

Ontario's Provincial Fish Strategy: *Fish for the Future*

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#AFSOC14

Outline

- **Fisheries Strategic Planning: A Short History**
 - S.C.O.L
 - S.P.O.F.
 - S.P.O.F. II
- **Draft 2014 Provincial Fish Strategy: Overview**
 - Management Approaches
 - Goal, Objectives and Tactics
 - Implementation Plans
- **How You Can Participate**
- **A Few Words About Parallel Universes**

S.C.O.L. (1972)

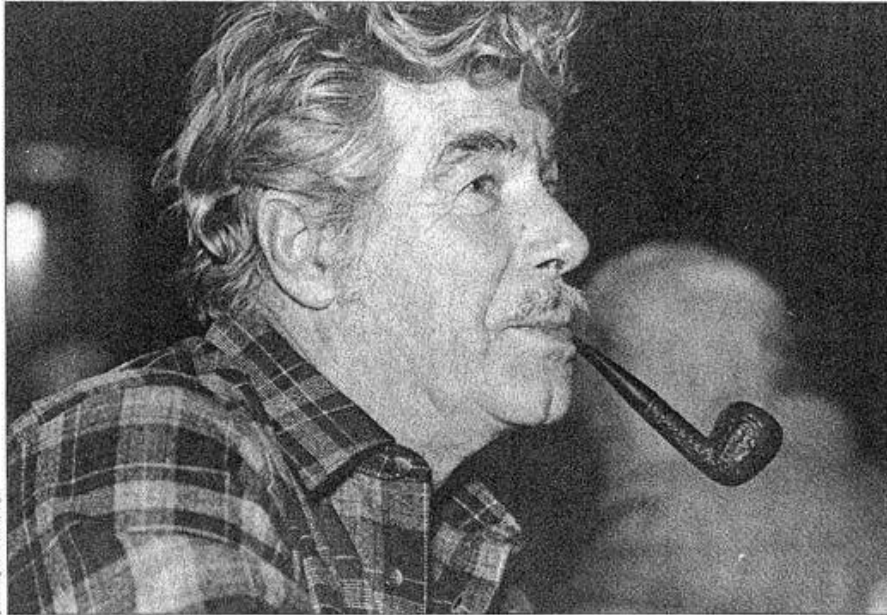


photo by Wm. Lanning

OMNR Photo

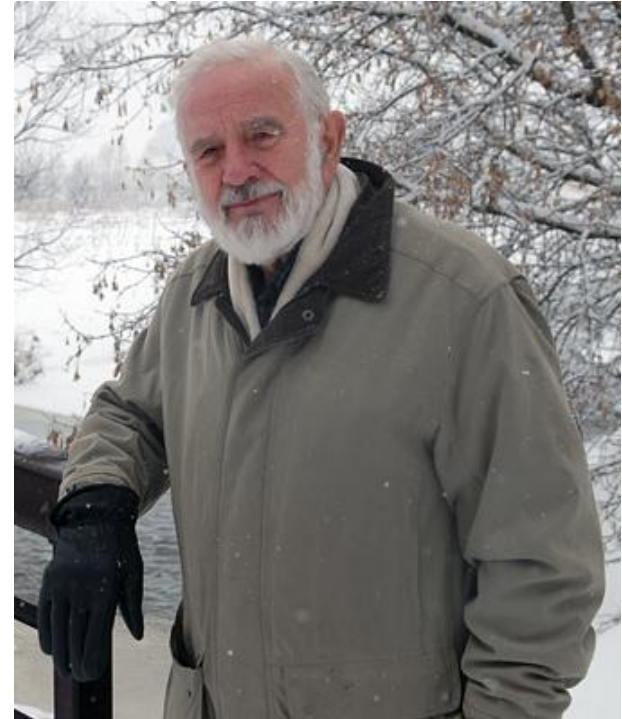


Photo credit: Stephen Bocking, Trent University

Loftus, K. H., & Regier, H. A. (1972). Introduction to the proceedings of the 1971 symposium on salmonid communities in oligotrophic lakes. *J. Fish. Res. Board Can.*, 29(6), 613-616.

S.C.O.L. (1972)

- Lakes can be **treated as sets** (e.g. fish communities), That respond to stresses in similar ways;
- Long term **monitoring data** series can give insight into ecological processes;
- Impacts of **stresses may take decades** to emerge (i.e. time lags); and
- Empirical **data should complement a modelling** approach (not all lakes can be monitored).



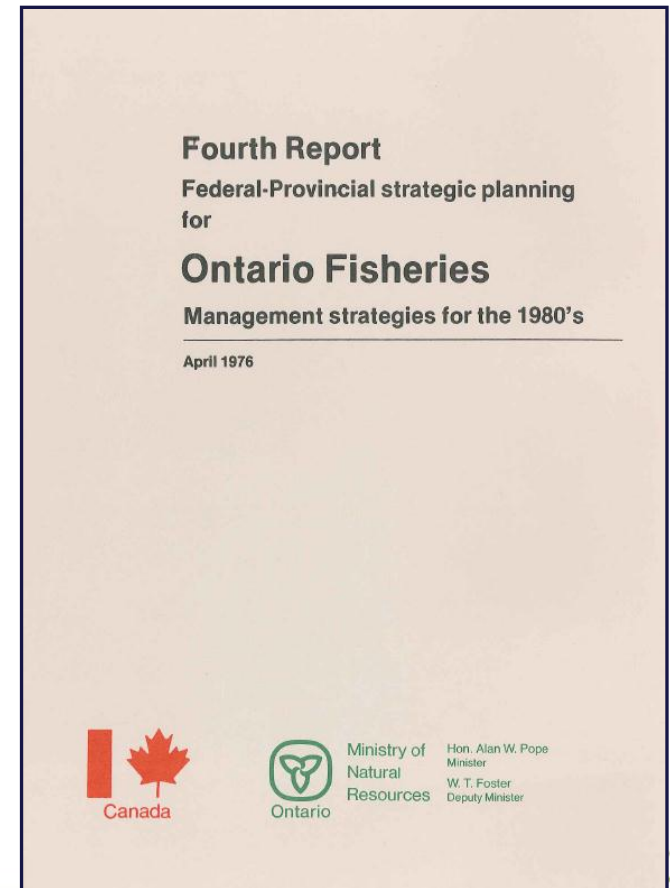
OMNR Photos

S.P.O.F. (1976)

Management Strategies for the 1980's

Initiated by Federal-Provincial Ontario Fisheries Committee:

- Gov't Working Group;
- Response to declining fish stocks as revealed by SCOL (over-fishing, introductions, eutrophication, habitat loss).



