# Road Maintenance Activities and The Fisheries Act

# A Guidance Document to Avoiding Conflict

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## Abstract

This document provides guidance to assist road managers in deciding which projects are likely to have a harmful effect on fish habitat. The Fisheries Act prohibits the harmful alteration disruption or destruction (HADD) of fish habitat. Some road maintenance activities can harm fish habitat.. The essential components of fish habitat are briefly described. Nine types of potentially harmful changes to habitat are discussed. A flow chart illustrates how these nine fish habitat concerns may affect the essential habitat components. Additional flow charts illustrate the concerns which are associated with specific road maintenance activities, such as roadside maintenance and bridge repair, and suggest mitigation techniques. Some mitigation measures are relatively easy to incorporate into a work plan, while others may require expert advice. By following the flow charts, road managers can identify the types of activities that may be in violation of the Fisheries Act, and determine when they should seek expert advice.

## Résumé

Le présent document vise à fournir des conseils aux responsables de la voirie pour les aider à décider quels projets d'entretien des routes sont susceptibles d'avoir des effets néfastes sur l'habitat du poisson. La *Loi sur les pêches* interdit toute activité entrainment la détérioration, la destruntion oula perturbation de l'habitat du poisson. Les composantes essentielles de ce dernier sont décrites, et neuf types de perturbations potentiellement délétères sont discutés. Un diagramme illustre comment celles-ci peuvent avoir un impact sur les composantes essentielles de l'habitat du poisson. D'autres diagrammes servant à illustrer les préoccupations que soulvènt des activités spécifiques d'entretien des routes, comme l'entretien des bords de route et la réfection de pont, et proposent des techniques palliatives. Certaines measures d'atténuation sont relativement faciles à inclure dans un plan de travail, tandis que d'autres requièrent l'aide de spécialistes. En se servant des diagrammes, les responsables de la voirie peuvent indentifier les types d'activité qui peuvent contrevenir à la *Loi sur les pêches* et déterminer quand ils devraiment demander l'aide spécialistes.

# 1.0 Introduction

Fish provide Canadians with numerous recreational and commercial activities. In recognition of this valuable resource, the federal government passed the Fisheries Act in 1868. The Act states that the protection of fish and their habitat is of utmost importance. Under the Act, the harmful alteration, disruption, or destruction (HADD) of fish habitat cannot occur without permission from the Minister of Fisheries and Oceans. But what is a harmful alteration, disruption or destruction, and how can it be avoided? Large scale projects that involve work in water are obvious potential HADDs and most proponents are aware of the need to seek guidance. The effects of routine maintenance type activities are not always as obvious, but in some cases the damage to fish habitat can be substantial and far reaching.

The purpose of this document is to provide guidance for road maintenance activities that take place in or near fish habitat. It outlines how an activity could harm fish habitat. This will help road managers determine where and how a fish habitat concern may arise.

# 2.0 The Fisheries Act

The Fisheries Act states “no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat” (Section 35(2)). The Department of Fisheries and Oceans must approve any project at which a HADD may occur. As well, “no person shall deposit or permit the deposit of any deleterious substance into water frequented by fish” (Section 36(3)). Any person found guilty of violating these regulations may be fined up to $1,000,000 and/or imprisoned for a period of three years. In addition, the person(s) responsible for the damage and may be required to return the site to its original state.

# 3.0 What is Fish Habitat?

As defined under the Fisheries Act, fish habitat is “spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.” In other words, fish habitat is any area or object that provides or contributes to fish food, cover, or reproduction. This includes areas where fish are not always present, such as migration routes.

## *3.1. How do you recognize fish habitat?*

### *Stream Categories*

Watercourses can be divided into three types based on their flow characteristics; permanent streams, intermittent streams, and ephemeral watercourses.

Any water course which flows year round is considered a permanent stream, regardless of its location. For example, a stream which was diverted at some time in the past, so that it flows within what would normally be considered the roadside ditch, is still a permanent stream. Nearly all permanent streams contain fish, and possible impacts on fish habitat should be considered whenever work is being done in or around them.

Intermittent streams flow only when the water table is high, and therefore cease to flow when the water table drops during the dry season. These streams may still be important fish habitat. In some cases fish spawn in these streams in the spring and the young move out shortly after hatching, so they are not affected by the stream going dry later in the year. Fish sometimes move into intermittent streams while they are flowing to feed, and then leave when they begin to go dry. Some fish species can survive in small isolated pools, and then spread out along the stream again when flow resumes. Intermittent streams can also carry sediment or other substances into permanent streams.

Unless it is known for certain that fish never use an intermittent stream, it is wise to assume that periodic use does occur. If work in and around intermittent streams is done while the stream is dry, the likelihood of damaging fish habitat is greatly reduced, as long as the habitat is not permanently changed. It is important, however, to anticipate what will happen when flow resumes, especially since this can occur quickly if there is a sudden storm.

The water found in ephemeral watercourses comes from surface runoff during the spring ice melt or immediately after a rain. It is often difficult to distinguish between intermittent streams and ephemeral watercourses. As a general rule, if there is a defined channel with no vegetation in the bottom the watercourse can be considered an intermittent stream. If there is no defined channel, and no area without vegetation, then the watercourse is probably ephemeral. Fish are rarely present in ephemeral streams, with a few exceptions; Pike and other closely related species often spawn in ephemeral streams, or in other areas which are temporarily flooded in the spring, including roadside ditches. If you are working in an area where northern pike are present in nearby lakes or larger streams you should consider the possibility that they spawn in such areas. Otherwise, concerns about work on ephemeral streams relate to their ability to carry sediment downstream.

### *3.2. The Essential Components of Fish Habitat*

There are four essential components to fish habitat: food, cover, spawning habitat and acces for migration. Fish require all four components, in adequate amounts, to survive and reproduce. Fish have the additional requirement of good water quality.

