



Invasive Species & Climate Change

Tracey Cooke
Executive Director

April 24, 2018

Up North on Climate Change Conference, Thunder Bay

Invasive Species Centre

- The Invasive Species Centre was founded by the Governments of Canada and Ontario to act as a hub for collaboration and knowledge sharing between stakeholders.
- Incorporated as a not-for-profit in 2011, the Invasive Species Centre has grown into a respected collaborator, knowledge broker, partner and leader in invasive species research and action in Ontario and beyond.

Mission: The Invasive Species Centre connects stakeholders, knowledge and technology to prevent and reduce the spread of invasive species that harm Canada's environment, economy and society.

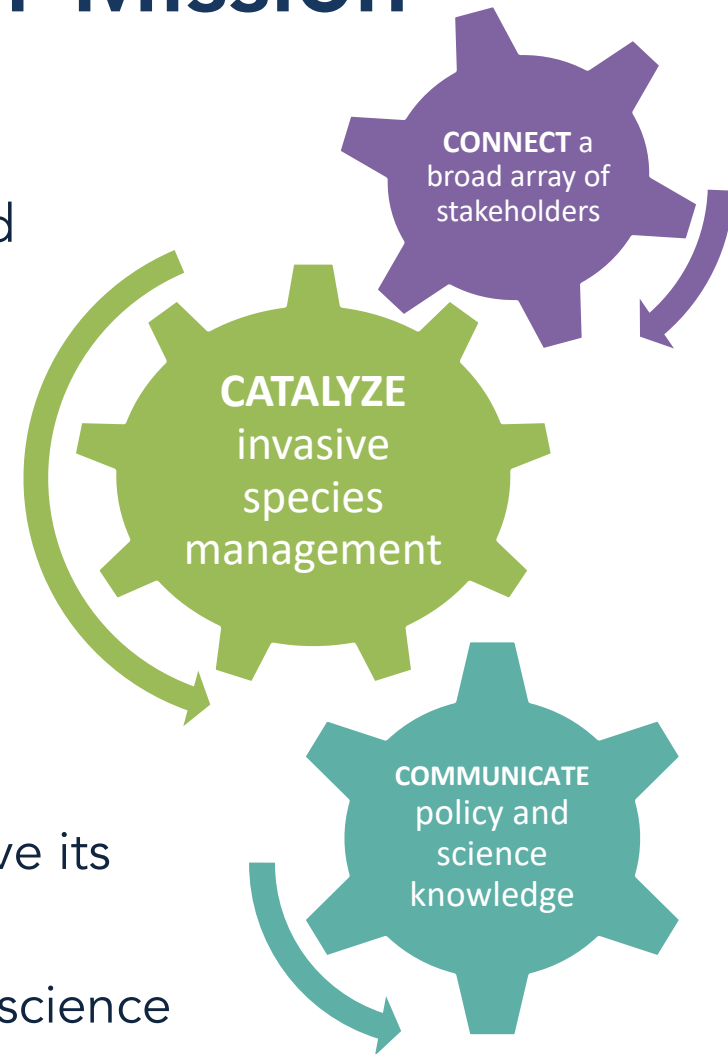


How we achieve our Mission

Thanks to funding provided by:

- Ontario Ministry of Natural Resources and Forestry
- Fisheries and Oceans Canada
- Ontario Trillium Foundation
- Northern Heritage Fund Corporation
- Canadian Food Inspection Agency
- Natural Resources Canada
- Canadian Forest Service

The Invasive Species Centre is able to achieve its mission by connecting with a broad array of stakeholders to catalyze invasive species management, and communicate policy and science knowledge.



Spreading the Message – Key Communications

2017/18

Social Media

- 67% increase in followers
- 54% increase in engagement
- Total reach of over 2,423,082

Websites

- 59,147 website visits
- 114,623 page views
- 49,052 users

Membership

- 334 members receive media scans
- 1086 subscribed to the Newsletter

Projects in 2017/2018

- Developing an online database of completed invasive species risk assessments
- Conducting ecological and socio-economic risk assessment research
- Developing a factsheet of economic impacts in Ontario
- Supporting the development and implementation of Ontario's Invasive Species Act
- Maintain and updating the Forest Invasives Canada website
- Investigating the integration of forest health components into the fire compact model
- Hosting Oak Wilt emergency response workshops
- Conducting a Risk Analysis for Mountain Pine Beetle
- Expanding the Early Detection and Rapid Response (EDRR) Citizen Science Network throughout the Algoma-Manitoulin region
- Conducting outreach and awareness of Asian carp
- Running the Insect Diagnostics program to support the MNRF Forest Health program and EDDMapS invasive species reports



Climate Change & Invasive Species

- Human-induced expansion of the “greenhouse effect” via CO₂ emissions
 - Burning fossil fuels
 - Land use changes
- For 400,000 years up until the early 20th century, CO₂ emissions never exceeded 300 ppm
 - In 2013, we reached over **400 ppm**
 - Currently at **409.6 ppm**



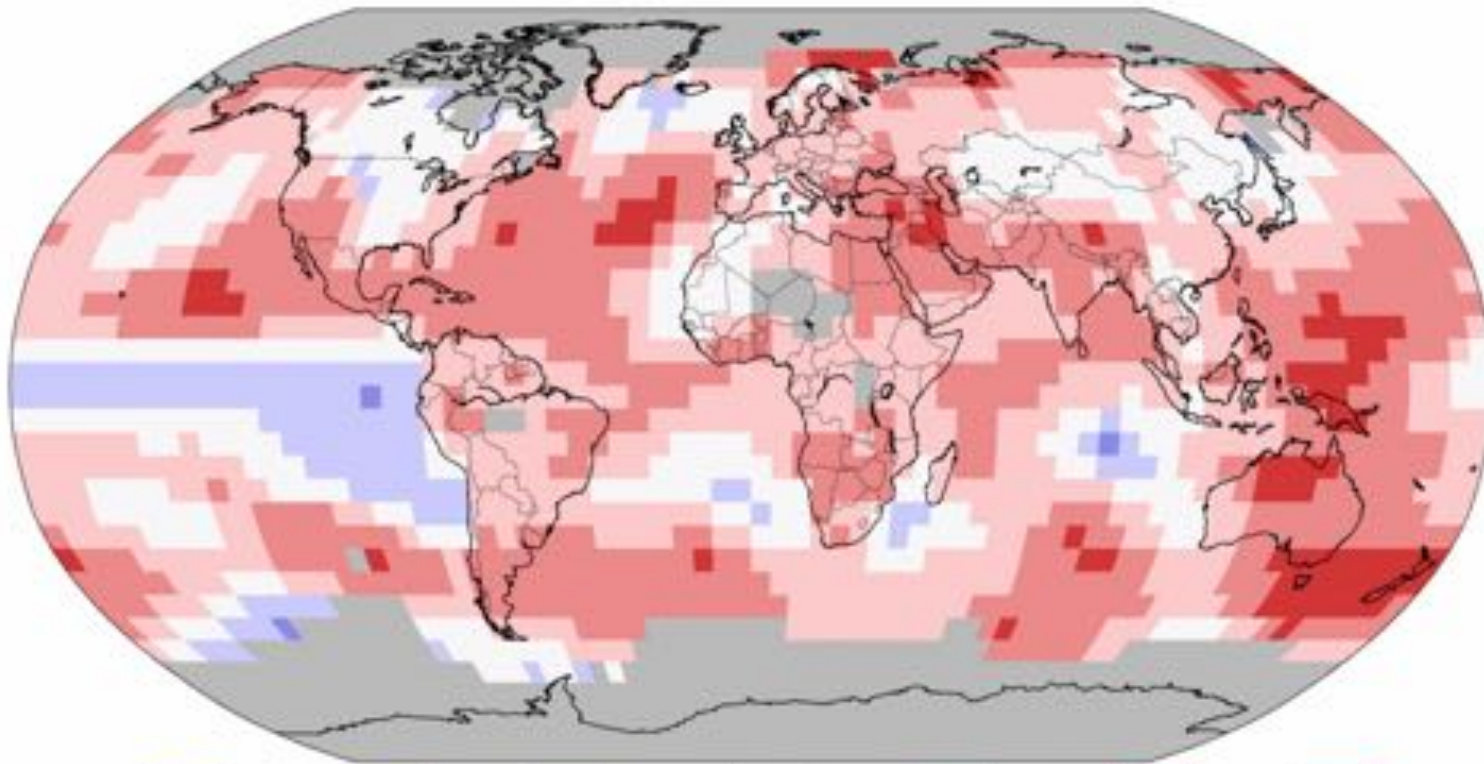
Source: National Oceanic and Atmospheric Administration. Some description adapted from the Scripps CO₂ Program website, "Keeling Curve Lessons."



