery of acidified, metal-contaminated lakes near Sudbury, Ontario, Canada. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Kim, N. and Yan, N.D. 2008. Methods for the laboratory culture of *Bythotrephes longimanus* Leydig (1860). AGM of the Canadian Aquatic Invading Species Network, April 21-22, 2008, Banff, AB. Poster

Kreutzweiser, D.P., Good, K.P., Capell, S.S. and Holmes, S.B. 2008. Leaf litter decomposition and invertebrate communities detect subtle logging impacts. The Nabs 56th Annual Meeting. Salt Lake City, Utah. May 27, 2008

Linley, D., Yan, N.D. and Keller, B. 2008. It's a matter of time: duration of non-acidity promoting recovery of zooplankton species richness. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Luek, A., Morgan, G. and Ramcharan, C. 2008. Recovering benthic invertebrate communities: A bottleneck for whole lake biological recovery? – Preliminary results from an extensive field study. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Luek, A. 2008. The importance of benthic invertebrates for recovering food webs. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

MacPhee, S. 2008. Climate induced changes in lake thermal habitat alters predator-prey interactions in a recovering freshwater zooplankton community. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Morgan, G., Gunn, J.M., Wissel, B., Luek, A., and Tremblay, A. Yellow perch (*Perca flavescens*) population responses to introduced piscivores. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Morgan, G.E. 2008. Yellow perch (*Perca flavescens*) as a sentinel species for environmental effects monitoring in the Sudbury area. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Morgan, G.E., Gunn, J.M., and Wissel, B. 2009. Size doesn't always matter – Yellow perch (*Perca flavescens*) growth varies with density and predation risk in Sudbury area lakes. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.

Murphy, C.A., Sloan, W., Morbey, Y.E., Johnston, T.A. and Shuter, B.J. 2008. Lipid mobilization and reproductive investment in lake trout (*Salvelinus namaycush*): stock specific patterns emerge from hatchery and field studies. 138th Annual Meeting of the American Fisheries Society, Ottawa, ON, Canada, August 17-21, 2008.

Muto, E.A., Kreuzweiser, D.P. and Sibley, P.K. 2008. The influence of riparian forest composition and structure on leaf litter inputs to boreal shield streams. The Nabs 56th Annual Meeting. Salt Lake City, Utah. May 27, 2008

Paterson, A. and Yan, N.D. 2008. Assessing the effects of climate change on plankton in Canadian Shield lakes affected by multiple ecological stressors. ASLO Climate Change Conference, Lake Tahoe, Sept. 10, 2008. Poster

Petrie, S., Badzinski, S., Belzile, N. & Chen, Y.-W., Ware, L. and Brady, C. 2008. Food-chain transfer and effects of selenium in waterfowl. Metals in the Human Environment Research Network 2008 Annual Symposium, Gatineau, Canada.

Petruniak, J. and Yan, N.D. 2008. The mechanics of *Bythotrephes longimanus* patch formation and implications for natural fluvial dispersal. 2008 ASLO summer meeting, June 8-13, 2008 St. John's, Newfoundland & Labrador

Petruniak, J. and Yan, N.D. 2008. Wind-induced patchiness of *Bythotrephes longimanus* as a predictor for dispersal success. AGM of the Canadian Aquatic Invading Species Network, April 21-22, 2008, Banff, AB. Poster

Prévost, M.C., Johnston, T.A., Haslam, L. C. and Addison, P.A. 2008. Reproductive life history variation in Great Lakes naturalized rainbow trout populations. 138th Annual Meeting of the American Fisheries Society, Ottawa, ON, Canada, August 17-21, 2008. Poster

Ramcharan, C., Keller, B., Yan, N.D. and Gunn, J.M. 2008. Use of heat content to study long-term trends in lake thermal regimes. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Ramcharan, C. 2008. The role of residual metals, predators, and contingency in the recovery of zooplankton communities. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Smol, J., Jeziorski, A., Paterson, A. and Yan, N.D. 2008. Aquatic osteoporosis: The widespread threat of calcium decline in fresh waters. Shallow Lakes Conference; Punta del Este, Uruguay, November 27, 2008

Somers, K.M., Sarrazin-Delay, C. and Keller, W. 2008. Teasing apart the cumulative effects of multiple stressors. Environmental Effects Monitoring Meeting, April 29-30. Gatineau, Québec.

