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**Inside this issue:**

Lessons from Christchurch cont.	2
The PCS Canada service	3/4
ICLR's McBean president-elect of ICSU	4
On-scene in Goderich, Ontario	5/6
Weatheradio: Your weather early warning system	7

## Lessons from the earthquake in Christchurch

By Paul Kovacs, Executive Director  
Institute for Catastrophic Loss Reduction

The damage I could see in Christchurch was much more extensive than expected. Over the past twelve months more than two dozen magnitude 5 or greater earthquakes have destroyed much of this lovely city. This tragic loss offers a number of lessons for Canada.

Christchurch is the second largest city in New Zealand, with a population similar to that of Victoria, British Columbia. Strong earthquakes regularly strike in New Zealand and the country is well prepared. Building codes reflect current knowledge about seismic engineering, and compliance with the codes is good. Emergency management professionals are aware of the hazard and skilled. Moreover, the public understands that they need to prepare for the risk of a major earthquake. Nevertheless the past year has been terrible and offers a number of lessons for Canada.

1. *All buildings can benefit from seismic retrofits:* The risk of a major earthquake is seen to be high in Wellington, the capital of New Zealand, and moderate near Christchurch. Over the past few decades there has been a greater investment in seismic retrofits in Wellington than in Christchurch, leaving Christchurch vulnerable, particularly older buildings, when a major earthquake did strike. For Canada, seismic safety is important in Vancouver, but also should take place in other communities with a

moderate or high risk of a major earthquake, including Montreal, Ottawa, Quebec City and Victoria.

2. *Earthquake insurance designed for homeowners:* Private insurers provide catastrophic earthquake insurance in New Zealand, covering damage to property in excess of \$100,000. This coverage is included for all homeowners within their basic policy. For a modest fee most homeowners choose to buy additional coverage from the government run earthquake insurance program that covers the first \$100,000 in damage. Coordination between private insurers and ►





allowed access due to ongoing safety concerns. Businesses, the media, insurance officials and other interested parties have not been permitted to visit the area other than during events managed by the government.



Moreover, this will continue for many months. Canadians establishing their expectations about business recovery should anticipate that officials would also focus on public safety even if that should extend the time and cost required to support a full recovery. On a smaller scale this has been evident in Slave Lake, where the government controlled access to many damaged properties.

4,000 buildings in downtown Christchurch were damaged, including 1,000 that will be demolished. 80 percent of the sewer and water infrastructure in the city was severely damaged. A major source of damage to homes, buildings and infrastructure was soil liquefaction. Many buildings were destroyed because of the shifting soils. A 1991 government report warned of the risk of large earthquakes and liquefaction in Christchurch nevertheless many aspects of the recent earthquakes continue to surprise experts.

governments ensures that homeowners are protected, while eliminating the risk of legal disputes after an earthquake. Canada's insurers, however, appear vulnerable to the potential for disputes about homeowner awareness of large deductibles, and about differences in coverage if the damage is due to fire, shake or tsunami. The U.S. insurance industry was arguing with policyholders in the courts for many years after hurricane Katrina about damage due to water or wind, but the risk of post event disputes is largely absent in New Zealand.

*4. Shallow earthquakes can be very destructive:* The greatest loss of life and destruction of property occurred on February 22 when a magnitude 6.3 earthquake struck 5 kms below Christchurch. Almost all of the earthquake fatalities in New Zealand over the past year were on February 22. This was a moderate earthquake, less powerful than the earthquake on September 4, 2010 and similar in strength to the June 13, 2011 event, but it is remarkable because it was very close to the surface. Canadians should seek greater information about the risk of shallow earthquakes.

Ongoing seismic research in Canada and elsewhere is essential to better understand earthquakes hazards and the opportunities to best manage the risk of loss from this hazard. 🐾

*3. Response officials will focus on public safety:* The central business district of Christchurch is closed. Only demolition crews and other government recovery officials are

*5. Engineers continue to learn about liquefaction:* More than 100,00 homes were damaged, including 10,000 that will be demolished. Almost all of the



# The PCS Canada service

## Bringing value to the insurance industry in Canada

By Gary Kerney, Assistant Vice President  
Property Claim Services

Insurance underpins the strength of many economies around the world and plays a critical role in economic recovery after disasters. These contributions are often not appreciated or fully understood. Accurate accounts of insurers' recovery and rebuilding efforts following catastrophes are critical, and the PCS-Canada™ service provides that information.

