

Linking Environmental Assessment to Environmental Regulation thru Adaptive Management via the Water Licencing Process

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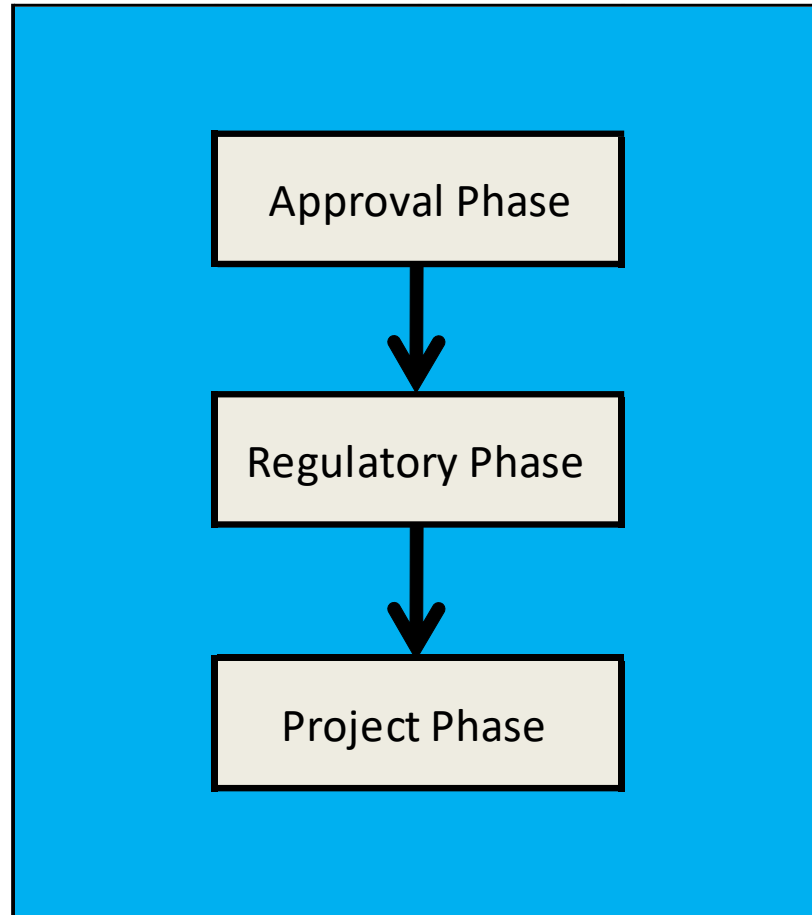
Wek'èezhìi
Land and Water Board

Approach

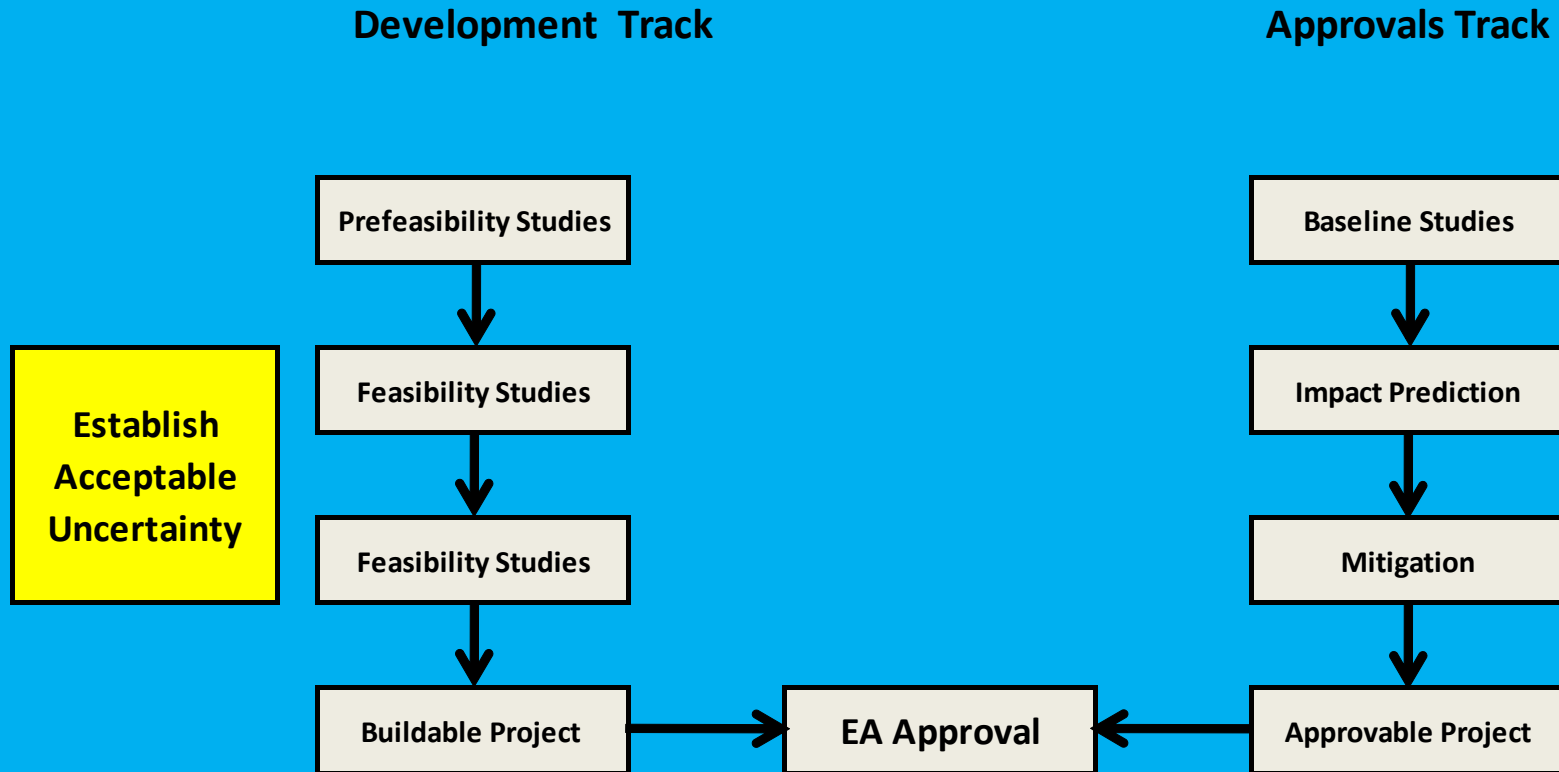
- ▶ The regulatory phases of mine life
 - Reducing uncertainty
- ▶ Departure from Assumed Conditions
 - A question of significance
- ▶ The response framework
 - A form of adaptive management
- ▶ Northwest Territories / Nunavut Focus



