

COOPERATIVE FRESHWATER ECOLOGY UNIT ANNUAL REPORT

2000 - 2001

Conferences and Workshops Organized

- Norm Yan and John Gunn co-convened a special session “The Recovery of Freshwater Ecosystems from Acidification” at the American Society of Limnology and Oceanography meeting in Copenhagen, Denmark, June 5-9, 2000.
- John Gunn organized a meeting of the Northern Lakes Recovery Study in Grimstad, Norway, June 13-14, 2000. The meeting was attended by most of the principal investigators from the Canada/Norway studies underway in Killarney Park. A second meeting of the group occurred on Dec. 12, 2000 during the 2000 Acid Rain Conference in Tsukuba Science City, Japan.
- Bill Keller and Jocelyne Heneberry hosted the 2001 Sudbury Restoration Workshop on Feb. 22, 2001. The theme of this year’s workshop was “Climate Change and Ecosystem Recovery”. The workshop was very well attended with more than 150 registrants.
- On Feb. 23, 2001 Shelley Arnott hosted the second meeting of the Boreal Shield Climate Change Network at Laurentian University. The network represents long term monitoring sites in Ontario (ELA, Turkey Lakes, Killarney, Dorset, Algonquin Park). The meeting was designed to develop collaborative projects for climate studies and to plan for future expansions of the network to other parts of the Shield.
- George Morgan with several OMNR staff biologists co-organized workshops and training sessions for fall walleye index netting and status of resource sampling in Thunder Bay, Kingston and Timmins during September to November 2000.

Website Established

Dave Pearson and his urban lakes team have established a lake information website (www2.region.sudbury.on.ca/lakewaterquality/) for the city of Sudbury, allowing the public to access physical and chemical data on city lakes.

Publications

- Arnott, S.E. and N. D. Yan. Factors affecting the emergence of zooplankton from resting stages: the interaction between recovery from acidification and drought. *Ecological Applications*, *in press*, *accepted March 2001*.
- Arnott, S. E., N. D. Yan, W. Keller, and K. Nicholls. The influence of drought-induced acidification on the recovery of plankton in Swan Lake. *Ecological Applications*, *in press*, *accepted May 2000*.

- Chen, W., N. Belzile, and J.M. Gunn. Antagonistic effects of selenium on mercury assimilation by fish populations near Sudbury metal smelters. *Limnology and Oceanography* (accepted).
- Dixit, S.S., W. Keller, A.S. Dixit, and J.P. Smol. 2001. Diatom-inferred dissolved organic carbon reconstructions provide assessments of past UV-B penetration in Canadian shield lakes. *Canadian Journal of Fisheries and Aquatic Science* 58:543-550.
- Dodson, S., S. E. Arnott, and K. Cottingham. 2000. Effects of primary productivity on species richness: patterns in lake communities. *Ecology* 81:2662-2679.
- Gunn, J.M. Impact of the 1998 El Niño on a lake charr population recovering from acidification. *Environmental Biology of Fishes*. (under review).
- Gunn, J.M. and S. Sandøy. 2001. Northern Lakes Recovery Study (NLRS) – Biomonitoring at the ecosystem level. *Water Air Soil Pollution* (in press).
- Gunn, J.M., W. Keller, R. Sein and P. Beckett. 2001. Liming of acid and metal contaminated catchments for the improvement of drainage water quality. *Water Air Soil Pollution* (in press).
- Gunn, J.M., E. Snucins, N.D. Yan and M.T. Arts. 2001. Use of water clarity to monitor the effects of climate change and other stressors on oligotrophic lakes. *Journal of Environmental Monitoring and Assessment*. 67(1/2): 68-88.
- Gunn, J.M., W. Keller, and D. Wales. 2000. Effects of climate change on water resources of Ontario's Boreal Shield: a review of existing long-term monitoring programs and information needs. Cooperative Freshwater Ecology Unit Report. Sudbury, Ontario.
- Gunn, J.M. and R. Sein. 2000. Effects of forestry roads on reproductive habitat and exploitation of lake trout (*Salvelinus namaycush*) in three experimental lakes. *Canadian Journal of Fisheries and Aquatic Science* 57(2): 97-104.
- Halvorsen, G.A., J. Heneberry and E. Snucins. 2001. Sublittoral chironomids (Diptera: Chironomidae) as indicators of acidification. *Water Air Soil Pollution* (in press).
- Henderson, B.A. and G.E. Morgan. Maturation of walleye (*Stizostedion vitreum vitreum*) by age, size, and surplus energy.
- Hindar, A., M. Posch, A. Henriksen, J. Gunn, and E. Snucins. 2000. Development and application of the FAB model to calculate critical loads of S and N for lakes in the Killarney Provincial Park (Ontario, Canada). NIVA Report SNO 4202-2000.
- Hunt, L., G.E. Morgan, and P. Boxall. 2001. Results from the Ontario fishing opportunity questionnaire conducted with resident licensed anglers. (under review).
- Keller, W., P. Dillon, J. Heneberry, M. Malette and J.M. Gunn. 2001. Sulphate in Sudbury, Ontario, Canada lakes: recent trends and status. *Water Air Soil Pollution* (in press).