Land & Ocean Temperature Percentiles Dec 2017–Feb 2018

NOAA's National Centers for Environmental Information

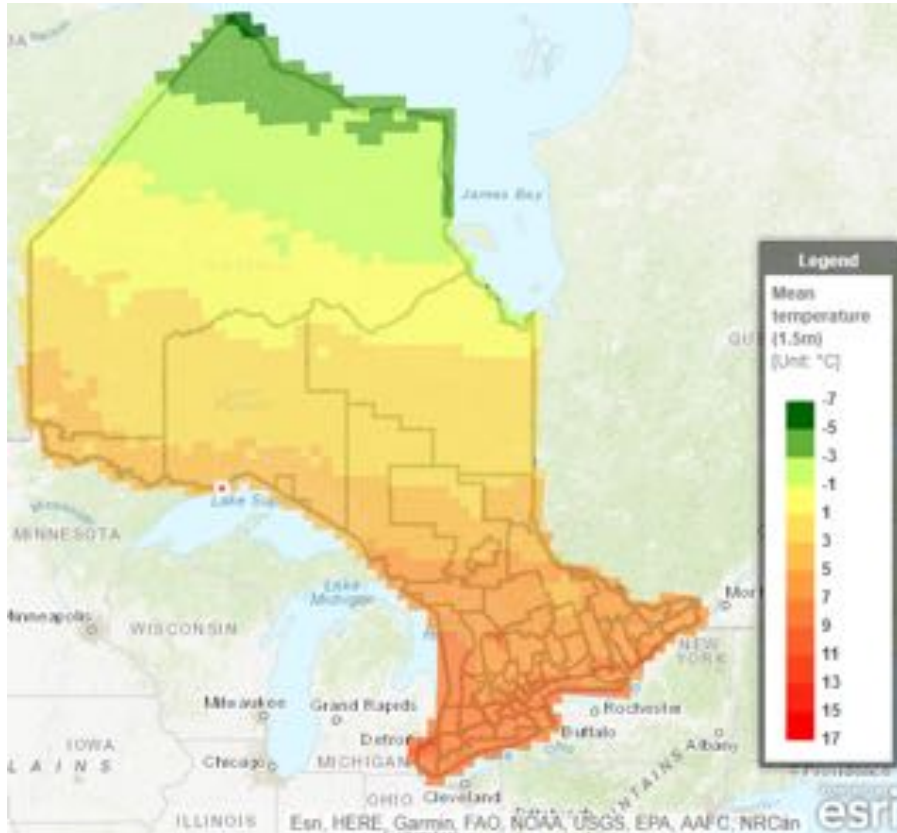
Data Source: GHCN-M version 3.3.0 & ERSST version 4.0.0



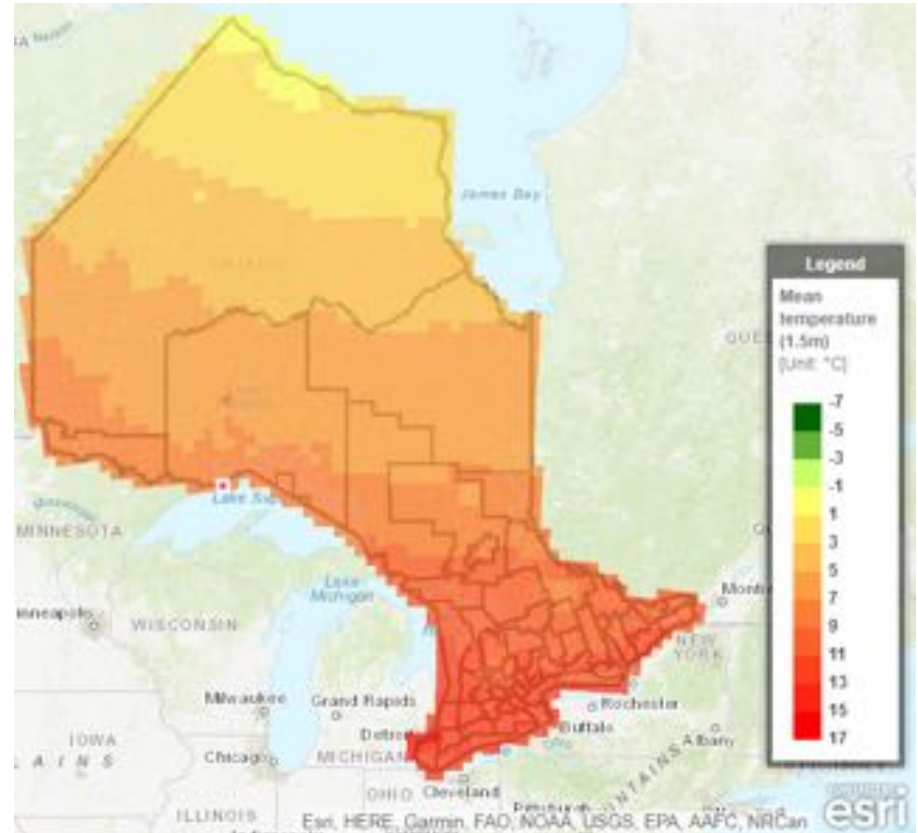
Wed Mar 14 07:36:34 EDT 2018

In most cases across the globe, temperatures are warmer than average

What About Northern Ontario?



Annual mean temperatures
from 1960-1990



Annual mean temperatures
from 2035-2065

Source: All climate projections presented are derived from a 5-member PRECIS ensemble generated by Wang, et. al (2012, 2014) at the University of Regina. The PRECIS ensemble was driven by the QUMP ensemble developed by UK Met Office Hadley Centre.

Climate Change and Northern Ontario

What could climate change mean for Thunder Bay?

Northern Communities feel climate change impact

CBC News - Posted: Oct 09, 2017 7:00 AM ET |

Northern communities face threat of climate change



By Ron Grech, The Daily Press (Timmins)
Wednesday, January 24, 2018 9:32:31 EST PM

:35 Author:

