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# Emerging Integration of Risk Assessments in an Aquatic Invasive Species Program

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**CEARA**

Centre of Expertise  
for Aquatic Risk  
Assessment

Centre d'expertise  
analyse des risques  
aquatiques

Canada 



## Outline

- Risk Assessment 101
- Risk Assessment in Canada (CEARA)
- Emerging Uses and Integration
- Conclusions



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## Risk Assessment

- Key component of any aquatic invasive species (AIS) program
- Traditionally used to determine risk of potential invaders to prevent their arrival
- Has now emerged to inform, and integrate with, all AIS program elements



## Risk Assessment Definition

A procedure to identify likelihood of threats & vulnerabilities, and analyze them to ascertain the magnitude of exposures.



## Risk Analysis



# Risk Assessment

## PROBABILITY OF INTRODUCTION

LIKELIHOOD OF

ARRIVAL

SURVIVAL

ESTABLISHMENT

SPREAD

## MAGNITUDE OF CONSEQUENCES

ECOLOGICAL  
CONSEQUENCES

uncertainty

OVERALL RISK



## Risk Assessment - Objective

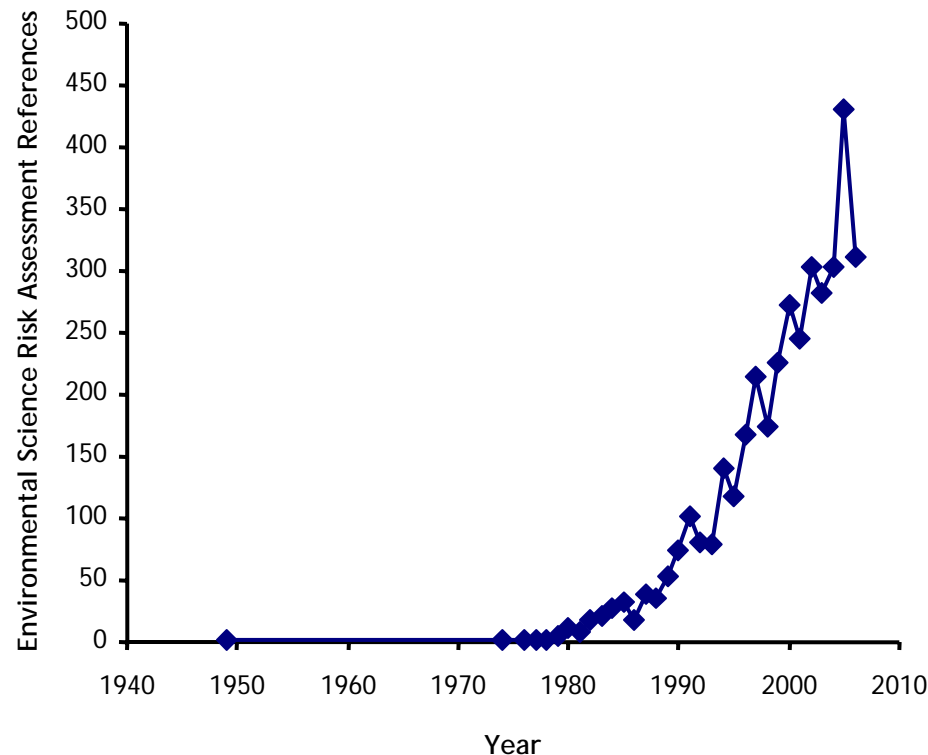
“..to evaluate, order, and structure incomplete knowledge so as to allow decisions to be made with as complete an understanding as possible of the current state of knowledge, its limitations, and its implications.” (Morgan, 1978)

**AIS:** Scientifically defensible information for decision-makers to prevent potential, or deal with ongoing, aquatic invasive species by identifying species, range and impacts.



