LE FLEUVE

St. Lawrence Action Plan Newsletter

Vol. 4, No. 1, December 1992

PEEP: An index for assening and comparing the toxic potential of industrial effluent

PEEP. It's a funny acronym for Potential Ecotoxic Effect Probe—a serious tool used in managing toxic industrial waste. Where Chimiotox measures the toxic content of industrial effluent (see article in last issue), PEEP evaluates the effect of that toxic content on living organisms.

PEEP is a scientific tool that allows the effluent of the 50 priority industries targeted by the St. Lawrence Action Plan (SLAP) to be compared on the same toxicity scale. A first experiment has been recently completed. Samples from the effluent of each of the 50 companies were evaluated and the results were presented to representatives from the major industrial groups involved: pulp and paper, metallurgy, and organic and inorganic chemicals. Pulp and paper companies registered the highest PEEP, meaning their effluent had the highest potential toxic effect on the organisms tested; the organic chemicals industry had the lowest PEEP. This new tool permits the comparison between groups of industries, as well as among different companies within the same industrial group.

Photo: Image Actuelle

Left to right; Christian Blaise, Georges Costan and Norman Bermingham, of Environment Canada's St. Lawrence Centre.

How does it work?

PEEP involves a series of biotests (bioessays). Laboratory-grown organisms are exposed to industrial effluent samples, and the biotests measure the potential toxic effects. The novelty is that all the information is integrated in a single index.

The experts who designed PEEP used biotests involving various types of aquatic organisms (bacteria, algae and crustaceans, for example). "This allows us to evaluate the potential effect of effluent on organisms found at different levels of the food chain (such as decomposers, primary producers and consumers)," explains Georges Costan of Environment Canada's St. Lawrence Centre.

"By conducting the tests with a single effluent sample which is subject to biodegradation during a period of five days, we can

determine how persistent the toxins are—how long they remain a potential threat. These different tests can also measure different levels of toxicity, depending on our interest to find out whether the toxic effects are lethal or sub-lethal with acute or chronic effects. In other words, we can determine if the organisms die, or if they suffer short or long-term physiological changes."

The PEEP includes and quantifies information about

- the magnitude of the toxic effects;
- the persistence of the toxic effects over time;
- the more or less specific nature of the toxic aggression (the number of species affected by the effluent).

Several practical factors helped to determine which biotests to be used: the response time to tests, the complementarity of the information produced by each test, the reliability of the experimental protocol and the common use of this test by the scientific community. Finally, the financial and technical limitations were also considered, in order to ensure optimum efficiency of the index.

What are the potential applications for PEEP? Norman Bermingham at Environment Canada's St. Lawrence Centre answers:

"PEEP can help us monitor the toxicity of a single effluent over time. It can also help us evaluate the relative contribution of each effluent from a given plant to the overall toxicity of the discharge. The PEEP index can help managers decide whether or not a costly chemical characterization study is necessary; obviously, such a study would be considered a priority if the PEEP is high. Lastly, PEEP can serve as a model for developing similar tools that might be applied to other problems, such as contaminated sediment."

And how does PEEP compare to the Chimiotox index?

"They're complementary," continues Mr. Bermingham. "Chimiotox doesn't tell us anything about the potential toxic effect of pollutants on organisms exposed to the effluent. The effects measured by PEEP include all ecotoxic phenomena, but don't tell us about the specific toxins that are causing the effects observed. Basically, one index reveals a problem that the other cannot detect. The Americans have clearly understood the issue: their *Water Quality Program* includes an analysis of chemical substances *and* their effects."

PEEP is already considered an essential management tool. It has been validated by the scientific community in an article published in *Environmental Toxicology and Water Quality* magazine, and is sparking great interest among researchers, particularly in Europe.

PARTNERS

THE QUEBEC FOREST INDUSTRIES ASSOCIATION

The Quebec Forest Industries Association has been the voice of pulp and paper producers since 1924. Today, the QFIA has 27 members, and thus represents the great majority of the province's logging and wood processing companies. The Association's main objective is to promote the value of the forest and its products while seeking effective ways to protect the environment. In addition, it keeps members informed about legislative developments that may affect their operations, and also represents them before government and other authorities.