**Food**

A healthy community, consisting of many different organisms is required to satisfy the traditional requirements of all life stages of fish. The diet of smaller fish consists of small, often microscopic organisms, such as plankton and algae. Larger fish will eat invertebrates, such as insects, worms and crayfish and most larger fish will also eat smaller fish. The introduction of toxic materials, even in quantities not considered lethal to the fish themselves, may greatly reduce the amount of plankton, algae or invertebrates. A change in substrate, caused by direct removal of bottom materials, or as a result of introduced sediment, alters the numbers and types of invertebrates living in the water. The alteration of bank vegetation reduces the number of insects falling into the streams. Many aquatic invertebrates eat leaves from trees or other plant material that has fallen into the water. Therefore alteration of bank vegetation can affect the amount of food available.

**Cover**

Cover provides areas of refuge from predators, competitors and high flows. Rocks, woody debris, undercut banks, overhanging vegetation, aquatic vegetation, and deep water all provide cover for fish. Fish instinctively inhabit areas with cover, and the elimination of cover drastically reduces the number of fish at a site.

**Reproduction**

The habitat requirements for reproduction vary widely between species but most fish require specific substrate, water temperature and water velocity to spawn. Brook trout require spring seepage (upwelling) through the stream bottom where the eggs are deposited. Because spawning requirements are so specific, even minor changes to spawning habitats can have serious effects.

**Migration**

Most fish do not spend their entire life in one place. Their habitat requirements change with the seasons, and with age. Spawning migrations of large fish like salmon are well known, but even small fish may move to special areas at certain times of the year to reproduce, to feed, or to over winter. If access to these areas is blocked, the species may be eliminated. Freedom to move through streams also allows fish to re colonise areas after an unusually dry year, or an extremely cold winter. For these reasons it is important that culverts and other structures are installed in a manner that permits fish to move through them.

### 3.2.1. Water Quality

Fish require good quality water in which to live. The introduction of harmful substances, either chemical or physical, may harm or kill fish, or the plants and animals on which fish feed.

Water temperature is another important aspect of water quality. Cold water species, such as trout, are particularly sensitive to an increase in water temperatures, and so warm water is a harmful substance. Activities that remove bank vegetation will decrease shading and increase surface runoff, both of which cause an increase in water temperatures.

Sudden changes in water temperature, either from cold to warm or warm to cold, can kill fish.

## 4.0 What kinds of changes can cause a harmful alteration, disruption or destruction of fish habitat?

Not all changes to fish habitat are harmful. If done carefully, work in and around lakes and streams can often cause no harm. In some cases changes to fish habitat may even improve conditions for fish. The types of changes that *may* be harmful to fish habitat are listed below and are represented in the inserted chart entitled " Potential Impacts of Alteration on Fish Habitat".

**1. Alteration of Channel Shape or Cross Section**

An alteration of channel shape or cross section can occur with culvert replacement or extension. Machinery in the water can alter the channel shape by compacting the bottom materials or collapsing the banks.

A change in channel shape often alters the water velocities in that area. Water velocities increase if the channel is narrowed, straightened, or shortened (steeper gradient). Water velocities decrease if the channel is widened or lengthened.

Changes in water velocities cause both local and large scale effects. Locally, bottom materials can change, with finer particles deposited where the current is slower, or removed where the current is faster. In either case, the substrate is changed, thereby altering food production, cover and possibly reproduction.

The stream channel is created and maintained by the water that moves through it. When water velocities change, the channel adjusts to compensate. Thus straightening one section of a watercourse can cause increased erosion upstream and downstream. This erosion increases the amount of sediment added to the stream, reducing water quality. In some cases, the water cannot carry away all of the sediment, and it accumulates on the stream bottom. This accumulation chokes out vegetation and buries larger substrate, which affects food production and spawning habitat.

**2. Changes to Bank or Bottom Materials.**

The bank or bottom materials can be changed intentionally, as with the addition of rip rap. Materials can also be crushed or moved by machinery in the water. A change in the bottom materials affects food production, cover, and spawning substrate. When the bank materials are changed, bank erosion may be affected. When either bank or bottom materials are changed, the channel shape or cross section may be altered, leading to the fish habitat problems outlined in concern number 1 (*Change in channel shape or cross section*).

**3. Addition of Sediment to the Stream or Mobilization of Existing Sediment**

Sediment may be added directly to the water during snow removal, bridge cleaning, sandblasting, or deck replacement. The introduction of sediment can also occur indirectly by any activity that causes an increase in soil erosion in ditches or along stream banks.

Some routine road maintenance activities stir up sediment that is already present (i.e., on the stream bottom ). This can happen when machinery enters the water, when dams are removed, or during culvert replacement.

Regardless of how sediment enters the water, the effects are the same. High sediment levels rarely kill adult fish, but can harm eggs and young. When the sediment eventually settles on the stream bottom, it can bury important food, spawning, and cover habitat. Where large amounts of sediment enters streams it can change the channel shape, creating the same fish habitat concerns as if the channel had been directly altered.

**4. Alteration of Bank or Buffer Vegetation.**

The reduction of bank vegetation, through cutting, spraying or the use of heavy machinery, can harm fish habitat. The reduction of bank vegetation may decrease shading, which can lead to higher water temperatures. Trees and branches that fall into the water provide important cover for fish. Roots in the bank hold the soil together and a reduction in bank vegetation increases erosion along the bank.

Even vegetation farther away from the banks, in the "buffer" area is very important because it helps to trap sediment during rainstorms.

Activities that increase the amount of vegetation on the banks or in the buffer zone usually improve fish habitat.

**5. Disruption of Flow**

For some activities, flowing streams must be diverted so that work can be completed "in the dry". Such activities usually require the construction of coffer dams or temporary diversions. Sudden reductions in flow while the area behind a dam fills or when water is first diverted may leave fish, and the organisms that they feed on, stranded. Dams block fish migration, affecting spawning and other seasonal movements.

When a coffer dam (or a beaver dam) is removed, the sudden release of water can cause erosion downstream. Where the dam has been in existence for some time, sediment that has been accumulated behind it can also be released downstream.

When a pond has formed behind a dam, the water in it may become very warm. In streams that are normally cold, the warm water can kill fish downstream.