See also:

- 5 Loftus, K. H., Johnson, M. G., & Regier, H. A. (1978). Federal-provincial strategic planning for Ontario fisheries: management strategy for the 1980s. *J. Fish. Res. Board Can.*, 35(6), 916-927.

S.P.O.F. (1976)

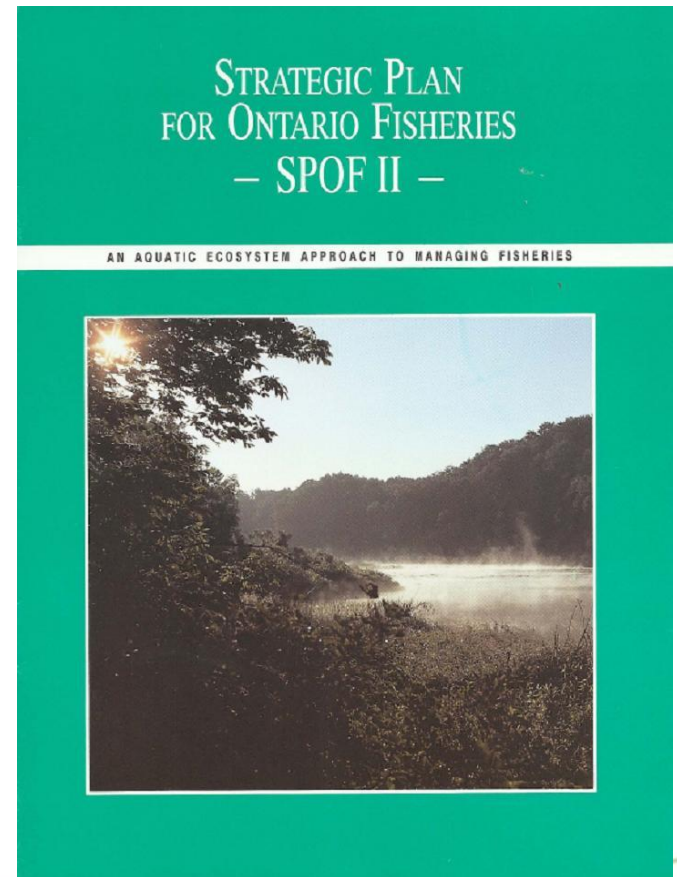
- More engaged public (e.g. CFIP). Policy & Program Direction
- Improved hatchery system.
- Resident Sport Fishing Licence.
- Catch quotas for commercial fishing.
- District Fisheries Management Plans (DFMPs).
- Establishment of Fisheries Assessment Units (FAUs).
- Experimental management approach.
- Initial OFIS development. Science Direction

S.P.O.F. II (1992)

An Aquatic Ecosystem Approach to Managing Fisheries

Ontario Gov't update of SPOF:

- Increased concern about ecosystem health;
- Included Stakeholder input.
- Incorporated concept of Sustainable Development - Brundtland Commission (1987).



S.P.O.F. II (1992)*

- Stocking Policy/Guidelines. Policy & Program Direction
 - Bait Policy Review.
 - Planning Reform (PPS - Fish Habitat Policy).
 - Watershed-based Planning.
- Expansion of FAU concept to network of aquatic ecosystems (proposed).
 - Research into watershed capacity modelling.
 - Collected more socio-economic data from Recreational Fishing Survey. Science Direction

Provincial Fish Strategy (2014)

Fish for the Future

MNR update/revision of SPOF II:

- Addresses Biodiversity, Climate Change, Aboriginal & Treaty Rights;
- Will include Stakeholder, Public & Aboriginal engagement.

Ontario's Provincial Fish Strategy:
Fish for the Future

Draft for Public Comment – January 2014

 Ontario



Federal and Provincial Natural Resource Legislation

Acts and Regulations

“The Legal Authority”

MNR Strategic Direction

Our Sustainable Future

“Long-term Strategic Directions and Current Priorities of the Ministry of Natural Resources”

Ontario's Provincial Fish Strategy

Goals, Objectives and Tactics

“Linking Strategic Direction & Fisheries Management”

Policy

Development & Review

Guiding Decisions that Impact
Fish, Fish Communities &
Supporting Ecosystems

Management

Planning & Activities

Guiding Planning & Management
Actions at Regional, Zone,
Watershed and Local Scales

Enforcement

Priority Setting

Providing Fisheries Input to
Compliance and Enforcement
Priority Framework

Science

Priority Setting

Ensuring Research & Science
Activities Continue to Support
Fisheries Priorities

Purposes of the Strategy

Two Main Purposes:

- To improve the conservation and management of fisheries and the ecosystems on which fish communities depend; and
- To encourage fishing as an activity that contributes to the individual well-being and the social, cultural and economic well-being of communities in Ontario.



Vision and Mission

Vision:

Healthy ecosystems supporting native self-sustaining fish communities, and fisheries that provide long-term ecological, social, economic, cultural and health benefits for the people of Ontario.

Mission:

MNR will provide leadership in the management of Ontario's fisheries, and the protection, restoration, and recovery of fish communities and their supporting ecosystems.

Target Audience and Scope

Policy document to guide Ontario government staff, key partners & stakeholders.

Scope:

- Existing and potential freshwater fisheries of the Great Lakes, inland lakes, rivers and streams of Ontario;
- Range of fisheries including Aboriginal subsistence, recreational, and commercial fisheries; and
- Fisheries for naturally recruited wild fish stocks to those based on naturalized populations.



Photo credit: Lloyd Mohr

Photo credit: Warren Dunlop

Three Management Approaches

- Based on current scientific approaches.
- Requires on-going Research and Monitoring to implement.