Under the St. Lawrence Action Plan, the QFIA has been an important partner in the campaign to characterize the effluent from Quebec paper mills.

The Association also works with the St. Lawrence Centre's Technology Development Branch to initiate technology demonstration projects. The QFIA is the pulse of the pulp and paper industry: it facilitates industry/government contact, and takes part in discussion groups on topics of concern to its members.

Working in cooperation with the St. Lawrence Centre and the Ministère de l'Environnement du Québec, the QFIA has undertaken a project to study sludge management: sludge volumes are expected to increase considerably as secondary treatment processes are implemented, and a serious examination of alternatives to burial is called for.

The Association endorses environment protection objectives with both words and actions. In fact, it is currently offering an environment training program designed for all industry employees in Quebec. The program goals are specific but the formula is flexible. Each company can adapt it according to its own training needs and personnel availability. Ultimately, the aim is to reach people in their day-to-day lives.

Forestry is the largest manufacturing industry in Quebec, and it is fittingly and energetically represented by the QFIA.

The pulp and paper industry and the St. Lawrence action plan

Of the 50 industrial plants targeted by the St. Lawrence Action plan, 15 are pulp and paper mills. It is estimated that more organic substances are discharged into the province's waterways by these 15 alone than by the entire population of Quebec. With just a few months to go in SLAP's mandate, we offer a status report on pollution control.

A normal pulp and paper mill produces a foamy, brownish effluent that contains various materials in suspension, such as wood residues and paper fibres. If the mill uses a chlorine-based process, the effluent also contains organochlorides.

Have things changed much since 1988? When the St. Lawrence Action Plan put 50 industrial plants on the priority list, it set a general objective of reducing the amount of toxic liquid waste they emitted by 90% by the year 1993. What have the 15 pulp and paper mills done to date toward achieving that objective?

From 1988 to 1991, there was an actual 36% reduction in suspended solids (SS), and an equivalent reduction in the BOD_5 (5-day biochemical oxygen demand); Chimiotox units, a measure of the relative toxicity of pollutants in the same effluent, dropped 22% in 1992. By 1993, it is expected that the total reductions will be 42% (SS), 47% (BOD_5) and 26% (Chimiotox units). In other words, we are far from our goal.

"With the new secondary legislation, the 90% objective should be reached in 1995," says Robert Tétrault, Director of SLAP's Joint Action Team (JAG). "As of next spring, however, we will have achieved an overall 70% reduction in the amount of toxic liquid waste discharged into the river by the 50 plants initially targeted by SLAP."

Does this mean the pulp and paper industry has been recalcitrant?

"Not really," answers Raymond Perrier, former Director of Environment Protection at Environment Canada. "In fact, the Quebec Forest Industries Association has behaved like a true partner, supervising pulp mill effluent characterization studies in accordance with a protocol prepared jointly with JAG. The operation was a tremendous success. Thirteen mills have also set up programs to reduce the contaminants in their effluent. We can hardly say that nothing has been done."

What kind of programs are we talking about?

- Three mills have installed a decanter: Abitibi-Price, Domtar Inc. (at Donnaconna) and Daishowa.
- Six mills have implemented different internal measures, from rationalizing effluent flow to separating different kinds of effluent: Abitibi-Price, Stone-Consolidated (at La Baie), Canadian Pacific Forest Products (since closed), Quebec and Ontario Paper Co., Cascades and Donohue.
- Other mills have reduced the amount of contaminants with a wide variety of systems: Perkins Paper in Candiac now discharges its effluent into the municipal sewage treatment system; Stone-Consolidated in Trois-Rivières is recycling its grey water; Abitibi-Price has reduced production of chemical pulp and is buying kraft pulp; Cascades is recycling some of its effluent; and Domtar in Beauharnois is treating its cooking liquor biologically.

Photo: Pierre Sylvestre, St. Lawrence Centre

Logs are stored before being processed in the mill.