Geoff Shields- Special to Wawatay News

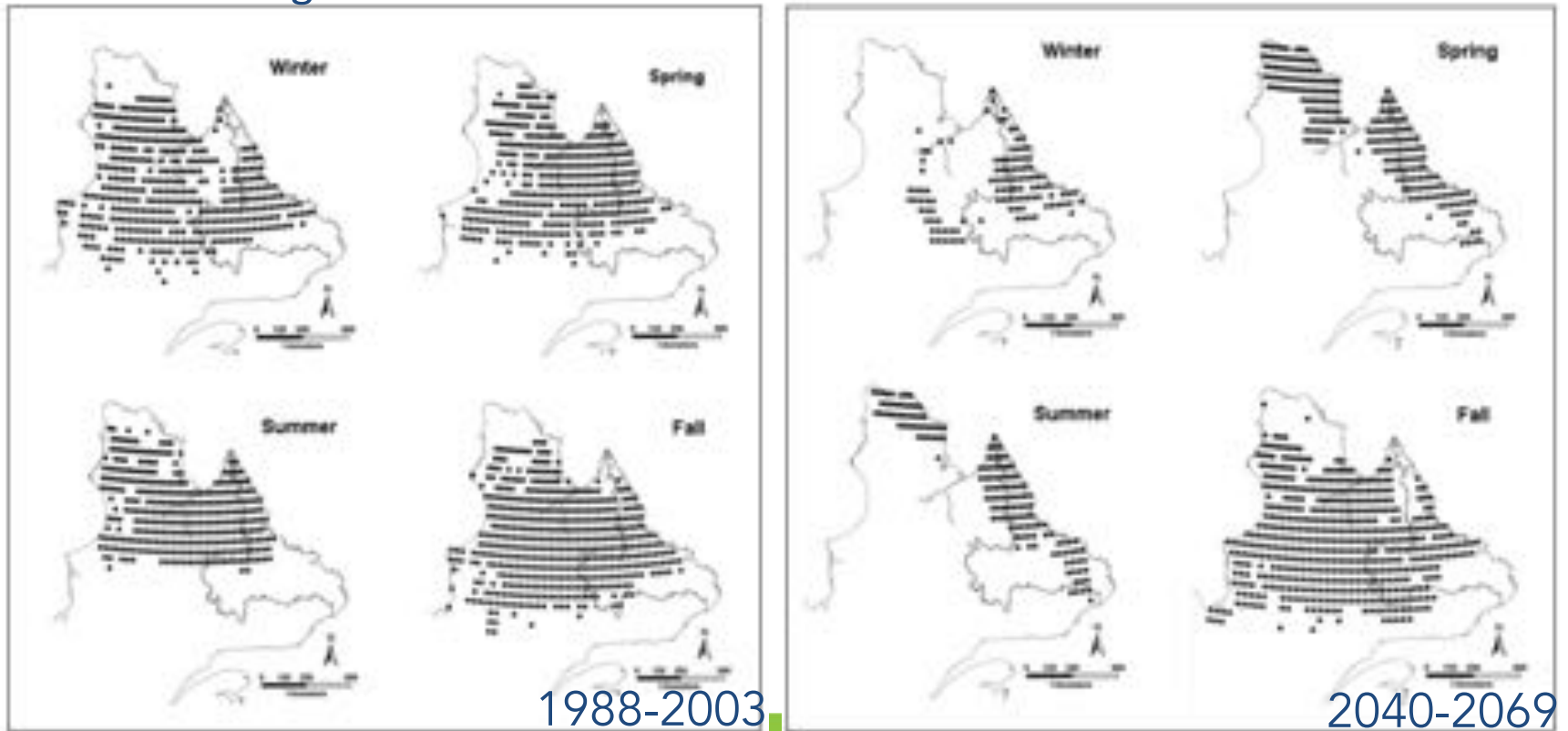
- Shortening winter road access
 - Once as long as 60-days, now as low as 20-days
 - 31 remote northern communities did not have access to ice roads at normal time of mid-January
- Hunting and fishing
 - Changes in fish population
 - Decrease in lake trout population because of reduced hypolimnion and increased competition

Source: chiefs-of-ontario.org; Climate Ontario, Note Number 4 (2007), MNRF



Climate Change and Biodiversity

- Migration in Motion
 - A migration model developed for >2900 species using climate change projections and understanding species-specific climate needs
 - **Pattern show mammals, birds and amphibians to migrate north**
- Caribou Migration



Climate Change and Invasive Species

Hellmann et al. (2008) predict 4 consequences for climate change on invasive species:

1. New pathways of spread and introduction
2. New species establishment
3. Change in impact of existing non-native and/or invasive species
4. Change in effectiveness of control strategies

Source: Hellmann JJ, Byers JE, Bierwagen BG, Dukes JS. 2008. Five potential consequences of climate change for invasive species. *Conserv. Biol.* 22:534–43



Climate Change and Invasive Species

1. New pathways of spread and introduction
 - A change in climate may change human movement and transportation



Tourism



International Shipping

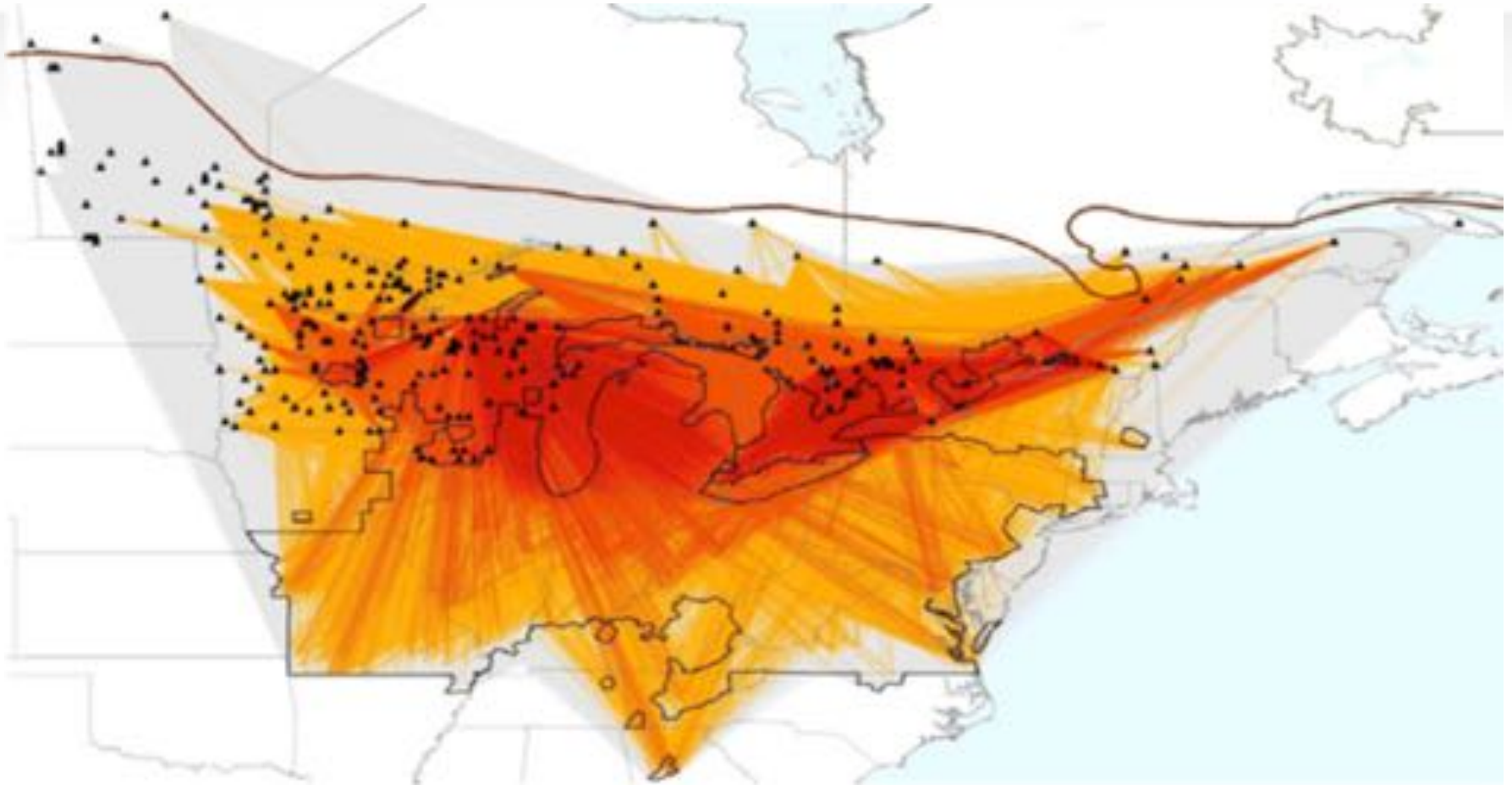


Natural Disasters

Source: Hellmann et al., 2008



Consumers - Recreational Pathways



Origin-destination vectors, of potential emerald ash borer (EAB) spread by traveling campers (Yemshanov et al. 2015)



Consumers – recreational travel

- Recreational travel poses a serious threat to invasive species spread
- 90% short distance travel (<100km per trip)
- 10% long distance travel (<500km per trip) (Koch et. al, 2010)
- Surveys in the United States have shown that ~30-40% of campers bring their own firewood and ~20% of un-treated firewood has live borers (Koch et al. 2012).