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A Broad-Scale Approach to Management of Ontario's Recreational Fisheries

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Abstract—Sustainable exploitation of Ontario's aquatic resources calls for a new management approach. This vast resource includes more than 250,000 lakes and offers angling opportunities for many popular species (e.g., walleye *Sander vitreus* [formerly *Stizostedion vitreum*], lake trout *Salvelinus namaycush*, brook trout *S. fontinalis*, northern pike *Esox lucius*, smallmouth bass *Micropterus dolomieu*, largemouth bass *M. salmoides*, and muskellunge *E. masquinongy*). In pioneer days, the "apparently inexhaustible abundance of resources" fostered an open-access policy promoting the recreational use of these resources for the benefit of the economy. After World War II, there was a rapid increase in angling effort and by the 1970s many lakes were being overexploited. Clearly, an unregulated, open-access policy was no longer appropriate. The result has been a rapid proliferation of fishing regulations as exceptions to divisionwide regulations that were created to protect lakes where problems were detected. The growing complexity of these regulations is the result of a management approach that has focused on individual lakes. This complexity is not popular with the angling public, and evaluation of its benefits has proven difficult because a change in regulations on one lake may affect fishing effort on other lakes. We argue that a larger spatial and temporal scale of management is needed when a resource is widely dispersed across a large population of lakes. This new approach should incorporate (1) consistent on biologically achievable objectives, (2) periodic, unbiased assessment of the state of the resource, (3) periodic evaluation to decide whether current management practices are meeting objectives, and (4) adaptive management in choosing among alternative management actions. Recent progress towards establishing this management approach in Ontario is discussed.

"Blessed with four Great Lakes, more than 250,000 inland lakes, and countless rivers and streams, Ontario offers more fishing opportunities than any other province or state in North America" (OMNR 2000). Ontario offers diverse angling opportunities for many popular species, including

walleye *Sander vitreus* (formerly *Stizostedion vitreum*), lake trout *Salvelinus namaycush*, northern pike *Esox lucius*, smallmouth bass *Micropterus dolomieu*, largemouth bass *M. salmoides*, muskellunge *E. masquinongy*, and brook trout *S. fontinalis* (Figure 1). In northern areas of the province, local economies are heavily reliant on natural resources and angler-based tourism is an important component. Here, most lakes have not been subjected to heavy fishing pressure and other anthropogenic

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Article Carl J. Walters

Is Adaptive Management Helping to Solve Fisheries Problems?

Adaptive management has been widely recommended as a way to deal with extreme uncertainty in natural resource and environmental decision making. The core concept in adaptive management is that policy choices should be treated as deliberate, large-scale experiments; hence, policy choice should be treated at least partly as a problem of scientific experimental design. There have now been upwards of 100 case studies where attempts were made to apply adaptive management to issues ranging from restoration of endangered desert fish species to protection of the Great Barrier Reef. Most of these cases have been failures in the sense that no experimental management program was ever implemented, and there have been serious problems with monitoring programs in the handful of cases where an experimental plan was implemented. Most of the failures can be traced to three main institutional problems: (1) lack of management resources for the expanded monitoring needed to carry out large-scale experiments; (2) unwillingness by decision makers to admit and embrace uncertainty in making policy choices; and (3) lack of leadership in the form of individuals willing to do all the hard work needed to plan and implement new and complex management programs.

INTRODUCTION

It has now been three decades since the concept of adaptive management was first proposed as an approach to dealing with extreme uncertainty about the impacts of various policy choices in renewable resource management (1-3). The concept arose from frustration in attempts to use computer modeling to integrate scientific knowledge so as to make useful predictions for decision makers. In many modeling case studies, we kept finding gaps in knowledge about various ecological processes that the modeling indicated to be important, and no indication of progress in dealing with those troublesome processes because they are ones that unfold at space-time scales which are inconvenient or costly for scientists to study (a notorious example is recruitment of new individuals to harvested fish populations, a complex process that typically takes place over spatial scales of thousands of kilometers and time scales of years). We concluded from such cases that integrative models cannot be reliably developed to compare policy choices, then the only way to learn about those choices is through direct comparisons of their performance in the field, i.e., through planned experimental comparisons. As this concept of management as experimentation was further developed, we used optimization methods from the theory of optimal control to help determine when it might be worthwhile to invest management resources in potentially costly experiments rather than relying upon initial guesswork and subsequent monitoring to uncover good policies (4).

Early case studies taught us to use two main arguments to justify adaptive management experiments, which we called "probing for untapped opportunity" and "coping with counterfactual dynamic responses." Experimental policy tests are a

way to probe the dynamic responses of a system, but more particularly such tests are justified only if the experimental policy represents a possible opportunity to improve management and if historical data are inadequate to show whether the policy has already been tried (inadvertently or deliberately). Counterfactual responses arise when scientists or managers attempt to base predictions on simple common sense arguments (like "reducing mortality rate of the fish should cause their abundance to increase"), when in fact the complexity of ecological systems implies that responses may depend on indirect and multiple causal pathways, including pathways that are easily overlooked even when prediction is approached with formal systems modeling techniques.

The idea of an adaptive approach to management continues to have wide intuitive appeal, so that it is now routine to see claims and even legislative requirements (for example, California's Marine Life Protection Act), that it will be used on cases ranging from restoration of endangered species to management of large marine ecosystems. In many cases the claim is simply that the results of initial policy choices will be monitored so as to identify need for corrective action (so-called "passive" adaptive management), but there have also been many cases where our original approach of using computer modeling to identify critical uncertainties and to aid in design of diagnostic management experiments has been followed.

Unfortunately, the practice of adaptive management has been radically less successful than one would expect from its intuitive appeal. A decade ago, I looked back at some 30 case studies where we had worked with interdisciplinary, multi-institution teams to develop adaptive management proposals. I could find evidence of field implementation of experimental policies in only four or five of those cases (5). In a few cases, even the initial modeling step failed to identify key uncertainties, but for most of the failures there was clear identification of needed diagnostic management experiments but recommendations to do these experiments were simply not followed. In (5), I suggested a variety of reasons for such failures, many related to problems with institutional incentive systems. Far more elaborate and elegant analyses have subsequently supported this finding and have suggested a variety of approaches to design of more effective institutions for management (6-10).

