The State of Floodplain Mapping in Ontario

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Don Pearson, General Manager
Presentation Outline

• Overview of Conservation Ontario
• Conservation Authority Mandate
• Conservation Authority Role in Flood and Erosion Hazard Management
• State of Floodplain Mapping in Ontario
• Future Focus for Flood Hazard Reduction
• Questions/Discussion
CONSERVATION ONTARIO

- Non-profit corporation
- Represents the network of Ontario’s 36 Conservation Authorities
- Governed by member Conservation Authorities
- Funded by members, contracts
Key Areas:

- Builds strategic partnerships
- Develops Common policy and positions
- Develops strategic communications & common products
- Pursues financial opportunities
Conservation Authorities Act passed in 1946 with the following objects:

“…to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals. R.S.O. 1990, c. C.27, s. 20.

Conservation Authority has the power to:

- to study the watershed,
- to determine a program to conserve, restore, develop and manage natural resources of the watershed
- To control waters to prevent floods or pollution…(s. 21)
Approximately 90% of Ontario’s population lives in a watershed managed by a Conservation Authority.
CA Governance

- Currently there are 36 Conservation Authorities in Ontario (5 Northern Ont)
- All “members” are appointed by municipal governments
- Majority of members are elected councilors; some citizen appointees
- Variable structure of boards/committees
CA Finance

• 2005 collective expenditures of $210 M; approximately 3000 employees
• Municipalities 2nd largest funding source

![Pie chart showing funding sources:]
- Self Generated: 45%
- Municipal General: 30%
- Provincial Section 39: 3%
- Provincial Other: 11%
- Municipal Other: 9%
- Federal: 2%
Key CONSERVATION AUTHORITY Attributes

- **Watershed-based** agencies
- Initiated by the **municipalities** located in the watershed who could request the minister to form an authority and represented by municipally appointed members
- **Cost sharing** between local and provincial government, other partners by agreement
- **Scientific and practical expertise** within Conservation Authorities for 60+ years
Business Functions of Conservation Authorities

1. Protection from Hazards (Flooding & Erosion)
2. Managing and Enhancing Stream Flow
3. Protecting and Enhancing Water Quality (wetlands, forest lands, stream corridors, contaminants, ambient water quality monitoring and source protection)
4. Preserving and Managing Natural Areas
5. Providing Recreational and Educational Opportunities in Conservation Areas
CA Role in Hazard Protection

- Watershed Based Resource Management Agency with broad mandate and powers
- Delegated responsibility to represent the Provincial Interest for Natural Hazards under the Planning Act and Provincial Policy Statements
- Planning advice to municipalities re: SWM
- Operational responsibilities for Flood Forecasting and Warning, infrastructure
- Regulatory Responsibilities under Section 28
Evolution of Hazard Protection

- driving force for CA formation was land (mis)use
  - Flooding, deforestation, soil erosion, water quality and quantity issues
- early programs based on government-developed “Conservation Reports”
  - Specific recommendations responding to key issues
  - Flood Control was major; structural measures preferred – Dams, Dykes, Channels
- Hurricane Hazel in 1954 provided necessary impetus for Section 28 Regulations, floodplain acquisition
- program moved beyond structural to emphasize land use planning and best management practices
Average North Atlantic storm tracks in October. (Adapted from American Practical Navigator. An Epitome of Navigation, N. Bowditch)
Evolution of Hazard Protection

- CA’s given power to regulate development in hazardous areas
- Flood plain mapping programs initiated in 1960’s, accelerated late 1970’s (FDRP)
- Municipal and landowner response not always positive – led to comprehensive review in 1980’s
- Resulting program review added support for prevention/mitigation approach
- Public expectations moving toward ecosystem protection
Evolution of Hazard Protection

- Change began to accelerate in 1990’s
- Common Sense Revolution
  - Massive cuts to transfer agencies
  - Municipal/provincial program realignment (downloading)
- Responsibility for land use planning devolved to Municipalities
  - Provincial Policy Statement
The *Conservation Authorities Act* was amended by the Province’s Red Tape Reduction Commission in 1997 to:

- Provide consistency among all CA Regulations
- Provide consistency with the Planning Act and Provincial Policies respecting Natural Hazards and Natural Heritage
- Provide a streamlined approvals process by delegating approval of individual Regulations to the Minister of Natural Resources
Evolution of Hazard Protection

- New (Generic) Regulation Passed in 2006
- Complement the Provincial Policy Statement
- Regulation of key areas to protect wetlands and recognize dynamic shoreline hazards
- Maintains traditional focus on riverine floodplains
- Increased capacity for watershed wide – urban flooding protection?
Evolution of Hazard Protection

**Previous Regulation**
- Former regulation governed:
  - Construction within any area subject to flooding under a regulatory storm event
  - Placement of fill within fill lines or scheduled fill areas
  - Alterations to watercourses

**Updated Regulation**
- Generic Regulation permits the regulation of:
  - Development within a regulated area
  - Interference & alterations to watercourses
  - Interference & alterations to wetlands
  - Interference & alterations to shorelines
Regulation Limit

Greatest extent of:

- Stream Valley System Hazard Limit
- Great Lakes Shoreline Hazard Limit
- 15 metre allowance on all Stream Valley System and Shoreline Hazard Limits
- All wetlands
- All Areas of Interference adjacent to wetlands (30 or 120 metres) or an allowance determined through an Environmental Impact Study
Evolution of Hazard Protection