Climate Change and Invasive Species

2. New species establishment

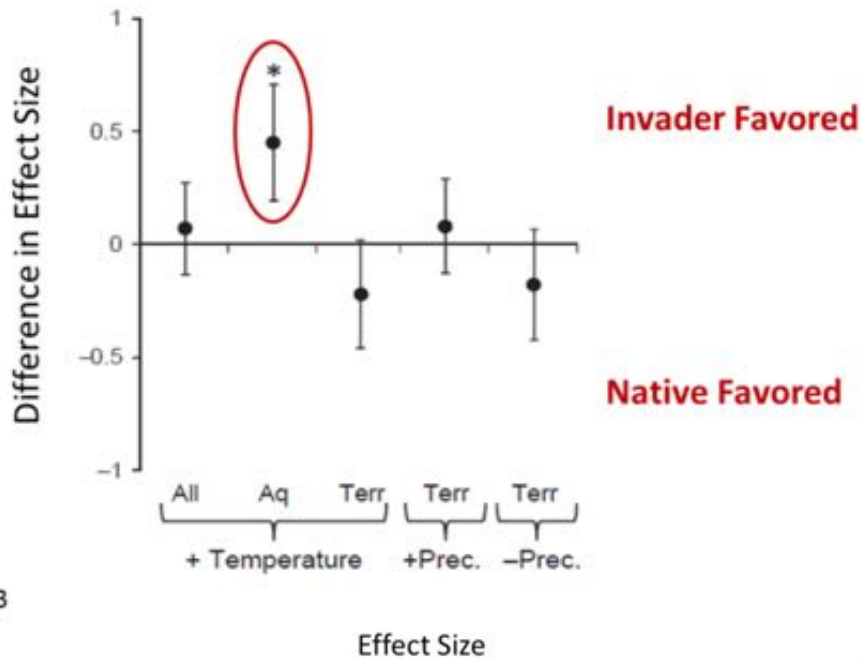
- A pest that could not survive under previous climate conditions (i.e., killed by winter cold) may be eventually able to establish under changed future conditions



White-cloud mountain minnow (*Tanichthys albonubes*), member of the carp family

New Species Establishment

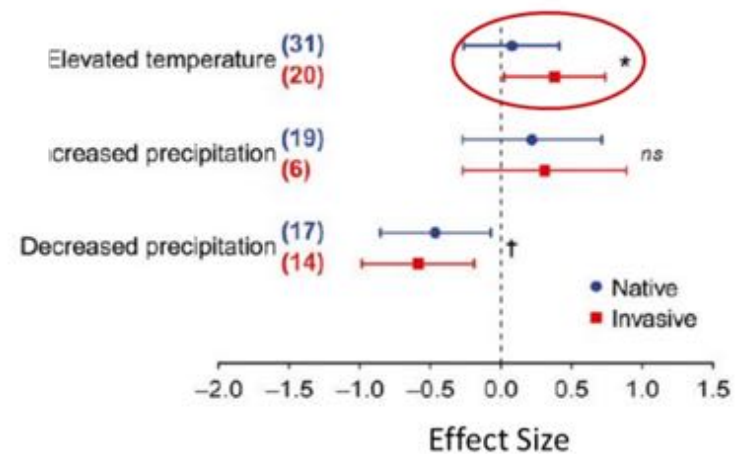
Rising temps favor aquatic
invasive animals



Sorte et al. 2013

Liu et al. 2017

Rising temps favor terrestrial
invasive plants



Liu et al. 2017

Climate Change and Invasive Species

3. Change in impact of existing non-native and/or invasive species
 - Novel climate conditions may influence the establishment and spread of a non-native species
 - An existing pest may exist in low populations on the landscape, limited by current climate conditions
 - Changed conditions may allow this pest to proliferate as a more serious threat, becoming “invasive”



Climate Change and Invasive Species

Warming favours a greater quantity and variety of forest pests

- Most pests are ectotherms which rely on environmental sources for body heat
- Warmer temperatures increase populations of defoliating insects and bark beetles



Climate Change and Invasive Species

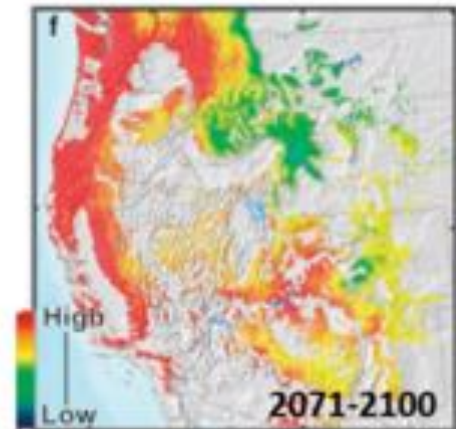
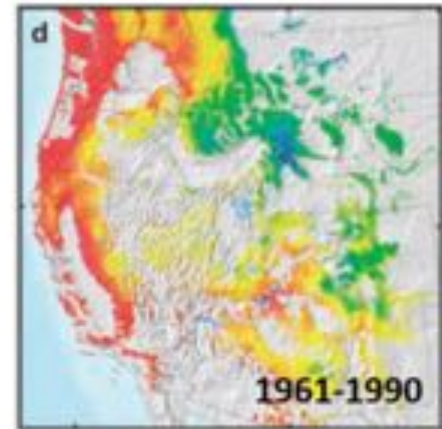
Forest pests have longer/more life cycles with warming



Mountain Pine Beetle kill – July 2009, Wyoming



Bentz et al. 2010



Probability of over-wintering

Climate Change and Invasive Species

- The spread of mountain pine beetle (MPB) in Canada:
 - MPB is native to Western North America
 - Up to 98% MPB are normally killed when winter temperatures persist at -40°C
 - Recent warm winters and hot, dry summers, coupled with a history of fire suppression programs have resulted in rapid expansion of MPB's population and range
 - MPB now reach further north in British Columbia and further north-east in Alberta than ever before.
- MPB is spreading eastward into the Boreal Forest, far beyond its native range, and could threaten Ontario's pine forests.