Somers, K.M., Sarrazin-Delay, C. and Keller, W. 2008. Teasing apart the cumulative effects of multiple stressors. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Standeven, K.J., and Johnston, T.A.. 2008. Sex-based divergence in mercury bioaccumulation by northern fishes. 138th Annual Meeting of the American Fisheries Society, Ottawa, ON, Canada, August 17-21, 2008. Poster

Szkokan-Emilson, E., Wesolek, B., and Gunn, J.M. 2008. Concordance of terrestrial and aquatic recovery: Does full recovery of aquatic systems have to await improvements in the land? Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS. Poster

Szkokan-Emilson, E. The role of land reclamation and forest regeneration on the recovery of near-shore benthic invertebrate communities. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan. Student Award Recipient.

Szkokan-Emilson, E., Wesolek, B. and Gunn, J.M. 2009. The importance of exported catchment products in shaping littoral benthic invertebrate communities. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.

Valois, A., Ramcharan, C., Keller, B. and Morgan, G.E. 2008. Landscape –scale patterns of zooplankton community structure in lakes recovering from acidification and metal contamination. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS.

Wallschläger, D., London, J., Chen, Y.-W., Belzile, N. and Martin, A.J. 2008. Determination of species-specific selenium exchange fluxes across the sediment-water interface. Goldschmidt 2008 Conference, Vancouver, Canada.

Webster, N. 2008. Effects of metal contamination and fish predation on the recovery of zooplankton in Sudbury lakes. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Weisz, E. and Yan, N.D. 2008. Factors influencing the presence of *Bythotrephes longimanus* in Canadian Shield lakes. AGM of the Canadian Aquatic Invading Species Network, April 21-22, 2008, Banff, AB. Poster, Recipient of Best Poster prize.

Weisz, E. and Yan, N.D. 2008. Factors influencing the presence of an invading macroinvertebrate predator, *Bythotrephes longimanus*, in Canadian Shield lakes. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. January 3-5, 2008. Halifax, NS.

Wesolek, B., Szkokan-Emilson, E. and Gunn, J.M. 2008. Spatial patterns in benthic invertebrate recovery: Use of site specific and subcatchment scale variables to predict change. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research, January 3-5, 2008. Halifax, NS. Poster

Wesolek, B. 2008. Use of littoral benthic invertebrates to assess factors that delay biological recovery of acid and metal damaged lakes. 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.

Wesolek, B., Szkokan-Emilson, E. and Gunn, J.M. 2009. Use of multiple methods to detect spatial differences in littoral benthic invertebrate communities: A site specific investigation. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.

Yan, N.D. "Assessing the risk of aquatic invasive species: the spiny water flea (*Bythotrephes*) in Canadian Shield lakes." The invited plenary lecture to introduce the theme of invading species at the 2008 Lake of the Woods Water Quality Forum, March 11-13, 2008, International Falls, MN, USA.

Yan, N.D. 2008. Managing invading species as if they were natural disasters: The example of the spiny water flea in Canada. Departmental lecture, Department of Biology, University of Alberta, Edmonton, AB, Nov. 28, 2008.

Yan, N.D. 2008. Managing invading species as if they were natural disasters: The example of the spiny water flea in Canada. Northeastern Ecosystem Research Cooperative (NERC) 2008 Conference, 12-13 November, 2008, Durham, NH, USA.

Yan, N.D. 2008. Emerging complexities in the recovery of lakes from acidification: climate change, metal toxicity and Ca decline. Departmental lecture in the département de biologie, Université de Montréal. November 10, 2008, Montreal, Quebec.