# RA - Environmental Sciences

Contaminants  
Contamination  
Exposure  
Health  
Genetics  
Carcinogen  
Carcinogenesis  
Radiological  
Transport



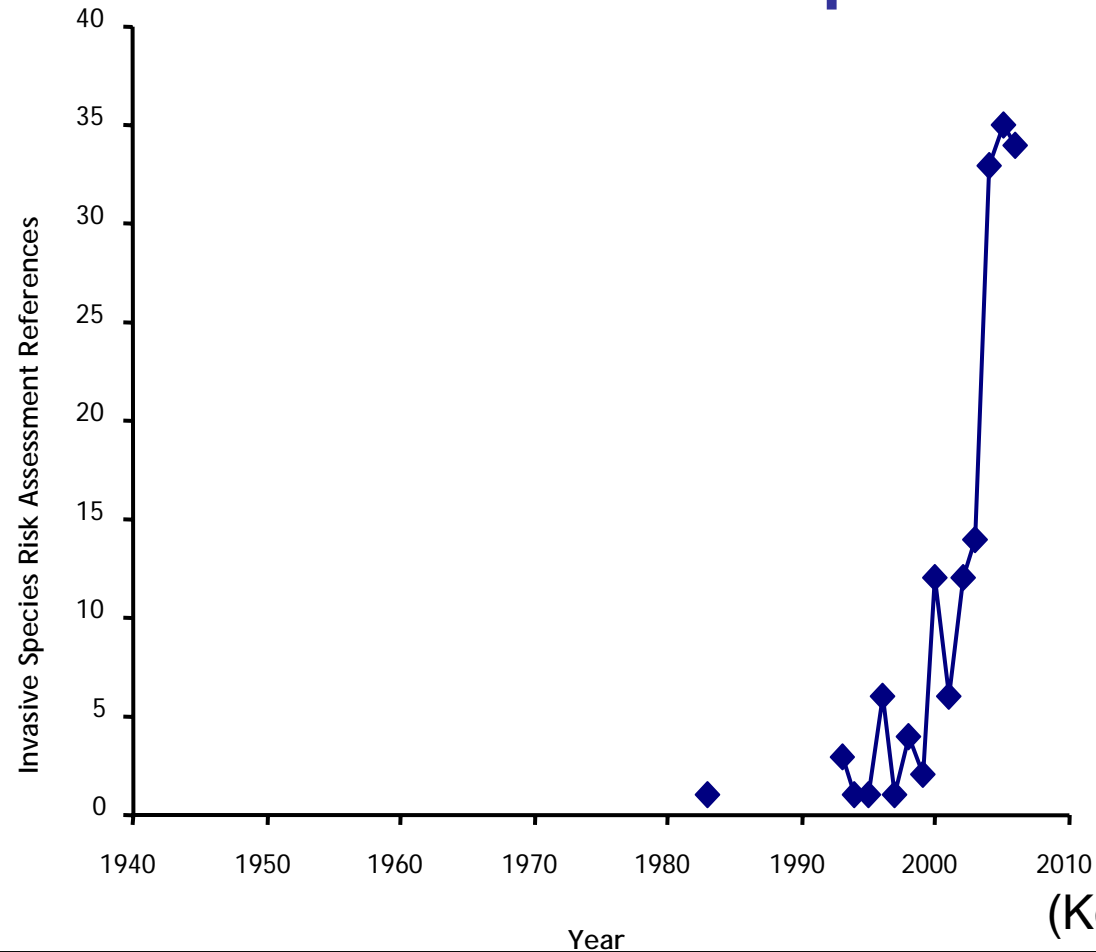
Epidemiology  
Toxic  
Toxicity  
Pollution  
Cancer  
Poison  
Radioactive  
Chemical waste  
Pesticides

(Koops and Cudmore)





# RA – Invasive Species



(Koops and Cudmore)



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## AIS Programs

- AIS is a global problem requiring global cooperation at national levels
- Convention on Biological Diversity
  - Article 8(h): Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.
- *Prevention is a proactive, cost-effective approach to addressing invasive species*



## AIS Program - Canada

- National Invasive Alien Species Strategy
- Canada Action Plan to Address the Threat of Aquatic Invasive Species
- Fisheries and Oceans Canada's AIS Program (2005-present)
  - Research
  - Monitoring
  - Development of a Regulatory Framework
  - Risk Assessment 

