



Fisheries Pêches  
and Oceans et Océans



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**GUIDE TO THE BRITISH COLUMBIA  
INTRODUCTIONS AND TRANSFERS COMMITTEE  
REVIEW PROCESS**

October, 2002

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# Table of Contents

Acknowledgements.....	3
Introduction .....	4
Scope of the Committee.....	4
Purpose.....	4
Structure .....	5
Governance .....	6
Outcomes Considered .....	6
The Review Process.....	7
Step 1: Receipt and Distribution of Application .....	7
Step 2: Determine if an application is covered by standard procedures or existing regulations or policies .....	8
Step 3: Detailed review of applications not covered by standard procedures .....	8
Step 4: Identification of outcomes relevant to a specific application.....	9
Step 5: Conditions for requiring an AORA and estimation of risk .....	10
Step 6: Communication of risk analysis and recommendations to decision-making authority on the application .....	12
APPENDIX 1: Standard Procedures .....	13
APPENDIX 2: Flowcharts of Process .....	14
APPENDIX 3: Information Requirements .....	19
APPENDIX 4: Aquatic Organism Risk Analysis (AORA) .....	23

## **Acknowledgements**

This document was prepared with the assistance of Craig Stephen, D.V.M., Ph.D., under contract to the British Columbia Introductions and Transfers Committee.

The following individuals are acknowledged for their contributions to this document through drafting or providing editorial comment: Brian Anderson, Gary Caine, Joanne Constantine, Carol Cross, Sandy Fraser, Sally Goldes, Bob Hooton, Dorothee Kieser, Jill Korstrom, Bryan Ludwig, Don Noakes, Ted Perry, Jaunita Ptolemy, Vic Swiatkiewicz, Ian Whyte, Ruth Withler, and Chris Wood.

## Introduction

This Guide outlines the review process used by the British Columbia Introductions and Transfers Committee (ITC) to evaluate applications to **introduce**<sup>1</sup> or **transfer**<sup>2</sup> live aquatic organisms into and within the Province of British Columbia. This document has several purposes:

1. To establish the approach and underlying principles used by the ITC to assess applications for introductions and transfers in a manner consistent with the *National Code on Introductions and Transfers of Aquatic Organisms (NCIT)*.
2. To make the evaluation process used by the ITC clear and accessible to the public, applicants, and the respective Executives and fisheries managers of the agencies represented on the ITC.
3. To provide a framework whereby relevant scientific and technical information can be assembled, assessed and communicated to the decision-makers.
4. To provide incumbent and future members of the ITC with a standardized framework for evaluation that can be applied to all proposed movements of aquatic organisms so that all applications are assessed in an equivalent and consistent manner.

This Guide summarizes the current evaluation process used by the ITC. It does not describe the procedure for individual applications; this information is available from government publications, websites, or any member of the ITC.

## Scope of the Committee

### Purpose

The purpose of the ITC is to provide decision-makers with advice on the risks associated with ecological, genetic and fish health issues for proposed introductions and transfers of aquatic organisms. The ITC evaluates the potential for **unacceptable biological effects**<sup>3</sup> associated with the intentional introductions of fish and aquatic invertebrates into British Columbia, and transfers between marine or freshwater environments within the Province.

The ITC is mandated to consider all live fish, as defined by the federal *Fisheries Act*. This definition includes all life stages of marine and freshwater finfish, molluscs, crustaceans, echinoderms, and marine mammals. In practice, the ITC deals mainly with movements of finfish and aquatic invertebrates; marine mammals are dealt with under separate statutes and policies. Aquatic plants, amphibians and reptiles are not covered by the ITC.

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<sup>1</sup> An *introduction* is the deliberate release or holding of live aquatic organisms in open waters or within a flow-through circulation facility that accesses open waters outside its present range (NCIT, 2001).

<sup>2</sup> A *transfer* is the deliberate movement of individuals of a species or population of an aquatic organism from one location to another within its present range (NCIT, 2001).

<sup>3</sup> *Unacceptable biological effects* are outcomes anticipated to result from the proposed introduction or transfer that could adversely affect the well being of native aquatic species or their habitat.

The ITC only considers potential effects to native aquatic organisms and/or their habitat. Evaluation of potential impacts to terrestrial species, including humans is generally outside the mandate of the ITC except in cases where there is a known and demonstrated risk to human health or terrestrial ecosystems.

The ITC evaluates the potential effects of intentional introductions of aquatic organisms to natural waters, fish-rearing facilities that are associated with natural waters, and imports for scientific, display spiritual and educational purposes. Introductions and transfers of live aquatic organisms for the table market, aquarium and pond trades, and use for live bait are beyond the ITC mandate, except in cases where the species is listed as prohibited under Section 5 of the Pacific Fisheries Regulations. Introductions and transfers of transgenic and other genetically modified organisms are not within the ITC mandate at this time.

The socio-economic outcomes of an introduction or transfer, which include human health, cultural and spiritual effects, and economic benefits are not evaluated by the ITC, although they may be issues of importance to the agencies represented on the ITC. Outcomes related to human health and safety issues from introductions and transfers are dealt with by the Canadian Food Inspection Agency, while the DFO has the responsibility for all aspects of conservation and fisheries management not within the mandate of the ITC.

### **Structure**

The ITC was formed through a Memorandum of Agreement between the federal and provincial governments. The key agencies involved are the federal Department of Fisheries and Oceans (DFO); and, the provincial ministries of Agriculture, Food and Fisheries (MAFF), and Water, Land and Air Protection (MWLAP). Under this agreement, professional staff from the three agencies are to provide a balanced review of existing scientific and technical information regarding all proposals for introductions and transfers, and provide advice to the appropriate regulatory agencies.

Each agency may designate two members to the ITC. Membership is established on the basis of scientific expertise in the areas of wild stock conservation, fisheries management, sport and commercial fishing, and aquaculture. The intent is to establish a broad range of expertise in order that the mandates of the three agencies are equally represented. However, final decision-making authority remains the purview of the agency(ies) in which statutory authority resides. In some cases, some members may have dual roles in that they may also be delegated by their agency to make decisions on behalf of that agency, without executive referral. Members of the ITC will consult with staff in their respective agencies on specific proposals. As a whole, the ITC may consult with independent experts nationally and internationally for additional information or independent analysis/opinion during the adjudication process.

## Governance

The ITC is bound by existing government legislation and policies regarding movements of live fish into and within the Province. Key regulations affecting the ITC process include:

1. Fisheries (General) Regulations made under the federal *Fisheries Act*;
2. Pacific Fisheries Regulations, Section 5 and Schedule VIII, made under the federal *Fisheries Act*;
3. Freshwater Fish Regulation (261/83) made under the provincial *Wildlife Act*; and,
4. Section 8, and the Aquaculture Regulation (364/89) made under the provincial *Fisheries Act*.

The ITC has also adopted or refers to several national and international regulations, policies and guidelines for assessing introductions and transfers. These include the National Code on Introductions and Transfers of Aquatic Organisms, federal Fish Health Protection Regulations, the Convention on International Trade in Endangered Species (CITES), and guidelines under the International Council for Exploration of the Seas (ICES).

## Outcomes Considered

The ITC evaluates **outcomes**<sup>4</sup> associated with a proposed introduction or transfer that could adversely affect the ability of resident wild or cultured fish to maintain healthy productive populations. The ITC identifies 3 main categories of effect that must be considered in the review:

1. **Genetic** – effects on the capacity of native species to maintain and transfer their current genetic identity and diversity to successive generations;
2. **Ecosystem** – effects on the distribution and abundance of native species resulting from alterations in relationships such as predation, and food and habitat availability; and,
3. **Disease** – effects on the incidence, distribution and/or impact of pathogens and parasites on native species

Of prime importance in the assessment of these general effects is the potential for the organism to establish itself in BC waters. The key elements in this consideration are the ability of the organisms to:

1. Enter natural waters;
2. Survive long enough and in such numbers to cause negative impacts;
3. Reproduce and establish self-sustaining populations in natural waters; and,
4. Extend its distribution beyond the initial site of entry.