Yan, N.D. 2008. Managing invading species as if they were natural disaster: the example of the spiny water flea in Canadian waters. Red Zone: Currents, chemical and change Symposium, 26-28 October, 2008, Winnipeg, Manitoba.

Yan, N.D. 2008. Has liming fostered recovery of crustacean zooplankton in Sudbury's urban lakes? 35th Annual Aquatic Toxicity Workshop, 5-8th October, 2008, Saskatoon, Saskatchewan

- Yan, N.D. 2008. 25 years of research on invaders in the plankton: lessons learned particularly from the spiny water flea, *Bythotrephes*. ASLO Summer Meeting, special session entitled, Back to the Future? Prospects in plankton ecology after 25 years of progress, 9 June, 2008, St. John's, Nfld, Canada
- Yan, N.D. 2008. Emerging complexities in the recovery of Canadian Shield lakes from historical acid deposition. Centre for Water Research, University of Western Australia, 21 May, 2008.
- Yan, N.D. 2008. Assessing the threat of aquatic invasive species: The spiny water flea (*Bythotrephes*) in Canadian Shield Lakes. School of Env. Sys. Eng., University Western Australia, Perth, AU, 15 May, 2008
- Yan, N.D. 2008. Emerging complexities in the recovery of Canadian Shield lakes from historical acid deposition. Department of Zoology, Cambridge University, Cambridge, UK, 28 April, 2008
- Yan, N.D. 2008. Emerging complexities in the ecological recovery of Ontario lakes from historical acidification. School Public and Environmental Administration, Indiana University, Bloomington, IN, 14 Feb, 2008.
- Yan, N.D. and Celis-Salgado, M. 2009. Evidence for global, regional, landscape, and in-lake influences on the recovery of Sudbury lakes from historical disturbances. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. Jan. 9-11, 2009, Ottawa, ON.
- Yan, N.D. 2008. Potential knowledge and knowledge gaps in CAISN's planned evaluation of impacts of the spiny water flea, *Bythotrephes*, on Canadian Shield lakes. Annual General Meeting of the Canadian Aquatic Invading Species Network, Banff, AB, April 22, 2008.
- Yan, N. 2008. Has liming fostered recovery of crustacean zooplankton in Sudbury's urban lakes? 35th Annual Aquatic Toxicity Workshop. Oct. 5-8, 2008. Saskatoon, Saskatchewan.
- Young, J. and Yan, N.D. 2008. Prey availability, not a refuge, regulates *Bythotrephes longimanus* abundance in Harp Lake, Ontario. Joint conference of the Society of Canadian Limnologists and the Canadian Conference for Fisheries Research. January 3-5, 2008. Halifax, NS.

Theses Completed

Graduate

Baker, S. 2008. M.Sc. Thesis. The effects of accumulated organic debris on the efficacy of methoprene to control emergence of mosquitoes in storm water catch basins. York University.

Tremblay, Ashley. 2008. M.Sc. Thesis. Direct and indirect effects of predation on genetic variability and phenotypic divergence in yellow perch (*Perca flavescens*). Biology Department, Laurentian University

Valois, A. 2008. M.Sc. Thesis. Spatial patterns in zooplankton recovery: the role of regional and local factors. Biology Department, Laurentian University

Weisz, E. 2008. M.Sc. Thesis. Factors influencing the presence of a native and an invading macroinvertebrate zooplanktivore in Canadian Shield lakes. York University.

Undergraduate:

Altschuller, I. 2008. Regulation dynamics of genes involved in Ca metabolism in daphnia exposed to low Ca and high temperature stress. Biology Department, York University.

Blackwell, B. 2008. A Paleolimnological Approach to Assessing Landscape Change in a Disturbed Boreal Watershed, Department of Geography, Laurentian University. 50 pp.

Canestrero, J. 2008. Does oligotrophication explain the increase in Cladoceran body size in Shield lakes? Biology Department, York University.