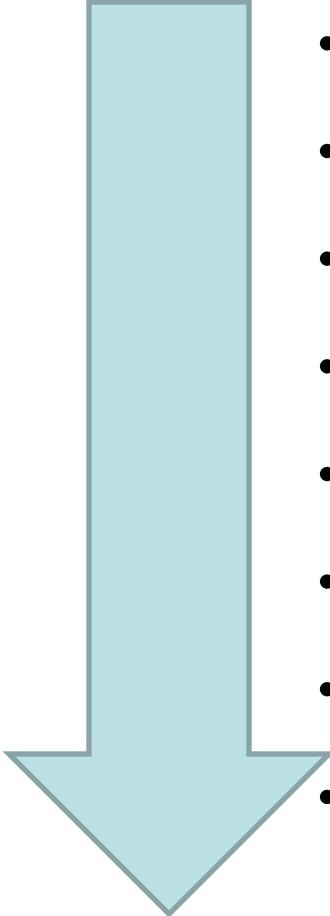


## Centre of Expertise for Aquatic Risk Assessment (CEARA)

- Internationally recognized national program of risk assessment for aquatic invasive species, formally in place since 2006
- Mandate: develop national standards for, and to provide guidance on, scientifically defensible biological risk assessments
- Risk assessments completed for:
  - 26 Species and 3 Pathways
- Close to 120 publications, including National Biological Risk Assessment Guidelines



## RA Process

- 
- Hazard identification
  - Manager needs (risk and beyond)
  - Parameter scoping (science and managers)
  - Science feedback – what is feasible
  - Refinement of scope
  - Draft risk assessment compiled
  - Final draft for peer review \*
  - Completion of risk assessment, public posting



## Peer Review

- Canadian Science Advisory Process (CSAS):
  - **Goal:** Provide timely, scientifically defensible advice to managers without influence from within the department and from non-scientific factors. To ensure the quality, integrity and objectivity of its science, includes outside (department) expertise
  - Challenged-based, face-to-face format – for authors and for peer reviewers
  - Consensus - absence of opposition, based on scientific data and information and not on external considerations, such as the potential impacts of future decisions.
  - Transparent – advice and conclusions to be discussed at meeting only



## Advice Products

- Proceedings – discussions and decisions
- Research Document – scientific paper of the work
- Science Advisory Report – management advice
- Primary Publications – another level of peer review
- Others as Requested – e.g. fact sheets





## Considerations

- Risk assessments do not provide concrete answers
- Advice is required often in the absence of adequate knowledge
- Identification of uncertainty is essential
- Clearly define the scope of the risk assessment



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## Emerging Uses and Integration

1. Science
2. Policy
3. Management



## Emerging Uses and Integration

1. Science
  - a. Research
  - b. Monitoring & Early Detection
2. Policy
3. Management



## 1.a. Science - Research

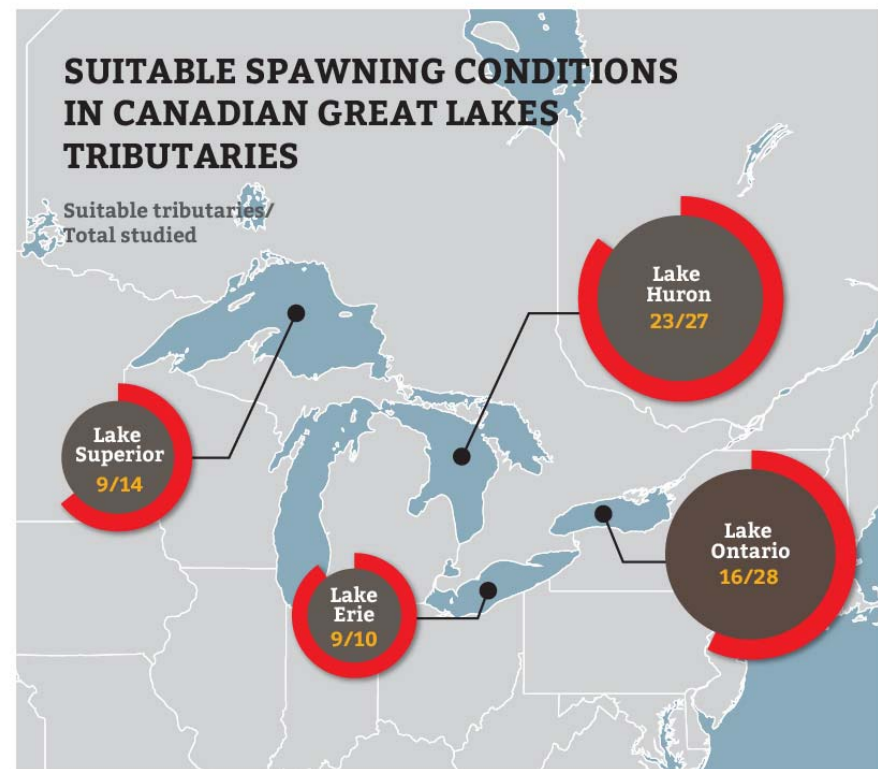
- Provide direction for areas requiring further research to strengthen certainty in ranking risk, or decreasing risk entirely
- Knowledge of biology of the species can provide direction into potential control options for species (tolerances etc.)