- The *Emergency Management Act* passed in 2003
- Mandates Municipalities to develop Emergency Plans to deal with range of hazards
- Designates responsibility for provincial Ministries to lead planning and response for specific emergencies
- Ministry of Natural Resources designated lead for riverine and lakeshore flooding
- *No lead has been designated for “urban flooding”*, although stormwater management is a municipal responsibility
State of Floodplain Mapping

- Ministry of Natural Resources and Conservation Ontario collaboration - “Water Hazard Digitizing Project”
- intent was to develop a digital database to:
  - Assist emergency managers to perform HIRA analysis
  - Provide emergency managers, including Conservation Authorities, Municipalities and the MNR access to floodplain and hazard information on a timely basis through Land Information Ontario
  - Assist municipal and emergency planners by identifying high risk areas where new / updated floodplain and hazard mapping is required
State of Floodplain Mapping

Existing conditions:
- Flood plain mapping carried out using significant resources of both the province and Conservation Authorities to develop engineered flood line maps.
- In 1978 the Canada / Ontario Flood Damage Reduction program (FDRP) was initiated
- In the mid 1990’s the FDRP program was wound down.
- Maps exist in a variety of formats and scales
- Some Conservation Authorities have floodplain maps digitized while others have maps in paper or Mylar map sheet forms.

Project Objectives:
- Create a map index layer
- Populate metadata records
- Scan and digitize or import digital map data
- Develop data maintenance documentation protocols
State of Floodplain Mapping

First Phase

• Define the status of flood plain mapping in the province, including date, type and method of flood line definition, and extent of hydraulic information

• Define the extent of information that exists related to the existing risk of flooding in terms of the type, risk level, and potential numbers of people that are at risk of flooding in Ontario
State of Floodplain Mapping

Preliminary Results

- Total area under CA jurisdiction: 108,589.6 km²
- More than 10 million residents in areas under CA jurisdiction
- 900 plus floodplain mapping projects have been undertaken, 85% with significant CA involvement
- More than 15,000 km of streams and rivers are floodplain mapped in Ontario, mapping covering 10,000 km²
- Great Lakes shoreline floodline mapping typically available
- 6% of total land area is within riverine floodplain
- Watershed population living in floodplains – minimum of 140,000 people, as many as 300,000
Results Continued

- Older floodplain projects cover most extensive areas and were typically completed under the FDRP program; new projects tend to be small and site or development specific.
- Typical base mapping has 1m contours, but is 1980’s 1:2000 OBM, or 1970’s vintage 1:2400 FDRP base mapping.
- A variety of hydrologic and hydraulic methods were used across CAs to calculate floodplains.
- 50% of projects require updating due to significant development since 1970’s when mapping originally completed; or due to better hydrologic and hydraulic methods and technology.
- Over 75% have the external limits mapped in digital format.
- Estimated cost to update mapping from $50 to $75 million.
Vision of Water Hazard Digitization Project can be realized only if resources and momentum are maintained.

Costs and Benefits must be quantified in terms of potential for future loss reduction.

Future loss reduction implies mitigation of risk for existing flood plain properties such as Special Policy Areas – 3D digital models.

EMA may be critical driver for completion, if products can inform pillars of Emergency Management – preparedness, prevention, mitigation, response and recovery.
State of Floodplain Mapping

- Case study of Hurricane Hazel today over Humber watershed (280 mm in 48 hours, 30,000 km$^2$, 81 deaths)
- $240$ million in property damage over 4 CA’s
- More than 100,000 sewer back up claims
- Estimated $400$ million basement water damage
Future Focus for Flood Hazard Reduction

- Past focus on riverine and lakeshore hazard prevention has been effective in reducing property damage
- Current land use planning and regulatory framework is effective in keeping new development safe from such risks; but are standards/criteria still relevant?
- Significant historical development still at risk; need better information, tools to mitigate
- Urban flooding is the emerging issue
Urban flooding

Peterborough 2002 – 2004
Toronto 2005 - $145 million in damages
– Emergency Management and Civil Protection Act

- MNR is lead for lake and riverine flooding, but does not include urban flooding
- Urban flooding is not a Provincially recognized emergency – therefore no lead ministry
- Responsibility by default flows to municipality
Future Focus – Urban Flooding?

Context for Planning

- Climate change – increasing threat
- Increased frequency of extreme weather
- Increasing urban population and exposure eg. standard of living
Future Focus – Urban Flooding?

Common problems for most municipalities

• Sewer back-up caused by:
  - aging infrastructure
  - combined sewers
  - individual buildings with inadequate sanitary, foundation and/or lot drainage
  - illegal connections
  - lack of wet and dry storm water retention ponds
  - lack of programs to disconnect gutters
  - reverse grade driveways

• Lack of funds for infrastructure investment
• Lack of applied research, gaps in building codes and standards e.g. mandatory sewer back-up valves for new buildings & homes
• Health risks from moulds caused by sewer back-up & floods
Future Focus for Flood Hazard Reduction

Form working group?

– Conservation Ontario, AMO, MNR, MOE, EMO, MMAH, MTO, ICLR, Industry?

• Report on issues and directions required
  – Examine existing risk levels
  – Future risks – climate change – expanding urban population
  – Viability of current design standards
  – Jurisdictional review
  – Examine appropriateness of existing policy tools e.g. Provincial Policy Statement,
  – Recommendations/changes required
Questions?

Don Pearson, General Manager
Conservation Ontario
120 Bayview Parkway
Newmarket, ON L3Y 4W3
905-895-0716 ext. 231
dpearson@conservation-ontario.on.ca