Table 1 outlines the set of general outcomes that the ITC considers when assessing applications for introductions and transfers. The ITC considers these outcomes to be of sufficient **severity**<sup>5</sup> that they are deemed, *a priori*, to be undesirable. These outcomes may be modified or expanded to suit specific applications. All elements associated with the movement, including the species, source, purpose of introduction, shipping methods, and final destination must be considered.

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<sup>4</sup> The cumulative result of the potential disease, ecological or genetic effects that may occur with an introduction or transfer.

<sup>5</sup> An outcome is considered *severe* if it can affect the well being, survival or reproductive capacity of native species or through impacts to their environment.

**Table 1: Outcomes to be evaluated for all applications for introductions and transfers**

CATEGORY	OUTCOMES OF CONCERN
<b>GENETIC</b>	Organism encounters and can breed with native species Organism directly affects the genetic characteristics of native species or stocks Organism affects the reproductive success of native species
<b>ECOSYSTEM</b>	Organism encounters and interacts with species of concern or their habitat Organism can displace species of concern or their preferred habitat Organism affects food supply (quantity, quality, availability) of species of concern Organism preys upon other species of concern, or modifies local habitat or water quality
<b>DISEASE</b>	Pathogens or parasites accompany organism or its shipping waters Pathogens or parasites enter natural waters via organism or effluents Pathogen or parasites encounter susceptible hosts Pathogens or parasites impair or kill species of concern

## The Review Process

Appendix 1 summarizes the pathways an application moves through the review process. Most applications (85%) can be dealt with as routine under Standard Procedures (Appendix 1) and can be summarily approved or rejected without the need to discuss at a full ITC meeting. All others require full discussion at ITC meetings. The ITC meets four times annually, usually every three months. Extraordinary meetings may be convened in special cases at the discretion of the ITC or direction of the participating agencies.

### Step 1: Receipt and Distribution of Application

A proponent may submit an application on the prescribed form to any ITC member. The member receiving the application screens it to ensure completeness and assigns an application number before distributing it to the other ITC members. Members then have ten working days to return comments to the member originating the application. During this period, members may make internal and external referrals to other agencies on the application (e.g. to local fisheries managers). Members may also refer applications to recognized scientific individuals outside of government for advice, information or opinion. Where comments or recommendations cannot be formulated within the ten-day period, the ITC will inform the proponent that the application will require further deliberation.

At the end of the ten-day period, members may recommend:

1. Approval, or conditional approval;
2. Rejection, with reasons; or,
3. Further deliberation and discussion by the ITC as a whole.

### Step 2: Determine if an application is covered by standard procedures, or existing

### **regulations or policies**

The ITC has established standard review procedures for a wide variety of introduction and transfer requests (Appendix 2). Standard procedures are established in situations where an introduction or transfer is routine, where existing regulations or policies allow for a particular introduction or transfer, or where an Aquatic Organism Risk Analysis (AORA), as specified in the NCIT has been previously performed. Standard procedures establish the conditions under which a specific introduction or transfer request may receive a recommendation for approval or rejection without further deliberation, based on historical precedent. This allows more expeditious processing of applications that are renewed annually, or are similar in nature to previous applications.

Standard procedures will not be used when any of the following conditions apply to an application:

1. An application has no historical precedent or is significantly different from past applications, or for which there are no existing policies or regulations;
2. The application proposes a range extension or use of a species or stock outside of its normal range; and/or,
3. An application proposes to use species prohibited under Section 5 of the Pacific Fisheries Regulations.

In these cases, an application will be subjected to further deliberation by the ITC as a whole. The ITC will determine what further information is required, and whether or not an AORA is required.

### **Results of Steps 1 & 2:**

1. **Ensures that applications are complete and compatible with existing policies.**
2. **Determines whether or not standard procedures can be applied to an application or if full deliberation by the ITC and/or an AORA is required.**

### **Step 3: Detailed review of applications not covered by standard procedures**

Assessment of applications not covered by standard procedures will be based, as a minimum, on a detailed review of the biology and life history of the species proposed for introduction or transfer, as it relates to the purpose and destination of the movement. The information elements required for this review have been adopted by ITC from those prescribed in the NCIT. These elements are listed in Appendix 3. It is not always necessary that an application will require that all of the information elements be completed. This will vary on a species-by-species and case-by-case basis.

In many cases, there is sufficient information already available to the ITC through a variety of sources.

These include:

1. *Personal knowledge/expertise* of a member or members on the ITC, utilizing collective experience for analysing particular applications;



2. *The ITC Database* contains all records of applications and permits issued by the ITC since the mid-1970s. Information captured includes species, sources, destinations, numbers to be introduced or transferred, outcomes of the adjudication, conditions of approval, and applicants personal information;
3. *The National Registry of Introductions and Transfers*, maintained by DFO, contains annual summaries of introductions and transfers for each Province and Territory in Canada, as well as a library of AORAs and other Risk Analyses that have been conducted in Canada;
4. *Published works*, scientific literature, government reports and other documents on species biological and potential effects of movements based on historical experiences in BC, Canada, and throughout the world; and,
5. *Outsourcing* to universities, colleges, research institutes and private companies throughout the world where a source of recognized expertise is identified.

In cases where the necessary information is not readily available, the proponent will be required to have a Biological Review conducted by a qualified individual or company, using the information elements listed in Appendix 3.

### **Results of Step 3:**

1. **A description of species, environment and management variables associated with an application; and,**
2. **A list of organism and environmental components that are of concern for the specific proposal.**

### **Step 4: Identification of outcomes relevant to a specific application**

The objectives of this step are to list the potential impacts related to a specific proposal, determine if there is sufficient information to assess these impacts, and whether or not a proposed introduction or transfer could result in unacceptable biological risks. These outcomes may vary in number and severity, depending on the conditions of a proposed introduction or transfer. The information elements listed in Appendix 3 represents a generic framework that can be applied, in whole or in part to all applications.

The ITC will determine if there is sufficient information, if additional information is required or, where particular concerns are identified or unknown, whether or not a full AORA will be required. Where particular concerns are identifiable, the ITC will document them and make the decision-making agency(ies) aware of these concerns and under what conditions they can be mitigated to an acceptable level of risk. This process for non-routine applications may not, in all cases lead to the requirement for an AORA. A key consideration at this stage is the level of certainty and sufficiency of information that an introduction or transfer will not result in an unacceptable biological risk. If the ITC determines with a high level of certainty that an unacceptable biological risk that cannot be mitigated against is presented by an introduction or transfer, the ITC may chose to recommend the application be rejected, with a written rationale for the

rejection. However, if the ITC determines an introduction or transfer poses a low risk, or the risk can be reduced to an acceptable level, it may choose to recommend approval, with or without conditions. Where the information provided is not sufficient to allow a reasonable estimation of unacceptable outcomes, or where the level of certainty is low, the ITC may choose to require a formal AORA to be conducted before further deliberation.

#### Results of Step 4:

1. A list of what *could* happen given the specific circumstances of an application;
2. Identification of unacceptable biological risks associated with the application that may require further deliberation; and,
3. Establishment of whether or not a decision can be recommended or if a formal AORA will be required prior to making a final recommendation.

#### Step 5: Conditions for requiring an AORA and estimation of risk

A Risk Analysis will almost always be required when:

1. The species proposed for introduction is a first-time exotic to BC;
2. A transfer of a species would result in a range extension;
3. A new or novel purpose is proposed for which the outcomes are not presently known.