## 1.b.Science – Monitoring & Early Detection

- Identify high risk pathways for species or pathway monitoring
- Provide direction for best ED techniques
- Identify vulnerable areas for monitoring and ED





# Emerging Uses and Integration

1. Science
2. Policy
3. Management



## 2. Policy

- Reveal important, risky pathways for regulation
- Support tool for screening large number of species (import or pathway) for prohibition
- Analyze effectiveness of regulations – *did they decrease risk?*







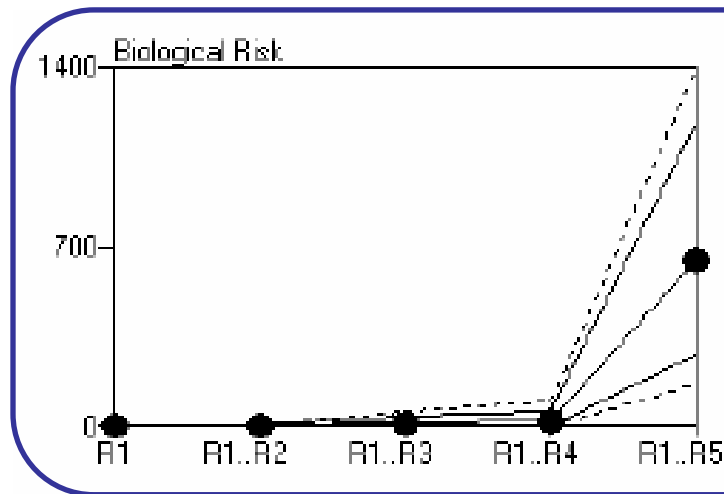
# Emerging Uses and Integration

1. Science
2. Policy
3. Management
  - a. Prioritization
  - b. Outreach
  - c. Response
  - d. Mitigation



## 3.a. Management - Prioritization

- No utility in a blanket classification of high risk, especially for resource allocation
- Identify those links in the invasive process that is most critical



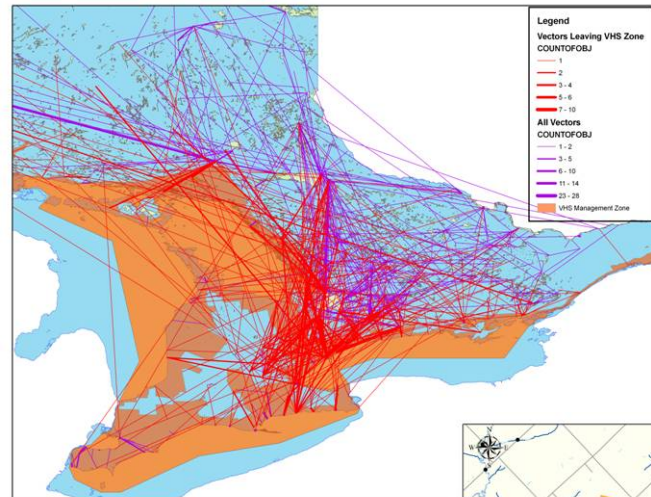
RA indicates that widespread impacts was the most critical link in the invasive process – efforts should be directed to preventing large-scale spread.