In a time of need, policyholders expect service from their insurers. This is the primary reason they pay premiums. They expect to be informed about disasters. The more information available about the impact of catastrophic events on communities and their economies, the more likely people are to comprehend the hardships they encounter and the risks they face. Quantifying losses and the associated costs are important aspects of understanding the full impact of extreme events – for insurers and for the communities and policyholders they serve. For example, in the aftermath of the 2005 hurricane strikes in the United States, PCS estimated that insurers would pay 3.2 million claims, and that 70 percent of those would be personal lines. In other words, 2.25 million people received some financial assistance from their insurance companies.

As we have seen in the United States and recently in Canada, insurer assistance has proven invaluable not only after hurricanes but also following hailstorms, windstorms, winter storms, wildland fires, and earthquakes. The Canadian people face the same risks as those that affect property owners in the United States. In fact, one recent report noted that weather-related losses in Canada provide “underwriting challenges.”

Since 1949, the Property Claim Services® (PCS®) service

has been identifying catastrophes for the insurance industry and estimating the losses those events cost insurers. The PCS service is recognized worldwide as the authority on catastrophes in the United States, Puerto Rico, and the U.S. Virgin Islands. The information from the PCS service is useful in all aspects of insurance operations, but PCS information is also valuable to government entities, from the National Hurricane Center and the Department of Commerce to individual state and local governments and their various agencies.

These same services are now available to the Canadian insurance market and the people and commercial entities they insure.

The PCS-Canada service has formally been in place since the second quarter of 2010. Since that time, the service has identified 11 catastrophes affecting various regions of Canada. The PCS-Canada service to date has estimated that the first nine events, based on current estimates, caused nearly 150,000 claims costing insurers almost CAD\$2 billion, with estimates for the latest two events pending.

In addition, the PCS-Canada™ service has conducted surveys of insurers concerning prior events thought to be catastrophes. Those events included the ice storm of 1998, a severe weather event in 2005, and nine events from 2009. The loss information related to the events is also available from the service.

To communicate with insurance organizations interested in the catastrophe activity in Canada, the PCS-Canada service has provided an online reporting service. All related catastrophe information is available on the password-

protected site. Registered users have access to daily weather summaries for Canada, all catastrophe bulletins from the first announcement to the final estimate, reports on events that could become designated catastrophes but have not yet reached the threshold, and news summaries and bulletins concerning catastrophe-related topics.

The PCS-Canada service has grown since its first days of operation. In the last year and a half, the number of users has increased by more than 300 percent. Growth steadily continues each month.

The PCS-Canada service will soon offer a multidimensional web-based tool to analyze and aggregate catastrophe information. The database tool will combine information about all catastrophes in a flexible, speedy, and easy-to-use application. We expect that this historical catastrophe information will be a valuable resource for catastrophe planning, reinsurance purchase, resource allocation, and underwriting and marketing activities. Users will be able to search for information using the catastrophe serial number, a particular year, specific provinces, the catastrophe “family” (e.g. hurricane or earthquake), and other search parameters. We expect the tool to be available no later than the beginning of 2012.

The PCS-Canada service already enjoys strong support in Canada. The service can rely on its Advisory Committee for sage advice and recommendations. The committee includes the Insurance Bureau of Canada, the Institute for Catastrophic Loss Reduction, and the Reinsurance Research Council. Representatives from these organizations have been most helpful with implementing ►

## ICLR's McBean president-elect of ICSU

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On September 30, Dr. Gordon McBean was designated as President-elect, the International Council for Science, at the Council's 30<sup>th</sup> General Assembly held in Rome, Italy. Dr. McBean is Professor in the departments of geography and political science at the University of Western Ontario, and serves as Director of Policy with the Institute for Catastrophic Loss Reduction (ICLR).

Under the organization's rules, Dr. McBean will become a member of ICSU's executive board immediately but will not serve as President until the next general assembly in 2014.

The International Council for Science (ICSU) is based in Paris and is a non-governmental organization with a global membership of national scientific bodies (121 members, representing 141 countries) and International Scientific Unions (30 members). Its mission is to strengthen international science for the benefit of society.