The ITC has adopted the Aquatic Organism Risk Analysis protocols prescribed by the NCIT, shown in Appendix 4. The AORA is based on an analysis of as much scientific information as is available to assess outcomes associated with genetic, ecosystem and disease/parasite effects on native species and their habitat. Where risks (hazards) are identified for each of these elements, the process estimates the **probability**<sup>6</sup> of an event occurring, and the magnitude of the **consequences**<sup>7</sup> of the event. Included in this process is an estimate of the level of certainty associated with the probability and consequences of an event, vary from a level of high certainty to high uncertainty. Only when a **risk**<sup>8</sup> can be reduced to low, with a reasonable level of certainty, will a recommendation for approval be made. The AORA is thus an iterative process, for which the intent is to try to reduce identified risks associated with an introduction or transfer to low, with a high degree of certainty. When this cannot be achieved, a basis is established for recommending the application be denied.

Estimates of probability are qualitatively expressed as:

- **Low** – an event is very unlikely to occur
- **Medium** – an event is as likely to occur as not
- **High** – an event is very likely to occur.

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<sup>6</sup> *Probability* is an estimate of the likelihood of an effect on native species and their habitat.

<sup>7</sup> *Consequences* are an estimate of the severity and distribution of the effect to native species and their habitat.

<sup>8</sup> *Risk* is the cumulative result of the probability and consequences of an effect on native species and their habitat

Similarly, estimates of the consequences of the risk are described as:

- **Low** – the impact to native species and their habitat is insignificant
- **Medium** – there will be a localized negative impact on native species or their habitat
- **High** – the impact to native species or their habitat will be severe and widespread.

Once these steps are completed for each element (genetic, ecosystem, disease) a cumulative estimate of risk can be determined. The power of this process is not so much the ratings, but the detail of the biological and other relevant information used in the assessment.

Probability estimates must consider factors that could increase the likelihood of risk, as well as factors that could reduce risk, including mitigative and preventative strategies. Consequences must be evaluated on the basis of the potential **magnitude**<sup>9</sup> of the risk. Generally, the ITC evaluates only those effects that are capable of negatively affecting the capacity of native species to survive and reproduce, or is deleterious to their habitat. The primary question relating to consequences is to determine how widely an effect would be if a risk were to occur. This is considered in three ways:

1. The geographical and spatial distribution of the risk
2. The temporal distribution, and
3. Intra- and inter-specific distribution.

Applications must be examined for features that could increase or reduce the distribution of a risk beyond the *geographical or spatial* confines of a facility or natural water body where the introduction or transfer is to take place. This examination includes:

1. Features of a facility such as:
  - plans to prevent fish escapes and measures to recover escaped stock;
  - treatment and disposal of effluent, including dead fish, from the facility; and,
  - barriers for fish, their products or wastes that prevent contact with other fish.
2. Features of natural waters in which fish are introduced or escape, such as:
  - access to waters that allow movement of the fish beyond the immediate area;
  - presence of fish and other organisms in the receiving waters; and,
  - water flow characteristics that could spread risk.
3. Features of the proposed species that could enhance or prevent their attempts to disperse, such as:
  - ability to survive in natural waters;
  - migratory behaviours; and,
  - adaptive strategies for dispersal.

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<sup>9</sup> *Magnitude is determined by the severity and distribution of risk, and must be considered in time, space, and the species or habitat affected.*

Applications are evaluated for *temporal distribution* factors that would prolong or sustain adverse effects beyond the time they first occurred. This may include:

1. The capacity of the risk to be transmitted to successive generations, depending on:
  - the ability of a pathogen to be vertically transmitted, or genetic effects that are not reduced over time;
  - presence of a reservoir or reservoir host that could sustain impacts beyond the initial effects; and,
  - the potential of the activity to promote the effect beyond one generation, or to confine it to one generation.

Applications must be assessed for *intra- and/ or inter-specific distribution* among conspecifics and other species. While the primary concern of the ITC is fish, an assessment can consider effects on other organisms that are wholly or partly dependent upon aquatic ecosystems. The magnitude of an effect will increase as the range of species, individuals, and habitat that could be affected increase.

**Result of Step 5: A complete AORA to be used for final adjudication of the application.**

**Step 6: Communication of risk analysis and recommendations to the decision-making authority on the application**

There are three possible outcomes of adjudication of an application for introductions and transfers:

1. Recommended approval without conditions;
2. Recommended approval with conditions that specify mitigation strategies or preventive actions that must be in place before an organism is introduced into or transferred within BC.
3. Not recommended where this risk is deemed unacceptable or unassessible.

The ITC will advise the decision-making authority of its recommendations and will provide the AORA or other information upon which the recommendations are based. This will also be communicated to the applicant. The applicant may wish to appeal any recommendation or decision made by the ITC through the appropriate decision-making authority. The statutory decision-making authority(ies) has the final responsibility to render a decision, as well as establish the terms and conditions for appeal.

