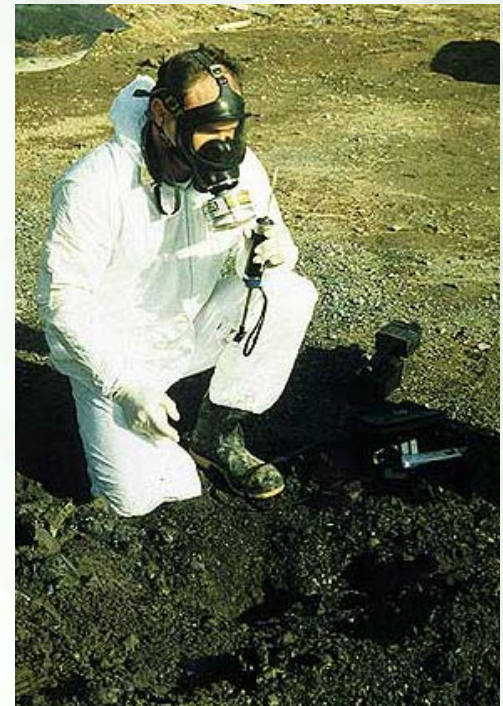


# Key Considerations in Ecological Risk Assessment + Effects on Risk Management



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# Overview

- Ecological Risk Assessment – what is it and when do you have to do one...?
- Key issues affecting risk management decisions
- Some big picture issues
- What we will likely start seeing over the next few years
- The take home messages