With more experience, it is now becoming clear that there are three main reasons for widespread implementation difficulties in adaptive management programs: (i) failure of decision makers to understand why they are needed, (ii) lack of leadership for the complex process of implementing an adaptive approach, and (iii) inadequate funding for the increased ecological (and often economic) monitoring needed to successfully compare the outcomes of alternative policies. This paper discusses each of these reasons and suggests what we might do to overcome them.

Failure to Comprehend the Need for Management Experiments

Proposals for management experiments are often greeted by decision making groups (such as fisheries management councils and stakeholders with strong political influence) with black

A fisheries risk-assessment framework to evaluate trade-offs among management options in the presence of time-varying productivity

Jeremy S. Collier, Randall M. Peterman, and Brett M. Zuehlke

Abstract: Empirically based simulation models can help fisheries managers make difficult decisions involving trade-offs between harvests and maintaining spawner abundance, especially when data contain uncertainties. We developed such a general risk-assessment framework and applied it to chum salmon (*Oncorhynchus tshawytscha*) stocks in the Arctic-Yukon-Kuskokwim region of Alaska, USA. These stocks experienced low abundance in the 1990s, which led to declarations of economic disaster and calls for changes in harvest strategy. Our stochastic model provides decision makers with quantitative information about trade-offs among commercial harvest, subsistence harvest, and spawner abundance. The model included outcome uncertainty (the difference between target and realized spawner abundance) in the subsistence and commercial catch models. We also used closed-loop simulations to investigate the utility of time-varying management policies in which target spawner abundance changed in response to changes in the Ricker productivity parameter (λ), as estimated with a Kalman filter. Time-varying policies resulted in higher escapements and catches and reduced risk across a range of harvest rates. The resulting generic risk-assessment framework can be used to evaluate harvest guidelines for most salmon stocks.

Résumé: Les modèles de simulation à base empirique peuvent aider les gestionnaires de la pêche à arriver à des décisions difficiles qui impliquent des compromis entre les récoltes et la préservation de l'abondance des reproducteurs, particulièrement lorsque les données contiennent des incertitudes. Nous mettons au point un tel cadre général d'évaluation des risques et l'appliquons aux stocks de saumons kéta (*Oncorhynchus tshawytscha*) dans la région Arctique-Yukon-Kuskokwim de l'Alaska, E.-C. Ces stocks ont connu des abondances faibles durant les années 1990, ce qui a entraîné des déclarations de désastre économique et des appels à des changements dans les stratégies de récolte. Notre modèle stochastique fournit aux gestionnaires des outils de décision avec des informations quantitatives sur les compromis entre la récolte commerciale, la récolte de subsistance et l'abondance des reproducteurs. Le modèle inclut l'incertitude du résultat (la différence entre les abondances de reproducteurs cibles et réelles) dans les modèles de capture de subsistance et de capture commerciale. Nous avons aussi utilisé des simulations en boucle fermée afin d'examiner l'utilité de politiques de gestion qui varient dans le temps dans lesquelles les cibles d'abondance des reproducteurs changent en réaction à des variations dans le paramètre de productivité de Ricker (λ), tel qu'estimé avec un filtre de Kalman. Des politiques qui varient dans le temps produisent des échappements et des captures plus élevés et réduisent le risque sur une gamme étendue de taux de captures. Le cadre générique d'estimation des risques qui se résout peut servir à évaluer les directives de capture pour la plupart des stocks de saumons.

[Traduit par la Rédaction]

Introduction

Managers of most North Pacific salmon (*Oncorhynchus* spp.) populations have two management objectives: one related to achieving desired harvests and one related to desired spawner abundances (escapements). The two objectives are directly linked by the salmon life history. Theoretically, long-term maximum sustainable yield (MSY) is achieved by annually obtaining the escapement target or goal, S_{target} , that produces that yield and harvesting all fish above that target (Hilborn and Walters 1992). However, three factors make sal-

mon management difficult in practice. First, salmon data are imperfect because of observation or measurement errors in both spawner abundance and stock identification of mixed-stock catches. Such errors make it difficult to reliably estimate S_{target} for a given population (Walters and Ludwig 1981). A second management challenge is created by harvesting. Even if the true S_{target} was known for a population, it usually cannot be obtained exactly because of (i) incomplete management control over the harvesting process (i.e., implementation error (Eggers and Rogers 1987) or outcome uncertainty (Holt and Hilborn 1992)), (ii) trade-offs between escapement and