# APPENDIX 1

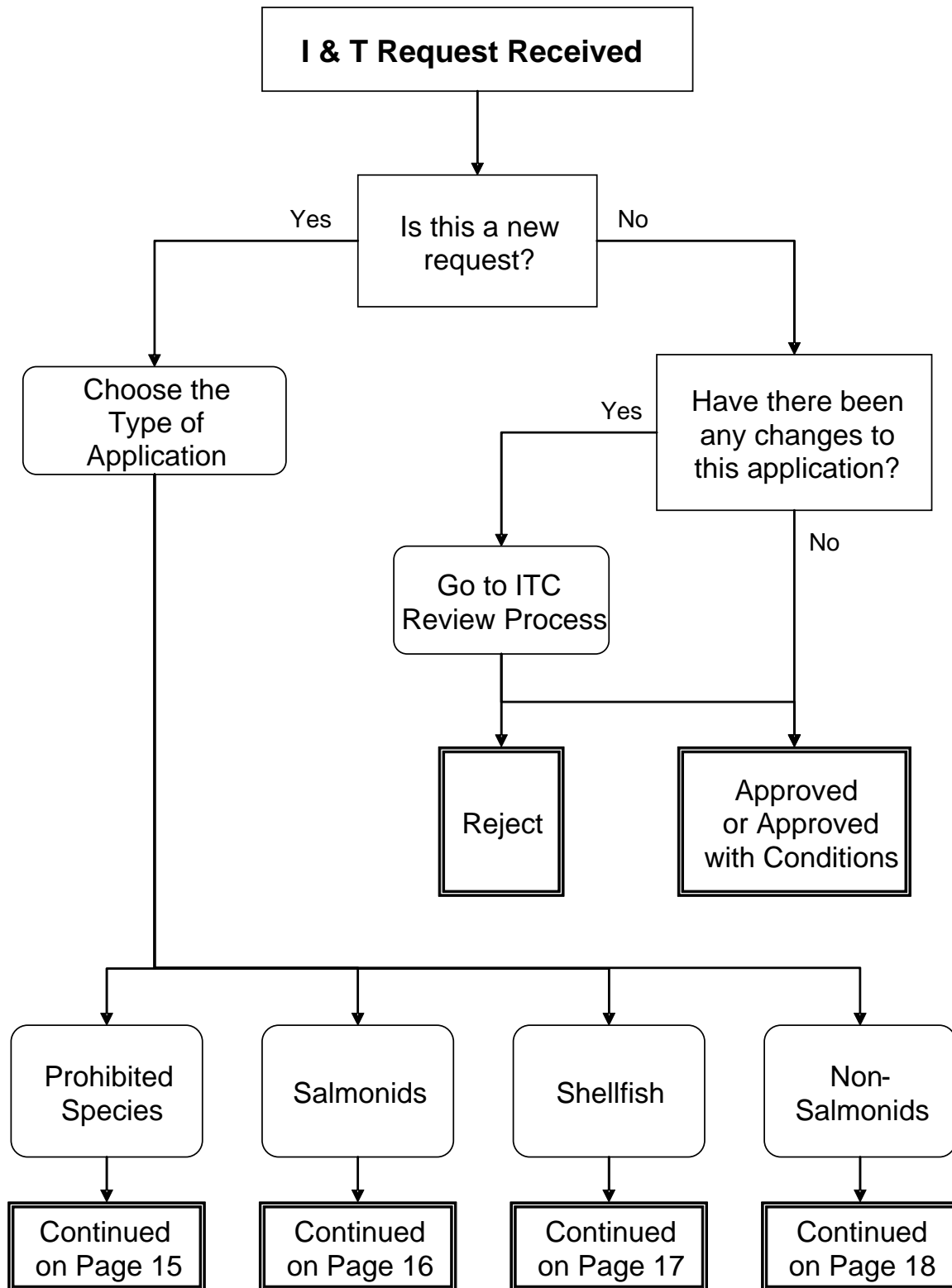
## Standard Procedures

Establishing standard procedures is based on the cumulative experience of the ITC members. The ITC considers historical precedents, existing regulations and policies, amount of variance from previous introductions or transfers, and whether or not a previous AORA for the proposed species or activity has been carried out and describes conditions under which an introduction or transfer may or may not occur.

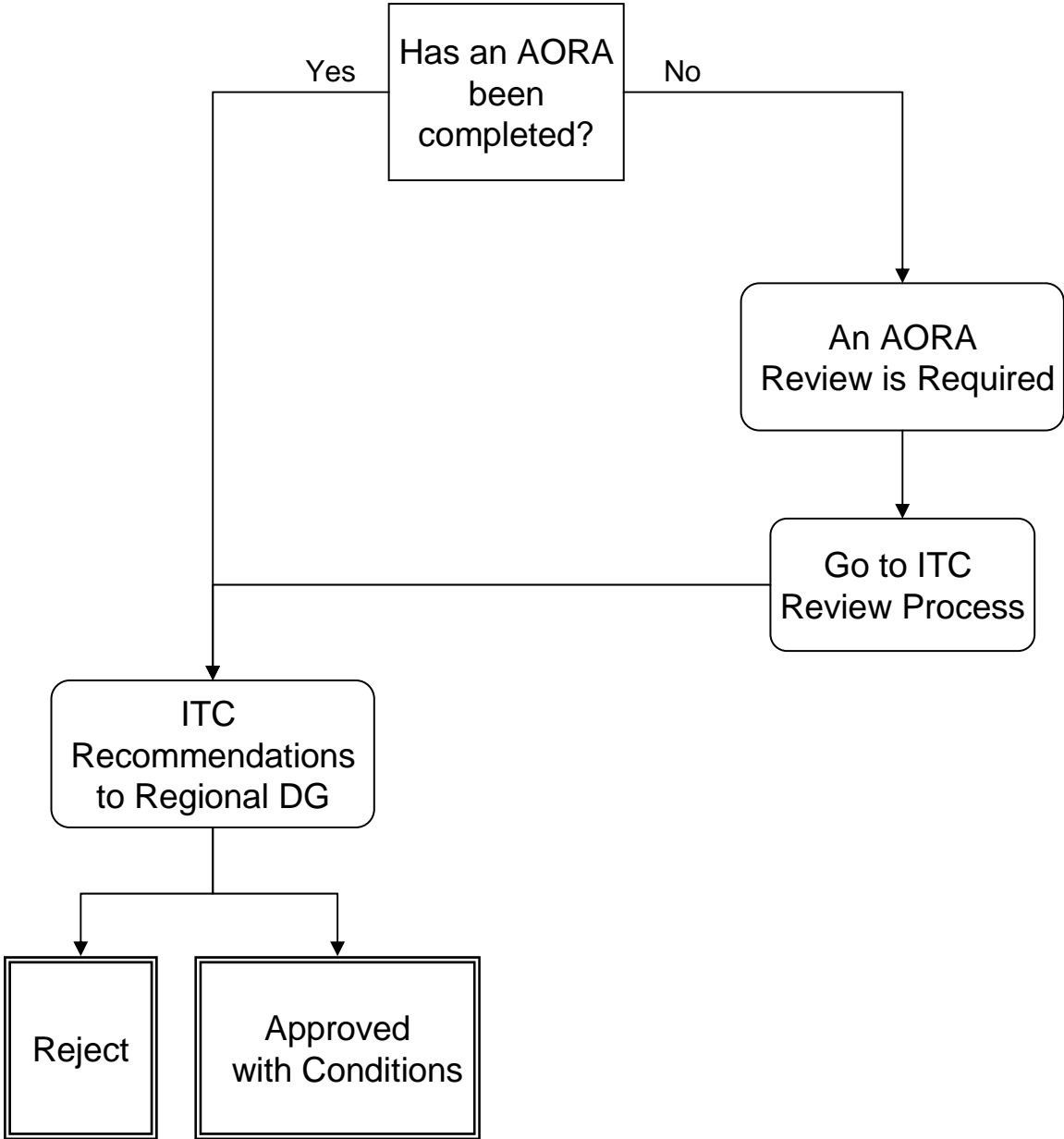
The following questions assist the ITC when it establishes standard procedures for specific situations:

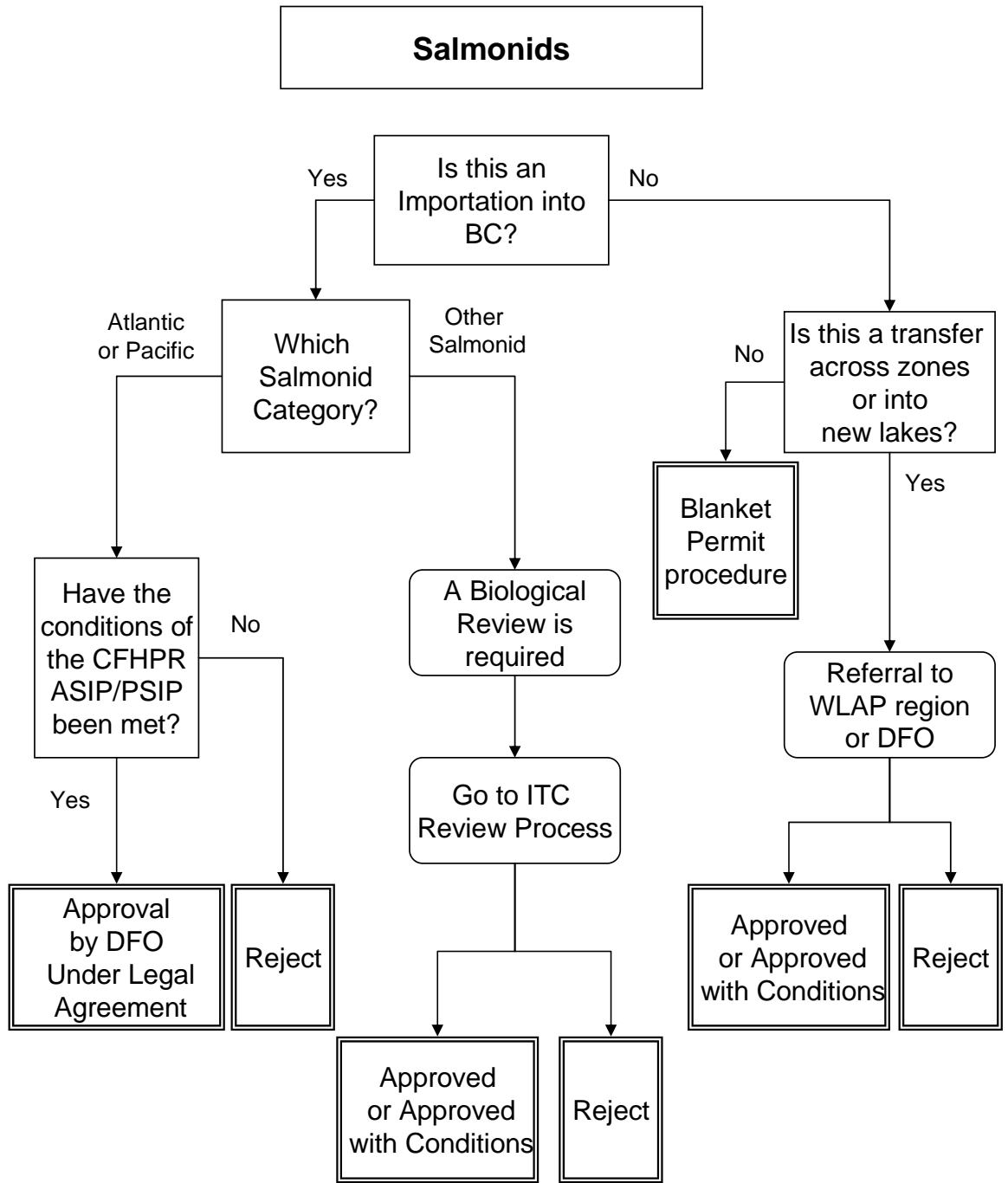
- 1. Are the physical parameters of the application considered by existing policies or previous activities?**
  - a) Does the location or the facility to receive the introduction or transfer present special concerns?
  - b) Are there special oceanographic or geographic characteristics of concern, such as unique or threatened habitat, watershed considerations, natural barriers to or routes for movement of the organism?
  - c) Does the source of the introduction or transfer raise additional concerns?
  
