



Part 3: Pathways of Effects and Risk Management





Part 3: Outline

- Pathway of Effects
 - What are they?
 - How do they help?
 - Case Studies
- Risk Management
 - Using the Risk Matrix
 - How does it help?
 - Case Studies





Pathways of Effects

- Basic Concept
- Why do we use this approach?
- How do we use this approach?
- Examples in the real world





What do PoE's help us to do?

Pathways of Effects are a framework for assessing effects to fish habitat:

- Permit clear communication and understanding of aquatic effects.
- Assist in identifying knowledge gaps.
- Allow input from First Nations/industry/other agencies on appropriate mitigation measures to prevent adverse effects.





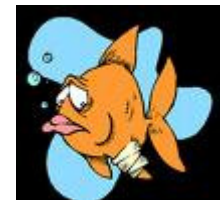
Steps in the PoE

1. Define the activities.
2. Develop a PoE model (or set of models) for all of these activities.
3. Use the risk matrix to assess the level risk of **residual effects**.
4. Determine an appropriate **management action**.



Managing Effects

- Where an effect cannot be avoided through mitigation or design, those effects must be examined more closely to determine if they are negative (some effects can be positive or neutral).
- When negative adverse residual effects remain, the risk matrix should be used to apply the appropriate management option.

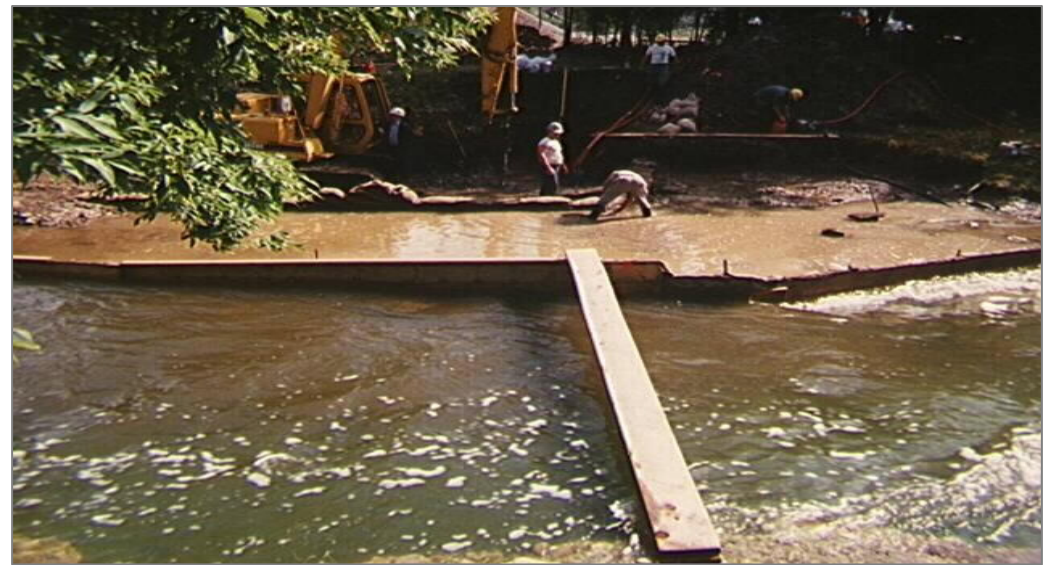




Mitigation

What is mitigation?

“Actions taken during the planning, design, construction and operation of works and undertakings to alleviate potential adverse effects”





Mitigation

“Actions taken during the planning, design, construction and operation of works or undertakings to alleviate potential adverse effects”

➤ **Mitigation = No HADD**

➤ No HADD = No Authorization

➤ Unacceptable HADD = No Authorization

➤ No Authorization = No CEAA





Pathways of Effects

There are two types of pathways:

- Land based
- In-water





Land-Based Pathways of Effects

- What are some examples of land-based activities that could initiate a Pathway of Effects?