Project Phases

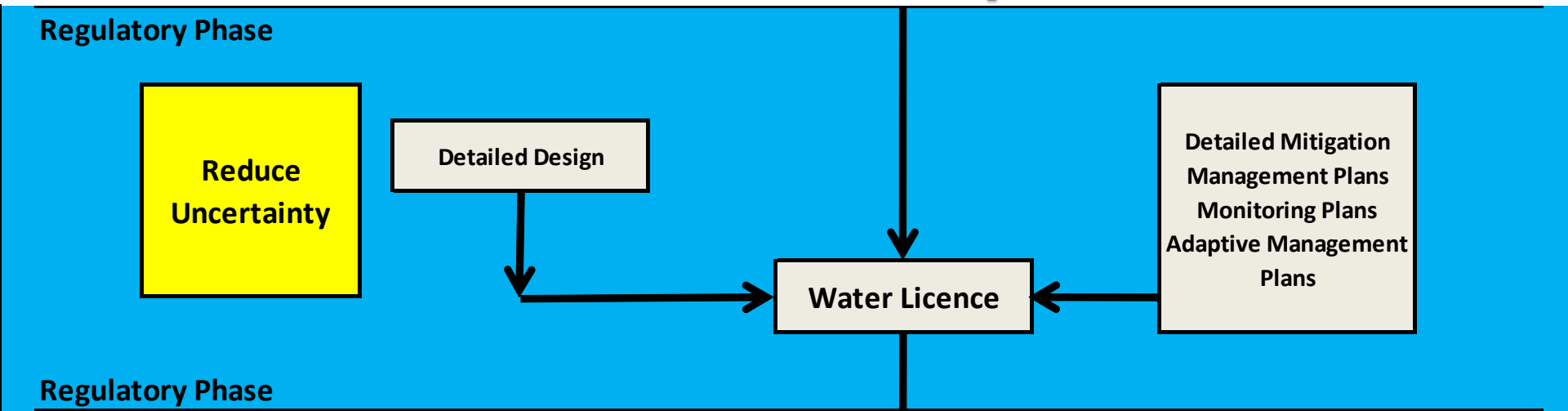


Approvals Phase Establishes Feasibility



Approvals Phase

Regulatory Phase Confirms Details to Achieve Feasibility

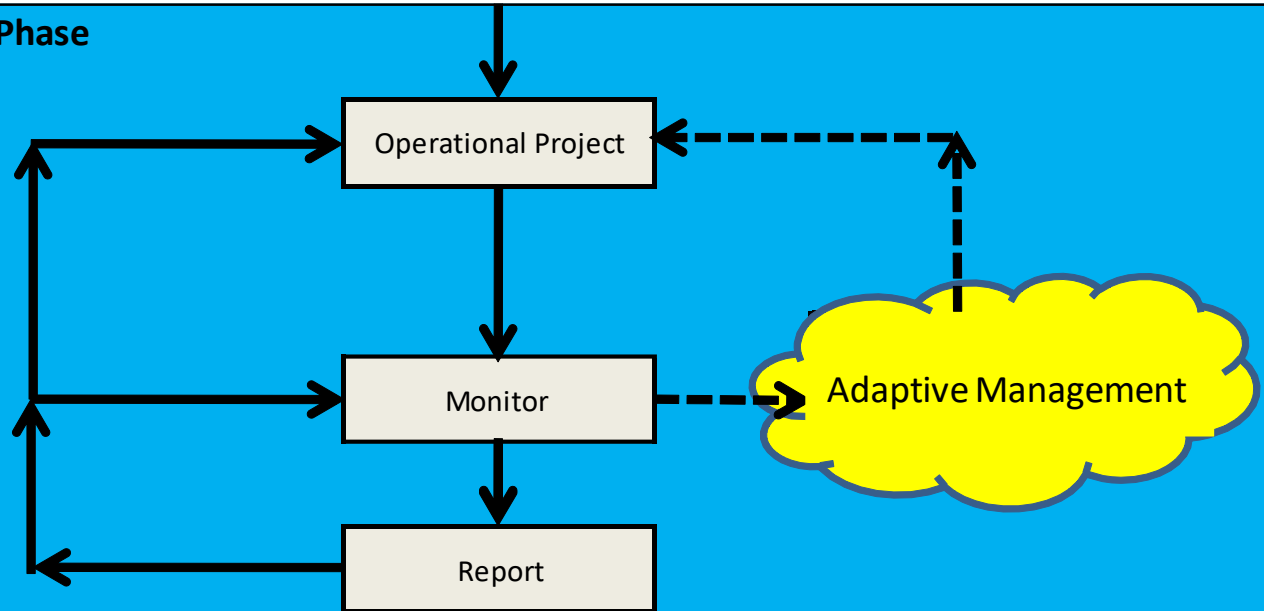


Sets Regulatory Standards
Details to achieve predicted level of
environmental protection