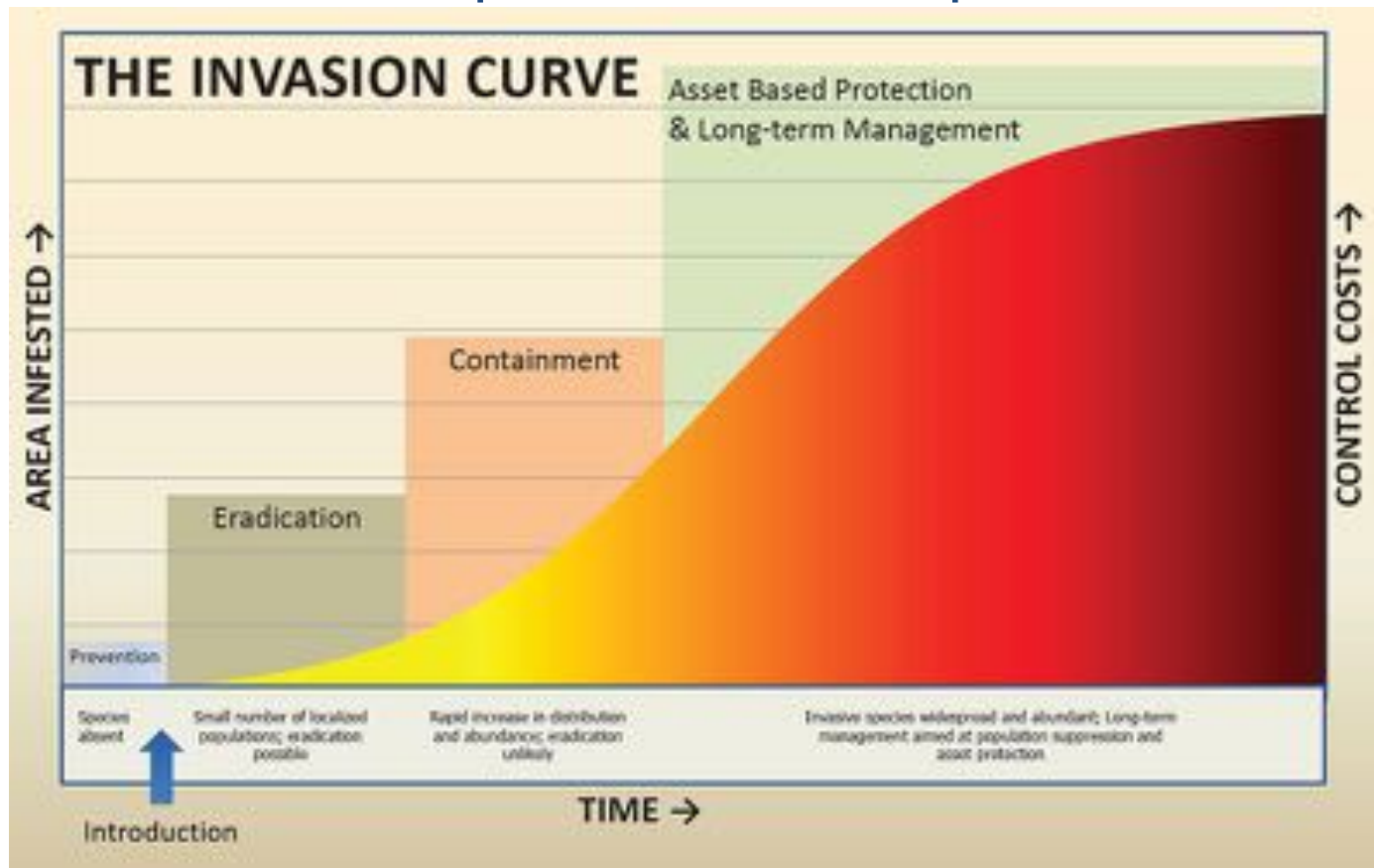
Climate Change and Invasive Species

- 4. Change in effectiveness of control strategies
 - Greater costs to mechanical and chemical controls
 - Battle between control and conservation
 - A recent assessment comparing resiliency of invasive species and native species found **88%** of invasive tree species are likely to be resilient to climate change influence on the environment, compared to **20%** expected resiliency in native tree species
 - Debate on resource allocation priority



So...what can we do?

- Reduce the pathway of spread



Source:
Minnesota
Department of
Agriculture

So...what can we do?

- Reduce the pathway of spread
 - Don't Move Firewood
 - Clean, Dry, Drain
 - Workshops & Training for Invasive Species Identification
 - Clean boots, clothing and all gear after time spent in the woods
 - Buy native wildflower seeds
 - Don't release pets or aquarium species into the wild



So...what can we do?

- Promote ecosystems resilience to invasive species through silvicultural strategies and sustainable land management
- Develop an invasive species management or response plan for your community
- Designate one community member as your 'invasive species ambassador' to stay informed on high risk species
- Raise awareness of invasive species to all community members at meetings, events, and in newsletters
- Report on all changes and sightings



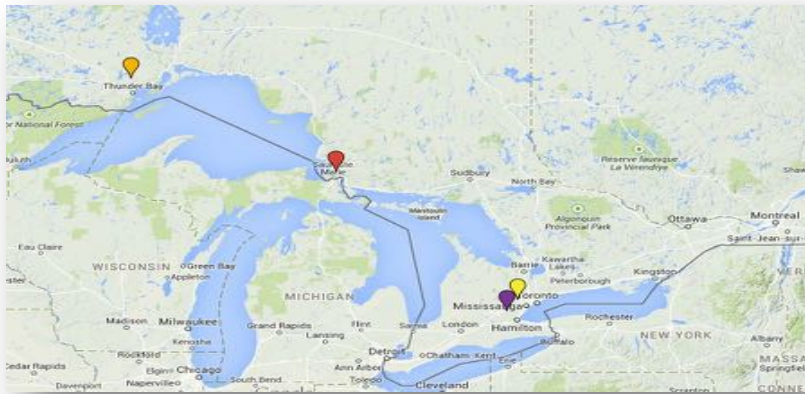
How does the ISC contribute?

- The Invasive Species Act
 - The Firewood Analysis Pathway
 - Risk Assessment Database
 - Socio-Economic Impact of Invasive Species
 - Economic Impact of Invasive Species in Ontario
 - Mountain Pine Beetle (MPB) Risk Analysis & Emergency Response
 - Aquatic Invasive Species Response Assessment
- Forest Invasive Website Expansion & Integration with EDDMaps
 - Early Detection and Rapid Response (EDRR) Network



EDRR Network Ontario: In a Nutshell

To create, train and equip an **EDRR network** to provide eyes on the ground to detect, track, respond to, and control invasive plants and insects in communities across Ontario.



Peel ● Halton ● Sault Ste Marie ● Thunder Bay
Sudbury & Algoma Region

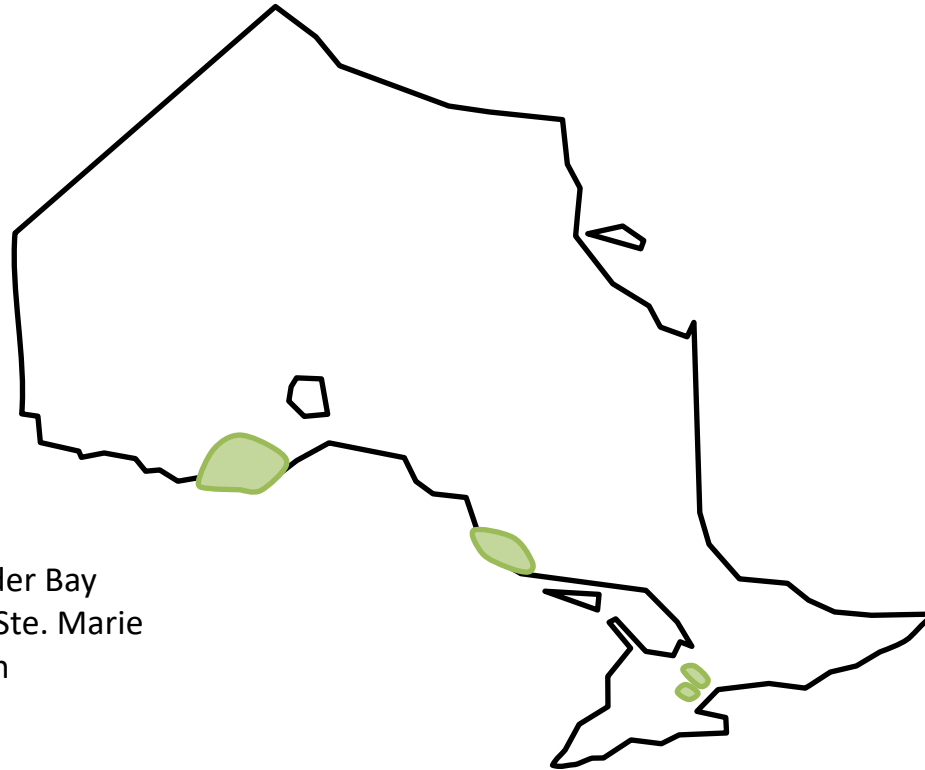
- Increase awareness & knowledge of invasive species
- Support hands-on work to more rapidly detect and reduce invasive species
- Engage youth & students to foster environmental responsibility
- Facilitate community partnerships to support restoration & maintenance of local habitats and recreational spaces