**6. Changes to Groundwater Flows**

Groundwater travels through the spaces between dirt and rock particles into streams and is important for maintaining stable flows. Only streams that receive a lot of groundwater will stay cold enough for trout to live in during the summer. Groundwater also helps these streams stay warmer during the winter, and this is important to keep the eggs of fall spawning fish from freezing. The location of groundwater seepage into streams is especially important to brook trout, as these are the only locations where they will spawn.

An increase in the size of footings or abutments or the extension of culverts can eliminate groundwater flow to specific areas. It is unlikely that a culvert extension or increases in footing or abutment size will significantly reduce water temperature or alter flow stability. However brook trout spawn directly on groundwater seeps. In many streams very little spawning habitat is available, and the destruction of even a small area of spawning habitat can have devastating effects on the fish population.

**7. Introduction of Toxic Materials**

Chemicals and debris that enter the water during bridgework, weed control, road paving, line painting or dust control may be toxic. These substances may kill fish directly, or reduce the

amount of food available for fish. Other substances can make fish ill, stop them from reproducing, or adversely affect the development of eggs and young.

**8. Fish Kills**

Activities such as blasting, or the quick release of water from behind a dam may kill fish. This will affect reproduction and food for the remaining fish populations.

**9. Blockage of Fish Passage**

Dams or culverts with the downstream end above the water's surface may permanently block upstream movements of fish. Culverts with very shallow water inside can also block fish, especially large fish, from moving up or downstream. If fish cannot get through certain areas, they may not be able to reach critical spawning grounds. Even species that are not considered migratory often travel up or downstream to preferred spawning or feeding areas. Any activity that blocks fish passage, even temporarily, should be timed so that the work does not coincide with spawning runs. The appropriate time will depend on which fish species live in the stream or lake.

### *Timing of Work*

Sediment can harm fish and fish habitat at any time, but eggs and developing larvae are especially vulnerable. They cannot move away from sediment, and are likely to be killed if they are buried by it. Therefore work in streams is usually not permitted when fish are spawning, or eggs are incubating. Different fish species spawn at different times of the year. Brook trout, brown trout, lake trout and the Pacific salmons spawn in the fall. Their eggs incubate through the winter, and the young emerge in the spring. In-stream work is not permitted during the fall or winter in streams that contain these species or near brook trout and lake trout spawning areas in lakes. Most other fish spawn in the spring or early summer, and where these species are present no in stream work is permitted during these times.

## 5.0 A Road Maintenance Activity Checklist

### *5.1 What are the Fish Habitat Concerns?*

The following pages outline the fish habitat concerns for each road maintenance activity. For many activities, additional concerns arise when machinery is in the water or coffer dams are used. Some activities may temporarily block fish passage. In this case, the timing of the activity is also a fish habitat concern, and work should be scheduled, where possible, so that it does not coincide with spawning runs.

### *5.2 The mitigation techniques available*

For many of the maintenance activities, simple mitigation techniques can reduce or eliminate the fish habitat concern. The use of bridge skirting during sandblasting, for example, eliminates the fish habitat concern of contaminants and sediments entering the water. Other activities will almost always require contacting the Ministry of Natural Resources. Culvert replacement for instance often requires detailed design information.

The following charts outline the mitigation methods that should be followed to avoid the harmful alteration, disruption or destruction of fish habitat. The mitigation measures have been colour coded according to the level of concern associated with each activity and mitigation.

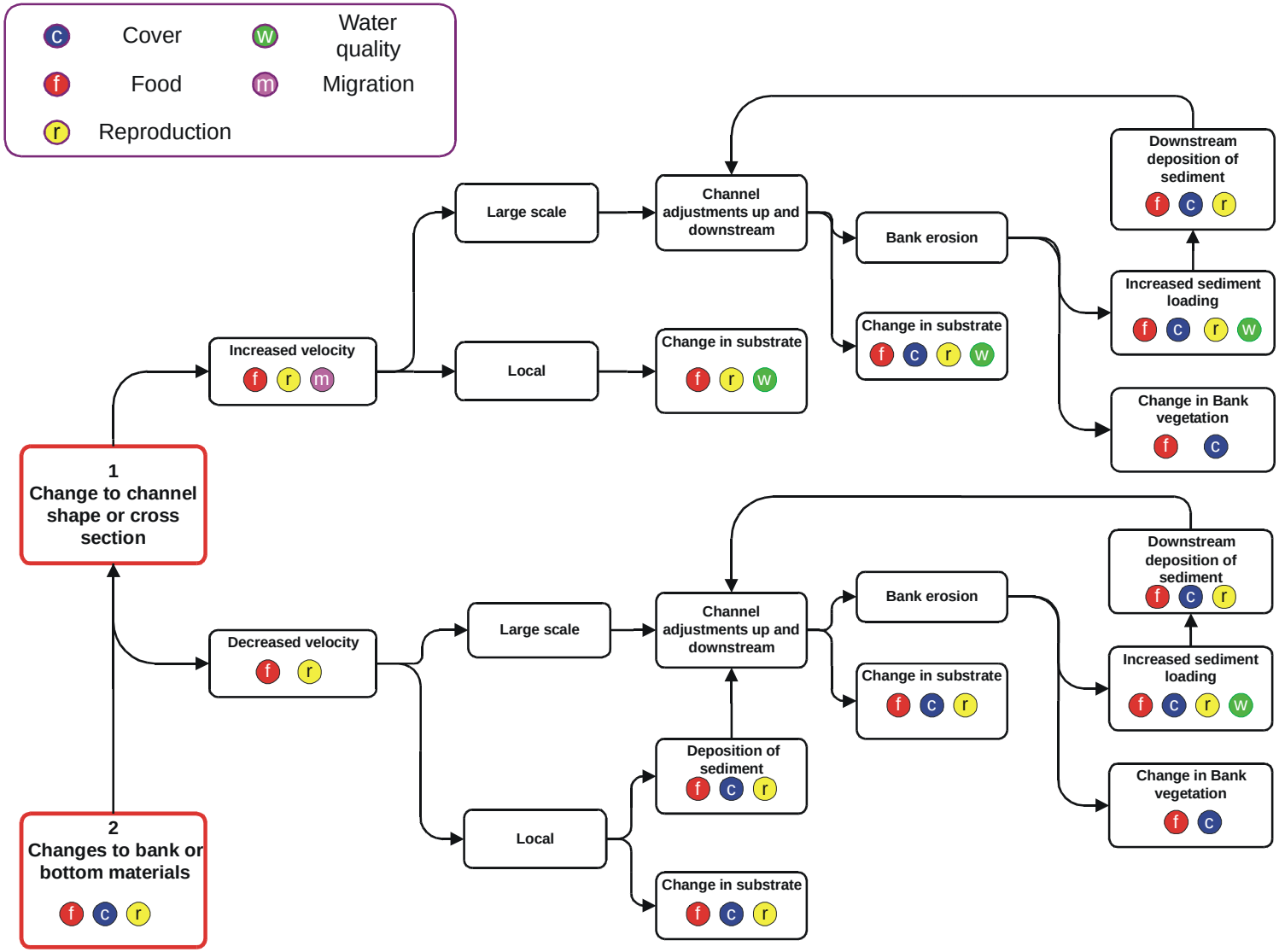
- Green: The potential harm to fish habitat is easily mitigated and work can proceed provided the proper mitigation techniques are used.