*“The impact of bigheaded carps on the Great Lakes is directly related to establishment. Therefore, preventing establishment is critical.”*

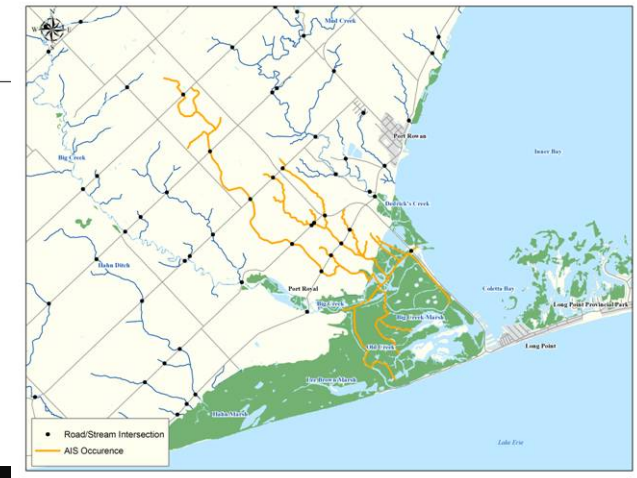


## 3.b. Management – Outreach

- Target critical vectors and their user groups
- Helps to clarify target audiences and stakeholders
  - Identification of riskiest vector nodes and spatio-temporal 'hot spots'



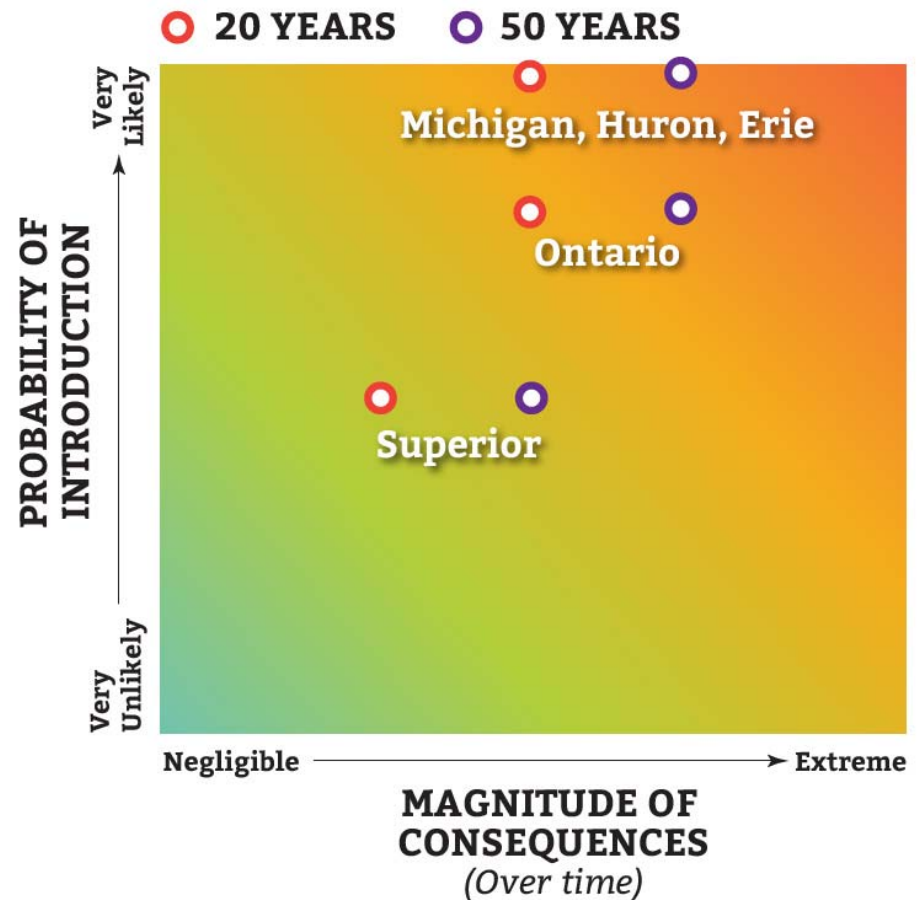
(Drake and  
Mandrak 2010)