- 2. Is the species to be introduced or transferred considered by existing policies or procedures?**
  - a) Is the species considered by standard procedures?
  - b) Are there endangered species or species of concern that could be affected by the proposed introduction or transfer?
  - c) Can organisms other than those identified for introduction or transfer accompany the organisms, transport waters or containers used for transport?
  
- 3. Do existing policies or procedures consider effects over the time scale relevant to the proposed introduction or transfer?**
  - a) Are there aspects of the proposal that would allow adverse effects to be manifested beyond the immediate time of the introduction or transfer, or beyond the time period specified by current preventative or mitigative measures?
  - b) Do existing policies or procedures consider changes that may have occurred to native species, stocks or their habitat that would make the standard procedures ineffective in preventing an unacceptable risk?

APPENDIX 2



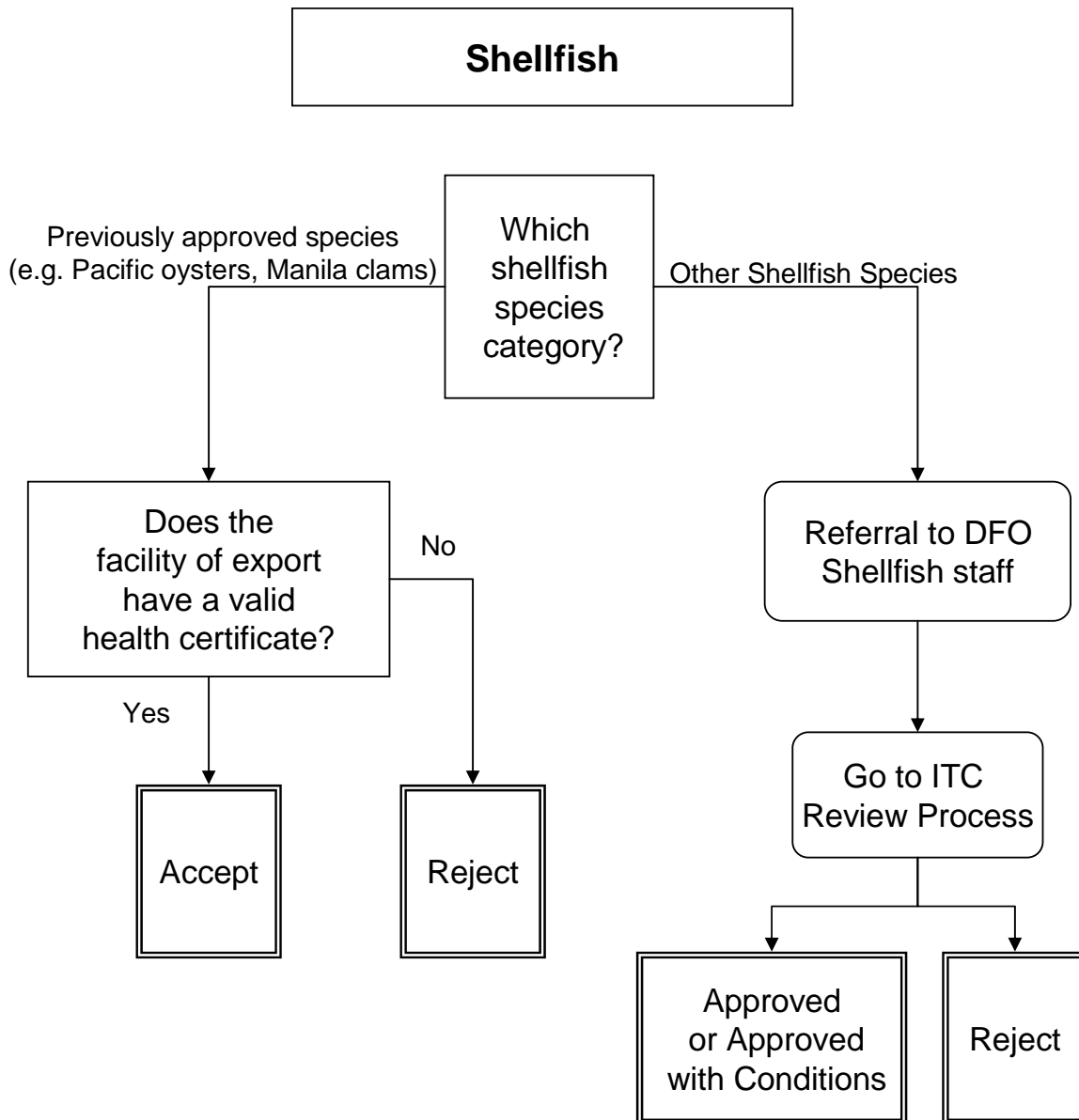
**Prohibited Species**



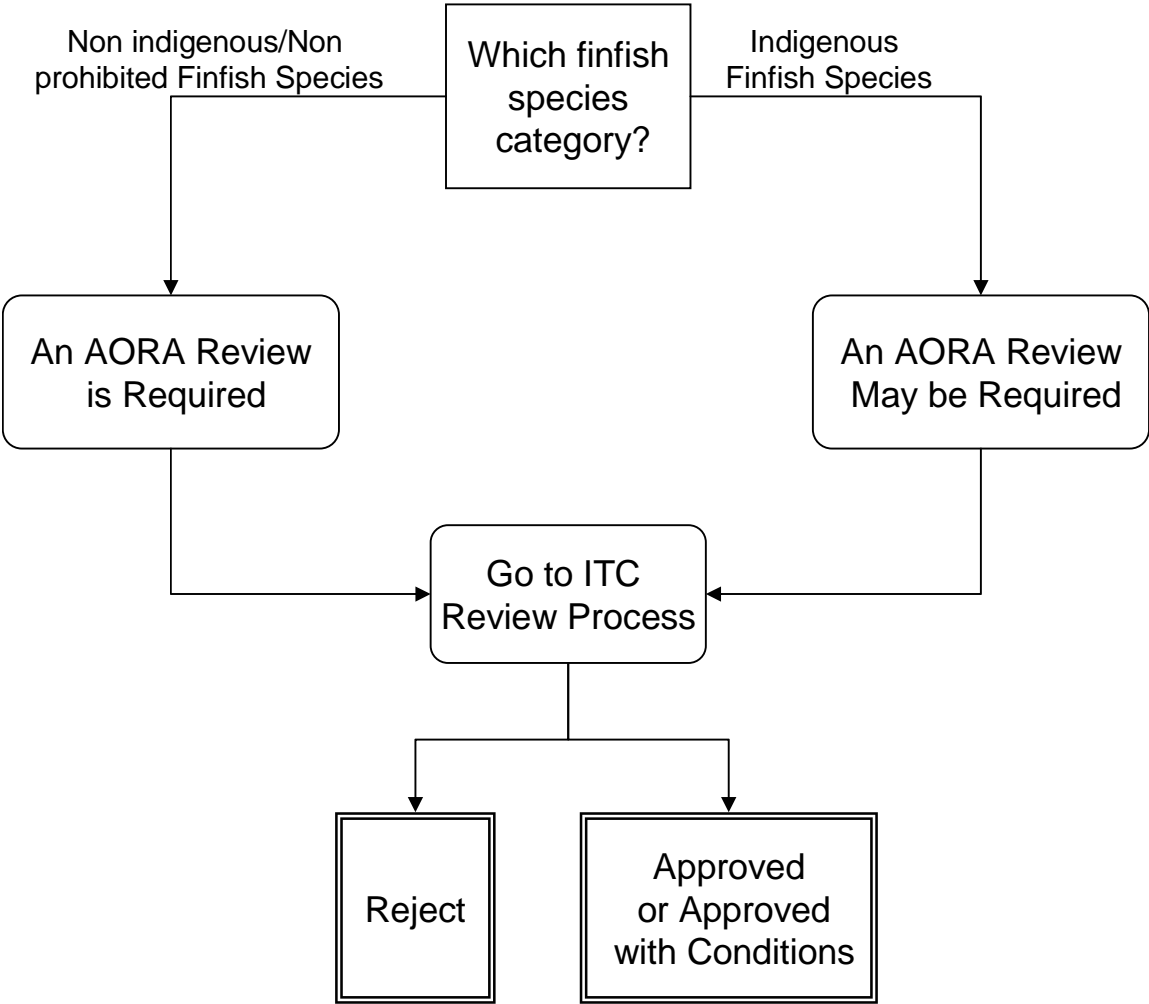


CFHPR = Canadian Fish Health Protection Regulations  
 ASIP = Atlantic Salmon Import Policy  
 PSIP = Pacific Salmon Import Policy





**Non-Salmonids**



## **APPENDIX 3**

### **INFORMATION REQUIREMENTS<sup>10</sup>**

#### **National Code on Introductions and Transfers of Aquatic Organisms**

##### **To be completed by the proponent**

Wherever possible, information is to be supported with reference from the scientific literature, and notations to personal communications with scientific authorities and fisheries experts. Applications lacking detail may be returned to the proponent for additional material, resulting in a delay in assessing the proposal. For some proposals, e.g., intraprovincial transfers or other routine introductions or transfers, the information requirement may be reduced significantly. The ITC should be consulted in such cases.

##### **A) Executive Summary**

Provide a brief summary of the document including a description of the proposal, the potential impacts on native species and their habitat, and mitigation steps to minimize the potential impacts identified.

##### **B) Introduction**

1. Name (common and scientific [genus and species]) of the organism proposed for introduction and transfer.
2. Describe the characteristics, including distinguishing characteristics, of the organism. Include a scientific drawing or photograph.
3. Describe the history in aquaculture, enhancement or other introduction (if appropriate).
4. Describe the objectives and rationale for the proposed introduction, including an explanation as to why such an objective cannot be met through the utilisation of an indigenous species.
5. What alternate strategies have been considered in order to meet the objectives of the proposal? What are the implications of a “do nothing” option?
6. What is the geographic area of the proposed introduction? Include a map.
7. Describe the numbers of organisms proposed for introduction (initially, ultimately). Can the project be broken down into different sub-components; if so, how many organisms are involved in each sub-component?
8. Describe the source(s) of the stock (facility) and genetic stock (if known).

##### **C) Life History Information of the Species to be Introduced or Transferred – For Each Life History Stage**

1. Describe the native range and range changes due to introductions.
2. Record where the species was introduced previously and describe the ecological effects on the environment of the receiving area (predator, prey, competitor, and/or structural/functional elements of habitat).