- Keller, W., S.S. Dixit, and J. Heneberry. 2001. Calcium declines in Northeastern Ontario lakes. *Canadian Journal of Fisheries and Aquatic Science* (submitted).
- Keller, W., J.M. Gunn, E. Snucins, and S.E. Arnott. 200_. Recovery of acidified lakes in the Sudbury, Ontario, Canada, area (in press – NAPAP Report).
- Keller, W., J. Heneberry, M. Malette, J. Binks and J. Gunn. 2001. Data report: extensive monitoring of acidified lakes in the Sudbury area, 1981-2000. Cooperative Freshwater Ecology Unit Report. Sudbury, Ontario, 152 p.
- Keller, W., J.M. Gunn, and S.E. Arnott. 2001. Developing a framework for assessing the effects of climate change and other stressors on the waters of Ontario's Boreal Shield. Cooperative Freshwater Ecology Unit Report. Sudbury, Ontario.
- Keller, W., P.J. Dillon, J. Heneberry, M. Malette, and J. Gunn. 2000. Sulphate and nitrate in Sudbury lakes: trends and status. Cooperative Freshwater Ecology Unit Report. Sudbury, Ontario.
- Kelso, J.R.M., N.P. Lester, J.M. Gunn, K.E. Smokorowski, W.G. Cole, C.K. Minns, R.J. Steedman, K.H. Mills. A framework for the advancement of aquatic science - lake habitat experiments as an example. *Aquatic Ecosystem Health and Management Society* (submitted).
- Jeffries, D.S., T.G. Brydges, P.J. Dillon, J. Dupont, J.M. Gunn, H.H. Harvey, W. Keller, and D.C.L. Lam. 200_. Aquatic acidification: issue status and outlook. Proceedings from Workshop on Threats to Water Quality, Toronto, ON, Jan. 22-24, 2001 (in press).
- Morgan, G.E. 2001. Fall walleye index netting manual. Ontario Ministry of Natural Resources.
- Pearson, D.A.B., A. Lock, N. Belzile and R. Bowins. Assessing Kelly Lake's history as a natural trap for mining industry and municipal effluent during the growth of Sudbury. Chapter 8 *in*: Rousell, D.H. and Jansons K. (eds.). *Physical Environment of the Sudbury Region, Ontario Geological Survey Special Volume* (in press).
- Pearson, D.A.B., J.M. Gunn, and W. Keller. The past, present and future of Sudbury's lakes. Chapter 9 *in*: Rousell, D.H. and Jansons K. (eds.). *Physical Environment of the Sudbury Region, Ontario Geological Survey Special Volume* (in press).
- Prevost F. and D.A.B. Pearson. Map of the lakes, rivers and wetlands of the City of Greater Sudbury, 1:125,000. For chapter 9 *in*: Rousell, D.H. and Jansons K. (eds.). *Physical Environment of the Sudbury Region, Ontario Geological Survey Special Volume* (in press).
- Schartau, A.K.L., B. Walseng and E. Snucins. 2001. Correlation between microcrustaceans and environmental variables in Killarney lakes, Sudbury, Canada. *Water Air Soil Pollution* (in press).
- Snucins, E., J.M. Gunn, W. Keller, S. Dixit, A. Hindar and A. Henriksen. 2001. Effects of regional reductions in sulphur deposition on the chemical and biological

recovery of lakes in Killarney Park, Ontario, Canada. *Journal of Environmental Monitoring and Assessment* 67(1/2): 179-194.

Snucins, E. and J. Gunn. 2000. Interannual variation in the thermal structure of clear and coloured lakes. *Limnology and Oceanography* 45(7): 1639-1646.