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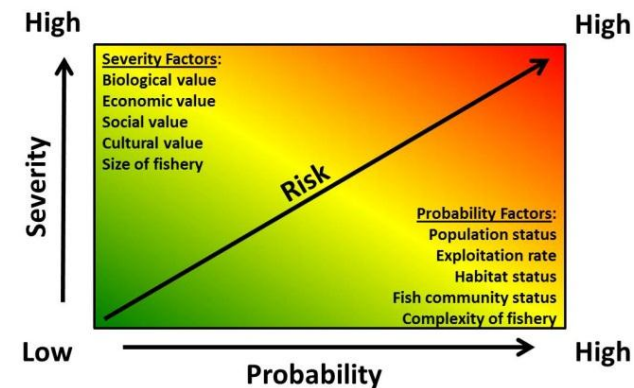
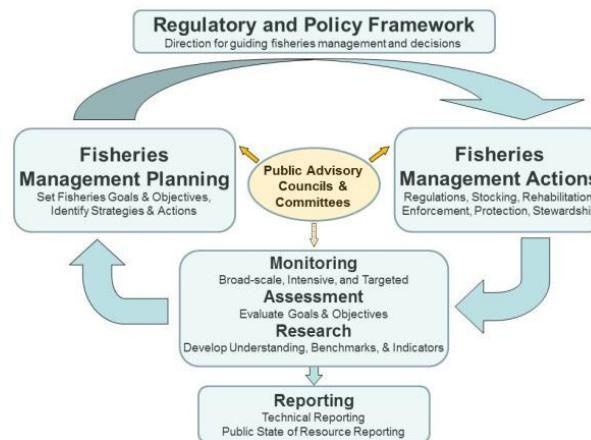
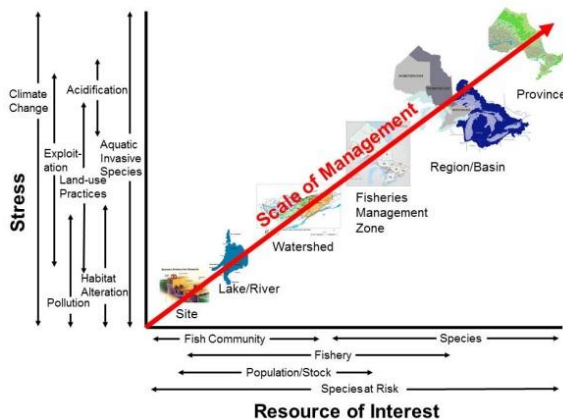
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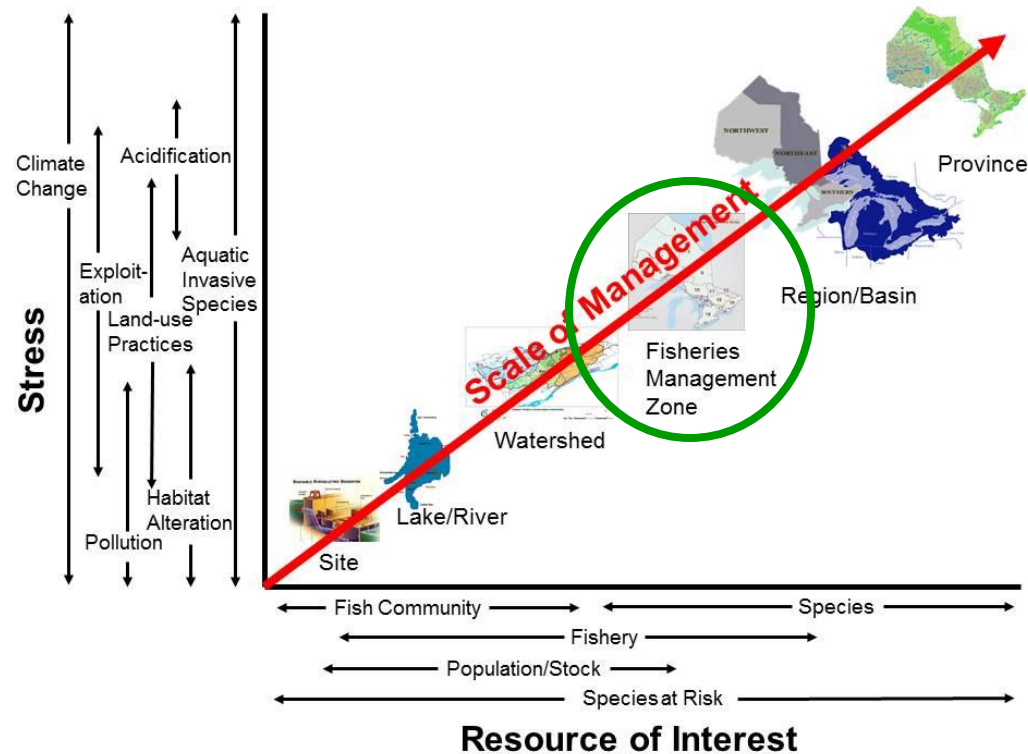
Three Management Approaches

- Landscape Approach
- Adaptive Management
- Recognizing Risk and Uncertainty



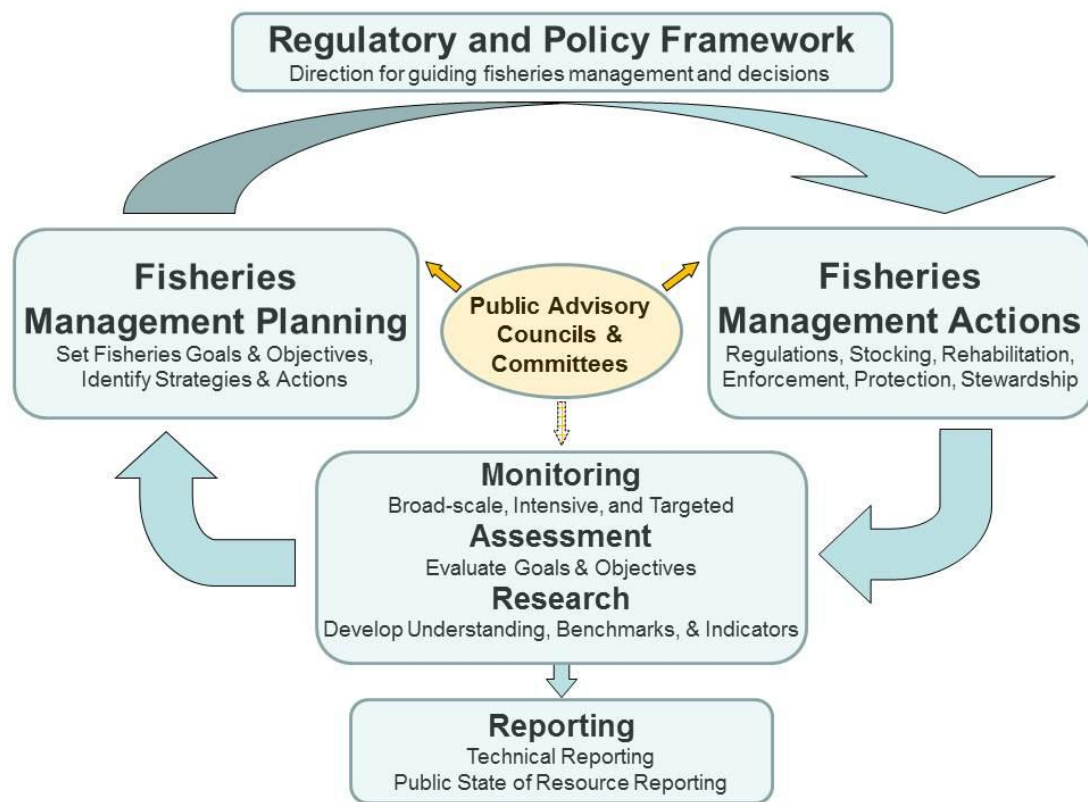
Landscape Approach

- **Fisheries Management Zones (FMZ):** primary unit for recreational fisheries management;
- Recognize that **other space (and time) scales** still play a role; and
- Defining the appropriate scale is based on **stressors, resource of interest, and level of risk.**