3. What factors limit the species in its native range?
4. Describe the physiological tolerances (water quality, temperature, oxygen, and salinity) at each life history stage (early life stages, adults, reproductive stages).
5. Describe the habitat preferences and tolerances for each life history stage.
6. Describe the reproductive biology.
7. Describe the migratory behaviour.
8. Describe the food preferences for each life history stage.
9. Describe the growth rate and lifespan (also in the area of the proposed introduction, if known).
10. Describe the known pathogens and parasites of the species or stock.
11. Describe the behavioural traits (social, territorial, aggressive).

#### **D) Interaction with Native Species**

1. What is the potential for survival and establishment of the non-native species if it escapes? (This question applies to species intended for aquaculture or for live rearing in a contained facility).
2. What habitat(s) will the introduced species likely occupy in the proposed area of introduction, and will this overlap with any vulnerable, threatened or endangered species? Indicate if the proposed area of introduction also includes contiguous waters.
3. With which native species will there be a niche overlap? Are there any unused ecological resources of which the species would take advantage?
4. What will the introduced species eat in the receiving environment?
5. Will predation cause any adverse impacts on the receiving ecosystem?
6. Will the introduced species survive and successfully reproduce in the proposed area of introduction or will annual stocking be required? (This question applies to species not intended for aquaculture or life in a contained facility).
7. Will the introduced species hybridize with native species? Is local extinction of any native species or stocks possible as a result of the proposed introduction? Are there any possible effects of the introduced species on the spawning behaviour and spawning grounds of local species?
8. Are there any potential impacts on habitat or water quality as a result of the proposed introduction?

#### **E) Receiving Environment and Contiguous Watershed**

1. Provide physical information on the receiving environment and contiguous waterbodies such as seasonal water temperatures, salinity, turbidity, dissolved oxygen, pH, nutrients and metals. Do these parameters match the tolerances/preferences of the species to be introduced, including conditions needed for reproduction?
2. List species composition (major aquatic vertebrates, invertebrates, and plants) of the receiving waters. Are any of these species known to be susceptible to the disease and parasites found to affect the introduced species in its native range?

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<sup>10</sup> excerpted from the *National Code on Introductions and Transfers*, CCFAM, September, 2001

3. Provide information on habitat in the area of introduction, including contiguous waters, and identify critical habitat. Which of those parameters match the tolerances/preferences of the species to be introduced? Can the introduced species disturb any of the habitat described?
4. Describe the natural or man-made barriers that should prevent the movement of the introduced organism to adjacent waters.

**F) Monitoring**

1. Describe the plans for follow-up assessment of the proposed introduced species' success in meeting/breaking the assessed risks of negative impacts on native species and their habitats.