Conference Presentations with Abstracts

Arnott, S.E., J.M. Gunn, W. Keller, and E. Snucins. 2001. The influence of El Niño on Boreal Shield lakes. p. 12, in *Proceedings from Sudbury Restoration Workshop. 2001, Laurentian University, Sudbury.*

Arnott, S.E., N. Yan, and W. Keller. 2001. The influence of drought on the biotic recovery of lakes from acidification. p. 15 in *Proceedings from Sudbury Restoration Workshop. 2001, Laurentian University, Sudbury.*

Arnott, S.E., J.M. Gunn, W. Keller. Use of EMAN Sites on the Boreal Shield to Assess the Impact of Climate Change on Lake Ecosystems. EMAN, Calgary, 2001. (Invited)

Arnott, S.E. The Influence of El Niño on Boreal Shield Lakes. *Climate Change and Ecosystem Recovery, Sudbury, Ontario, 2001.*

Arnott, S.E. The Influence of Climatic Events on Biota in Lakes Across the Ontario Boreal Shield. *Society of Canadian Limnologists, Toronto, Ontario, 2001.* (Invited)

Arnott, S.E., N.D. Yan, C. Holt, W. Keller. The recovery of lakes from acidification and the emergence of zooplankton resting eggs. *American Society of Limnology and Oceanography, Copenhagen, 2000* (Invited).

Binks, J. and G.E. Morgan. Community and environmental effects on walleye (*Stizostedion vitreum vitreum*) life history variation. *Canadian conference for Fisheries Research, January 2001, Toronto.* (poster)

Davidson, J., W. Keller, K. Somers, and G. Watson. 2001. Applying the reference condition approach to monitor benthic invertebrates in streams of the Sudbury mining area. p. 20, in *Proceedings from Sudbury Restoration Workshop. 2001, Laurentian University, Sudbury.*

Dixit, S.S., W. Keller, A.S. Dixit, and J.P. Smol. 2001. Past UV-B penetration in Sudbury area lakes. p. 21 in *Proceedings from Sudbury Restoration Workshop. 2001, Laurentian University, Sudbury.*

Dixit, S.S., A.S. Dixit, L. Joynt, J.M. Gunn, and W. Keller. Long-term environmental trends in Killarney Park lakes. *Ontario Parks Research Forum. May 10, 2001. Black Creek Village, Toronto.*

Gunn, J.M. Effects of extreme temperature on lake charr (*Salvelinus namaycush*): Loss of a population in a Canadian Shield Lake during the warmest years of the past half century – 1998, 1999. June 28, 2000. 4th International Charr Symposium Trois-Rivières, Quebec

- Gunn, J.M. Impact of the 1998 El Niño event as a lake trout population recovering from acidification (invited). Society of Canadian Limnologists. Jan. 6, 2001. Toronto, Ont.
- Gunn, J.M. Northern Lakes Recovery Study (NLRS) – Biomonitoring at the Ecosystem Level (invited keynote). 6th International Conference on Acidic Deposition – Dec. 15, 2000. Tsukuba Japan.
- Gunn, J.M. Impact of the 1998 El Niño event as a lake trout population recovering from acidification May 10, 2001. Canadian Society of Zoologists, Sudbury.
- Henderson, B.A. and G.E. Morgan. Effects of surplus energy on the maturation of walleye: individual and population effects. Canadian Conference for Fisheries Research, January 2001, Toronto.
- Keller, W., J. Heneberry, and P. J. Dillon. 2001. Nitrate in Sudbury area lakes: trends and status. p. 27, in Proceedings from Sudbury Restoration Workshop. 2001, Laurentian University, Sudbury.
- Keller, W. Recovery of Zooplankton Communities from Acidification. Society of Canadian Limnologists. Jan. 6, 2001. Toronto, Ont.
- Keller, W. Calcium Declines in Northeastern Ontario Lakes. Society of Canadian Limnologists. Jan. 6, 2001. Toronto, Ont.
- Malette, M.D. and G.E. Morgan. Management implications of life history variation in northern pike (*Esox lucius*) populations in northeastern Ontario. Canadian Conference for Fisheries Research, January 2001, Toronto (poster).
- Morgan, G.E. and M.D. Malette. Management of walleye (*Stizostedion vitreum vitreum*) populations in northeastern Ontario. Presented to the Walleye Technical Committee, Mid-West Fish and Wildlife Conference, Minneapolis, Minnesota and at the Canadian Conference for Fisheries Research, January 2001, Toronto.
- Snucins, E. and J.M. Gunn. 2000. Climate change effects on the thermal structure of clear and coloured lakes near Killarney, Canada. American Society of Limnology and Oceanography. June 7, 2000. Copenhagen, Denmark.

Theses Completed

- Gorzynski, R. 2000. The temperature effects of urban runoff and in-stream impoundments on an urban brook trout creek, Junction Creek, Sudbury, Ontario, Canada. B.Sc. thesis, Laurentian University, 64 p.