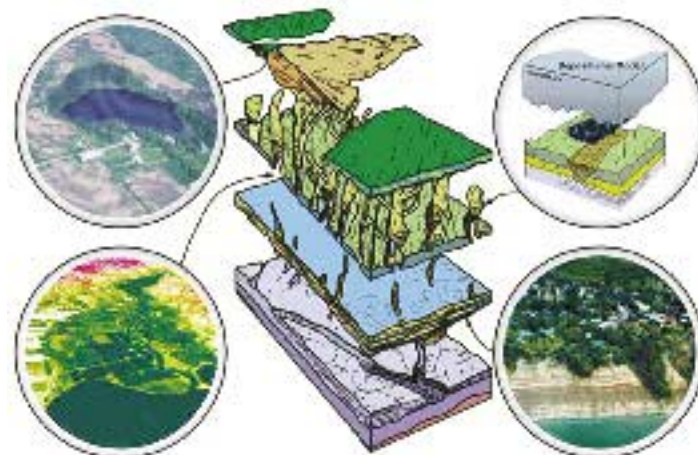




## the ENVIRONMENT

*Ensuring a healthy environment and sustainable use of our resources is a central value for Canadians. These are also key goals for Government of Canada scientists and science-based programs. The following stories provide an overview of the diverse ways that innovative federal research and development is at work to protect the quality of our land, water and air, and to preserve species for Canadians now and in future generations.*



### Stopping run-off from getting away

It's enough to make a farmer cry: With just one heavy spring rain, freshly applied agricultural fertilizers and herbicides can wash off fields into watercourses. It's a loss for the crops and a problem for the surrounding environment. But Government of Canada scientists are showing that this run-off pollution can be prevented.

Agriculture and Agri-Food Canada researchers at the Greenhouse and Processing Crops Research Centre in Harrow, Ontario, have created an integrated reservoir and irrigation system to re-cycle surface and field tile run-off. (Buried tiles are often used in agricultural fields to help drain the soil.)

The system works by storing field tile drainage and surface runoff water in reservoirs during wet periods and using it during dry spells. During the dry months of July and August, the water,



including all the nutrients and herbicides, is pumped back to the crop through the same tiles used to recover the water.

And the result is not only good for the environment, it could also have farmers smiling: In field trials at Harrow during the past two years, the system has increased soybean yields by nearly 50 per cent and corn yields by 90 per cent.

*Get more information on how Agriculture and Agri-Food Canada's Ontario-based research is improving food sustainability, safety and innovation at <http://res2.agr.gc.ca/london>. or call (519) 873-5867.*

### An Ontario solution to a blue box dilemma

It's a reality that turns avid recyclers red: Regardless of all the effort to clean and sort them, the majority of blue-boxed household plastics go to a landfill. With support from the National Research Council Industrial Research Assistance Program (NRC-IRAP), a London, Ontario-based company is working hard to change this.

"The problem is that if you've got mixed plastics they're generally incompatible and, at best, you can only use them in very low grade, low value applications, such as plastic wood," says Dr. Jim Brown, the founder and president of Plas-Sep.

In the company's patented separation process, mixed plastics—everything from plastic pop containers to margarine tubs—are chopped into five to ten millimetre-

sized chunks, washed, and dried. The chunks are then tumbled through a mixer where they develop an electrostatic charge, the same kind of charge that makes clothes cling. Next, the chunks are dropped through an electric field which separates the plastics based on differences in their electrostatic charges. The 99 per cent pure sorted plastics are then recyclable into their original use.

NRC-IRAP support enabled Plas-Sep to upscale its prototype batch process that could handle only a kilogram, to a continuous process, ton-an-hour machine.

The company will soon be making recyclers smile with five full-scale operating units, including ones in Ontario, Quebec and Europe.

*Get more information about how NRC-IRAP, the Government of Canada's premier innovation assistance program for small and medium-sized Canadian enterprise, is turning green ideas into reality at [www.irap-pari.nrc-cnrc.gc.ca](http://www.irap-pari.nrc-cnrc.gc.ca) or call (877) 994-4727.*



### Protecting Ontario's groundwater

A new Government of Canada study is giving water use planners in Ontario's Oak Ridges Moraine (ORM) region the equivalent of powerful 3-D x-ray vision to see and protect underground water resources. It's insight that is proving to be critical to the sustainable use of this precious clear, blue resource in Ontario's most rapidly developing area.

"You can't protect underground water effectively if you don't know where it is," says Geological Survey of Canada (GSC) scientist, Dr. David Sharpe, who led the regional ORM groundwater mapping project in collaboration with numerous municipalities and provincial ministries.

To be completed next year, the groundbreaking decade-long project is the first of its kind in Canada to create 3-D maps of the locations and

flow of regional, rather than just local, underground water reservoirs, or aquifers. The ORM region, a beautiful, hilly 160 kilometre-long glacial landform north of Toronto, is the most heavily used aquifer in Canada.