Operations and Closure Phase Manages Project to Meet Regulatory Standards

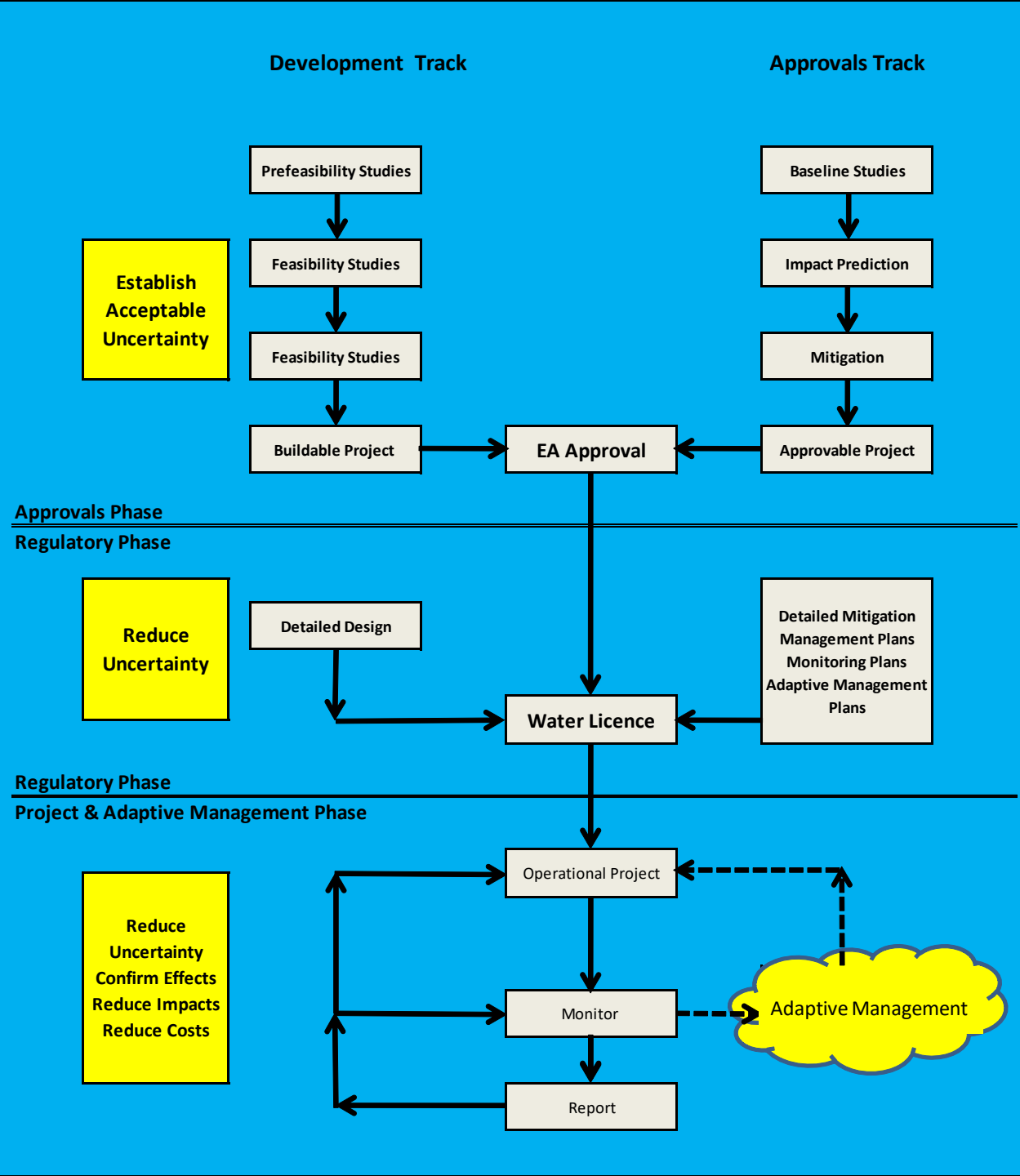
Project & Adaptive Management Phase

Reduce
Uncertainty
Confirm Effects
Reduce Impacts
Reduce Costs

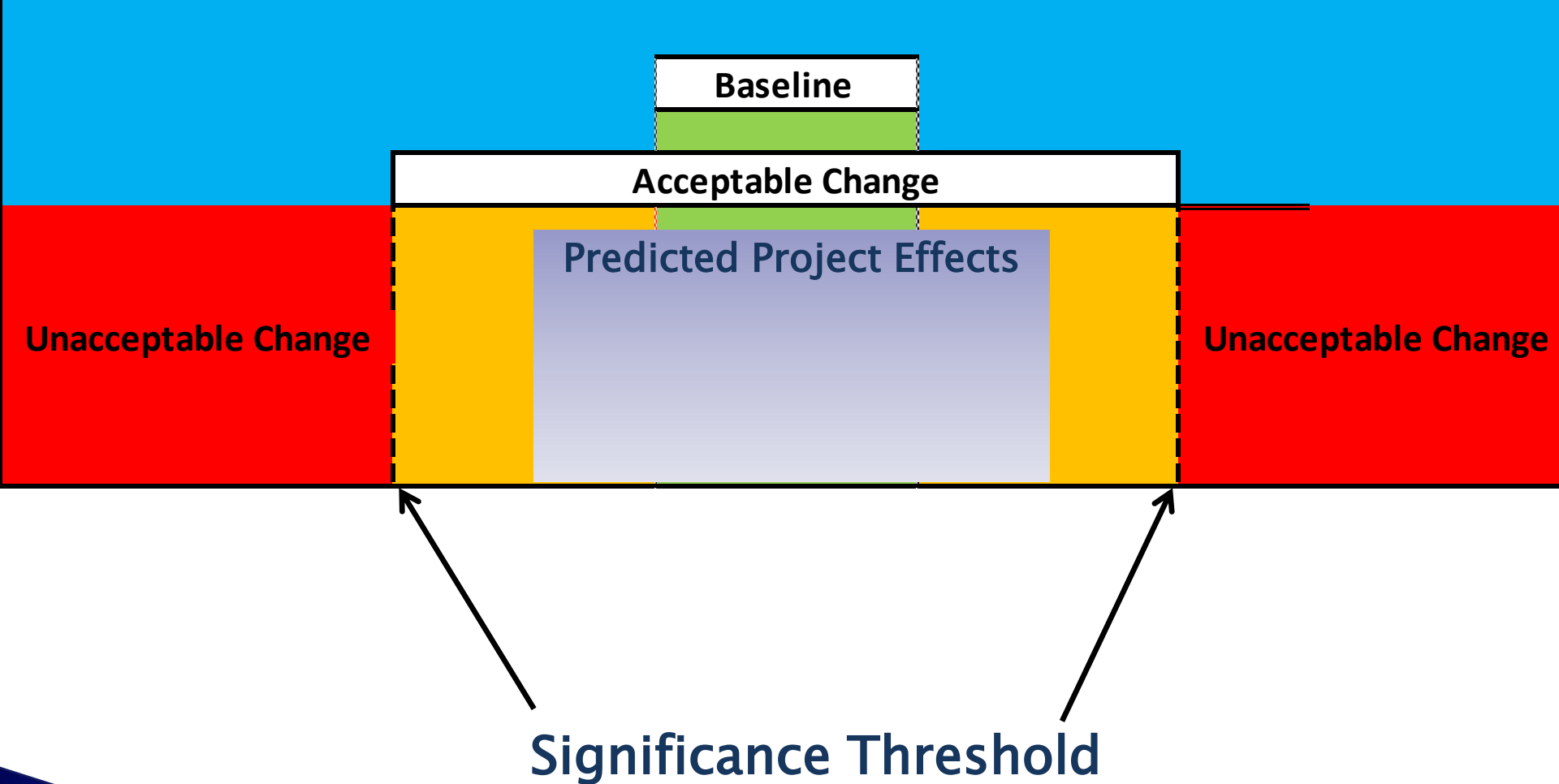


Monitoring and Adaptive Management to reduce
uncertainty

Project Phases Detail



Environmental Thresholds Established in Approvals Phase



Problem

EA process does not define significant adverse effects in a measurable way

EA process predicts effects and determines if they are acceptable or not

How does one determine a significance threshold ?

What is a significant adverse effect ?

Not significant – impacts are measurable at the individual level, and strong enough to be detectable at the population level, **but are not likely** to decrease resilience and increase the risk to population maintenance and opportunities for traditional and non-traditional use.

The cloud of uncertainty

Significant – impacts are measurable at the population level and **likely** to decrease resilience and increase the risk to population maintenance and impact opportunities for traditional and non-traditional use.

A number of high magnitude and irreversible impacts at the population level (regional scale) would **likely be significant**.