"Assuming the lead with ICSU is a natural next step recognizing a lifetime of leadership by Dr. McBean within the international science community," said Paul Kovacs, Executive Director of ICLR. "Gordon's affiliation with our Institute makes me confident that he will be an outstanding spokesman for the world's scientific community. It has

perhaps never been more important to ensure a solid scientific foundation for societal actions to address current global challenges. As a professional colleague and a personal friend, I congratulate Gordon on this outstanding achievement and wish him all the best as President of ICSU."

Dr. McBean received his B.Sc. in Physics and Ph.D. in Oceanography from the University of British Columbia (UBC), and also holds a M.Sc. in Meteorology from McGill University. He was a scientist at Environment Canada from 1970 to 1988 when appointed Professor and Chair of the Atmospheric Science Program at UBC. In 1992, he was appointed Head of the Department of Oceanography. From 1994 to 2000, he was Assistant Deputy Minister (ADM) responsible for the Meteorological Service of Environment Canada.

Dr. McBean's research interests are in atmospheric and climate sciences, ranging in scope from the natural sciences to the policies of governments and peoples' responses to them. An area of interest is the changing occurrence of extreme weather events with climate change, their influence on public systems, and strategies for adaptation. In addition to his activities at UWO and ICLR, Dr. McBean is active nationally and

internationally. He is Chair of the Board of Trustees of the Canadian Foundation for Climate and Atmospheric Sciences and member of the U.S. National Academy of Sciences Committee on partnerships in weather and climate services, and the International Council for Science Advisory Committee on the Environment. He is also lead author for the Arctic Climate Impact Assessment's chapter on the climate system. He has received the Patterson Medal for distinguish contributions to meteorology by a Canadian and is a Fellow of the Royal Society of Canada, the Canadian Meteorological and Oceanographic Society, and the American Meteorological Society. He is also a Member of the Order of Canada and the Order of Ontario. 🐾



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### The PCS Canada service *cont...*

the service, and we at PCS-Canada look forward to working with these groups for a long time to come.

The service is also grateful to MSA Research, Inc., and its CEO, Joel Baker, who realized early on the value of the service to the insurance industry in Canada. He has worked diligently over the past several years to make such a service a reality and to ensure it continues

to provide reliable information to the industry.

The PCS-Canada service welcomes inquiries from interested parties. You can learn more about the service at [www.pcs-canada.com](http://www.pcs-canada.com), and you can submit questions to us here as well. 🐾

Gary Kerney, Assistant Vice President, Property Claim Services.



# On-scene

## Investigating the F-3 twister in Goderich, Ontario

By Sarah Elizabeth Stenabaugh

PhD Candidate, Engineering, University of Western Ontario

On August 21, 2011, a tornado formed over Lake Huron and passed through the town of Goderich, Ontario. After surveys conducted by Environment Canada and the University of Western Ontario it was classified as an F3 tornado, having produced wind speeds in the range of 250-320km/h. It made landfall at the Sifto Mine where it caused significant damage before impacting the downtown square and making its way to Ben Miller (Figures 1a and 1b).

The downtown square sustained the worst damage, with

many historical brick buildings damaged or destroyed. The courthouse, located in the centre of the square, survived mostly intact with damage being limited to broken windows and building contents due to breaches in the building envelope. A number of brick buildings, both in the square and downwind along the tornado's path, sustained façade failure to their second and third storeys. This introduced significant volumes of debris into the wind field.

Damage from debris was noted downwind as well as on the



Figure 2: Damage to vehicles, debris field and displaced chair.

side perimeters of the damage path. When compared to other surveys of past storms, there ▶