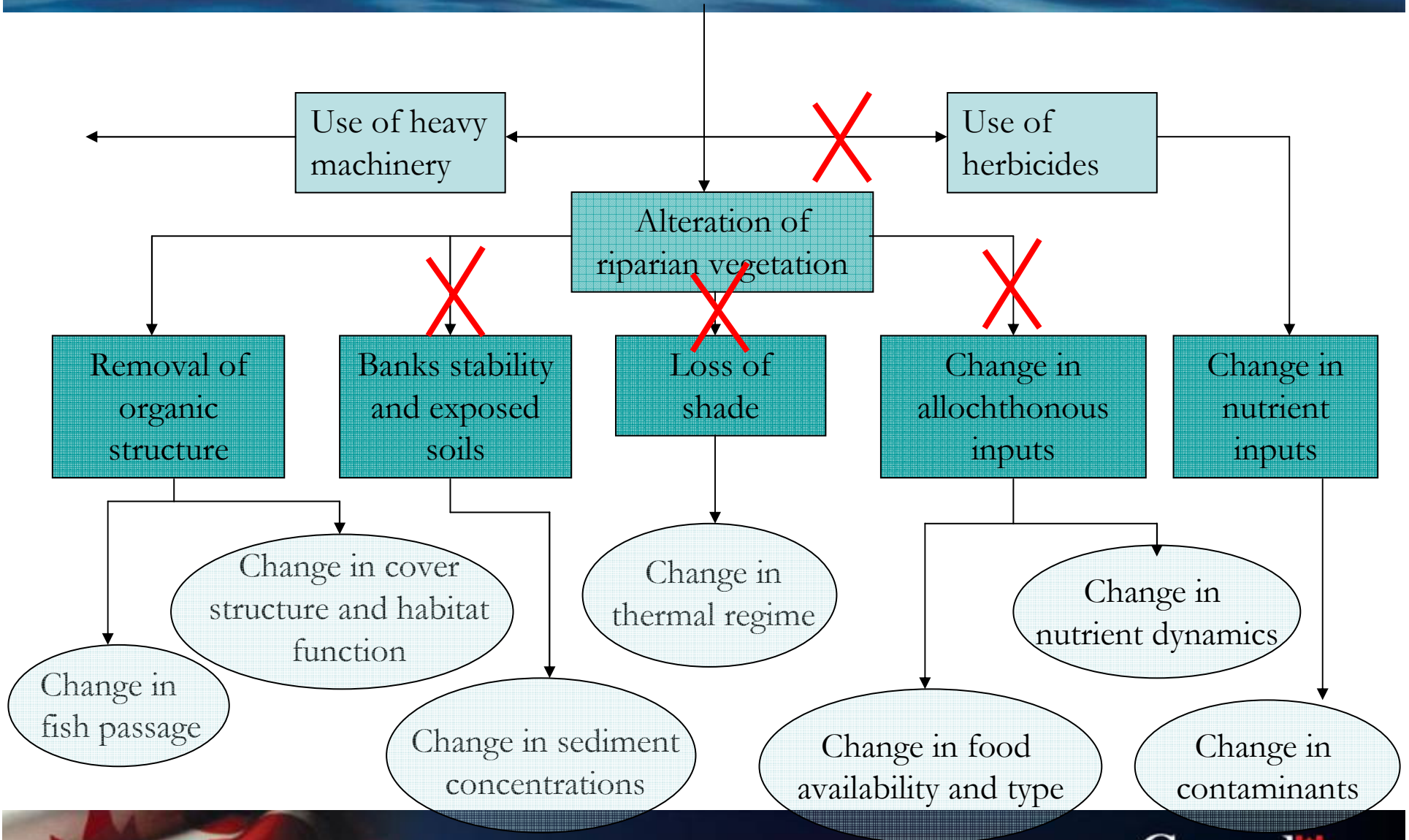
Land-Based

- Vegetation clearing
- Grading
- Excavation
- **Use of Explosives
- **Use of Industrial equipment
- Cleaning or maintenance of bridges or other structures
- Riparian planting
- Streamside Livestock grazing





Vegetation clearing





In-Water Pathways of Effects

- What are some examples of in-water activities that could initiate a Pathway of Effects?