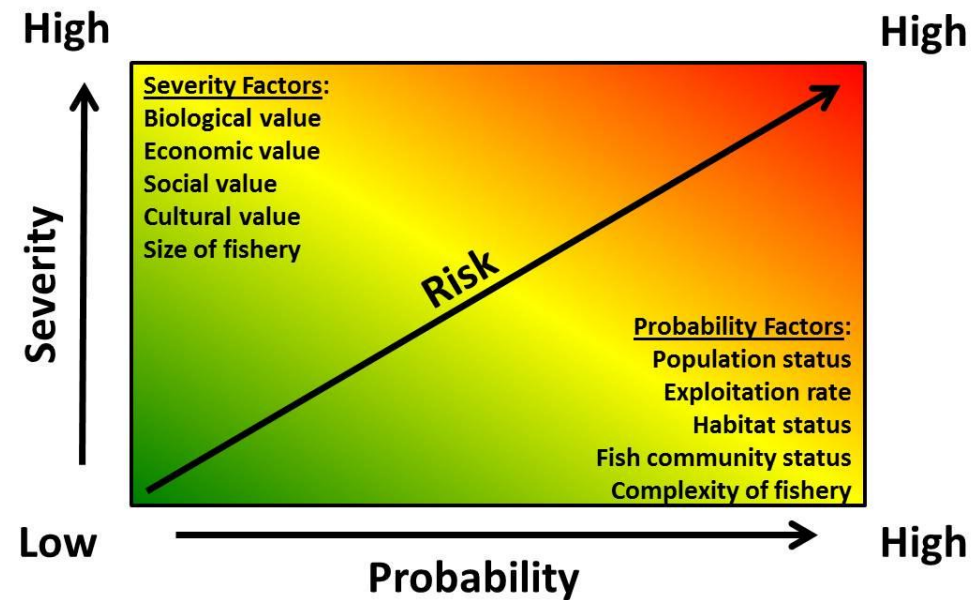
Adaptive Management

- ‘Learning through doing’, continuous commitment to improvement;
- Linkages across program areas;
- Clearly defined role for input; and
- Clear accountabilities.



Recognizing Risk and Uncertainty

- Risk and uncertainty inherent in natural systems;
- ‘Risk’ is a combination of **probability** and **severity of occurrence**;
- Informed by science, expert and traditional knowledge; and
- Need to develop priorities based on risk, and manage to reduce risk where possible.

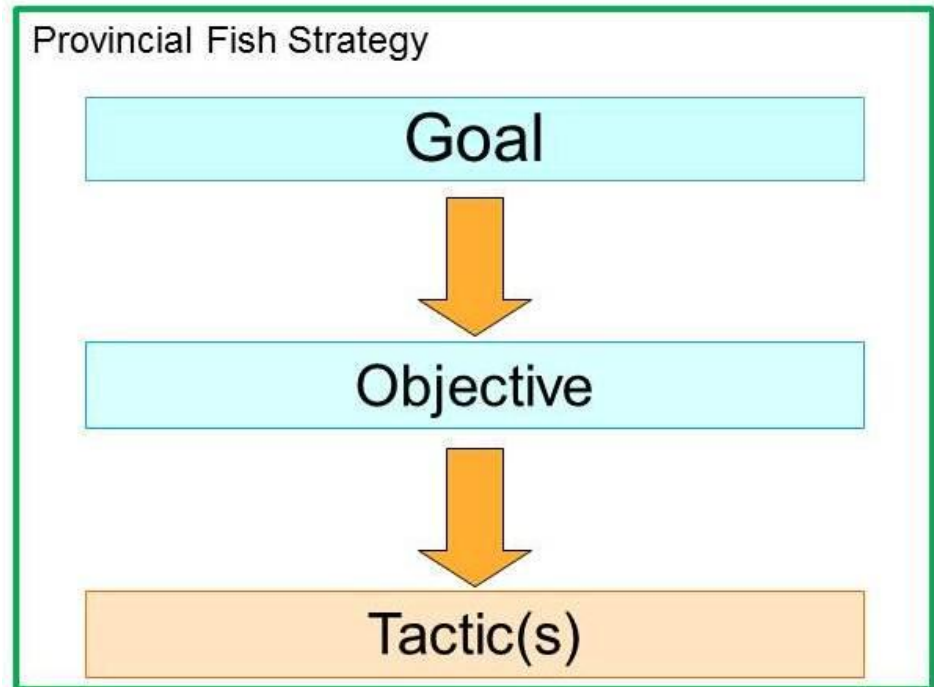


Goals, Objectives, and Tactics

Long-term **Goals** reflect ideal future conditions;

Objectives are shorter term and represent categories of activity; and

Tactics are detailed actions that government can focus on to contribute to achieving the Goals and Objectives.