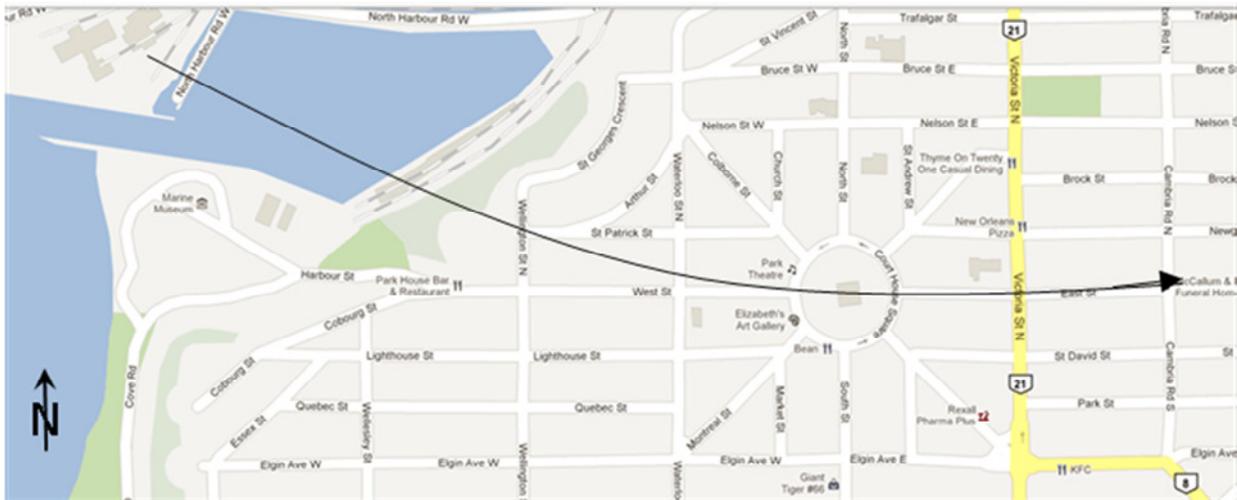


Figure 1(a): Tornado path through downtown square.

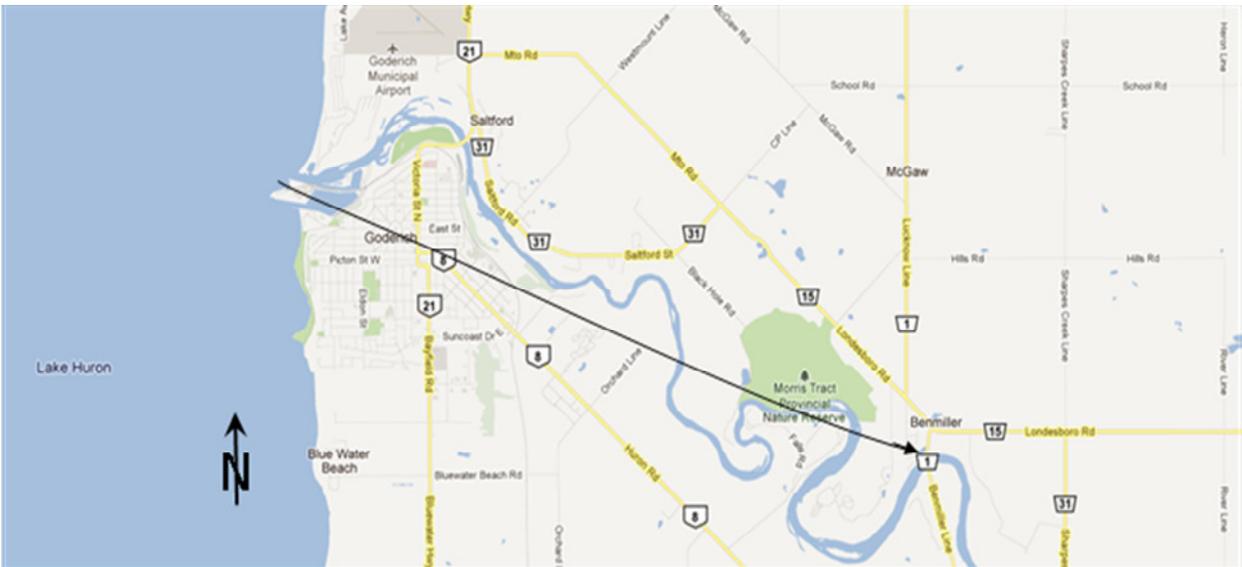


Figure 1(b): Tornado path along surveyed area.



was increased damage to structures as a result of debris entrained in the wind field. Figure 2 shows a child's school chair that was displaced approximately 140 metres and trapped in a tree. Figure 3 shows a brick that broke the driver's window of a vehicle before puncturing the windshield from the inside.