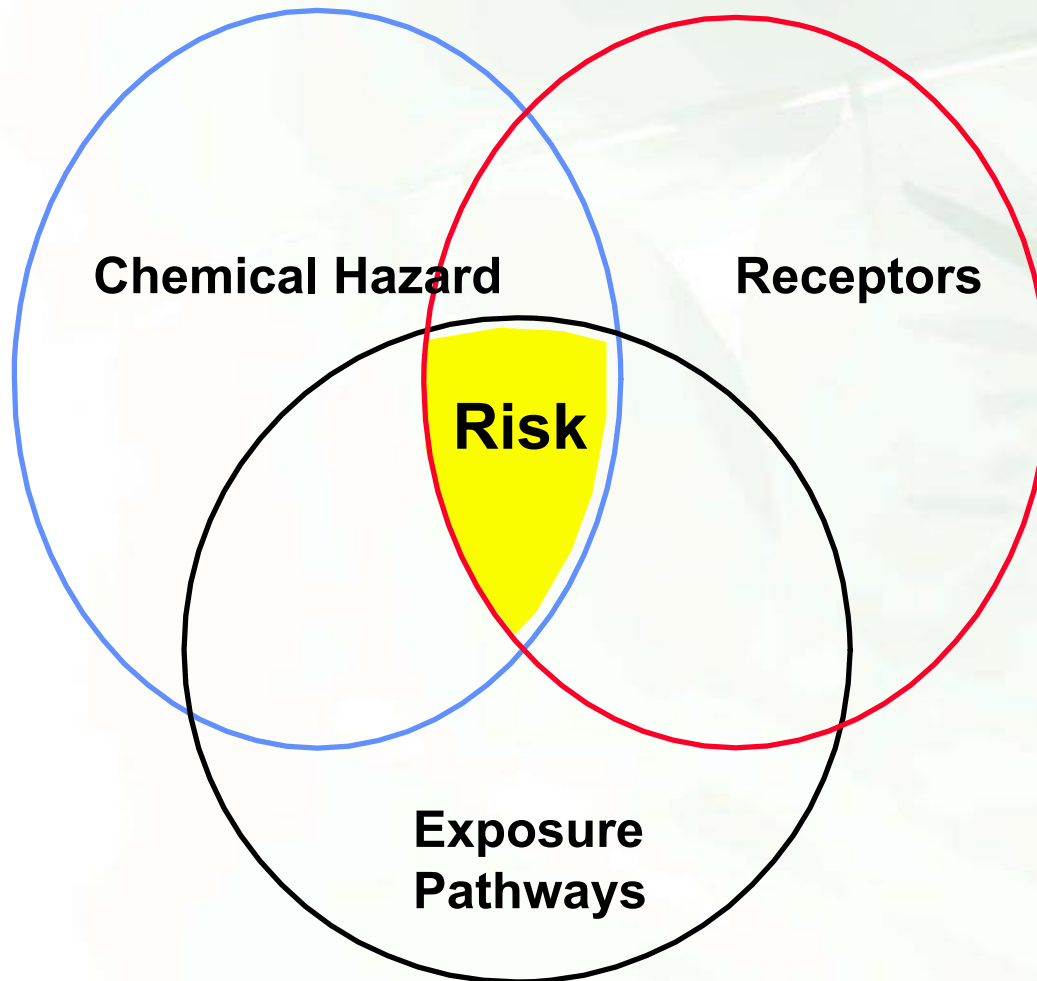
# **Ecological Risk Assessment**

**The What;  
The When;  
The Why...**

# For the Uninitiated...What is an ERA?

- Scientific study
- Estimates the nature and magnitude of potential risk to selected species (plants, aquatic life, wildlife, etc.) related to exposure to chemicals present in the environment
- Multidisciplinary approaches and expertise required – involves field sampling, chemistry, toxicology, biology (aquatic/terrestrial), statistics, environmental modelling, hydrogeology, remedial planning
- Requires a considerable amount of professional judgement
- Not a “black box” or “cookbook” assessment....

# When should an ERA be conducted?...



# When should an ERA be conducted?

- Regulatory requirement
- Corporate due diligence and/or environmental policies
- Public pressure/concern
- Insurance/legal issues
- Other reasons...?

# Specific “Trigger” Text Under RBCA

- To determine whether an ERA is required under RBCA for a site impacted by petroleum hydrocarbons, one must first:
  - Assess presence of ecological habitat within 150 m of site that could be adversely impacted by site conditions
  - Use Reference Guidelines Tier 1 Checklist for Ecological Receptor Assessment in Atlantic Canada ([www.atlanticrbca.com](http://www.atlanticrbca.com))
  - Checklist divided into two parts: ecological habitat and exposure assessment
  - If Site Professional answers “yes” to any questions in the checklist, further assessment of potential ecological impacts is required

# Why Is Ecological Risk Assessment Needed?

Protection of human health does not necessarily ensure protection of the environment:

- **Different exposure routes**
  - Cleaning of pelt, plumage may result in ingestion of contaminated soils / sediments
- **Different doses**
  - Wildlife eat entire fish not fillet, people have diverse food sources
  - Some species spend their entire lives in sediment, or on a contaminated site, etc. and receive all food from site
- **Different toxicity**
  - DDT and eggshell thinning