Significant Change \neq significant adverse effect

Significant changes are measurable

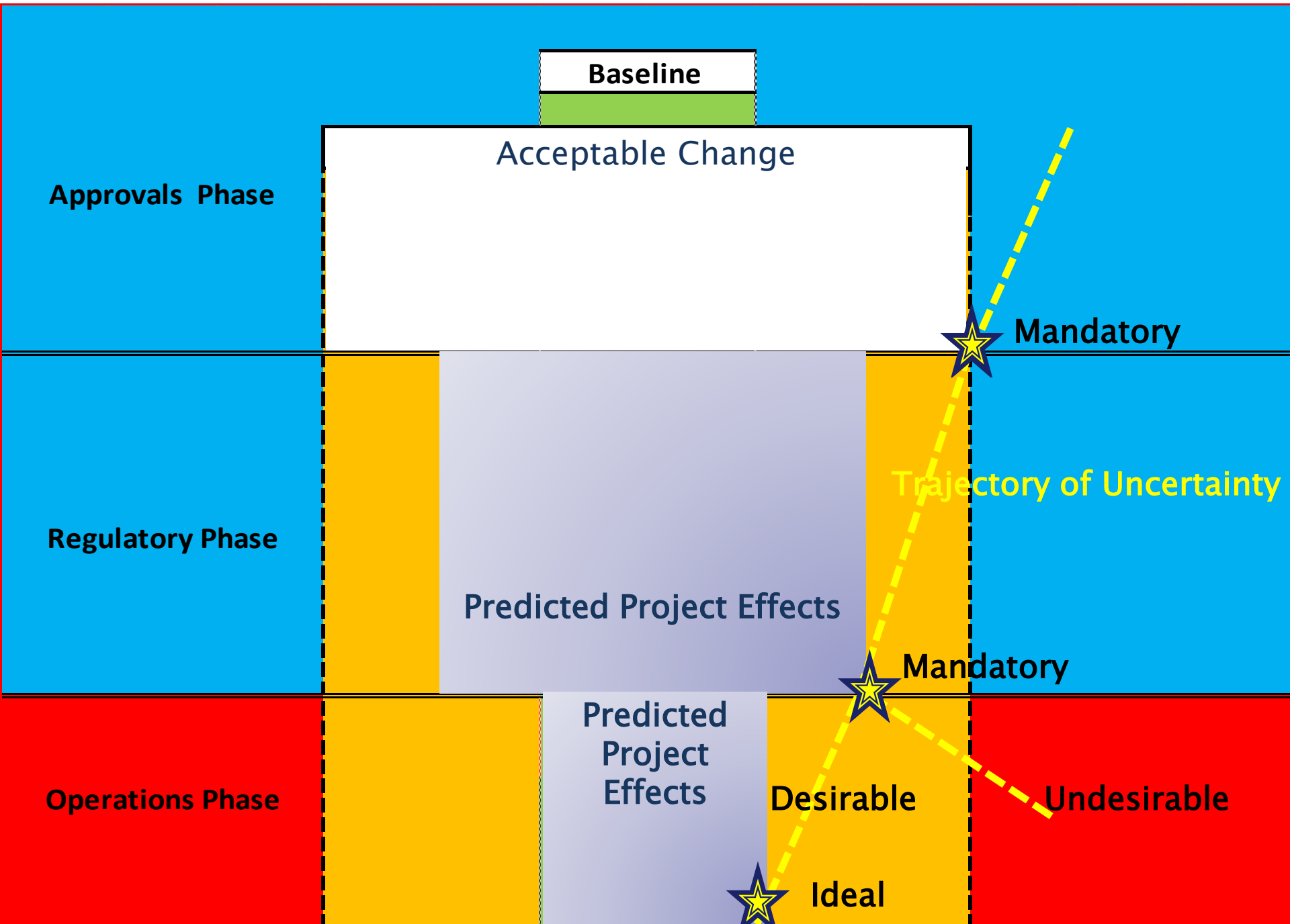
- increased above guideline
- >10% above baseline

Significant adverse effect

- “know it when you see it”
- Avoid getting there
- very hard to describe ahead of time

How do you deal with departures from
EA predictions?