Foster, S. 2008 Evolution of the Kelly Lake Delta: Implications for Landscape Change in the Sudbury Area, Environmental Earth Science Program, Laurentian University. 40 pp.

Laurin, Cory and Mitchell Shaw. 2008. Comparison of macroinvertebrate community structure in naturally recovered lakes versus experimentally neutralized lakes in the Sudbury area. Biology Dept., Laurentian university

Mantha, N. 2008. The Effect of Site Characteristics on Soil Freezing and Disturbance near Sudbury, Ontario, Environmental Earth Science Program, Laurentian University. 40pp.

McMullen, C. 2008. The Redistribution of Metal Contaminants Due to Soil Erosion in the Sudbury Area, Environmental Earth Science Program, Laurentian University. 49pp.

Prévost, M. 2008. Reproductive life history of Great Lakes rainbow trout. Biology Dept., Laurentian University

Standeven, K. 2008. Sex based differences in fish mercury bioaccumulation. Biology Dept., Laurentian University.

Research Grants

Y. Alarie

- NSERC Operating Grant

S. Arnott

- Ontario Ministry of the Environment, Best-in-Science, Climate effects on vertical structure in lakes and implications for food web interactions. 2007-2009
- NSERC Discovery Grant, The importance of regional and local factors in recovery from environmental stressors, 2004-2009
- NSERC Network Grant, Canadian Aquatic Invasive Species Network. 500 lake synoptic survey to identify regional spread, colonization success and *Bythotrephes longimanus* impacts on food webs of Shield lakes. 2005-2010.

N. Belzile

- NSERC Discovery Grant, Biogeochemistry of toxic trace elements in lake sediments.
- NSERC MITHE-SN Network (with Petrie, Chen) Effect of selenium in waterfowl.
- NSERC RTI (with Watterson) Solid phase extraction system
- CFI/OIT Gas Chromatography-Mass Spectrometry system (with Watterson)

R.W. Dirszowsky

- Canadian Foundation for Innovation - Leader's Opportunity Fund / Ontario Research Fund, Field Assessment of Boreal Shield Sediment Budgets and Landscape Change

J. Gunn

- NSERC/Canada Research Chair, Tier 1
- NSERC Collaborative Research and Development Grant (with York University, Vale Inco Ltd., Xstrata Ltd.) Barriers to Biological Recovery.
- NSERC Discovery Grant, Effects of warmwater invasive species on lakes recovering from acidification.
- NSERC Research Capacity Grant (Environmental Chambers)
- OMOE, Best in Science (Benthic Invertebrate Methods)
- CFI "Aquatic Restoration Ecology Lab" (AREL)
- Vale Inco Ltd., Junction Creek Restoration
- NOHFC, GIS Intern
- OMNDM, Summer Student Subsidies

- MOE (with T. Johnston) Factors affecting temporal trends in Hg in N. Ontario fish
- Friends of Killarney (LT restoration)
- Ontario Parks (LT restoration – Florence Lake)

T. Johnston

- Northern fisheries research (Johnston, Ontario Ministry of Natural Resources, Aquatic Research and Development, Base Operating Funds, 2004 – ongoing)

B. Keller

- Vale Inco Limited, Aquatic Restoration Group (ARG) support
- Xstrata Limited, ARG support
- Ontario Ministry of the Environment, ARG support
- Environment Canada, Northern Ontario Benthic Invertebrate Biomonitoring Network (NOBIBN) support
- Vale Inco Limited, NOBIBN support
- Ontario Ministry of the Environment, NOBIBN support
- Ontario Parks, Evaluating Habitat Suitability for Wild Aurora Populations in their Native Lakes
- Canadian Wildlife Service, Zooplankton studies

C. Ramcharan

- NSERC Discovery Grant, New directions in lake foodwebs

C. Sarrazin-Delay

- MOE Best in Science – Effects of temporal variation and sampling method on benthic invertebrate communities