Using remote sensing technologies, the GSC researchers discovered that ancient glacial valleys north of the ORM, including the Holland Marsh, continue under the moraine.

"These ancient valleys and their sand and gravel fills are in effect an underground plumbing system," says

Dr. Sharpe, adding that the work has identified major new aquifers.

The results have already put groundwater resources on the map for

municipal planners in a region of intense urban growth. And for the first time ever, municipalities in the region have hired staff hydrogeologists.

Based on this underground success, Dr. Sharpe and provincial partners have set their sights on a Great Lakes Basin-wide groundwater study.

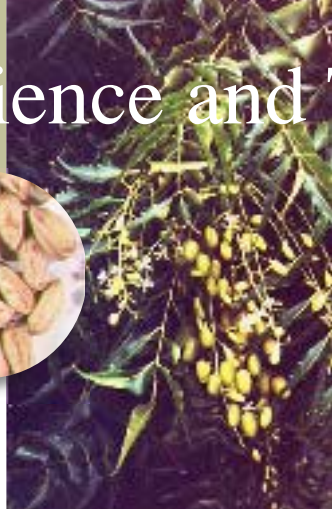
The GSC, a division of Natural Resources Canada, is the country's premier agency for geoscientific information and research.

**You can't protect underground water effectively if you don't know where it is**

*Learn more about the Oak Ridges Moraine groundwater study at <http://sts.gsc.nrcan.gc.ca/orm/index.asp> or call (613) 992-3059.*



## Ontario tree pests get a new natural enemy



Government of Canada scientist Dr. Blair Helson was looking for a natural alternative to the conventional pesticides used to battle the bugs of Ontario's trees. He found it in the seeds of the Neem, a common tree in India.

"The current trend is to develop new insecticides that have reduced risk to us and the environment," says Dr. Helson, a research scientist at the Canadian Forest Service (CFS) Great Lakes Forestry Centre in Sault Ste. Marie, Ontario. "We've been able to demonstrate that Neem is a very effective and safer product for use against some of our major forest pests."

Beginning in the mid 1990s, Dr. Helson, in collaboration with CFS colleagues, conducted wide-ranging experiments to show that azadirachtin, an extract from Neem seeds, is highly effective against a range of sawfly species. These insects eat the needles of common Ontario trees, including pines and spruces. As a result of this

work, a commercial version of Neem is now registered for use in Canada. It has already been successfully used to protect red pine in Simcoe County, Ontario from an outbreak of pine false webworm.

Neem is safe for birds and mammals, including humans. And since it has to be eaten to be effective, it should kill only those insects that are actually eating the trees.

Dr. Helson is now working on testing and commercializing a system that he's invented to inject Neem directly into trees. It's an approach that will provide an even more targeted way for trees to brush-off their insect pests.

*The CFS, a division of Natural Resources Canada, promotes the sustainable development of Canada's forests and the competitiveness of the Canadian forestry sector. Learn more at [http://www.glf.forestry.ca/science\\_e.html](http://www.glf.forestry.ca/science_e.html) or call (705) 541-5520.*

## Water power and fish health

What's the link between switching on the kitchen lights in the morning and the health of fish in Ontario's rivers? Ask the Department of Fisheries and Oceans' (DFO) Dr. Karen Smokorowski. The Government of Canada scientist is leading one of the most extensive Canadian research projects ever, exploring how water flow changes controlled by hydroelectricity-generating facilities impact river ecology.

Dr. Smokorowski's collaborative science experiment with the Ontario Ministry of Natural Resources (OMNR) and Great Lakes Power Limited (GLPL) is focused on the Stepphill Falls generating facility on the Magpie River near Wawa, Ontario. This medium-sized river is known for its excellent brook trout fishery. So, when GLPL built the Stepphill Falls facility in the late 1980s, the lease agreement with the OMNR included strict ramping rate restrictions in order to protect downstream fish and habitat. The agreement also provided the opportunity to alter these

restrictions based on the results of scientific study.

Ramping rate is the measure of how quickly water flow through a hydroelectricity facility turbine is increased or decreased. The rate of water flow change is crucial to maximizing hydroelectric energy production during periods of peak demand, such as at breakfast and dinner time.

The eight-year study, begun in 2000, will closely examine how changes in the ramping rate at the Stepphill Falls facility affect downstream fish community structure, food availability and habitat.

The results of the study could be used to protect fish and their habitat, while maximizing the production of clean, renewable energy.

"For me the greatest benefit that can come out of the study is that it will provide policy makers with the scientific evidence to make the decisions that are the best for people and the environment," says Dr. Smokorowski.