# Why Is Ecological Risk Assessment Needed? continued...

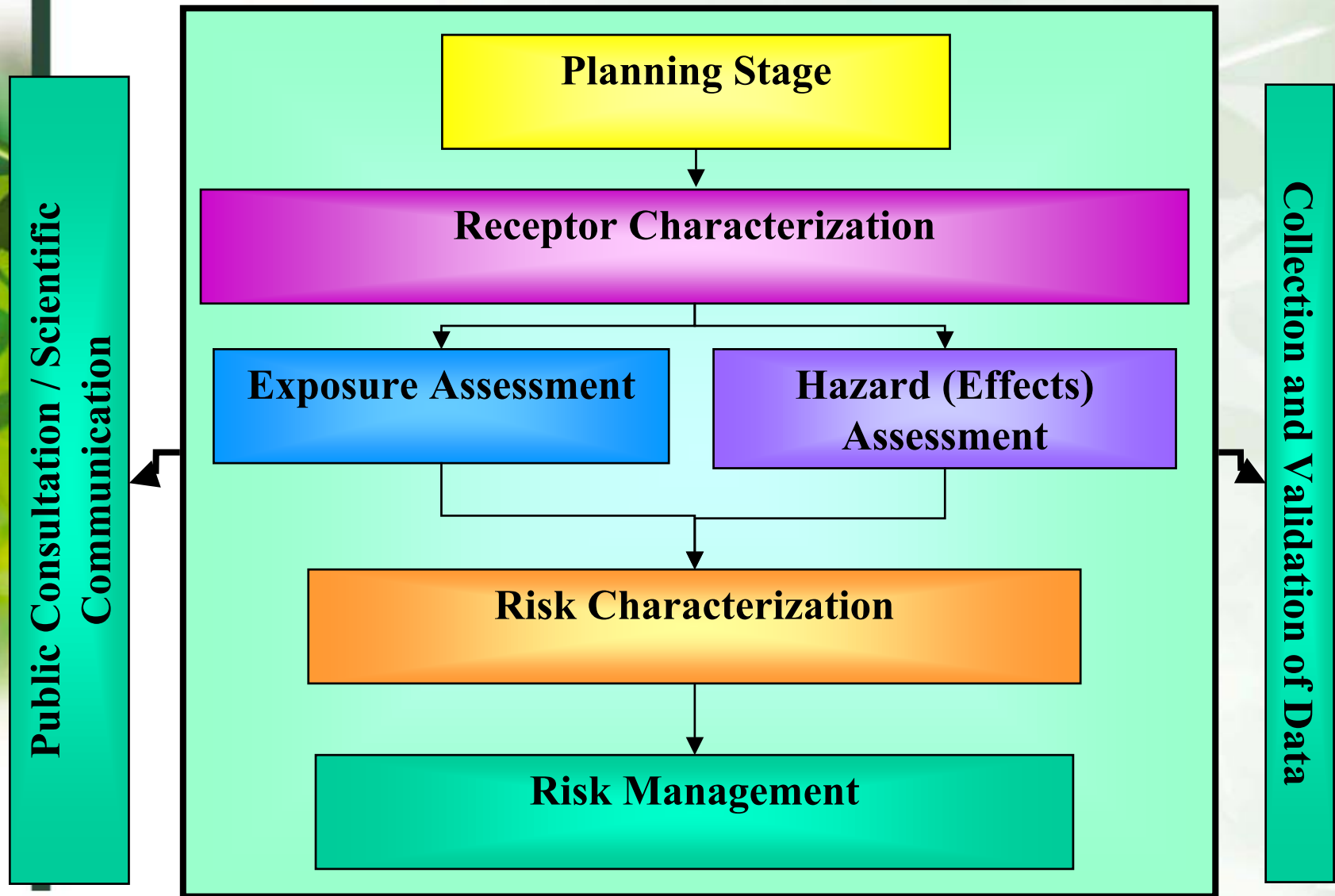
## Generic Criteria/Guidelines

- Protective (i.e., conservative)
- Most organisms, most environments, most of the time
- Do not account for site-specific factors

## Risk Assessment

- Modify level of conservatism
- Evaluate several scenarios
- Evaluate particular species
- Can account for site-specific modifying factors
- Can consider effects of chemical mixtures
- Can evaluate both current and future risks
- Can allow for assessments of chemicals lacking guidelines

# National CCME ERA Framework



## ERA framework.....

- Each step of the assessment process involves a significant amount of professional judgement....



# Risk Assessment to Risk Management

- Eventually, the ERA will land on your desk....
  - If there is potential for adverse health effects in selected species, typically there will be recommendations for remedial work/risk management options or further study...
  - If the study concludes there are no concerns, there may be no recommendations for further study or risk management or remedial work..



# **Risk Management Decision-Making**

**Key issues affecting decisions**

# Tools for Decision-making

- A variety of tools can factor into risk management decision-making:
  - Ecological Risk Assessment report
  - Human Health Risk Assessment report
  - Aesthetic issues
  - Physical hazards
  - Public concerns/pressures
  - Regulatory/compliance issues
  - ....others?