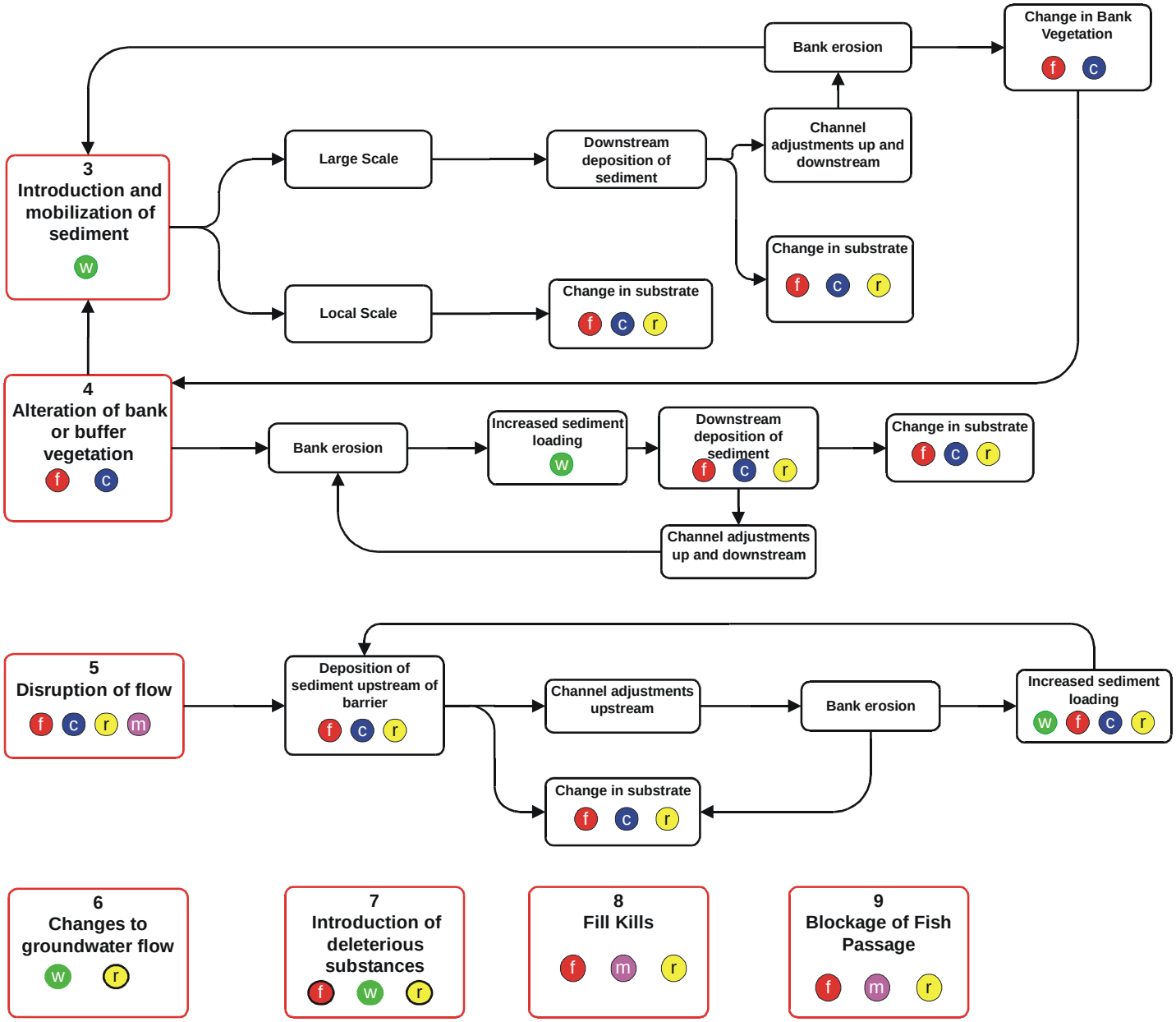
- Yellow: The potential harm to fish habitat is not as easily mitigated. Where it is not possible to follow all mitigation measures, or on larger projects, professional advice should be sought.