An agency of the Government of Ontario
Un organisme du gouvernement de l'Ontario

Community-level early *detection* & *action* as appropriate

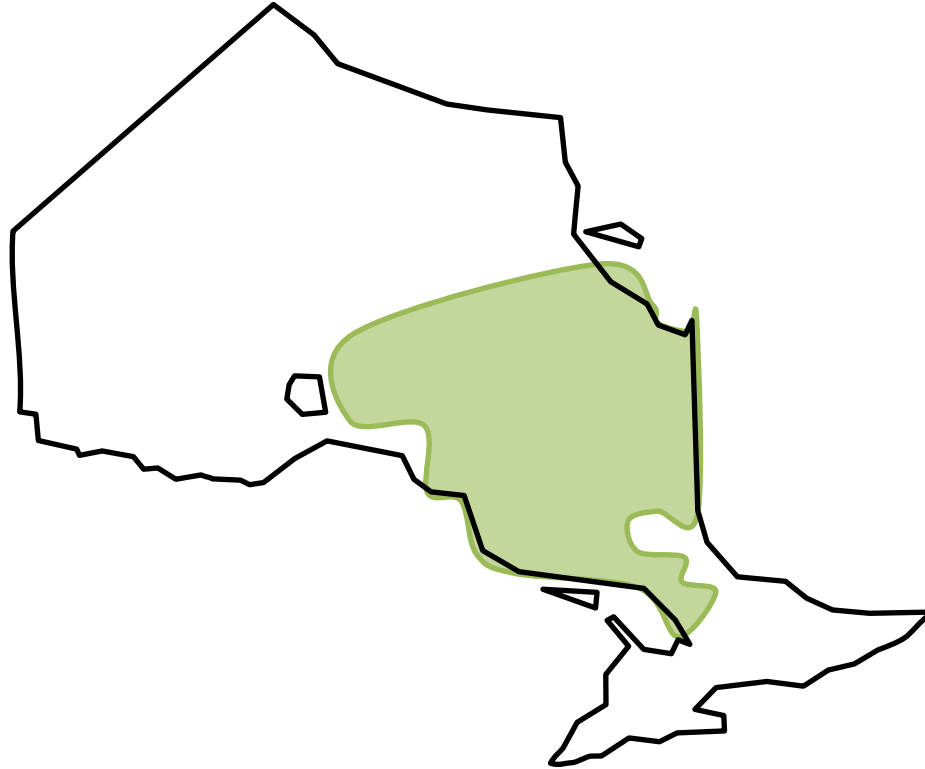
EDRR Ontario Phase I: 2014-2017



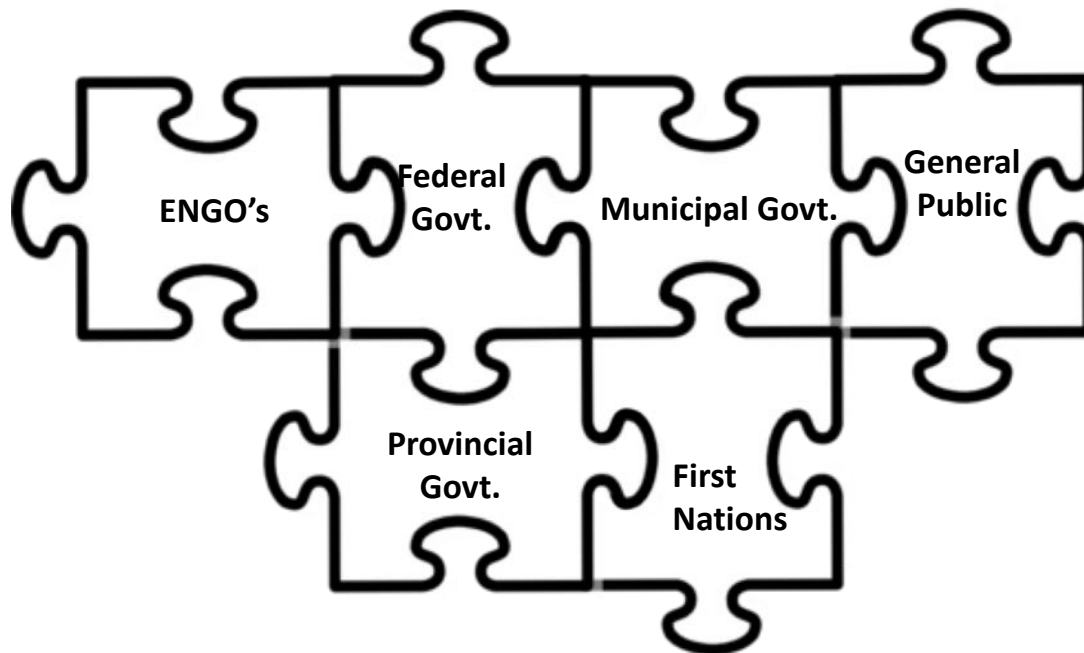
- Thunder Bay
- Sault Ste. Marie
- Halton
- Peel



EDRR Ontario Phase II: 2017-2019



Collaborative Invasive Species Control



Professional Training Workshops



CFIA Inspection Staff Training Spring 2016

EDRR Network staff supported CFIA summer inspection staff training for GTA region held in Guelph.

- Focused on species not present in Canada/Ontario
- Informed future “watch list” development



MNRF District Staff Training Winter 2016

Canada/Ontario Agreement funded workshops held in Northern & Central Ontario on EDNR Network priority species.

- Covered species encroaching these districts
- Introduced staff to species not present in Ontario
- Worked through collaborative multi-stakeholder invasion scenarios



Professional Training Sessions Fall 2015

Workshops hosted in Halton, Peel, SSM & Tbay to present new species to local partners and professionals working in field.

- Conservation Authority staff
- Local, provincial & national ENGOS
- MNRF District staff
- Municipal staff
- Academics & Grad Students



Training Workshops



Summer Staff Training 2017

Training for Ontario Parks staff on local invasive species identification and detection



Envirothon Workshops Summer 2016

Delivered invasive species workshops & judging at both Provincial and North American Envirothon events on EDRR priority species.



Aquatic Invasive Species Workshops Fall 2017

Coming soon!

Ash Seed Collection Workshops Fall 2018



Broader Engagement Initiatives



Invasive Species Awareness Week Winter 2016 & 2017

EDRR resources made the #InvSpWk campaign possible from 2016-2018. Reaching new audiences with priority EDRR species.

- Grew to 32 formal campaign partners
- More than 5M SM interactions, centered around Peel Region, Halton Region & GTA in 2018



Invasive Species Cycling Tours Summer 2015 & 2016

Reaching new audiences, and cementing partnerships with invasive species themed safe-cycling tours.

- Partnership w/ local “green-group” resulted in est. an invasive species tool-share program
- Cross promotion of all local EDRR events & increased volunteer base



Priority Invasive Monitoring Winter 2016 & 2017

Numerous workshops & sampling days hosted across all 4 pilot areas, hosted in collaboration with local partners.

- “Hemlock Hikes”: Mississauga, Oakville & SSM
- DSV mapping with CVC & Power @ Forks P.P.



Open House

Calling all Sudbury Environmental Champions!
Join us for an
INVASIVE SPECIES OPEN HOUSE

About Our Program:
For more than 2 years we have been working in communities across Ontario to increase collaboration on invasive species issues. We work with local partners (from grassroots to government) to support and expand invasive species outreach and action opportunities.
We're excited to bring our program to Sudbury over the next 2+ years and want to meet with local stakeholders to explore opportunities for collaboration.

What to Expect:
Please join us for a drop-in meet & greet to discuss how the EDRR Network program can work with the environmental champions of Sudbury to achieve invasive species success.

Where to Find Us:
When? ~~Monday July 24th~~ **Sunday July 25th** 2017,
7:00pm to 8:30pm
Where? Green Room, ReThink Green
176 Larch Street, Unit 305
More Info? Email colin@oninvasives.ca



EDRR EARLY DETECTION & RAPID RESPONSE NETWORK ONTARIO
www.edrrontario.ca

Sudbury



Workshop

Save The Date!
AQUATIC INVASIVE SPECIES WORKSHOP
Sunday 15 October 2017

Join us for a **free** workshop on aquatic invasive species threatening Sudbury lakes! In this free one-day workshop experts will present on how to:

- **Identify** common aquatic invasive species
- **Monitor** for aquatic invasive species with new tools & techniques
- **Properly permit for & control** aquatic invasives on your property
- **Prevent** new aquatic invasive species from establishing in your lake
- Other interesting aquatic invasive species topics!