*Learn more about how DFO scientists are working to protect Ontario's freshwater habitats at [www.dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca) or call (705) 942-2848.*

**Changes in the ramping rate may affect downstream fish communities**

## Recovery of an endangered migratory bird

A rare combination of songbird and bird of prey, the Eastern Loggerhead Shrike was commonly seen hunting for grasshoppers, mice, and even small birds in the grasslands of rural south-eastern Manitoba, Ontario, Quebec, and parts of New Brunswick. But in the past 50 years, their numbers have declined sharply.

Currently, just a handful of breeding pairs frequent an area near Winnipeg, two small populations can be found near Napanee and Orillia, and the odd pair appears near Owen Sound and on Manitoulin Island. Because these robin-sized birds are too small to track by radio-telemetry, the location of their wintering grounds remains a mystery.

The Government of Canada supports the recovery of this bird. Part of the strategy is to establish a captive population, which began with 43 birds taken

from the wild as nestlings. By 2002, this population increased to over 120 birds.

A collaboration with local landowners, Wildlife Preservation Trust Canada, and other partners has allowed techniques to be developed for the release of captive-bred, young shrikes in an experimental project near Ontario's Smiths Falls. Breeding birds are placed in specially-designed cages in suitable natural habitats. The young shrikes that are produced are then banded and released to the wild.

The ambitious goal for recovery is 500 wild pairs – and the project is taking flight. The first satellite breeding centre will be established in Bruce County. Because shrikes will "imprint" to their initial territory and return year after year, the centre will be placed in the short, grassland habitat the birds require.

*Learn more about the Government of Canada's effort to promote biodiversity at [www.ec.gc.ca](http://www.ec.gc.ca) or <http://wildspace.ec.gc.ca> or call (519) 986-1249.*



## Ontario's meteorologists in training

Canadians love to talk about the weather. Now Ontario school children can talk about it with greater authority. In 1998, Sky Watchers, one of Environment Canada's educational initiatives, made its Ontario debut and has, since then, registered over 400 schools. Through the program, students in Grades 4 through 7 learn about the science of meteorology by taking weather observations during the school year.

"Getting students engrossed in a hands-on learning process at an early age really keeps their interest alive in science," says Julie Turner, Sky Watchers Coordinator for the Ontario Region of Environment Canada.

The unique program includes a resource kit with all the equipment and reference material— including a barometer, an anemometer, and cloud charts—needed to

set up a weather observation station at each school. Students record daily weather information, such as air pressure, wind speed and precipitation, to reinforce their classroom lessons. Each school posts their weather observations to Environment Canada's Sky Watchers Web site. Students can then compare their observations with those of schools in other parts of the country, or print off a series of weather observations for graphing or mapping exercises.

Each participating classroom also receives the Sky Watchers Guide to Weather, which was specifically written to support the requirements of the Ontario Grade 5 Science Curriculum.

"Weather is a great vehicle for teaching subjects such as geography and math," says Ms. Turner, "and many of the activities in our Guide are cross-curricular."

*Learn more at the Sky Watchers Web site at [http://weatheroffice.pvr.ec.gc.ca/skywatchers/index\\_e.html](http://weatheroffice.pvr.ec.gc.ca/skywatchers/index_e.html) or call (807) 346-5949.*

## On the trail of the disappearing ozone over Ontario

The ozone layer over Ontario is about to get a major check-up with the launch of SCISAT-1, the Canadian Space Agency's (CSA) first scientific satellite in 30 years.

Slated for launch in the summer of 2003, the satellite will carry the Atmospheric Chemistry Experiment (ACE). Its mission is to better understand the chemical processes involved in the distribution of life-protecting ozone in the upper atmosphere, especially over Canada.

"In the last 20 years, about six per cent of the ozone over the global mid-latitudes—including over Toronto and Ottawa—has

disappeared. It's a bit of a mystery. Why is this happening?" asks Dr. Peter Bernath, ACE's Mission Scientist for the Canadian Space Agency and a University of Waterloo atmospheric chemist.

Orbiting at 650 kilometres above the Earth, and circling 15 times a day, the ACE mission will use two specialized instruments to measure the presence of more than 14 different types of molecules in the ozone layer based on the different wavelengths of light they absorb.

"The big reason for the interest in understanding atmospheric chemistry is the effect it has on us—both in terms of health and the environment," says Dr. Bernath. The ozone layer protects life

on Earth from the harmful effects—including skin cancer and eye damage—of the sun's UV-B radiation.

The information gathered from the ACE mission will be critical for Government of Canada and international policy makers in assessing existing environmental policies and in developing new measures to protect the ozone layer.

*The Canadian Space Agency is at the forefront of the development and application of space knowledge for the benefit of Canadians and humanity. Get ready for the launch of SCISAT-1 at [www.space.gc.ca/asc/index.html](http://www.space.gc.ca/asc/index.html) or call (450) 926-4370.*



*The 150 kilogram SCISAT-1 satellite carrying the ACE mission is slated for launch from a NASA Pegasus XL Rocket in the summer of 2003.*

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