N. Yan

- MOE Best in Science - The emerging threat of Ca decline: quantifying current and predicting future Ca levels and their effects on aquatic biota in a 1600 lake watershed (in conjunction with Queen's Univ.)
- NSERC – Partnership development with Univ. of Western Australia studying the dispersal of invading plankton
- MOE Best in Science – Evaluation of trends in zooplankton and phytoplankton biomass and community composition in Lake Simcoe since 1980 in relation to phosphorus levels and exotic species invasions

Co-op Unit Staff 2008

Ramsey House:

Elizabeth Bamberger - Business Manager
John Gunn – Canada Research Chair, LU
Tom Johnston - Fisheries Scientist, MNR
Bill Keller – Limnologist, MOE
George Morgan – Aquatic Systems Analyst
Karen Oman – Research and Administration

Laurentian University Science Building:

Yves Alarie – Biosystematics
Peter Beckett- Education and Outreach
Nelson Belzile - Environmental Chemistry
Randy Dirszowsky – Geomorphology/Paleolimnology
Dave Pearson - Urban Lakes Coordinator/Science Communication
Micale Prévost- Research Technician
Charles Ramcharan - Aquatic Ecologist

Water House:

Andrea Ford - Data Manager
Jocelyne Heneberry - Monitoring Coordinator, MOE
Jason McCourt – Environmental Officer, MOE

Fish House:

Lee Haslam – Senior Fisheries Technician, MNR
Jason Houle – Senior Fisheries Technician/ Data Manager
Johanne Jamieson – Junction Creek Stewardship Committee
Sarah Woods – Junction Creek Stewardship Committee

Bug House:

Manisha Bhattarai – Research Assistant
Daniel Dechaine – Research Assistant
Kim Fram - Invertebrate Taxonomist
Chantal Sarrazin-Delay - Biomonitoring Biologist
Donna Strang – Research Assistant
Ivan Vincent – Research Assistant
Lynne Witty – Invertebrate Taxonomist

B.Sc., M.Sc. and Ph.D. Students:

Altschuller, I., B.Sc., York University
Blackwell, B., B.Sc., Laurentian University

Canestrero, J., B.Sc., York University
Foster, S., B.Sc., Laurentian University
Hackett, K. B.Sc., Laurentian University
Mantha, N., B.Sc., Laurentian University
McMullen, C., B.Sc., Laurentian University
O' Donnell, R., B.Sc., Laurentian University
Quinn, J., B.Sc., Laurentian University

Baker, S., M.Sc. Candidate, York University
Cairns, A., M.Sc. Candidate, York University
Fuschino, J., M.Sc. Candidate, York University
MacPhee, Shannon, M.Sc. Candidate, Queen's
Petruniak, J., M.Sc. Candidate, York University
Szkokan-Emilson, Erik, M.Sc. Candidate, Laurentian
Tang, Rex, M.Sc. Candidate, Laurentian
Tremblay, Ashley, M.Sc. Candidate, Laurentian University
Valois, Amanda, M.Sc. Candidate, Laurentian University
Webster, Natalie, MSc. Candidate, Laurentian
Weisz, E., M.Sc. Candidate, York University.
Wesolek, Brian, MSc. Candidate, Laurentian

Celis-Salgado, Martha, Ph.D. Candidate, York University
Cott, Peter, Ph.D. Candidate, Laurentian
Luek, Andreas, Ph.D. Candidate, Laurentian
Kim, N., Ph.D. Candidate, York University
Kreutzweiser, David, Ph.D. Candidate, Laurentian
Palmer, Michelle, Ph.D. Candidate, York University
Truong, Yen Thi Hoang, Ph.D. Candidate, Laurentian
Yang, Dan, Ph.D. Candidate, Laurentian
Zhao, Qiu-Xiang, Ph.D. Candidate, Laurentian

Field Technicians and Research Assistants:

Adam Smits	Krysta Souliere	Blythe Browne
Stacey Greene	Cory Laxdal	