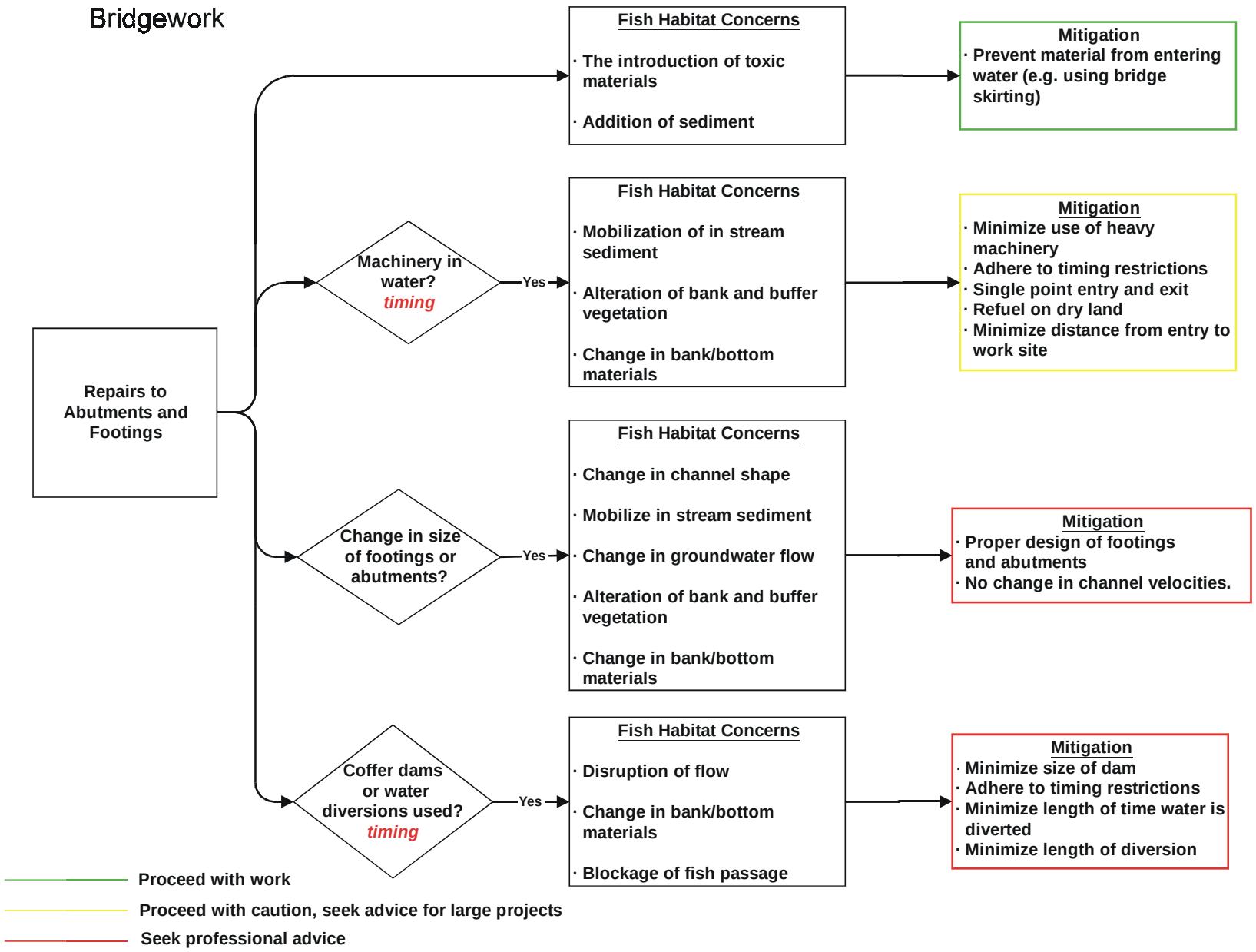
- Red: The potential harm to fish habitat is difficult to mitigate without professional input. For these types of activities professional advice must be sought.

Note that for all activities there may be timing restrictions, dependent on the species of fish present in the work area.

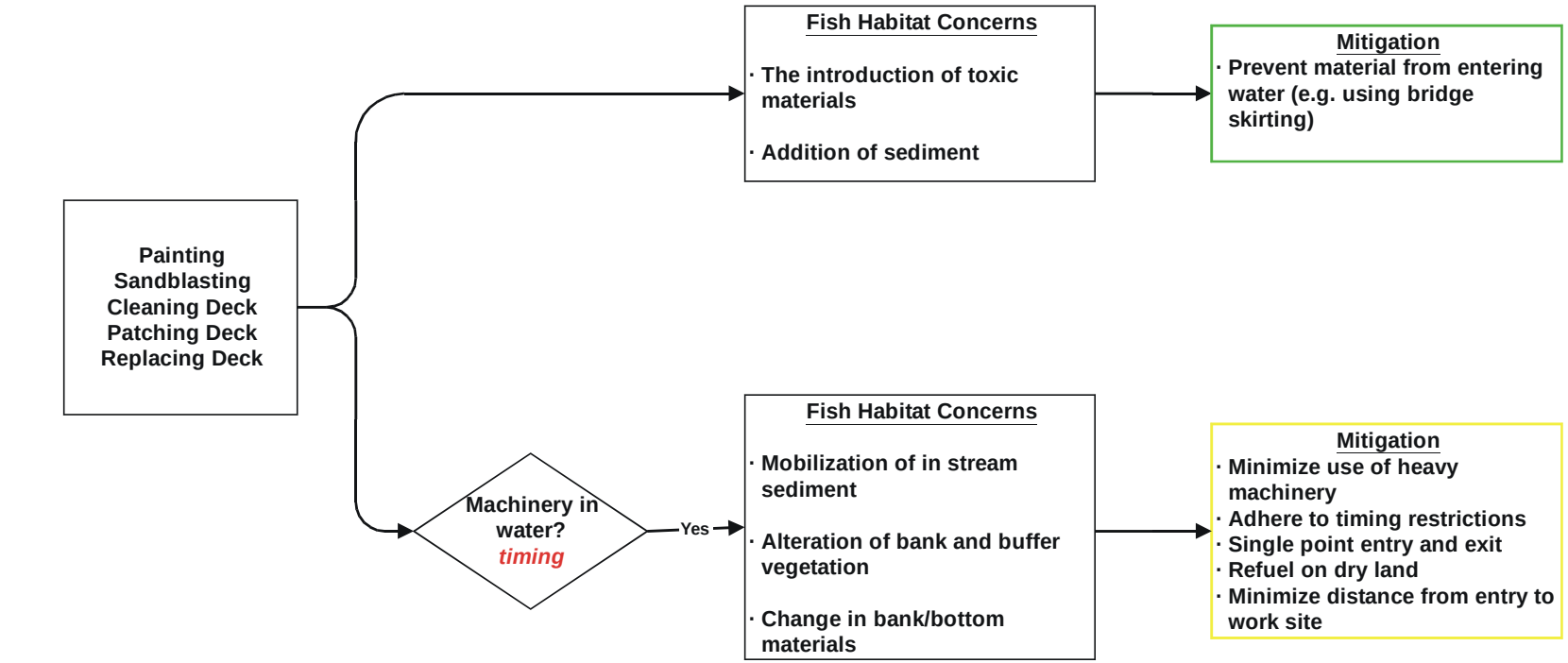
# The Potential Impacts of Alteration on Fish Habitat