Event Details
LOCATION: Living with Lilies Centre
840 Ramsey Lake Rd., Sudbury
COST: Free!
RSVP: colin@oninvasives.ca by October 5 to confirm catering

Looking for More Info?
Agenda & Further Details (as available):
<http://edrrontario.ca/index.php/event/sudbury-aquatic-invasives/>
Subscribe for the EDRR Sudbury Mailing List:
<http://edrrontario.ca/index.php/subscribe/>

EDRR EARLY DETECTION & RAPID RESPONSE NETWORK ONTARIO
www.edrrontario.ca


Sault Ste. Marie Open House

EDRR Network Ontario has been working in communities across Ontario, including Sault Ste. Marie, to increase collaboration on invasive species issues for over two years. We are excited to be continuing our work in the Algoma region.

Come join us for a drop-in meet & greet to share your ideas on how the EDRR Network can continue working with the environmental champions of Sault Ste. Marie.

Monday, November 20
7 - 9 pm
1100 Fifth Line East,
SSMCA Sugar Shack
*Light refreshments will be provided

For more info contact Lauren Bell at lbell@invasivespeciescentre.ca



Sault Ste. Marie



Free Invasive Plant Workshop

In Sault Ste. Marie

The Early Detection Rapid Response (EDRR) Network Ontario is hosting a workshop on invasive plants in Algoma. Come spend the day learning about terrestrial and aquatic invasive plant species, what's here and what's on our watch-list. Agenda TBA.

April 22, 2018
9am - 3pm (Lunch Provided)
Quality Inn, 180 Bay St. Sault Ste. Marie

Please RSVP to Lauren Bell by April 8th to confirm catering
lbell@invasivespeciescentre.ca



Resources

- EDRR Website



www.edrrontario.ca

New Technical Bulletins

- 14 new tech bulletins
- Updated, summarized Best Management Practices for Land Managers



Free Toolkit Sharing Program

- Stewardship oriented tool kits
- Housed at the Invasive Species Centre office in Sault Ste. Marie
- Currently seeking local house for kit
- Tools available for use to help detect and manage invasive species
- I.e.
 - Saws, shovels, gloves, tarps
 - Extractigator
 - HWA sampling kits

Example species include:

- Common Buckthorn
- European Common Reed
- Garlic Mustard
- Giant Hogweed
- Invasive Honeysuckle
- Japanese Knotweed
- Wild Parsnip



Establish your own citizen science network

- Identify key partners (local conservation groups, CAs, master gardeners, MNRF branches and NGOs)
- Host an open house to identify gaps in resources and training
- Select species for monitoring or removal
- Utilize EDDMapS Ontario as a reporting and training tool



Utilize Established Networks and Resources

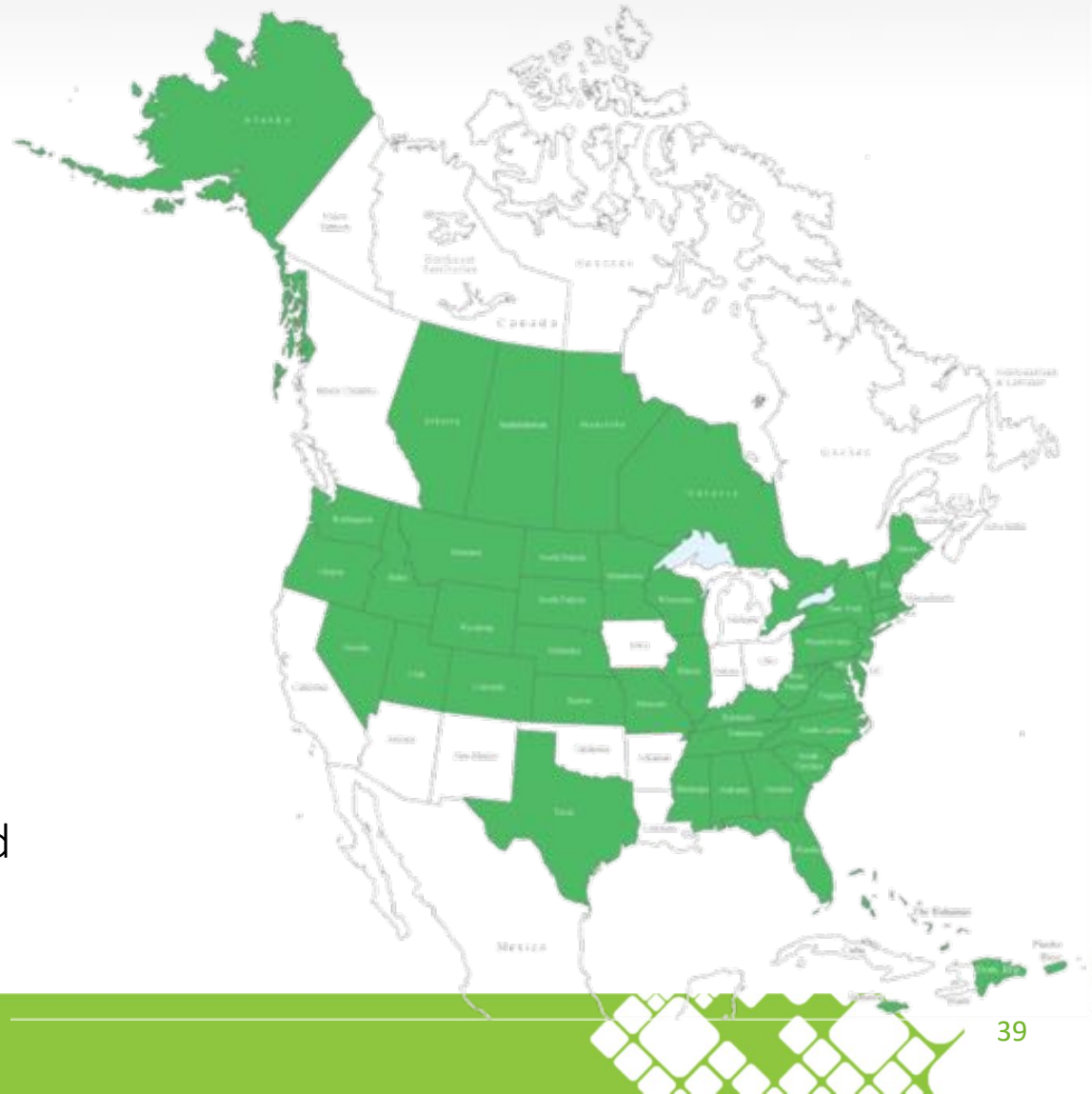
Outside of the EDRR catchment?
You can still benefit from the network through:

- Access to resources and invasive species materials
- In house expertise is available on all taxa
- Links to partners and industry professionals across Ontario