"These efforts are laudable, but they're not enough," continues Mr. Perrier. "The problem is that we expected new regulations for the pulp and paper industry in 1990, and we got them in 1992. The industry simply waited to find out exactly how government would proceed before making any major investments. But the Quebec Forest Industries Association has taken a clear stand: from now on, its members will do whatever is necessary to comply with the new standards, on schedule. Still, we will be only 20% away from the objective set in 1988."

Until now, the 15 mills targeted by SLAP have been governed by 1979 provincial regulations and federal guidelines. New legislation requires them to set up secondary treatment facilities; in

addition to the BOD_5 and suspended solids, they will also have to deal with dioxins and furans.

In his October 14 speech at the *Waterways for the World* International Symposium, federal Environment Minister Jean Charest called the 90% objective a "great motivator" adding that it was in this spirit that the goal had been set a little high.

As for the delay in passing new legislation, a number of factors interfered. Tough economic times, for example, meant new regulations would have been badly received. Other things to remember are the difficulty inherent in creating the right legislation, the considerable consultation required—specifically to ensure that the new standards don't clash with those of other jurisdictions—and meetings of the various technical committees.

Now that the legislation is in effect, things are speeding up. The federal and provincial governments are in the process of finalizing an administrative agreement regarding how the new regulations will be applied to the 60 pulp and paper mills located in Quebec. Among other things, the agreement might include single-window processing of all files. The 15 mills targeted by SLAP currently account for 39% of the industry's annual production. The objective for 1995: to reduce the SS load by 46%, the BOD_5 by 88% and Chimiotox units by 84%.

Robert Dubé, the new Director of Environment Protection at Environment Canada is optimistic:

"We are going to work more closely than ever with the industry when it comes to prevention. Respect for the environment becomes a condition of profitability, particularly given today's more demanding consumers and the emergence of clean new technologies that compete favourably with the old systems. We've taken the first of many giant steps."

New Federal and Provincial Regulations

The new federal legislation passed in May 1992 has affected the *Canadian Environmental Protection Act* (which dates back to 1988) and significantly modifies the *Fisheries Act*. In Quebec, a new *Regulation respecting pulp and paper mills* was passed in October, replacing the one that had been in effect since 1979. The areas of application may be different, but generally speaking, the environmental standards of both the federal and provincial legislation are now stricter and more clearly defined.

The federal regulations affect effluents, antifoaming agents and wood chips, while those in Quebec cover water, air and wastes. The federal government specifically restricts dioxin and furan levels in industrial wastes; the new provincial regulations govern all organochlorin compounds, including dioxins and furans. Dioxins and furans will be virtually eliminated by January 1994, and organochlorin will be progressively eliminated between now and January 2001.

The following are the other main objectives with regard to controlling industrial effluent and atmospheric emissions:

- the total elimination of acute toxicity in industrial effluent by September 30, 1995;
- an overall reduction, by September 30, 1995, of certain pollutants found in effluent discharged into our waterways: the organic load is to be reduced by 77% and suspended solids by 28%;
- a 20%-90% reduction in the amount of particles, reduced sulphur compounds and sulphur dioxide emitted by chemical pulp mills, by December 31, 1996.

The pulp and paper industry will have to invest more than $1 billion over six years to comply with the new regulations. Biological wastewater treatment systems will also have to be installed by that time. In addition, penalties under the new legislation are far more severe and fines for offenders are much higher.

F.F. Soucy and the St. Lawrence Centre: a fine example of cooperation

In August 1991, the F.F. Soucy paper company in Rivière-du-Loup began work on a revolutionary project, in cooperation with the St. Lawrence Centre. The goal is to completely reuse the plant's effluent and involves nothing less than closed-circuit production.

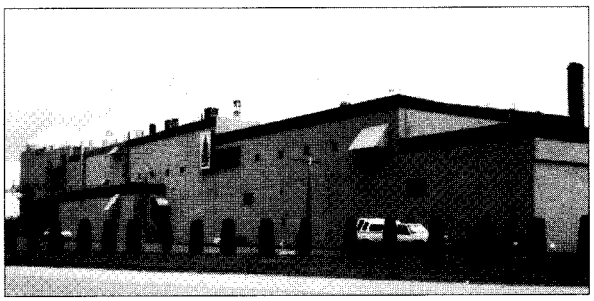

Photo: F.F. Soucy

The F.F. Soucy mill at Rivière-du-Loup.