3
Introduction and mobilization of sediment
w
Large Scale
Downstream deposition of sediment
Channel adjustments up and downstream
Bank erosion
Change in Bank Vegetation
f c
Change in substrate
f c r
Local Scale
Change in substrate
f c r
4
Alteration of bank or buffer vegetation
f c
Bank erosion
Increased sediment loading
w
Downstream deposition of sediment
f c r
Change in substrate
f c r
Channel adjustments up and downstream
5
Disruption of flow
f c r m
Deposition of sediment upstream of barrier
f c r
Channel adjustments upstream
Bank erosion
Increased sediment loading
w f c r
Change in substrate
f c r
6
Changes to groundwater flow
w r
7
Introduction of deleterious substances
f w r
8
Fill Kills
f m r
9
Blockage of Fish Passage
f m r


Bridgework
Repairs to Abutments and Footings
Machinery in water?
timing
Yes
Change in size of footings or abutments?
Yes
Coffer dams or water diversions used?
timing
Yes
Fish Habitat Concerns
· The introduction of toxic materials
· Addition of sediment
Mitigation
· Prevent material from entering water (e.g. using bridge skirting)
Fish Habitat Concerns
· Mobilization of in stream sediment
· Alteration of bank and buffer vegetation
· Change in bank/bottom materials
Mitigation
· Minimize use of heavy machinery
· Adhere to timing restrictions
· Single point entry and exit
· Refuel on dry land
· Minimize distance from entry to work site
Fish Habitat Concerns
· Change in channel shape
· Mobilize in stream sediment
· Change in groundwater flow
· Alteration of bank and buffer vegetation
· Change in bank/bottom materials
Mitigation
· Proper design of footings and abutments
· No change in channel velocities.
Fish Habitat Concerns
· Disruption of flow
· Change in bank/bottom materials
· Blockage of fish passage
Mitigation
· Minimize size of dam
· Adhere to timing restrictions
· Minimize length of time water is diverted
· Minimize length of diversion
Proceed with work
Proceed with caution, seek advice for large projects
Seek professional advice