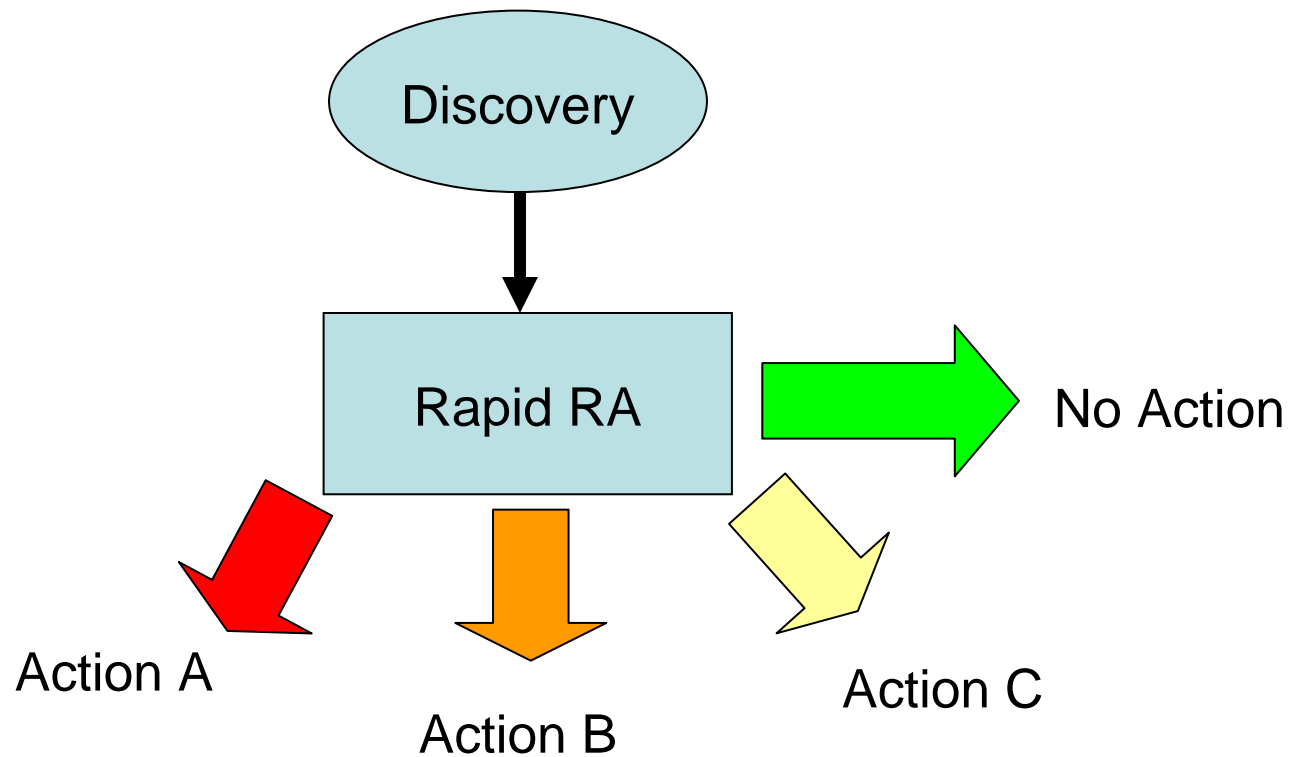
## 3.c. Management –Response

- Determine need for an action and type of action:
  - How long to manifest and what the environment would look like over a certain timeframe
  - Provide advice for management recommendation





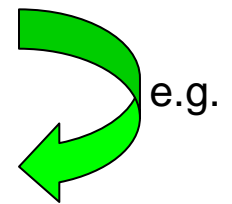
## 3.c. RA in a RR Framework





## 3.d. Management – Mitigation

- Provides advice on best available science (along with other factors (econ, soc, techn, legal)) for decision-makers on potential courses of action
- Allow 'what if' questions regarding the consequences of various potential actions
- Post-mortem of management actions to identify need for adaptation