In-Water

- Marine Seismic Surveys
- Placement of material or structures in water
- Dredging
- Water extraction
- Organic debris management
- Addition or removal of Aquatic vegetation management
- Wastewater Management
- Change in timing, duration and frequency of flow
- Fish passage Issues
- Structure removal
- Placement of marine finfish aquaculture sites
- **Use of Explosives
- ** Use of Industrial Heavy machinery



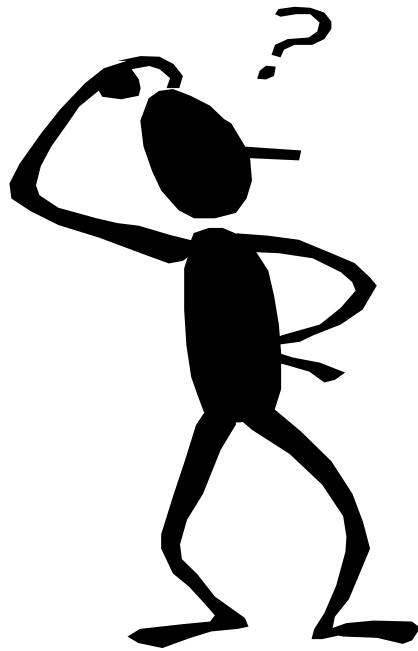


Using the Pathways of Effects

- Use Pathways of Effects to identify potential impacts.
- Determine how mitigation can break the link between development activities and their potential impacts.