Reduction of Uncertainty



Baseline

Acceptable Change

Approvals Phase

Mandatory

Regulatory Phase

Trajectory of Uncertainty

Predicted Project Effects

Mandatory

Operations Phase

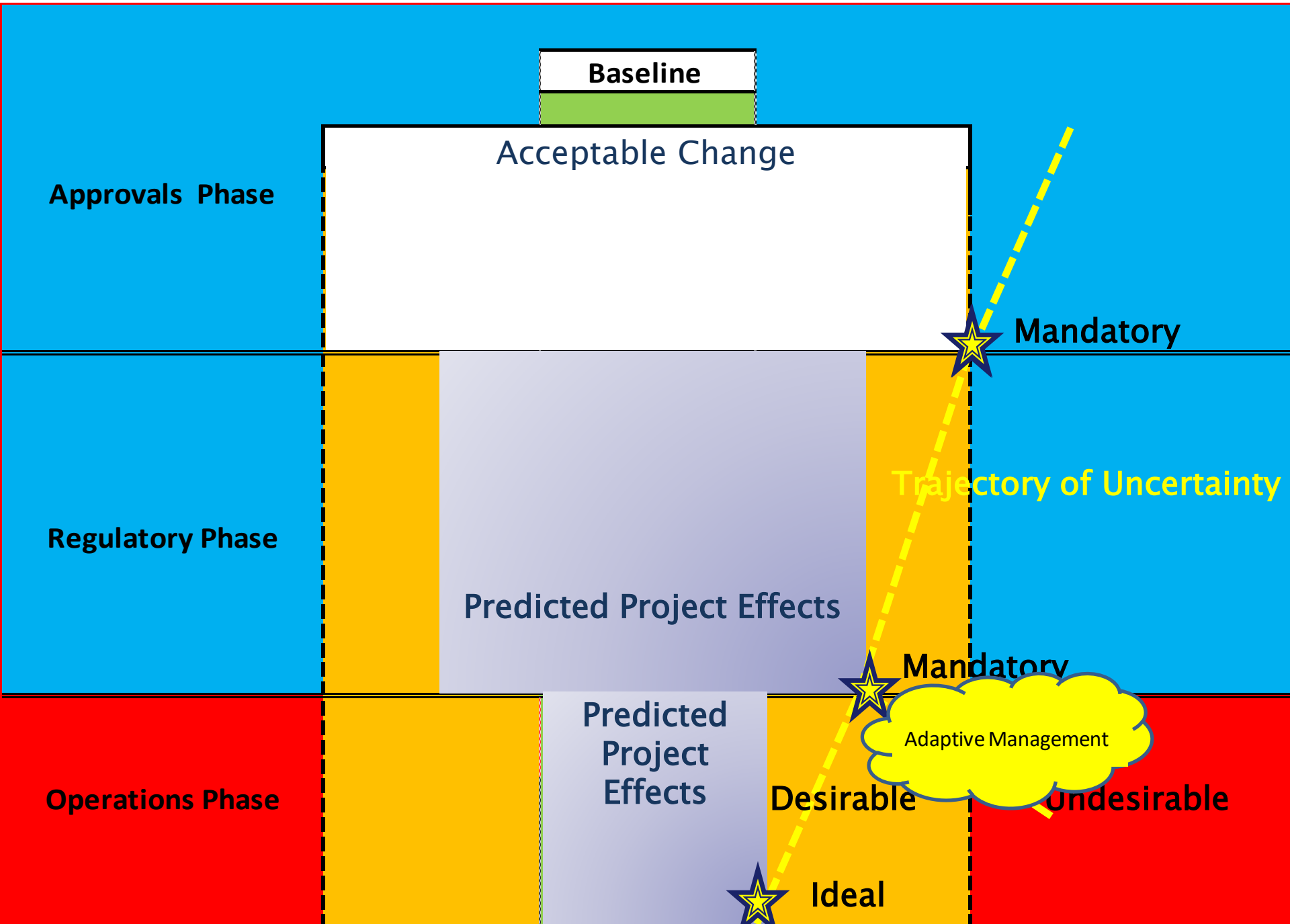
Predicted Project Effects

Desirable

Undesirable

Ideal

The Role of Adaptive Management



Project Approval

- ▶ EA and Licence approved
 - Under set of assumed conditions of project outcome
 - With low level of uncertainty
- ▶ Need to manage project to
 - Maintain environment within thresholds
 - Reduce uncertainty
 - Reduce impacts
 - Reduce Costs



Adaptive Management

Departure from Assumed Conditions

- ▶ Changes exceed predictions
- ▶ Unpredicted changes
- ▶ Unpredicted interactions, multiple stressors or cumulative effects



Adaptive Management

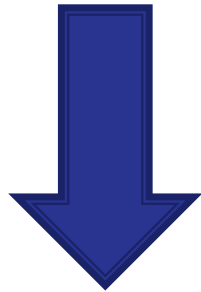
Departure from Assumed Conditions

≠ Significant Adverse Effect

But does raise the level of uncertainty

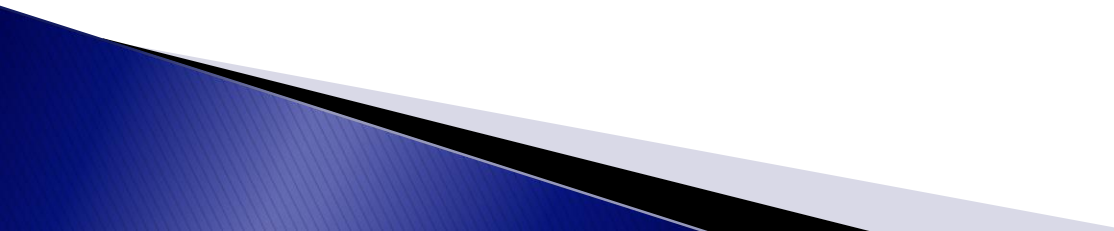
Departure from Assumed Conditions

- ▶ Detect and monitor change
- ▶ Assess its significance
- ▶ Manage or mitigate the changes



Adaptive Management Strategy

Adaptive Management

- ▶ Prevents an unexpected change from becoming a significant adverse effect
 - ▶ Allows for continual improvement
 - ▶ Popular element of EA process
 - ▶ Required element of Licensing process
- 

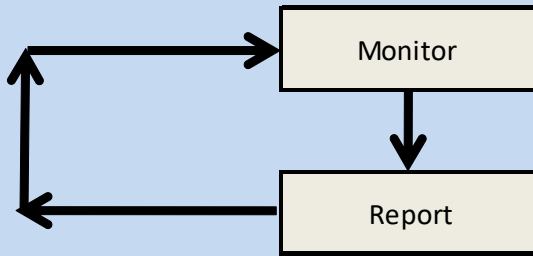
WLWB Observed Two Extremes in Adaptive Management Approaches

- ▶ too fuzzy and general
 - learning by doing – *“we’ll figure it out if it occurs”*
- ▶ too prescriptive
 - Develop a response to all possible eventualities

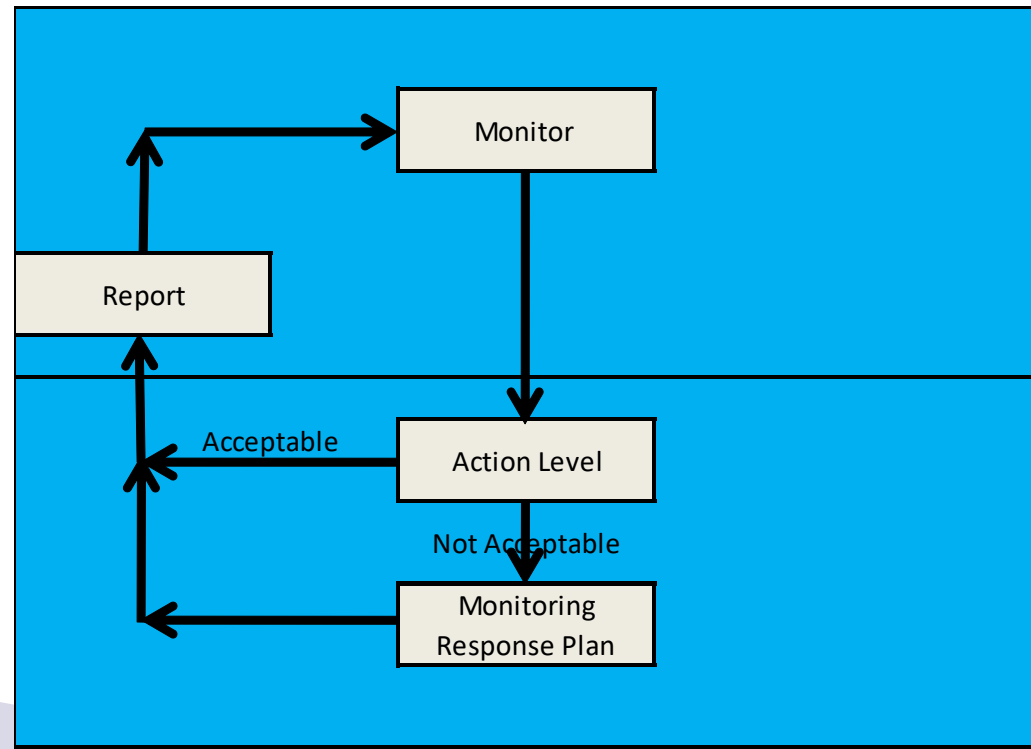
The Response Framework

- ▶ Two elements
 - Action Levels
 - Monitoring Response Plan
- ▶ A process

The Response Framework starts with a comparison to an “Action Level”