**G) Precautions and Management Plan**

1. Describe the management plan for the proposed introduction or transfer. This should include but not be restricted to the following information:
  - a) details of the disease certification status of stock to be imported;
  - b) disease monitoring plan proposed for the introduced stocks following introduction or transfer;
  - c) precautions taken to ensure that no other species (fellow travelers) accompany the shipment;
  - d) who will be permitted to use the proposed species and under what terms and conditions;
  - e) will there be a pre-commercial phase for the proposed introduction or transfer;
  - f) description of the quality assurance plan for the proposal; and,
  - g) other legislative requirements that need to be met.
2. Describe the chemical, biophysical and management precautions being taken to prevent accidental escapes of any fish, parasite and/or pathogens to and their establishment in non-target recipient ecosystems. Give details of the water source, effluent destination, any effluent treatment, proximity to storm sewers, predator control, and site security.
3. Describe contingency plans to be followed in the event of an unintentional, accidental or unauthorized liberation of the species from rearing or hatchery facilities, or an accidental or unexpected expansion of the range.
4. If this proposal is intended to create a fishery, give details of the fishery objective. Who would benefit from such a fishery? Give details of management plans and, if appropriate, include changes in management plans for species that will be impacted.

**H) Business Data**

1. Provide the legal name of the owner and company, the aquaculture licence number and business licence (if applicable) or the name of the government agency or department with a contact name, telephone, fax and email information.
2. Provide an indication of the economic viability of the proposed project.

## **I) References**

1. Provide a detailed bibliography of all references cited in the course of the preparation of the risk assessment.
2. Provide a list of names, including addresses, of scientific authorities and fisheries experts consulted.

## APPENDIX 4

### AQUATIC ORGANISM RISK ANALYSIS

#### National Code on Introductions and Transfers of Aquatic Organisms

#### To be Completed by Introductions and Transfers Committees<sup>11</sup>

### INTRODUCTION

To evaluate risks associated with the introduction or transfer of aquatic organisms, it is necessary to assess the probability that a species will become established and the consequences of that establishment. The process addresses the major environmental components. It provides a standardized approach for evaluating the risk of genetic, ecological and disease impacts as well as the potential for introducing a “fellow traveler” or parasite that might impact the native species of the proposed receiving waters. This approach has been adapted from "Final Draft - Report to the Aquatic Nuisance Task Force - Generic Non-indigenous Aquatic Organisms Risk Analysis Review Process, Washington, DC, February 9, 1996 by the Risk Assessment and Management Committee of the U.S. Aquatic Nuisance Species Task Force” (Anon. 1996).

At each of Steps 1, 2 and 3, the element rating and rationale for the rating should be recorded, based on the following criteria:

A **HIGH** rating means that the risk is likely or very likely to occur.

A **MEDIUM** rating means that there is a probability of negative impact.

A **LOW** rating means that the risk is considered to be insignificant.

***Note:** For the High and Medium category of risks, application of appropriate mitigation measures is required to lessen the risk to a Low rating. However, it is recognized that this may not be possible for all proposals.*

***The strength of the review process is not in the ratings but in the detailed biological and other relevant information statements that motivate them.***

<sup>11</sup> Unless the authorizing jurisdiction requires the Risk Analysis to be prepared by the proponent

**Part I – Aquatic Organism Ecological and Genetic Risk Assessment Process**

**Step 1 Determining the Probability of Establishment**

Complete the following table and provide a brief rationale with appropriate references to support the rating given.

Element Rating	Probability of Establishment (H, M, L) <sup>1</sup>	Level of Certainty (VC to VU) <sup>2</sup>
Estimate of probability of the organism successfully colonizing and maintaining a population in the intended area of introduction <sup>3</sup>		
If the organism escapes from the area of introduction, estimate the probability of its spreading <sup>4</sup>		
<b>Final Rating</b> <sup>5,6</sup>		

Explanatory Notes

- |   |        |
|---|--------|
| H | High   |
| M | Medium |
| L | Low    |

Element ratings should be supported with data and references, including a rationale for the rating given.

- |    |                      |
|----|----------------------|
| VC | Very certain         |
| RC | Reasonably certain   |
| RU | Reasonably uncertain |
| VU | Very uncertain       |

The level of certainty is intended to give an estimate of whether the element that is being rated is based on scientific knowledge, experience, or whether it is extremely subjective and based on “best guess”. Such uncertainties need to be taken into account when making a decision.

- Characteristics within this element include: the organism coming in contact with an adequate food resource; suitability of habitat, encountering appreciable biotic and abiotic environmental resistance; and the ability to reproduce in the new environment.
- Characteristics within this element include: ability for natural dispersion; estimated range of the probable spread; ability to use human intervention/activity as a means of dispersal.
- The final rating for the **Probability of Establishment** is assigned the value of the element with the lowest risk rating (example: **High** and **Low** ratings for the above elements would result in a final **Low** rating).
- The final rating for the **Level of Certainty** is assigned the value of the element with the **Lowest** level of certainty (e.g. **Very Certain** and **Reasonably Certain** ratings would result in a final **Reasonably Certain** rating).



## Part 1 – Step 2 Determining the Consequence of Establishment of an Aquatic Organism

The “**Consequence of Establishment**” is assigned a single rating based on environmental impacts.

<b>Element Rating:</b> Estimate of magnitude of environmental impacts, if established.	<b>Consequences of Establishment (H, M, L)<sup>7</sup></b>	<b>Level of Certainty (VC to VU)<sup>8</sup></b>
Ecological impact on native ecosystems both locally and within the drainage basin. <sup>9</sup>		
Genetic impacts on local self-sustaining stocks or populations. <sup>10</sup>		
<b>Final Rating<sup>11,12</sup></b>		

### Explanatory Notes

7. See Note 1.
8. See Note 2
9. Ecological impacts that can affect the distribution or abundance of native species resulting from alterations in relationships such as predation, prey availability, and habitat availability. In assessing the ecological impacts of establishment, the assessors should take into consideration whether the non-indigenous stock i) enters or alters the habitat of indigenous species, ii) displaces indigenous species from optimal habitat, iii) affects the quantity, quality, and availability of food supply of indigenous species, iv) prey on other species of concern.
10. Genetic impacts which can affect the capacity of native species to maintain and transfer to successive generations its current identity and diversity. In assessing the genetic impacts, the assessors should take into consideration whether the non-indigenous stock i) encounters or interacts with species of concern, ii) affects the survival of local species, iii) affects the reproductive success of local species, or iv) affects the genetic characteristics of native stocks or species.
11. The final rating for the **Consequences of Establishment** is assigned the value of the element with the **highest** rating (example: **High and Medium** ratings for the above elements would result in a final **High** rating).
12. See Note 6.

**Part 1 – Step 3 Estimating Aquatic Organism Risk Potential**

The overall Risk is assigned a single value based on the **Probability of Establishment** and the **Consequences of Establishment**.

Component Rating	Element Rating (H,M,L)	Level of Certainty (VC to VU)
Probability of Establishment estimate <sup>13</sup>		
Consequences of Establishment estimate <sup>14</sup>		
<b>FINAL RISK ESTIMATE</b> <sup>15,16</sup>		

Explanatory Notes:

13. As estimated in Step 1 - Use the “final rating level” and “final level of certainty”, respectively

14. As estimated in Step 2 - Use the “final rating level” and “final level of certainty”, respectively

15. Under “element rating ” – Table 1 provides a guide for categorizing the final risk estimate

16. Under “level of certainty” - the final level of certainty for the **Final risk estimate** is assigned the value of the element with the **lowest** certainty level (e.g. a **Very Certain** and **Reasonably Uncertain** estimate for the probability of establishment and consequences of establishment, respectively, would result in an overall **Reasonably Uncertain** level of certainty).

**Definition of Overall Aquatic Organism Risk Potential**

**HIGH** = Organism(s) of major concern (major mitigation measures are required). Proposal not recommended unless mitigation procedures can be developed to reduce the risk to Low.