The company is also adding new restrictions of its own. "Under the program, we're planning to reduce the flow of effluent so that there is less water to treat in the plant," explains Fabien Arsenault, Engineering Superintendent at F.F. Soucy.

"We also expect the quality of our finished product to be at least as good as the one we currently produce," he adds, "which means that as we develop techniques to reduce water consumption, we must set up new programs to increase product quality, in order to offset any undesirable effects created by using less water."

The initial phase of the project has already yielded encouraging results: in one year, water consumption has dropped from 34 to 28 cubic metres per metric ton of paper produced. New processes are also in development and the cost of current closed-circuit production techniques is still being assessed.

The St. Lawrence Centre is involved in the project in two ways. "The first is financial," explains the Centre's Ronald Zaloum. "We're paying 20% of the costs incurred by F.F. Soucy. But our input is also technical—we regularly review the technical aspects of the project to ensure that all the objectives established jointly with the enterprise are being met."

The eel: a precarious species in the St. Lawrence

Not much is known about the eel, other than that it is in a very precarious situation in the St. Lawrence River basin. "Since 1986, our Cornwall station has recorded a 95% drop in eel recruitment," says Martin Castonguay of the Institut Maurice-Lamontagne in Sainte-Flavie, which is affiliated with the Department of Fisheries and Oceans of Canada.

Why are the eels disappearing? At the moment, nobody has an answer, but Mr. Castonguay has an idea. "It would be reasonable to speculate that two main factors are at work. First of all, pollutants in the river are undoubtedly affecting the eels, although it's impossible to say exactly to what extent.

"Second, the eels' habitats have been negatively affected in the last several decades by such things as the construction of the St. Lawrence Seaway and the building of hydroelectric dams. Eels live a long time, so long-term effects are entirely plausible."

The government of Quebec is responsible for Salmonidae and eels. Serge Tremblay of the Ministère du Loisir, de la Chasse et de la Pêche du Québec (MLCP) is also very concerned. "The first alarm was sounded by fishermen in Rivière-du-Loup. For ten years, the commercial catch, which has traditionally been very lucrative, has been declining.

"At the moment, all the information is being compiled and a report should be out soon. The next step will be to create a group to study the eel, with a view to initiating discussions between interested parties so that possible solutions can be explored."

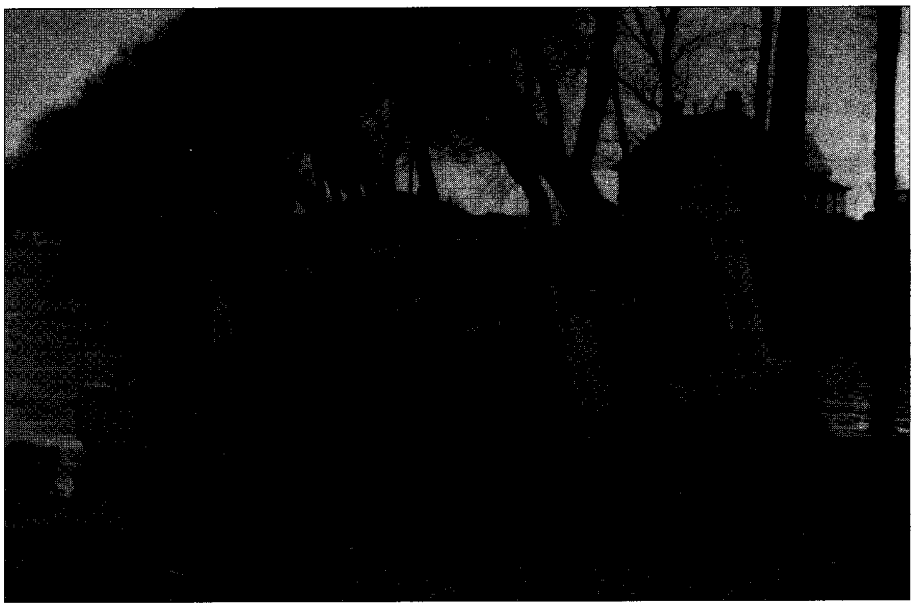

Photo: Jean-René Mongeau

Part of an abandoned eel trap, a vestige of a once thriving activity.