Action Level (predetermined)
triggers
Monitoring Response Plan
(adaptive)



Action Level

- ▶ Action Level 1 Predetermined in Licence Process
 - Prevents delay in response
 - automatically triggers Response Plan
 - Prevents debate on significance and need to respond

Action Level

- ▶ Set for monitored parameters
 - Measurable indicator of change
 - All measured ecological parameters relating to VECs used for the EA (not just the VECS)
 - All Contaminants of Potential Concern (COPC) identified in Regulatory Process and managed via Effluent Quality Criteria
 - Any departures from predictions

Set Action levels sufficient to maintain below significance threshold(s)

Set Significance threshold(s)
to protect VEC

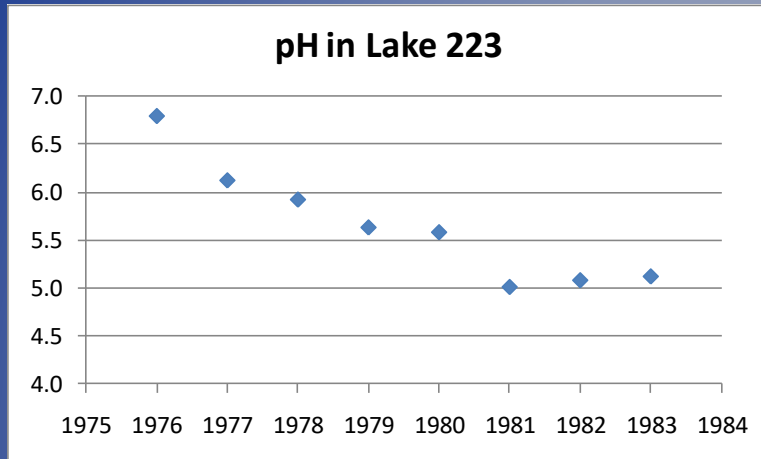
Lake trout – Fisheries Act

- Commercial fishery
- Sport fishery
- Aboriginal fishery



Experimental Acidification of ELA Lake 223
Schindler et al., Science 1985

Significance Thresholds and Action Levels



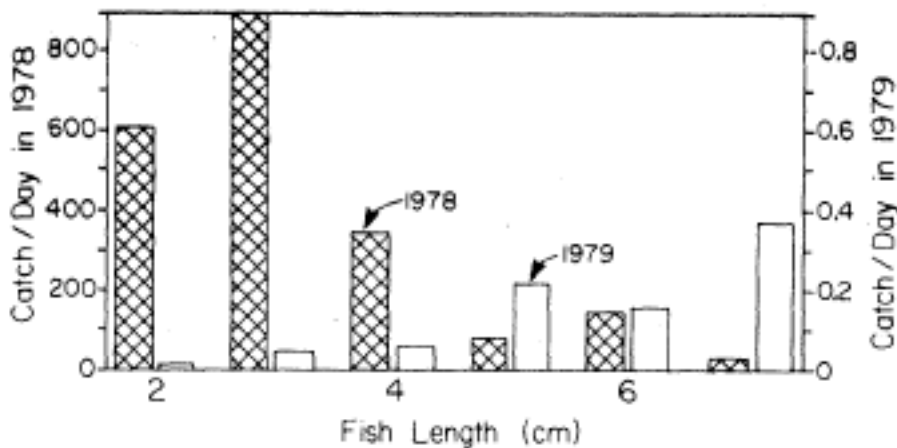
Significance Threshold Reached in 1981–82 (pH 5.0)

–Loss of recruitment – 1981

–Loss of Condition factor – 1982



I Fathead Minnow Size Structure



Forage Base / Early Indicator

Fathead Minnow – “non VEC”

–Loss of recruitment in 1979 (pH 5.6)

– extirpation in 1980 (pH 5.6)

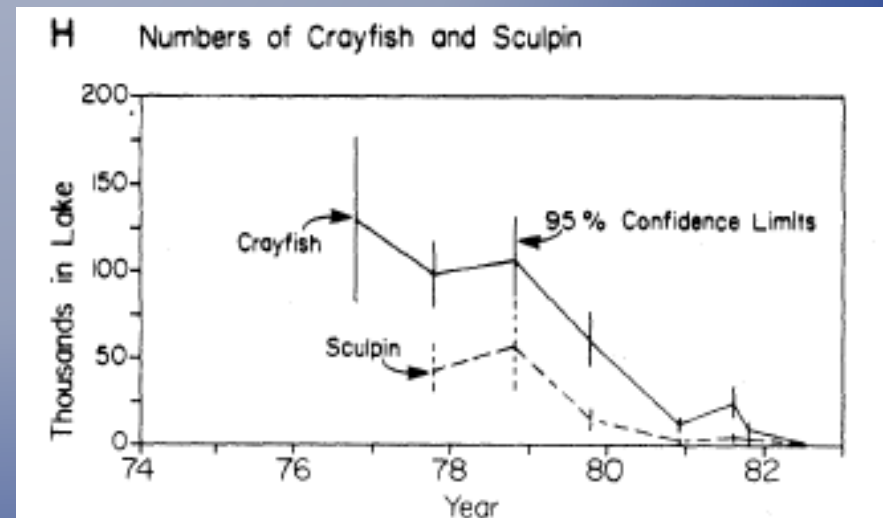
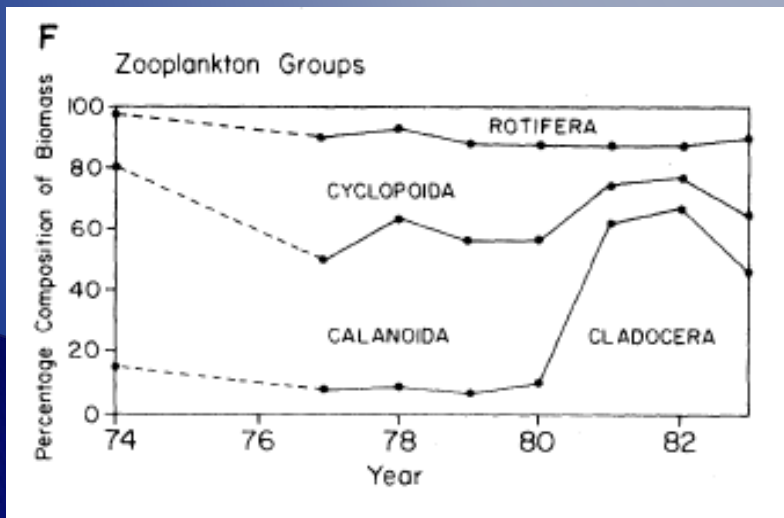
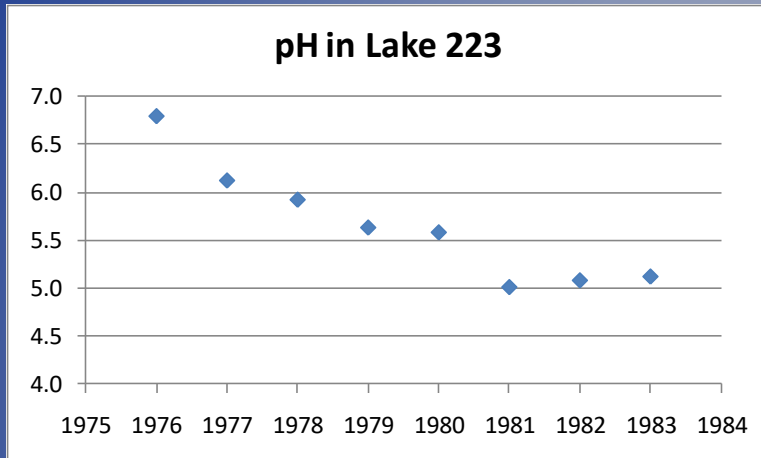
Significance Thresholds and Action Levels