**MEDIUM** = Organism(s) of moderate concern. Proposal not recommended unless mitigation procedures can be developed to reduce the risk to Low.

**LOW** = Organism(s) of little concern. Proposal recommended for approval. Mitigation is not needed.

*Note: It is advised that the proposal be approved as presented (no mitigating measures required) only if the overall estimated risk potential is LOW*

*Note: It is advised that the proposal be approved only if the overall confidence level for which the overall risk was estimated is VERY CERTAIN or REASONABLY CERTAIN.*

*Note: For an overall HIGH or MEDIUM risk, a second risk assessment needs to be conducted to determine whether the proposed mitigation procedures are adequate to reduce the overall risk to LOW.*

## **Part 1 - Step 4 Completion of Risk Assessment Documentation**

### **Specific Management Questions (Mitigation Factors or Measures)**

#### **Additional Factors and Notes**

1. Mitigation measures could reduce risks to a low rating. Mitigation measures include but are not limited to the following:

Reducing risk of genetic impact on local stock:

- hold in containment facilities to prevent escape
- use stocks genetically similar to stocks in receiving waters
- sterilize organisms to prevent interbreeding with local populations

Reducing risk of ecological impact on local ecosystems:

- use local stock only
- sterilize organisms to prevent natural reproduction and increase in population size
- use species that cannot reproduce naturally in receiving waters
- hold in containment facilities to prevent escapes

- 2 Are there any neighbouring jurisdictions to consult?

If Yes – Has this been done?

Is the neighbouring jurisdiction concerned?

If Yes – Has the dispute avoidance mechanism outlined in Appendix II been applied?

**Part 2 – Pathogen, Parasite or Fellow Traveler Risk Assessment Process**

**Step 1 Determining the Probability of Establishment**

Complete the following table and provide a brief rationale with appropriate references to support the rating given.

Element Rating	Probability of Establishment (H,M,L) <sup>17</sup>	Level of Certainty (VC to VU) <sup>18</sup>
Estimate the probability that a pathogen, parasite or fellow traveler may be introduced along with the species proposed for introduction. Note that several pathways may exist through which pathogens or accompanying species can enter fish habitat. Each must be evaluated.		
Estimate the probability that the pathogen, parasite or fellow traveler will encounter susceptible organisms or suitable habitat.		
<b>Final Rating</b> <sup>19, 20</sup>		

Explanatory notes:

17. See Note 1

18. See Note 2

19. The final rating for the **Probability of Establishment** is assigned the value of the element with the **lowest** risk rating (e.g., a **Medium** and **Low** estimate for the above elements would result in an overall **Low** rating). Note that the calculation of the final rating follows the multiplication rule of probabilities (i.e., the probability that a given event will occur corresponds to the product of the individual probabilities). Thus the final risk of establishment is assigned the value of the lowest individual probability estimate.

20. The final rating for the **level of certainty** for the Probability of Establishment is assigned the value of the element with the **lowest** level of certainty (e.g. a **Very Certain** and **Reasonably Uncertain** ratings for the above elements would result in a final **Reasonably Uncertain** rating).

**Part 2 - Step 2 Determining the Consequence of Establishment of a Pathogen, Parasite or Fellow Traveler**

Complete the following table and provide a brief rationale with appropriate references to support the rating given. The final rating of the Consequences of Establishment is assigned a single rating based on environmental impacts.

<b>Element Rating</b> – Impacts of establishment of a parasite, pathogen or fellow traveler on native species and/or aquaculture in the watershed.	<b>Consequences of Establishment (H, M, L)</b> <sup>21</sup>	<b>Level of Certainty (VC to VU)</b> <sup>22</sup>
Ecological impacts on native ecosystems both locally and within the drainage basin including disease outbreak, reduction in reproductive capacity, habitat changes, etc.		
Genetic impacts on local self-sustaining stocks or populations (i.e. whether the pathogen, parasite or fellow traveler affects the genetic characteristics of native stocks or species).		
<b>Final Rating</b> <sup>23, 24</sup>		

Explanatory notes:

21. See Note 1

22. See Note 2.

23. The final rating for the **Consequences of Establishment** is assigned the value of the element with highest risk rating (e.g. **High** and **Medium** ratings for the above elements would result in a final **High** rating)

24. See Note 20.

**Part 2 - Step 3 Estimating Pathogen, Parasite or Fellow Traveler Risk Potential**

The overall Risk is assigned a single value based on the **Probability of Establishment** and the **Consequences of Establishment**.

<b>Component Rating</b>	<b>Element Rating (H, M, L)</b>	<b>Level of Certainty (VC to VU)</b>
Probability of Establishment estimate <sup>25</sup>		
Consequence of Establishment estimate <sup>26</sup>		
<b>FINAL RISK ESTIMATE</b> <sup>27, 28</sup>		

Explanatory notes:

- 25. As estimated in Step 1 - Use “final rating for probability of establishment” and “final rating for the level of certainty”, respectively.
- 26. As estimated in Step 2 – Use “final rating for consequences of establishment” and “final rating for the level of certainty”, respectively.
- 27. Under “element rating” – refer to Table 1, which provides an outline for categorizing the final risk estimate.
- 28. See Note 20.

Definition of **“Pathogen, Parasite, Fellow Traveler Organism Risk Potential”**

- HIGH** = Organism(s) of major concern (major mitigation measures are required). Proposal not recommended unless mitigation procedures can be developed that will reduce the risk to Low.
- MEDIUM** = Organism(s) of moderate concern. Mitigation is justified. Proposal not recommended unless mitigation procedures can be developed to reduce the risk to Low.
- LOW** = Acceptable risk - organism(s) of little concern. Proposal recommended for approval. Mitigation is not needed.

*Note: It is advised that the proposal be approved as presented only if all potential hazards (as defined in Step 1) for which the overall risk was estimated is LOW.*

*Note: It is advised that the proposal be approved only if the overall confidence level for which the overall risk is VERY CERTAIN OR REASONABLY CERTAIN*

*Note: For an overall HIGH or MEDIUM risk, a second risk assessment needs to be conducted to determine whether the proposed mitigation procedures are adequate to reduce the overall risk to LOW*

## **Part 2 - Step 4 Completion of Risk Assessment Documentation**

### **Specific Management Questions (Mitigation Factors or Measures)**

#### **Additional Factors and Notes**

Mitigation measures could reduce risks to a low rating. Examples of mitigation measures include the following:

#### **Reducing risk of transferring accompanying pathogens, parasites and/or fellow travelers**

- health inspection and certification
- pre-treatment for pathogens, diseases and parasites
- inspection for fellow travelers
- disinfection prior to discarding water in which the organisms arrived
- vaccination
- disinfection of eggs
- importation as milt or fertilized eggs only
- quarantine incoming organisms and use as broodstock, release F<sub>1</sub> progeny only if no pathogens, parasites or fellow travelers appear.

**Table 1. How to Categorize the Final Risk Estimate<sup>29</sup>**

<b>Probability of Establishment</b>	<b>Consequences of Establishment</b>	<b>Final Risk Estimate</b>
High	High	High
High	Medium	High
High	Low	Medium
Medium	High	High
Medium	Medium	Medium
Medium	Low	Medium
Low	High	Medium
Low	Medium	Medium
Low	Low	Low

#### Explanatory Notes

29. If there is no increment between the two estimates, the final risk estimate takes the value of the lower of the two probabilities (precautionary approach). For example, if the Probability of Establishment is High and the Consequence of Establishment is Medium, the Final Risk Estimate will be High. If the Probability of Establishment is Low and the Consequence of Establishment is High, the Final Risk Estimate will be Medium.