Five Goals

1. **Healthy ecosystems** that support self-sustaining native fish communities
2. **Sustainable fisheries** that provide benefits for Ontarians
3. A fisheries management **program** that is **effective and efficient**
4. **Science and information** to inform fisheries policy and management decisions
5. **Informed and engaged** stakeholders, partners, Aboriginal communities and members of the public

Goal 4: Science and information to inform fisheries policy and management decisions

- **Objective 4.1: Monitor** at the appropriate spatial and temporal scale
- **Objective 4.2: Develop and use** applied fisheries and aquatic sciences and social **science**.
- **Objective 4.3:** A coordinated and standardized approach to **information management**

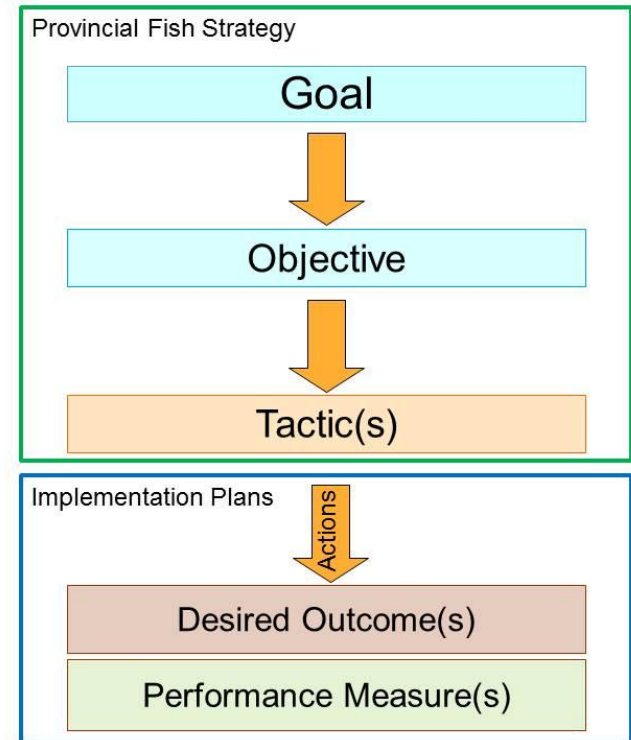
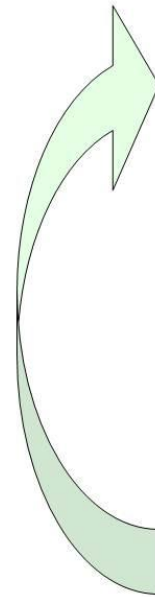
Tactics: Fifteen tactics related to these three objectives

Implementation Plans:

Actions, Desired Outcomes, and Performance Measures

- Tactics provide basis for developing **Implementation Plans** where specific **Actions** and **Desired Outcomes** identified;
- Progress will be measured by using **Performance Measures** against which we can measure Desired Outcomes; and
- **Monitoring and Evaluation** will determine how well we are doing and will provide useful information for reviewing Goals & Objectives.

Monitoring & Evaluation



How You Can Participate

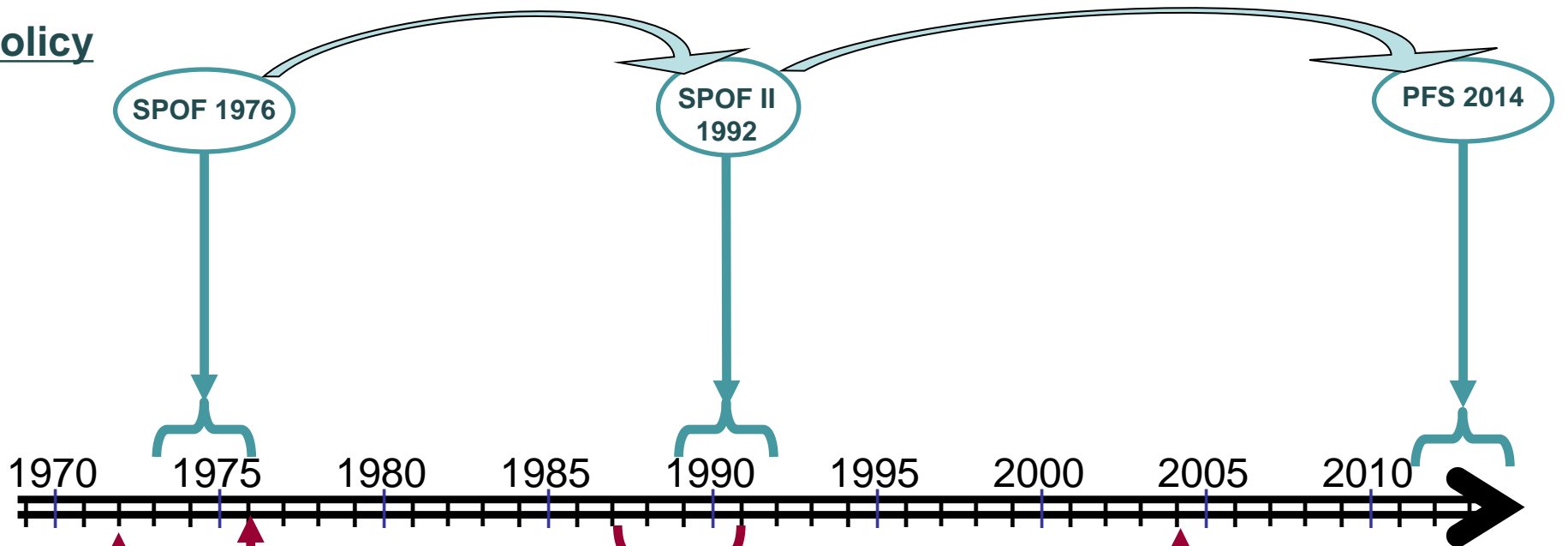
- Draft **Strategy** is posted on Environmental Registry (Registry #: 012-0291) for comment:
Jan 21st - May 21st, 2014
www.ontario.ca/environmentalregistry
- Ontario Public Service (OPS) staff should submit comments directly to Fisheries Policy Section:
fishpolicy@ontario.ca