Using the PoE's



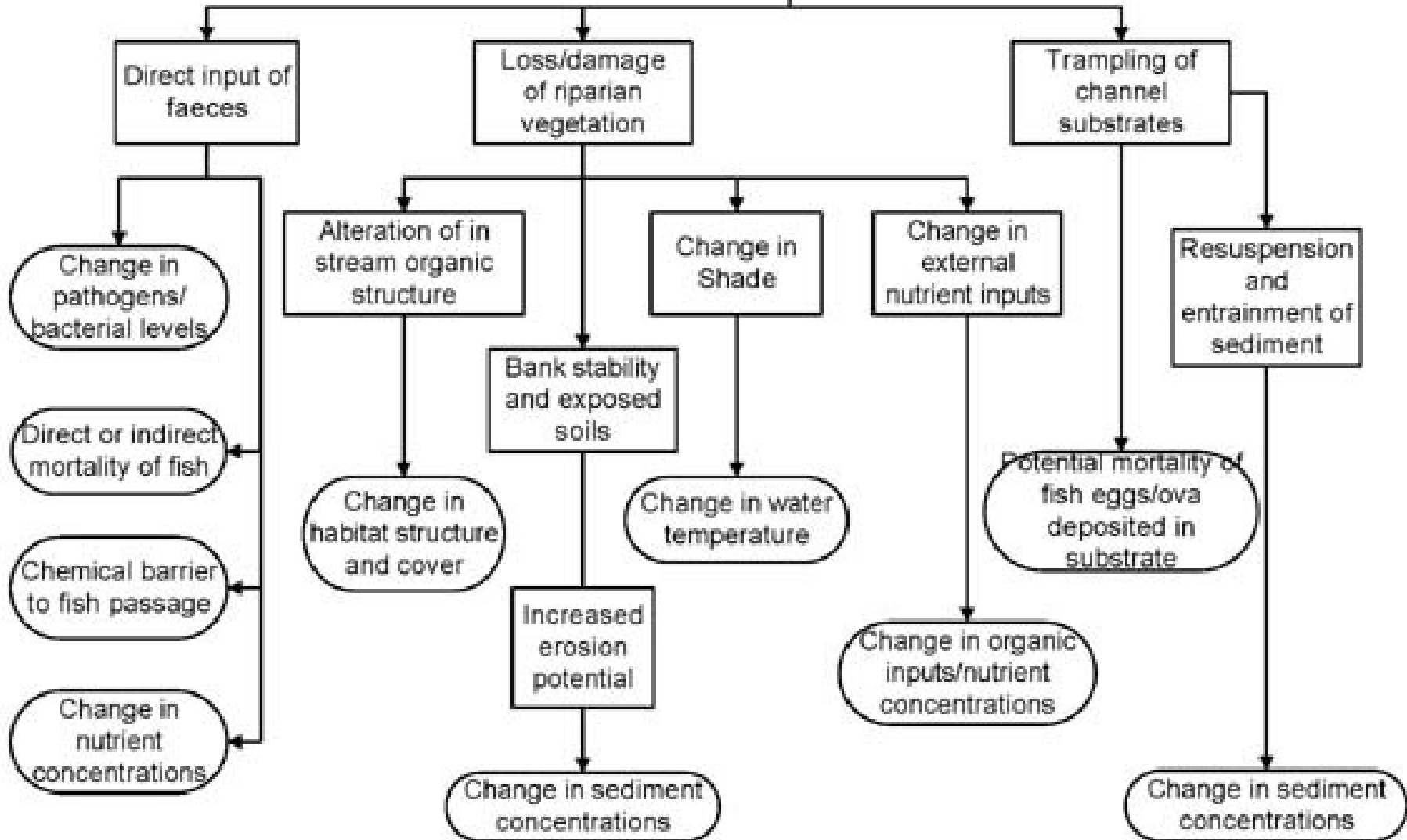
Cows in the Creek



2/2/2003

Land-based activities

Streamside livestock grazing





Purpose of the Risk Matrix

- To illustrate the level of risk posed by a development.
- Uses the scale of the effect and the sensitivity of the habitat to estimate the level of risk.
- Helps to determine if:
 - mitigation is required,
 - the development proposal should be redesigned, or if it is safe to go ahead.



Risk Factors for Fish & Fish Habitat

Scale of Negative Effect

- Extent (Size)
- Duration
- Intensity

Sensitivity of Fish/ Habitat

- Species Present
- Habitat Resilience
- Species Dependence on Habitat
- Rarity





Scale of Negative Effect

Attribute	Description	Examples of scales
Extent	Refers to the direct “footprint” of the development proposal, as well as areas indirectly affected, such as downstream or down-current areas.	<ul style="list-style-type: none">• Site or segment – localized effect• Channel reach or lake region• Entire watershed or lake
Duration	The amount of time that a residual effect will persist.	<ul style="list-style-type: none">• Short term (days)• Medium term (weeks-months)• Long term (multiple years – permanent)
Intensity	The expected amount of change from the baseline condition. Intensity is a way of describing the degree of change, such as change in water temperature, salinity, flow, suspended sediment etc.	<ul style="list-style-type: none">• Habitat still suitable but not as productive• Habitat quality significantly reduced• Habitat quality unusable



Species Sensitivity

- **Species Present** – Sensitivity of the species to change in environmental conditions (e.g., sediment inputs). **Habitat Resilience** – The ability of an aquatic habitat to recover from change in environmental conditions
- **Species Dependence on Habitat** - Use of habitat by fish species – some species can spawn in a wide range of habitats while other have a very specific habitat requirements
- **Rarity** – The relative strength of a fish population or prevalence of a particular habitat type



Risk Management

- Once risk has been assessed using the PoEs and the Risk Matrix, a management option can be selected.
- Management options will vary depending on the level of risk associated with the development proposal:

Low Risk: Operational statements, Letters of Advice, Guidelines, Certification.