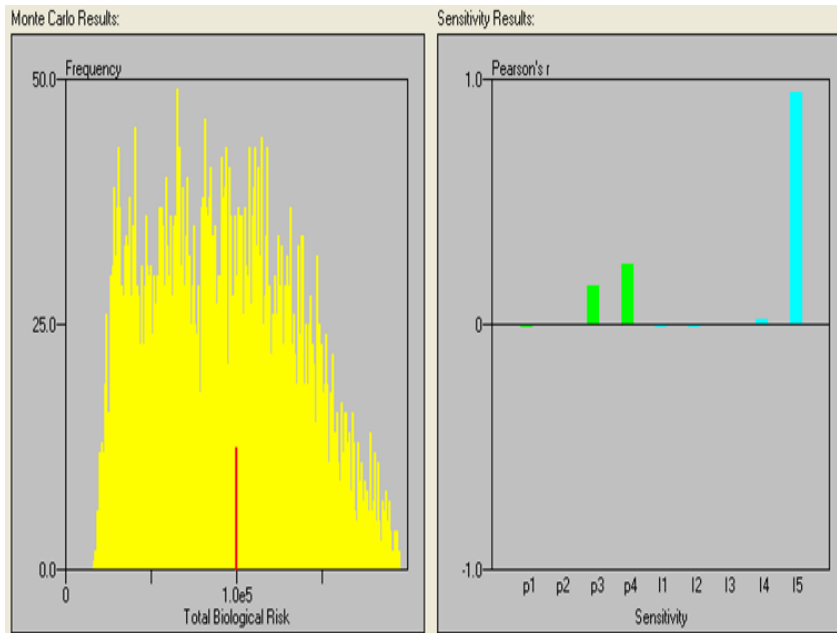


# Post-mortem of Actions

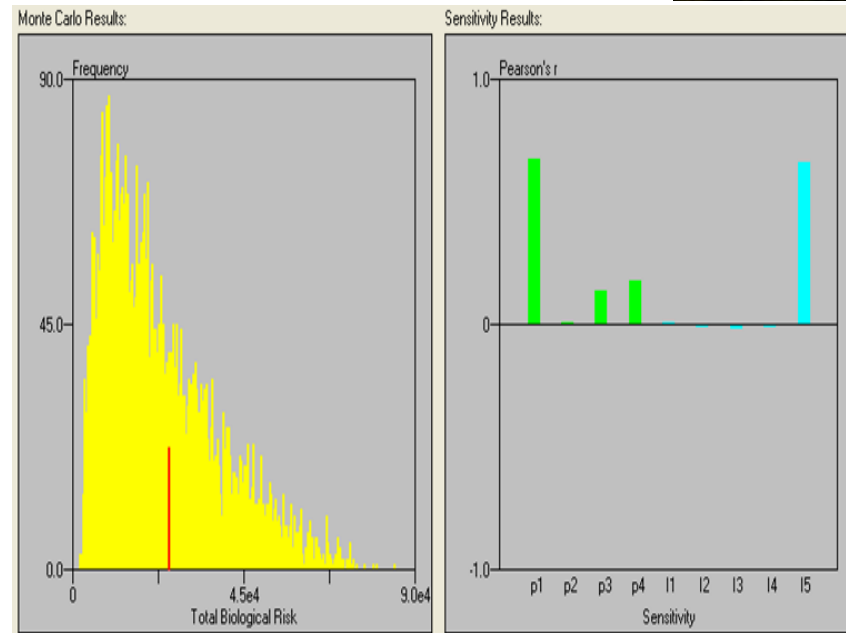


QBRAT

## Pre-Eradication:



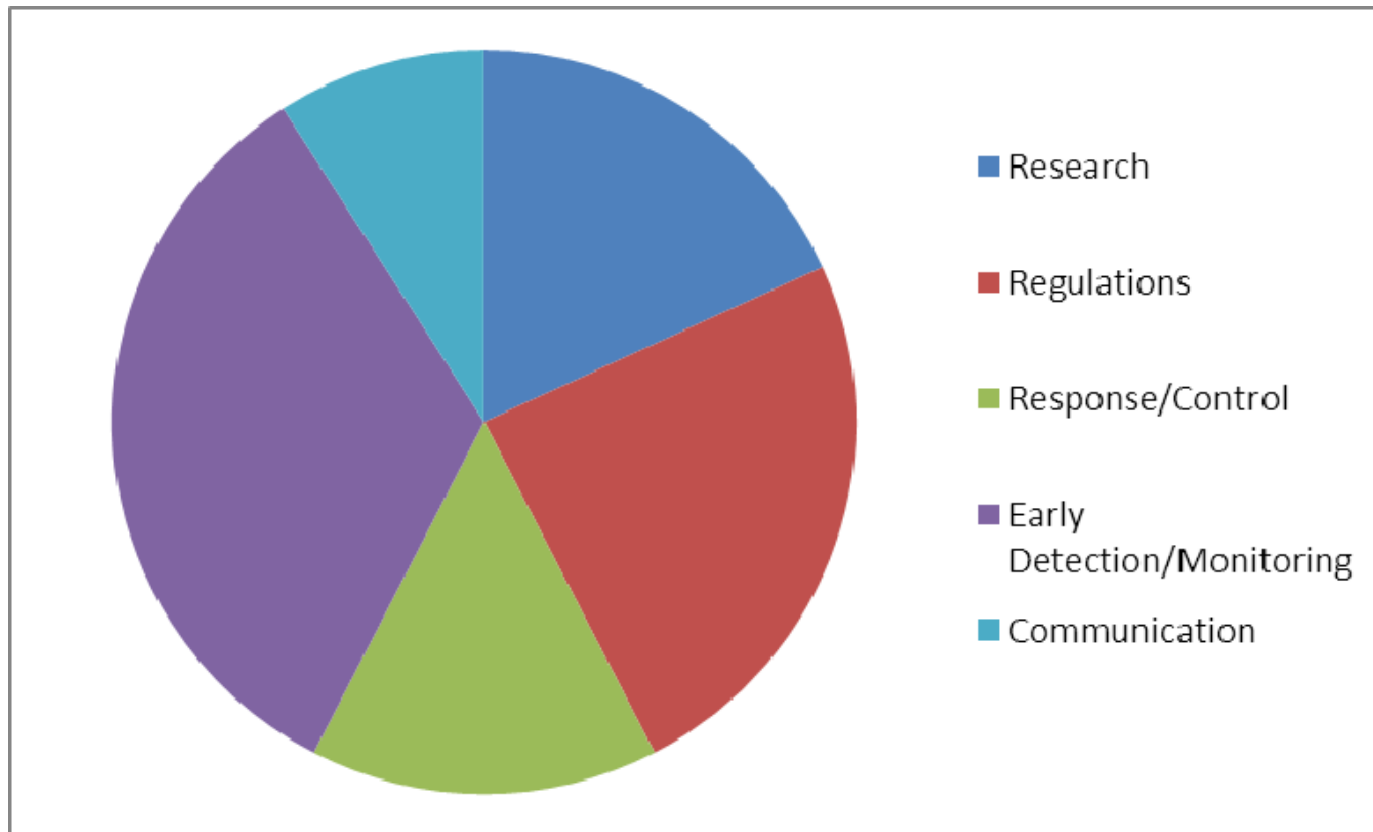
## Post-Eradication:



**Eradication effort reduced risk by 74%**



## CEARA Risk Assessments







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## Conclusions

- RA continue to be an essential component of a risk-based, preventative AIS program - provide advice for prevention and identification of potential invaders.
- Emerged to become an integral part of all AIS program elements: science, policy, management...
- With limited resources, focus must be on highest concerns; risk assessment advises the allocation of limited resources to most effective management actions.



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[www.dfo-mpo.gc.ca/science/coe-cde/ceara/index-eng.htm](http://www.dfo-mpo.gc.ca/science/coe-cde/ceara/index-eng.htm)



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