A Few Words About Parallel Universes

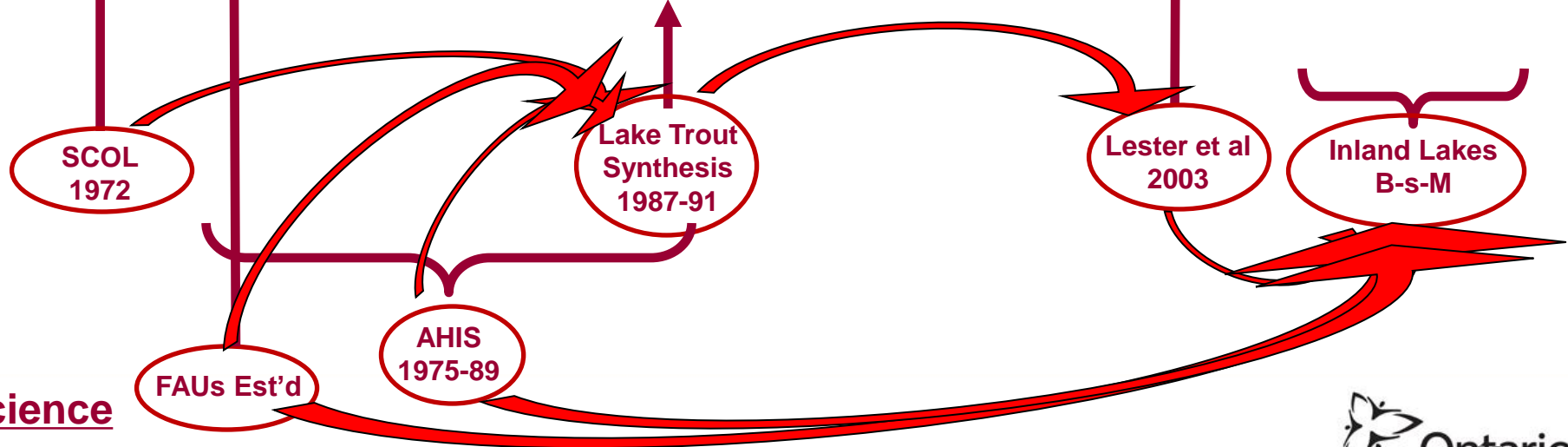


Policy & Science: Parallel Universes?

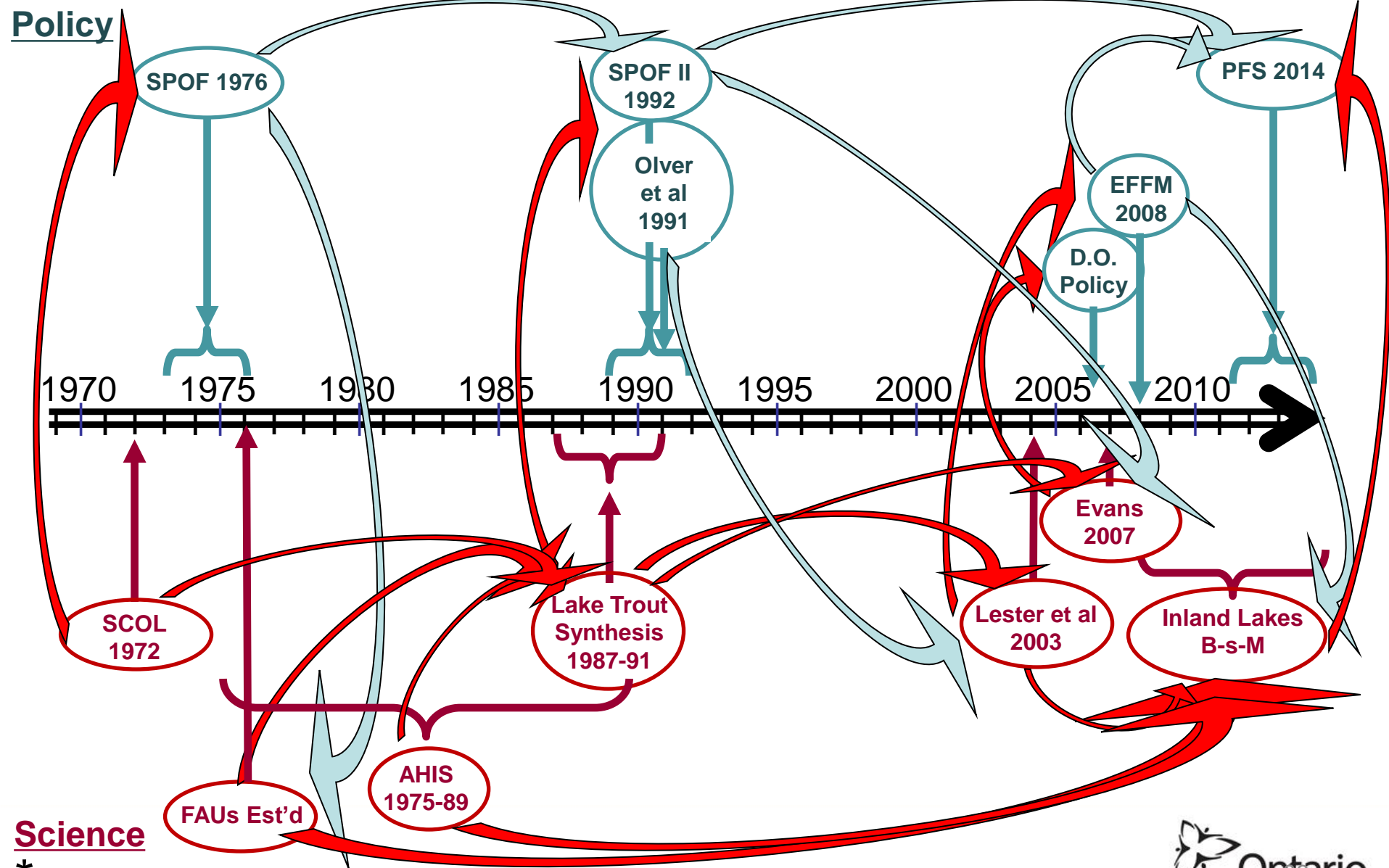
Policy



Science



'Eddies in the space-time continuum'*



* With apologies to Douglas Adams

Summary

- Ontario has a long history of Strategic Fisheries Planning (SPOF, SPOF II), informed by Science (e.g. SCOL);
- Much has changed since SPOF II was released in 1992;
- In response, MNR has drafted new Provincial Fish Strategy;
- Incorporates recent science-based understanding of successful resource management approaches; and
- Provides direction for Science (Research and Monitoring).

You have an opportunity to influence the final *Strategy*.

Acknowledgements

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- Many **OMNR staff** across the province (incl. some **retirees!**);
- Partner **Agencies, Stakeholders, First Nation and Métis** groups for past and future insight and input.

Questions?

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