Non VEC indicators lost early
No prior warning of trouble for VEC (lake trout)

LESSONS

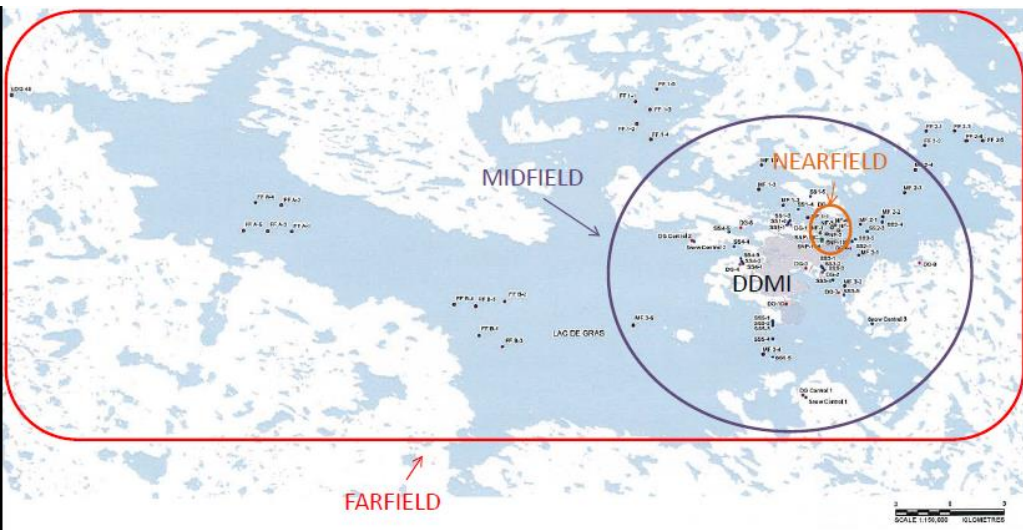
Action Levels need to include non VEC indicators in order to protect VECS

Action Levels need to respond to rapid changes



Action Level

- ▶ Recommend three action levels as minimum
 - Need only set one to start
- ▶ Complex environments may need more to accommodate
 - Magnitude of change
 - Spatial extent of change
 - Rapid changes