# Key Issues Affecting Decision-Making

- If the ERA is a critical tool driving the management plan for the site:
  - **Number 1**: Is the study of adequate quality to make appropriate, defensible decisions?
  - **Number 2**: Is the degree of uncertainty in the study findings acceptable?



# 1. Study Quality: How do you know...?

- You may have..
  - personal expertise or experience with these types of studies;
  - confidence in the capability and expertise of your chosen consultant;
  - no clue whether it is a quality study, because it is such a technical report you can not understand 90% of it;
- So...where do you go from here?

# 1. Key “Quality” issues..

- Study design;
  - Data quality;
  - Selection of chemicals of potential concern;
  - Selection of receptors;
  - Assessment and measurement endpoints;
  - Toxicity reference values;
  - Assumptions used in Exposure modelling;
  - Conservatism of the assessment;
  - Integration of the various lines of evidence and overall interpretation of potential for risk
- ....if these are off-base...THE CONCLUSIONS MAY BE AS WELL!!!

# 1. Does quality matter?

- If the costs of implementing the suggested risk management options are low - quality may not be as big a factor in your decision to proceed....
  - ...but what if the study completely missed something important? You could be on the hook for liability in the years to come.

# 1. Study Quality: How do you know...?

- Regulatory review
- Peer review
- Enhance your personal expertise with ERA
- ...these should increase your confidence in the findings of the study

## 2. Study uncertainty: What you need to know

- Uncertainty associated with every RA study (ERA or HHRA)
- Uncertainties, and their impact on the study findings, should be discussed in the ERA report
  - This assists you in understanding the significance of decision-making based on the study
- You have to have a clear understanding of how confident you can be in the conclusions

## 2. Study uncertainty

- Mantra is when we have high uncertainty – ALWAYS be conservative
  - Bias exposure estimates high
  - Bias hazard assessment high
- Results: a conservative (protective) assessment
- Risk Management Outcome:
  - Could be remediating when you don't need to
  - Could be remediating more than you need to
  - High uncertainty = High \$\$\$\$\$\$

## 2. Uncertainty – Key areas

- Are exposure estimates being extrapolated from other media (e.g., surface soil contamination as a predictor of surface water concentrations)?
- How conservative are the exposure assumptions – are wildlife assumed to be feeding 100% of the time at the site?
- How representative is the toxicity data to the species being assessed?
- Are the study conclusions based on “no effect”-based toxicity data?
- Are the conclusions based on a single “line of evidence”?

## 2. Uncertainty: Goals

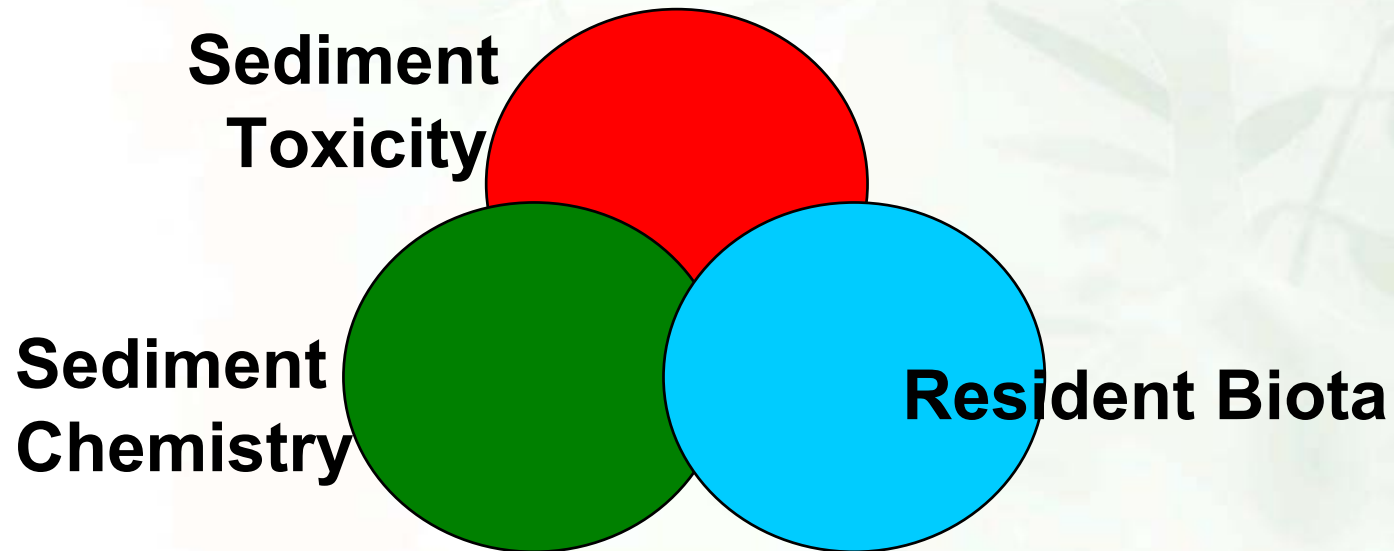
- If High uncertainty = High \$\$\$\$
- Goal:
  - should be to reduce uncertainty without compromising ecological protection
- Outcome:
  - Reduction in risk management costs
  - More confidence in decisions related to degree of and approach to risk management