## Bridgework



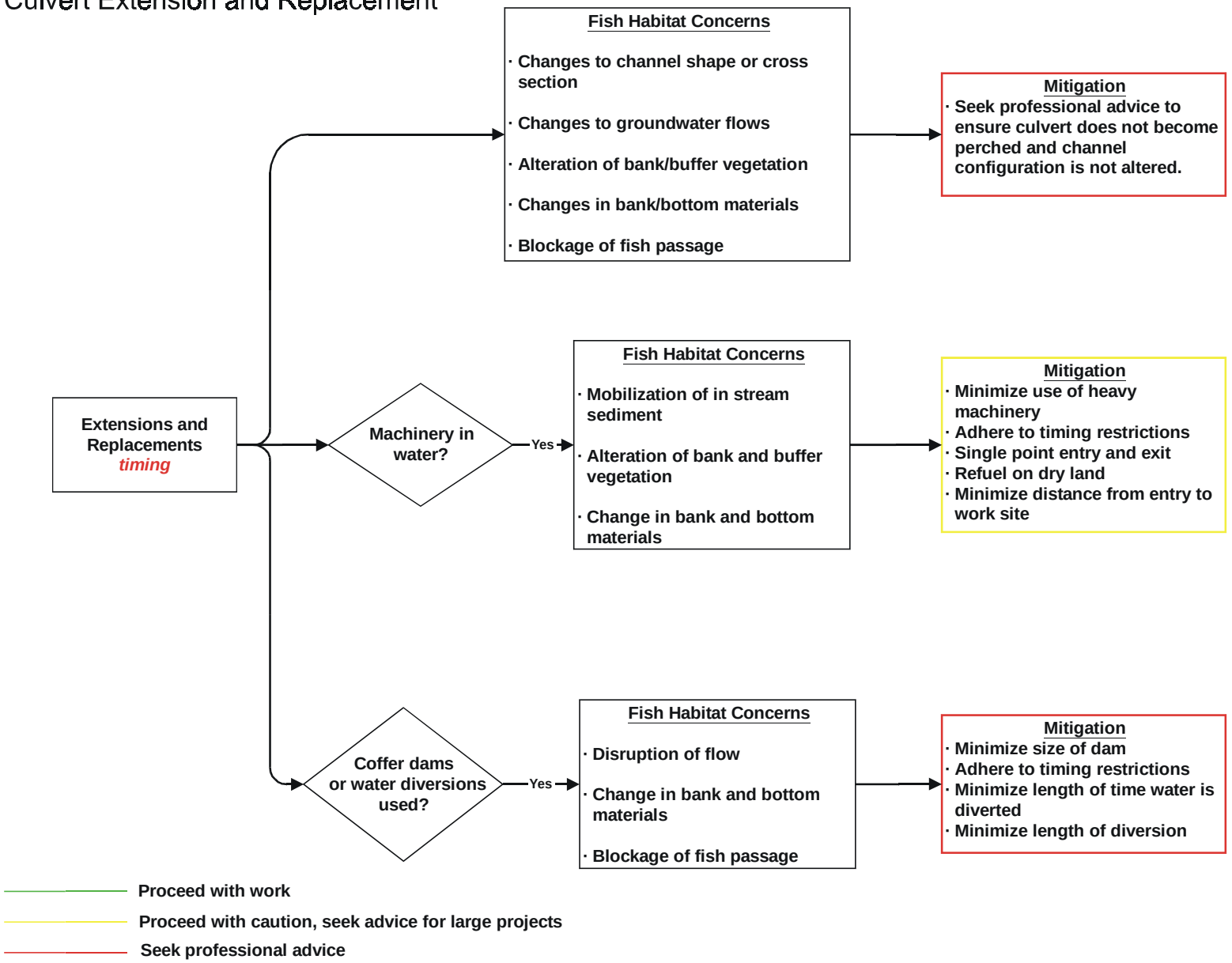

Proceed with work

Proceed with caution, seek advice for large projects

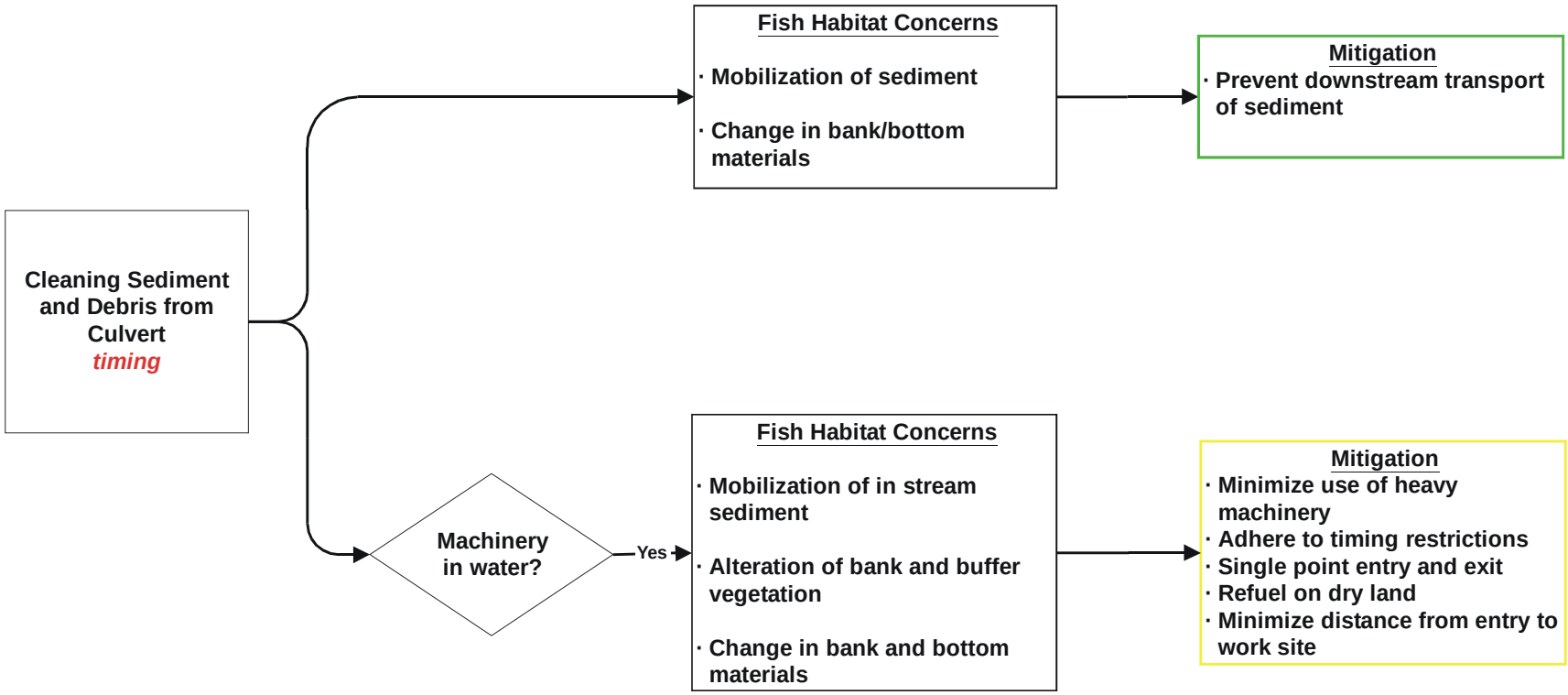
Seek professional advice

1. Samis, S.C., M.D. Nassichuk and B.J. Reid. 1990. Guidelines for the protection of fish and fish habitat during bridge maintenance operations in BC. Can. Tech. Rep. Fish. Aquat. Sci. 1692: vii + 64pp.