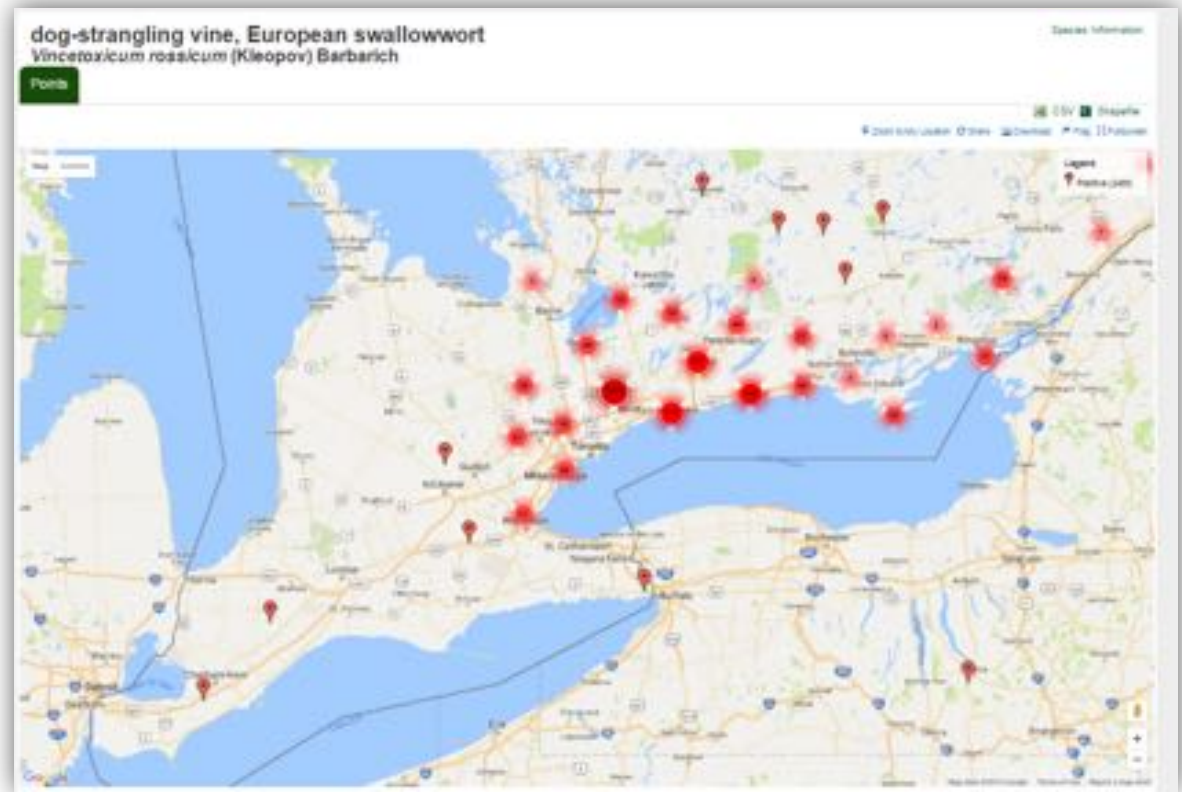
EDDMapS Ontario

- Launched in 2005 by the Centre for Invasive Species and Ecosystem Health at the University of Georgia
- Adapted for Ontario and launched April 2014
- Combines data from other databases, organizations & volunteers
- Data will become the foundation for a better understanding of invasive species distribution around the world



EDDMapS Ontario

- Over 35,000 Reports in the EDDMapS Ontario Database
- Easily Accessible
- Verified
- Available in Real-time



EDDMapS Ontario



Smartphone App

The EDDMapS Ontario app brings the power of EDDMapS to your smartphone. Now you can submit invasive species observations directly with your smartphone from the field. These reports are uploaded to EDDMapS and e-mailed directly to verifiers for review.



Search for **EDDMapS Ontario**

Download under wifi connection



Reporting in EDDMapS



Location Tools:

- Click and drag red marker to sighting location
- Select a Jurisdiction
- Red denotes required fields
- Latitude
- Longitude
- Conversions


Location

Province: **Jurisdiction:**

Latitude (°): **Longitude (°):**

Must be entered in Decimal Degree (DD.XXXX) and DMM.MNDDDDMMSSSS Must be entered in Decimal Degree (DD.XXXX) and DMM.MNDDDDMMSSSS

Location Description/Nearest Address:



Images

For verification purposes, take at least two digital images, a close up of the species and one of the site. All photos uploaded to EDDMapS Ontario may be used by the Invasive Species Awareness Program for Educational and Promotional Purposes.

Image 1:
(jpg) (Provide as much detail as possible. Do not include personal information. All information entered in this field will be displayed publicly. If the photo is not yours)

Caption:

Photo by:

Image 2:
(jpg) (Provide as much detail as possible. Do not include personal information. All information entered in this field will be displayed publicly. If the photo is not yours)

Caption:

Photo by:

Image 3:
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Caption:

Photo by:

Image 4:
(jpg) (Provide as much detail as possible. Do not include personal information. All information entered in this field will be displayed publicly. If the photo is not yours)

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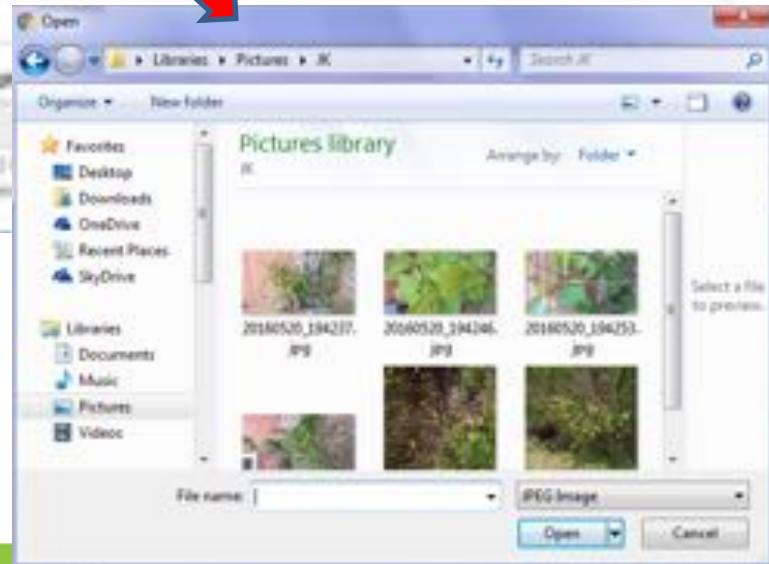
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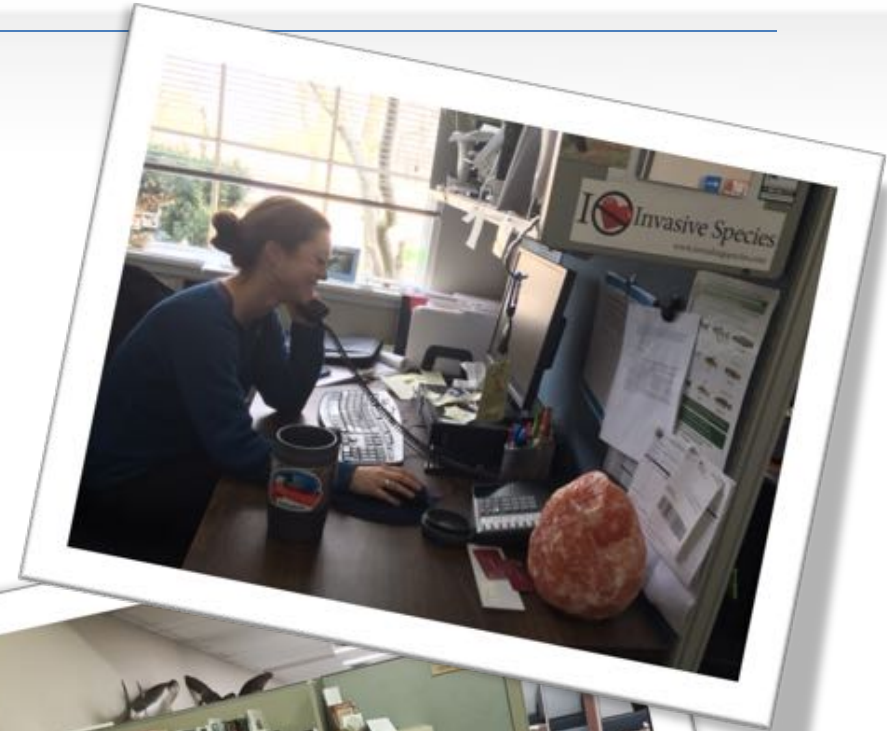
Image 3:

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Support Through ISAP

- Invading Species Hotline
 - Toll free number to the public
 - 1-800-563-7711
 - Provide information and receive reports of invasive species in the province
 - Mon-Fri 9-5



What else can we be doing?

- Collaboration between monitoring programs in the Province
- Joint research
- Be aware and informed on issues
- Exchange/training of people to gain knowledge and skills
- Get communities involved to understand the risk
- Educate: Spread awareness and gain support



Photo: T. Scarr, NRCAN



FOREST INVASIVES CANADA

Online portal for information about the invasive species that threaten Canada's forests and biodiversity.

insects | plants | pathogens





JOIN OUR NETWORK

FREE membership program provides up-to-date information to educate the public on invasive species issues.

Members have access to:

- The Invasive Species Centre's Quarterly Newsletter
- Invitations to events and webinars
- A Bi-weekly Media Scan



@InvSp



Invasive Species Centre



www.invasivespeciescentre.ca



Who Are You Working For?