Some of the surrounding neighbourhoods sustained damage, mostly observed to be damage to shingles, soffits and fascia and general property damage. From the survey it appears that the more severe damage was caused by debris impact. Some buildings were noted to be partially missing their roof structures.

The trees along the



Figure 4: Stem break tree failure.

damage path also sustained significant damage and were found to typically fail by three methods; stem break – where the trunk of the tree is snapped a few metres above the ground (Figure 4), wind throw – where the tree is pushed over at the base and the root ball is unearthed (Figure 5), and root break - where the trunk snaps off at the ground (Figure 6). The majority of the trees were found to be mature and well rooted, although some were observed to be weakened by rot. The majority of the trees located in the central square were either



Figure 5: Wind thrown tree failure.

destroyed or severely damaged. While the buildings will be repaired and rebuilt, some of these trees are irreplaceable.

The state of emergency that was declared by the city of Goderich remained in effect for at least three weeks post storm to assist with the recovery efforts. A number of agencies and organizations assisted with the emergency response and recovery efforts. While overall the response was successful, these events reinforce the need for efficient communication and planning. Practice events which include all the stake holders would go a long ways to improving both response time and overall effectiveness.

Homeowners are also reminded to do their part by having an emergency plan and by having



Figure 6: Root break tree failure.

provisions to last a minimum of 72 hours in the event of a natural disaster. 🐾



Figure 3: Brick protruding from windshield.

# Weatheradio

## Your weather early warning system

By Geoff Coulson

Warning Preparedness Meteorologist, Environment Canada

It's 2:40 a.m. Sunday morning, June 6, 2010 in Leamington, Ontario. You and your family are sound asleep when suddenly the Weatheradio in your kitchen emits a piercing tone that wakes everyone up. After the tone, a voice says that Environment Canada has issued a tornado warning for your area. Shortly after this, a brilliant flash of lightning lights up your bedroom followed almost immediately by the sharp crack of thunder. The winds begin to build in intensity outside causing your house to make groaning noises. You quickly gather your family together and head down to the basement. Minutes after all of you get into the basement, the wind noise increases outside and you hear a large snapping noise followed by a crash as the large tree in your front yard falls on your house. As quickly as it began, the noise outside dies away to be replaced by an eerie calm. You wait a few more minutes in the basement to ensure the storm is truly over and then you venture back upstairs only to find your bedroom roof buckled and pieces of tree sticking into your home. The damage is substantial but your overwhelming feeling is one of relief that everyone in your family is safe.

This could have been the scenario for a family in Leamington or other residents in southern Essex County in Ontario, where four separate tornadoes appeared around 3 a.m. on that day. How many

residents were aware of the tornado warnings issued by Environment Canada at around 2:45 a.m. is not known. However, at that time of the morning, even if you were awake and had the radio or TV on, it is not guaranteed that you would have known about the warnings. One way that could have helped to ensure your knowledge of significant weather in the area would have been through a Weatheradio receiver.

A Weatheradio uses a set of special frequencies not found on the AM or FM bands that are used by both Environment Canada and the National Weather Service in the United States to inform citizens of impending severe weather. Most Weatheradio units are equipped with a standby/tone alert setting whereby the radio can just sit in your home in standby mode and then suddenly come to life with a piercing tone when severe weather warnings have been issued for the immediate area. This capability is of special significance for tornado warnings since the state of the science for forecasting these deadly storms only allows 10 to 20 minutes of advance warning in many cases.

Environment Canada's Weatheradio network consists of 187 transmitters located across the country providing a signal to over 90 per cent of the Canadian population. The network broadcasts a continual cycle of local weather observations and forecasts, in English and French, allowing users to stay on top of



day-to-day weather. Portable weatheradios allow you to keep track of the latest weather info while involved in outdoor activities like camping, fishing, boating and biking. The weather forecasts will be interrupted whenever severe weather warnings impacting the local area have been issued.

The units come in a variety of styles and price ranges, from small portable units (some also having the AM/FM bands) to larger desktop models.

More information on Environment Canada's Weatheradio system can be found at [www.ec.gc.ca/weatheradio](http://www.ec.gc.ca/weatheradio)

In addition to a variety of electronics stores, Weatheradios can also be purchased online from electronics or other retailers. 🐾

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*Mission*  
To reduce the loss of life and property caused by severe weather and earthquakes through the identification and support of sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters.

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