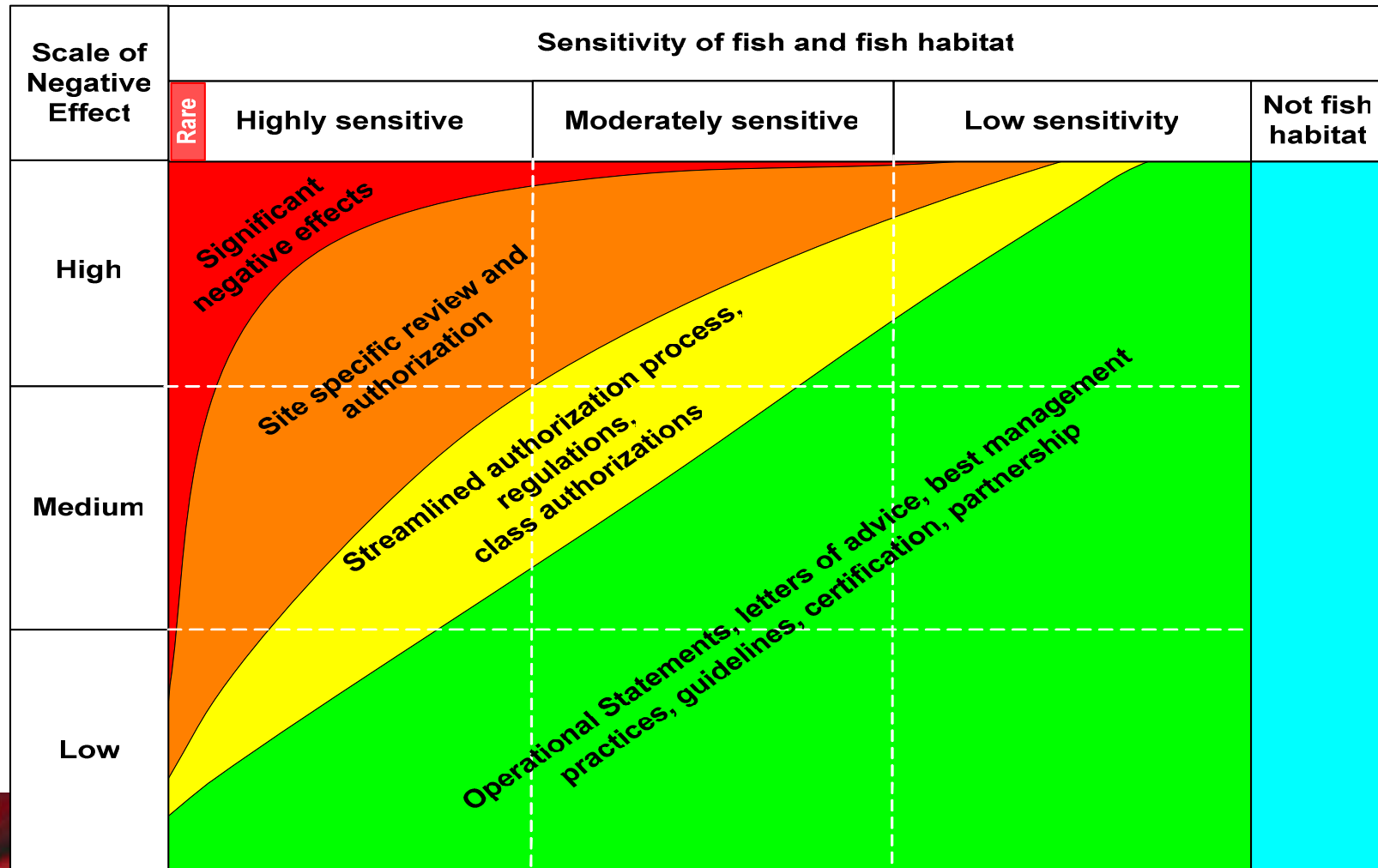
Medium Risk: Regulations, Class Authorizations, CEAA Class Screenings etc.

High Risk: site specific review and authorizations with compensation.





Risk Matrix for Fish Habitat





Risk Management

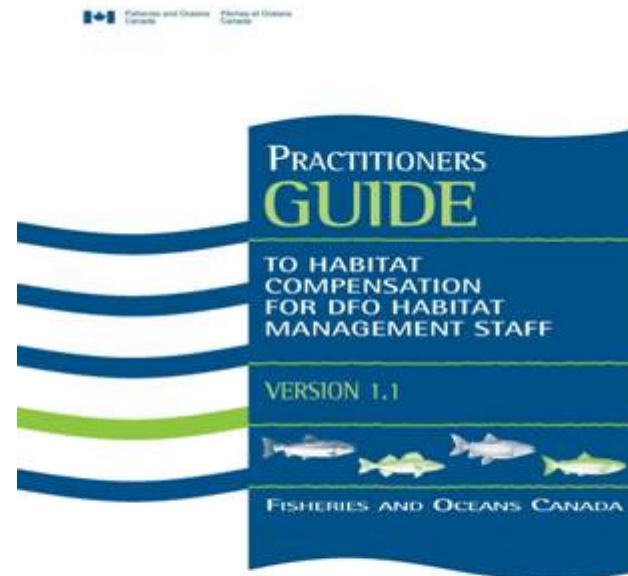


- Review the Risk Matrix and its application to development proposals.
- Understand the definition of risk as relates to fish habitat and development proposals.
- Understand the elements of risk and how these support the risk assessment process.
- Use the risk matrix to estimate risks at the development proposal level.



Tools

- Operational Statements
- Template Authorizations for Watercrossings (draft)
- Practitioner's Guides
 - To Compensation
 - To Risk Management
 - To Writing Authorizations
 - To Writing LOAs
 - To Letters of Credit



Canada



New Culvert Installation Activity

- List the land-based and in-water activities that are involved in culvert installation.
- Use the mitigation provided to break the links?
- Identify “links” that haven’t been broken and identify the type of mitigation needed to break the links.