The eel has been somewhat forgotten recently, mainly because the problem appeared without warning. Other species were already on the priority list, but that hasn't prevented the Department of Fisheries and Oceans of Canada from doing its part:

"Under the St. Lawrence Action Plan, we've received funds that were supposed to go toward beluga research," explains Mr. Castonguay. "However, we've been able to put some of the money into research on eels. Actually, we believe there is a link within the food chain between the eel and the beluga. The eel may in fact be one of the main sources of contamination for the beluga."

The plight of the eel is certainly no longer in the background. The link between the eel and the beluga, as well as the fairly significant fact that eel fishing is commercially important in Quebec, will make this a priority issue for all those involved with aquatic wildlife and its management.

The effect of air pollution on chemical contamination in the St. Lawrence River

Everyone knows that toxic industrial waste affects the St. Lawrence River system. However, the impact of airborne chemical compounds deposited in the water is still relatively unknown. This phenomenon could explain the presence of a considerable number of pollutants.

A lack of data prevents a proper assessment of the situation and there is an urgent need for a network of stations to monitor these airborne contaminants.

In 1990, Environment Canada's Atmospheric Environment Service (AES) and the St. Lawrence Centre undertook a major project designed to evaluate what percentage of the organic and inorganic compounds in the river comes from the air. The first sampling station was set up in 1991 at Sainte-Françoise, near Villeroy, on the south shore between Montreal and Quebec City.

"We chose Sainte-Françoise because we wanted the deposition data to be as free as possible from the influence of external factors," says Jean Tremblay of AES. "Our choice was determined by a number of things: for example, the site is far from major sources of pollution, urban areas and heavily travelled roads. We wanted to make sure that we would get true background levels for the area between Montreal and Quebec City."

The Sainte-Françoise station has all the equipment necessary for the meteorological and chemical aspects of the project: it has a complete weather station and sampling devices to measure precipitation, aerosols and vapours.

Hundreds of chemicals have been found in the St. Lawrence River. A number of them have probably been deposited from the air, to a greater or lesser extent. To justify a more in-depth study, it had to be shown that these chemicals were affecting water quality, that they could be found in the air and that they could be sampled and analyzed using current techniques.

Sainte-Françoise is the first of at least three such stations.

Photo: Environment Canada

A sampling station for airborne toxins. Equipment for measuring chemical and meteorological data.

READINGS

ST. LAWRENCE TECHNOLOGIES

Two publications have recently appeared in the "St. Lawrence Technologies" series, and are intended for industrial companies, businesses, organizations and individuals interested in new environmental technologies.

The documents are produced by the St. Lawrence Centre's Technology Development Department. The Department's primary role is to work with the private sector, providing technical and financial support for technology development and demonstration projects designed to reduce and control toxic substances discharged into the river.

The first publication is a brochure called **Technology Development and Demonstration: Project Profiles**. It contains a brief description of the 30 or so projects undertaken in the last three years by the Technology Development Department, in conjunction with the private sector, in the following four areas: industrial wastewater, hazardous waste, contaminated sediment and contaminated soil.

Some of these projects have already been the subject of articles in this newsletter. For example, we recently highlighted the development by Zénon Environnement inc. of membrane bioreactors for treating industrial wastewater; in this issue, you can read about the implementation of closed-circuit production techniques at the F.F. Soucy thermo-mechanical pulp and newsprint mill.

Cooperation in technology development is proving very fruitful. Input is also coming from the academic milieu: research centres at UQAM and the École Polytechnique have been involved in projects being carried out with the St. Lawrence Centre (and UQAM's environment research centre continues to participate).

The new brochure contains information about the duration of each project, its total cost, present status and anticipated date of completion. It also provides a list of references, mentions the financial participation of the St. Lawrence Centre, and notes the telephone numbers of the people in charge of the project at the Centre.