## 2. Reducing Uncertainty: Bioavailability

- This is a key item affecting risk management decisions
- Typically, screening level assessments do not consider bioavailability (assumes 100%)
- Therefore, remediation decisions based on screening level ERA results could be markedly more expensive than those based on more advanced ERAs
- Site-specific bioavailability is accounted for in situations which involve site-specific toxicity tests, tissue sampling, etc.
- Increased understanding of bioavailability can significantly reduce remedial costs

## 2. Reducing Uncertainty: Multiple Lines of Evidence

- The more the merrier...



- porewater chemistry
- bulk sediment

- benthic survey
- tissue bioaccumulation



# The Big Picture on Risk Management Decision-Making

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# Are you well prepared?

- Be proactive!!! Being forced into a reactive situation, with little scientific data to support arguments of no or low risk will present “communication challenges”!
- Several possible scenarios:
  - no data – no understanding of potential risk
  - old data; incomplete or inappropriate interpretation
  - final report – tied up with a bow!

## Is your ERA decision-tool a good one..?

- Give the data a reality check...do the assessment conclusions actually make sense, given the degree of contamination reported in the data?
- Do the conclusions of the ERA actually correlate with the Risk Management options presented?
- Do the “next steps” for data collection or monitoring actually dove-tail with the findings of the assessment?

# Do you have buy-in on the process/decisions?

- Where possible and appropriate:
  - Engage the neighbours
  - Engage the regulators
  - ...reducing the “surprise” factor may increase the acceptance of the risk management options, particularly if the stakeholders play a role in the process



# **ERA in the next few years**

**What we expect to see...**

# What to expect in ERA over the next few years

- Changes to the Freshwater Aquatic Life guidelines (protocol update) – primary focus will be on metals;
- Changes to Soil Quality Guidelines (protocol update);
- Increased interest and consideration of amphibians and reptiles;
- Increased involvement from the federal regulatory community for federal sites
- New EcoSSTLs (US EPA)
- Increased experience and therefore more scrutiny of reports
- Sites requiring expensive remediation – increased number of lines of evidence

## What to expect...

- Watch for US EPA Framework for Assessment of Metals in ERAs
- Wish List:
  - Update and expanded CANADIAN guidance on ERA protocols/approaches and critical issues
    - e.g. toxicity reference values for wildlife
    - e.g. chemical screening

# Key Take Home Messages

- ERA is an important tool for decision-making
- If the ERA is the “driver”:
  - Quality
  - Uncertainty
- It is an iterative tool – focus next level of assessment on key areas of uncertainty
- Lots of “new tools” coming down the pipe, but updated guidance is critical due to the growth in application of this type of assessment in risk management decision-making