Development Proposed: Culvert

In-water activities

- Placement of material
- Use of industrial equipment
- Dredging
- Water extraction
- Aquatic Vegetation Management
- Organic debris management
- Wastewater management
- Flow
- Use of Explosives
- Fish passage
- Structure removal

Land-based activities

- Vegetation Clearing
- Grading
- Excavation
- Use of Explosives
- Use of industrial equipment
- Cleaning or maintenance of bridges or other structures
- Riparian planting





13/12/2006

Land-based activities

Vegetation Clearing

See: Use of industrial equipment pathway

Use of industrial equipment

Use of herbicides

Alteration of riparian vegetation

Addition or removal of in stream organic structure

Bank stability and exposed soils

Change in Shade

Change external nutrient/energy inputs

See: fish passage pathway

Change in habitat structure and cover

Increased erosion potential

Change in water temperature

Change in nutrient concentrations

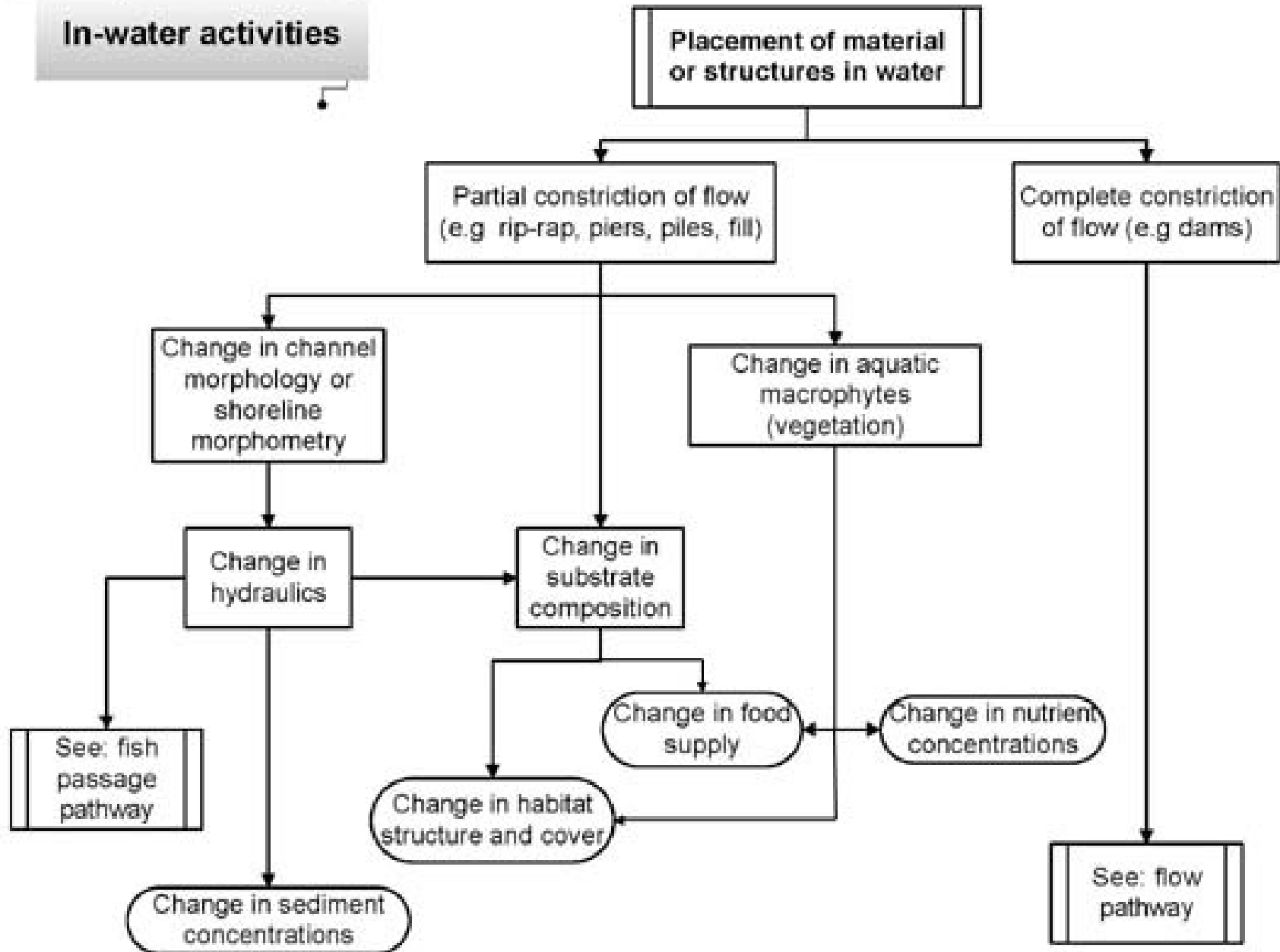
Change in sediment concentrations

Change in food supply

Change in contaminant concentrations

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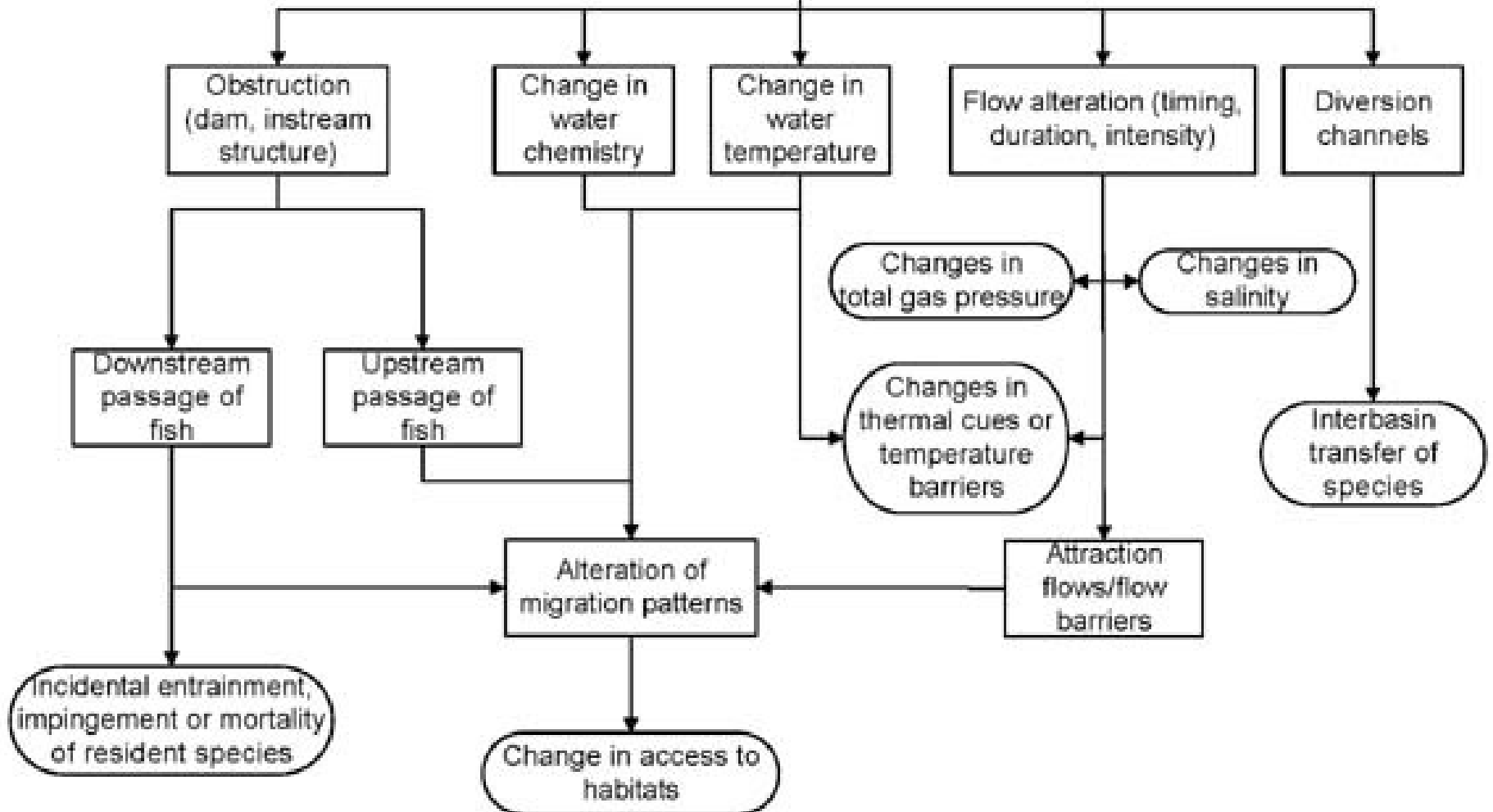
In-water activities