The Technology Development Department has also introduced a series of **Fact Sheets** that briefly describe the results of joint projects carried out by the St. Lawrence Centre and the private sector. **Treating Pulp and Paper Mill Effluent by Biofiltration Using the Biocarbone ™ Process** is the first in the new series.

This full-colour, illustrated fact sheet features all the important technological, environmental and economic data on the project. There is also full information about the project objectives, how it is being carried out, what problems were encountered, what results have been achieved and what the potential and limitations of the technology are. In all, it is a very helpful document for anyone interested in keeping up with the latest developments in environmental technology.

All these publications are available in English and French (the brochure is bilingual) from

The St. Lawrence Centre
Conservation and Protection
Environment Canada
105 McGill Street, 4th floor
Montreal, Quebec H2Y 2E7
(514) 283-7000

Since it began full-time operation in January, weekly measurements have been taken of organic compounds, like PAHs and PCBs, and inorganic elements, like lead and mercury. "Right now, all we have are preliminary data," says the St. Lawrence Centre's Ken Lum, "but we have nevertheless been able to detect certain organic substances, such as PAHs, and several heavy metals in wet and dry depositions at the Sainte-Françoise station."

A model has been established to assess the relative importance of the sources of pollutants in the river; 1990-91 results indicate that the atmosphere may be a potentially significant source of certain contaminants, such as PAHs. "In 1993, we'll begin evaluating atmospheric deposition in the St. Lawrence River," concludes Mr. Tremblay. "By that time, we'll have set up a data bank for airborne chemicals that will serve not only to ascertain the role of air pollution in contaminating the river, but also to determine the level of pollution to which the population is exposed."

In the second phase of the project, two new stations will be set up, thus providing even more data that will help to quantify on this relatively unknown source of water pollution.

HOT OFF THE PRESS

GAGNON, M., Y. Ménard and J.-M. Coutu. 1992. *Structure de la communauté ichtyenne intertidale de l'estuaire moyen du Saint-Laurent: cadre de référence pour le suivi à long terme de l'état de l'écosystème de l'estuaire du Saint-Laurent.* Rapp. tech. can. sci. halieut. aquat. 1870F: vii + 35 p. Department of Fisheries and Oceans of Canada.

DALCOURT, M.-F., P. Béland, E. Pelletier and Y. Vigneault. 1992. *Caractérisation des communautés benthiques et étude des contaminants dans des aires fréquentées par le béluga du Saint-Laurent.* Rapp. tech. can. sci. halieut. aquat. 1845F: vii + 86 p. Department of Fisheries and Oceans of Canada.

Canadian Technical Reports of Fisheries and Aquatic Sciences is a series reflecting the wide range of interests and policies of the Department of Fisheries and Oceans of Canada. Copies of these new reports are available (in French only, for now) by writing to:

Department of Fisheries and Oceans of Canada
Fisheries and Habitat Management Branch
Fish Habitat Division
Champlain Harbour Station
P.O. Box 15,500
901 Cap Diamant
Quebec City, Quebec G1K 7Y7

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***Ensemble des fiches d'information sur les 50 industries visées par le Plan d'action Saint-Laurent*, St. Lawrence Action Plan Joint Action Team, 3rd edition, June 1992.**

This is a brief outline of basic information pertaining to each of the 50 industrial plants targeted by the St. Lawrence Action Plan. Included are data concerning industrial processes, effluent treatment, main contaminants discharged, resources and uses to be preserved, if any, and compliance with legislation. The completely updated third edition is designed for Plan partners, the media and interested ecology groups. The booklet is available (in French only, for now) by contacting:

Environment Canada
Conservation and Protection
(514) 496-6851

CONTACTS

PEEP: AN INDEX FOR ASSESSING AND COMPARING THE TOXIC POTENTIAL OF INDUSTRIAL EFFLUENT

Norman Bermingham and Georges Costan
(514) 928-4256
St. Lawrence Centre, Environment Canada