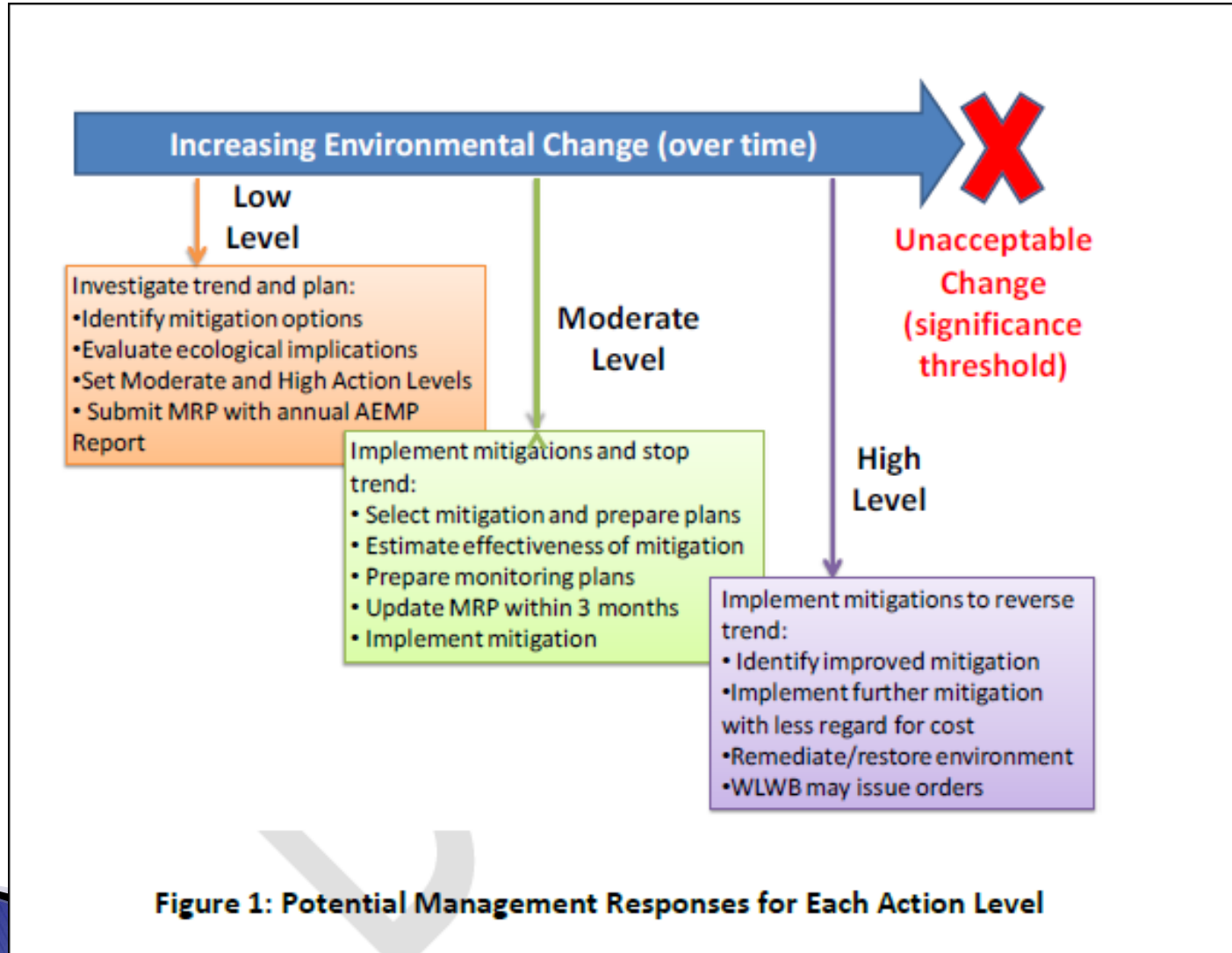


Effect level	Magnitude of Effect	Extent of Effect	Evidence	Action/Notes
1	statistical difference	Near-field	Strong	Early warning.
2	Greater than: normal range	Beyond Near-field	Strong	Establish Effects Benchmark if EA benchmark does not exist for measurement end-point that is beyond normal range.
3	Greater than: normal range and 50% of benchmark	Beyond Near-field	Strong	Confirm site-specific relevance of existing EA benchmark. Establish Effects Benchmark if necessary.
4	Greater than: normal range and "Effects Benchmark minus 20%"	Near-field	Strong	Investigate mitigation options. Define a Critical Effect Threshold if it does not exist.
5	Between: Effects Benchmark and "Effects Benchmark plus 20%"	Near-field	Strong	Re-assess Effluent Quality Criteria (EQC). Implement mitigation required to meet new EQC if applicable.
6	Between: Effects Benchmark and "Effects Benchmark plus 20%"	Mid-field	Low	Re-assess EQC. Implement mitigation required to meet new EQC if applicable.
7	Greater than: "Effects Benchmark plus 20%"	Near-field	Low	Re-assess EQC. Implement mitigation required to meet new EQC if applicable.
8	Greater than: "Effects Benchmark plus 20%"	Mid-field	Low	Re-assess EQC. Implement mitigation required to meet new EQC if applicable.
9	Between: Effects Benchmark and "Effects Benchmark plus 20%"	Far-field	Low	Re-assess EQC. Implement mitigation required to meet new EQC if applicable.
10	Greater than: "Effects Benchmark plus 20%"	Far-field	Low	Critical Effect Threshold

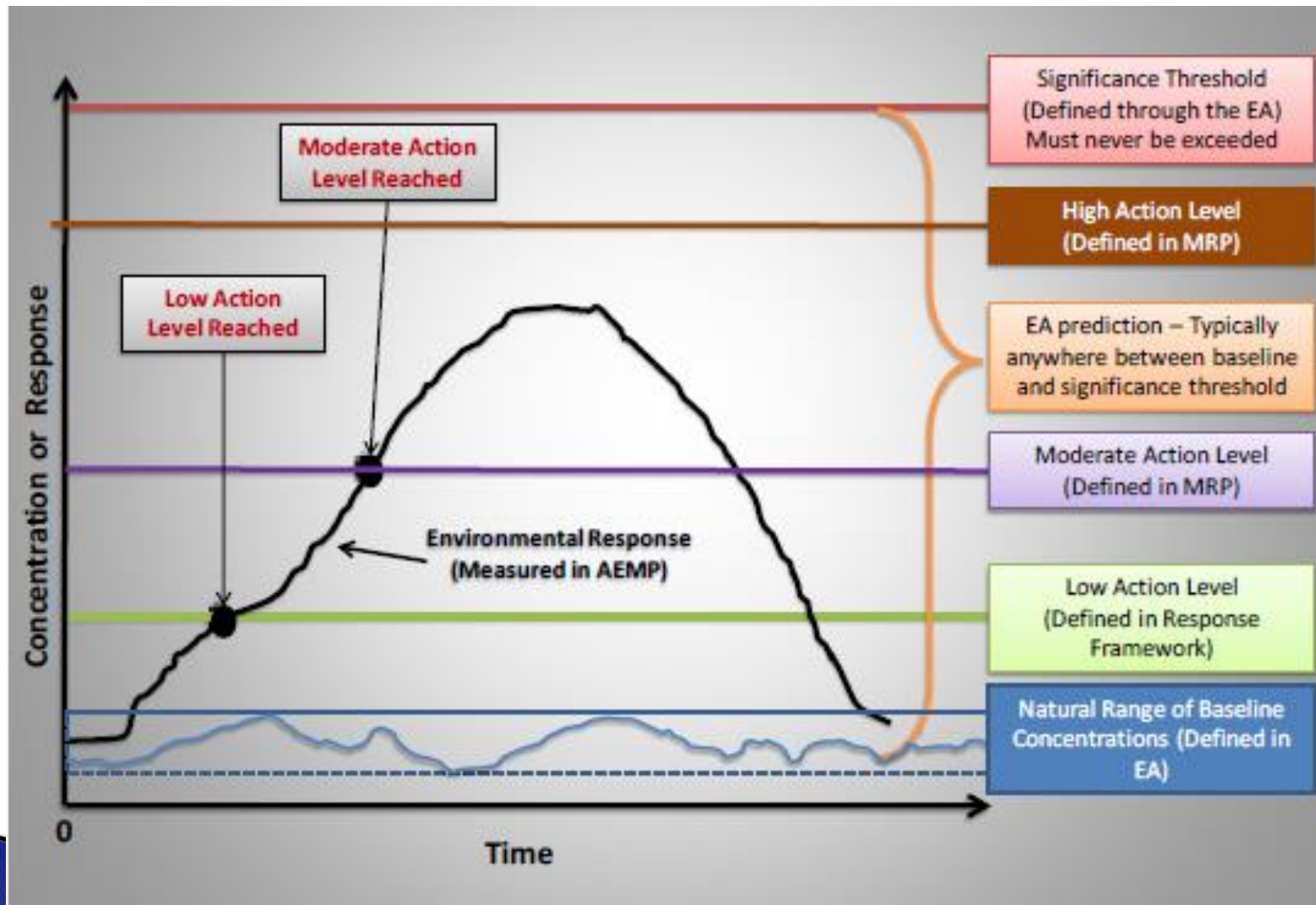
Monitoring Response Plans

- Intensity increases from one Action Level to the next
- Allows staged response in proportion to degree of change
 - Enhanced monitoring
 - Causation studies
 - Mitigation
 - Source reduction
 - Enhanced treatment (revised EQC)

Action Levels and Response Plans



Process of the Response Framework



The Response Framework

- ▶ Pre-planned response to unexpected changes
 - How to respond – regulated
 - Not how to correct it – operator determines
- ▶ Add structure and rigour to monitoring program
- ▶ Is not an emergency response plan
 - is pre-planned
- ▶ Iterative and progressive
 - scaled to extent of environmental change
- ▶ Provides opportunity for review and comment by all Parties
 - NWT/Nunavut process very inclusive and less adversarial

The Response Framework

- ▶ Required element of major projects in NWT
- ▶ Increasingly being added to major projects in Nunavut
- ▶ We would all benefit from better and measurable definitions of significant adverse effect
 - Response framework provides early intervention – short of SAE
 - Need to incorporate non VECS into response framework to avoid impacts to VECS