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In-water activities

Fish passage issues





Fisheries and Oceans
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Pêches et Océans
Canada

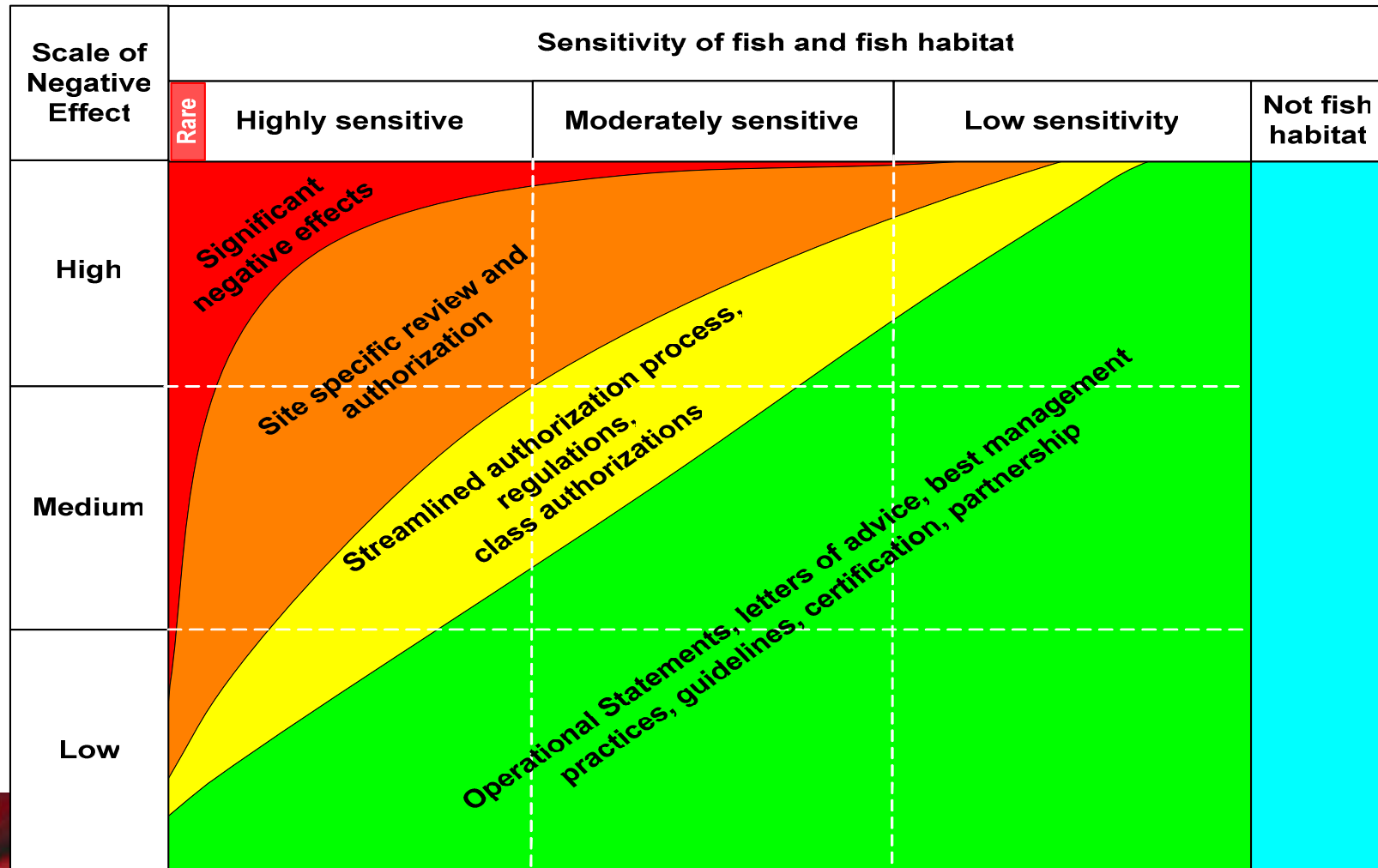
Residual impacts?



Canada



Risk Matrix for Fish Habitat





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Pêches et Océans
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Canoe Launch Development





Review of steps

- 1) Identify POEs
- 2) Break the links (mitigation)
- 3) Residual effects
- 4) dot on risk matrix