THE PULP AND PAPER INDUSTRY AND THE ST. LAWRENCE ACTION PLAN

Robert Dubé
(514) 283-0178
Environmental Protection, Environment Canada

Raymond Perrier
(514) 496-1911
St. Lawrence Centre, Environment Canada

Robert Tétrault
(514) 873-6499
SLAP Joint Action Team

F.F. SOUCY AND THE ST. LAWRENCE CENTRE: A FINE EXAMPLE OF COOPERATION

Fabien Arsenault
(418) 862-6941
F.F. Soucy

Ronald Zaloum
(514) 283-4252
St. Lawrence Centre, Environment Canada

THE EEL: A PRECARIOUS SPECIES IN THE ST. LAWRENCE

Martin Castonguay
(418) 775-0500
Department of Fisheries and Oceans of Canada

Serge Tremblay
(418) 643-5469
Ministère du Loisir, de la Chasse et de la Pêche du Québec

THE EFFECT OF AIR POLLUTION ON CHEMICAL CONTAMINATION IN THE ST. LAWRENCE RIVER

Ken Lum
(514) 928-4470
St. Lawrence Centre, Environment Canada

Jean Tremblay
(514) 283-1107
Atmospheric Environment Service, Environment Canada

COMING EVENTS

79th Annual Meeting and EXFOR '93
(Annual meeting of the Canadian Pulp and Paper Association)
January 25-29, 1993
at the Montreal Convention Centre.
For more information:
D.H. Paterson
(514) 866-6621

Canada's First National Conference and Trade Show on Water Conservation
February 4-6, 1993
at the Winnipeg Convention Centre.
For more information:
Hans Foerstel
(819) 953-1512

IN BRIEF

LARGE RIVER MANAGEMENT: A STEP IN THE RIGHT DIRECTION

As mayor of the host city, Montreal's Jean Doré was the guest speaker at the closing ceremonies of the *Waterways for the World* International Symposium on October 15 at the Montreal Convention Centre. Mr. Doré spoke in favour of establishing a **Large Rivers of the World Secretariat** in Montreal, after Symposium participants expressed the desire to set up such a centre, which would serve as a locus for the international exchange of information, for training and for joint efforts in large river management. They were supported in their proposal by the Société du centre de conférences internationales de Montréal.

A NEW MLCP REPRESENTATIVE ON THE SLAP MANAGEMENT COMMITTEE

The SLAP Management Committee of the Canada-Quebec agreement has welcomed a new representative from the Ministère du Loisir, de la Chasse et de la Pêche du Québec (MLCP). George Arsenault, who replaces André Magny, was named Assistant Deputy Minister, Wildlife Resources, on June 29, 1992.

Mr. Arsenault has worked in government and non-government organizations and brings his solid experience in wildlife conservation and management to the St. Lawrence Action Plan. Over the years, he has held various positions with the Canadian Wildlife Service. As Provincial Director of Ducks Unlimited Canada, he was responsible for the organization's financing and overall operations in Quebec. Mr. Arsenault assumed the duties of Assistant Deputy Minister, Wildlife Resources from 1987 to 1989, and as such, has already sat on the Management Committee. He returns as MLCP representative with renewed vigour and even greater experience.

Photo: MLCP

George Arsenault, Assistant Deputy Minister, Wildlife Resources, with the Ministère du Loisir, de la Chasse et de la Pêche du Québec.

CATALOGUE OF ST. LAWRENCE ACTION PLAN PUBLICATIONS

This catalogue, which was updated in September 1992, lists no fewer than 390 SLAP publications. The catalogue and all the publications in it are available from the St. Lawrence Centre Documentation Centre, located at 105 McGill St., 4th floor, Montreal, Quebec H2Y 3E7, (514) 283-2762 (phone), (514) 283-9451 (fax).

OBITUARY

It is with great regret that we announce the death of Richard Tardif, who had been in charge of communications for SLAP at the Ministère de l'Environnement du Québec since late 1990. Richard was a respected professional who enjoyed writing and translating in his spare time. All those who knew him will remember his as a life well lived. Our sincerest condolences to his wife and family.

LE FLEUVE

St. Lawrence Action Plan Newsletter

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