## Culvert Extension and Replacement



# Culvert Cleaning

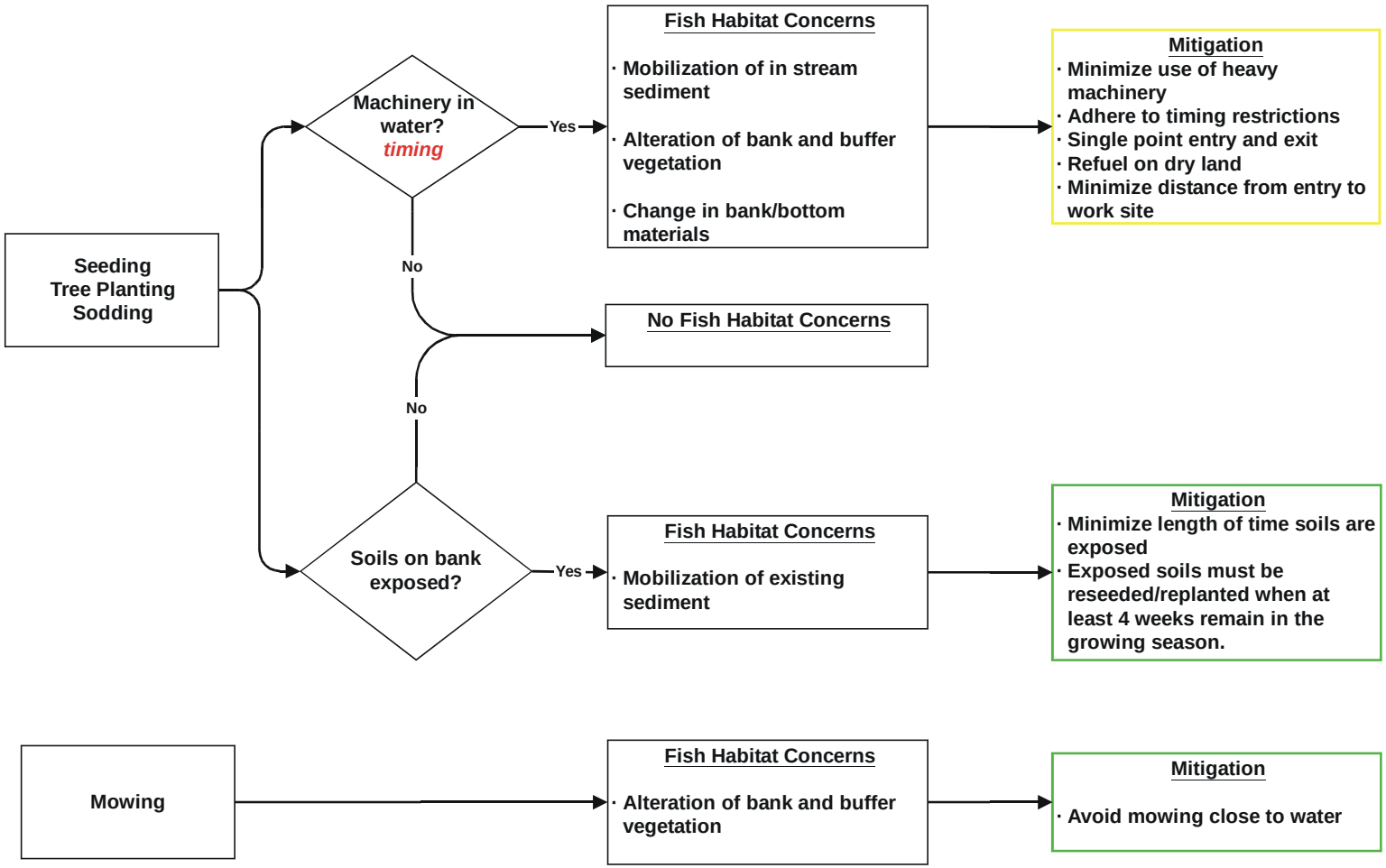



Proceed with work

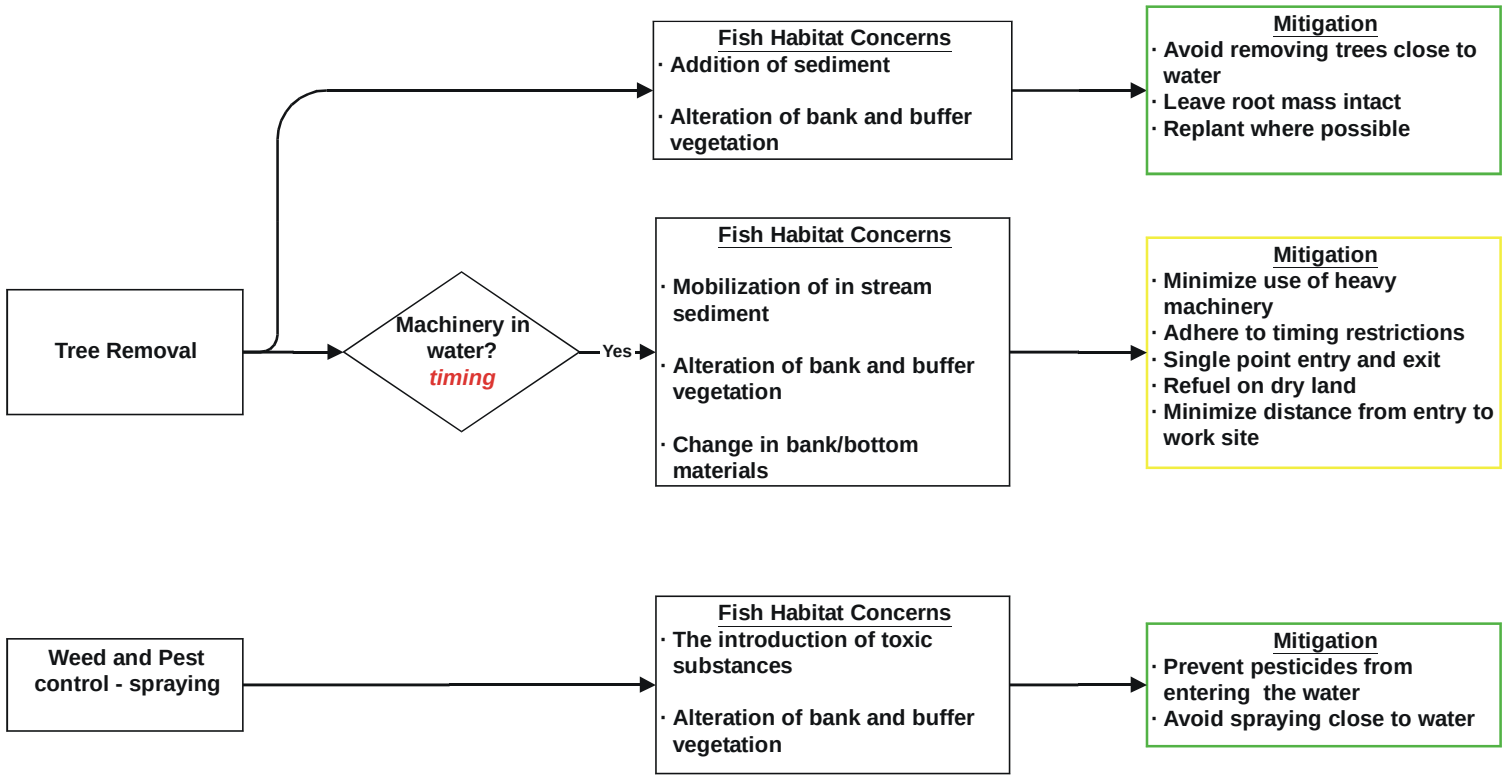
Proceed with caution, seek advice for large projects

Seek professional advice

## Roadside Maintenance



## Roadside Maintenance

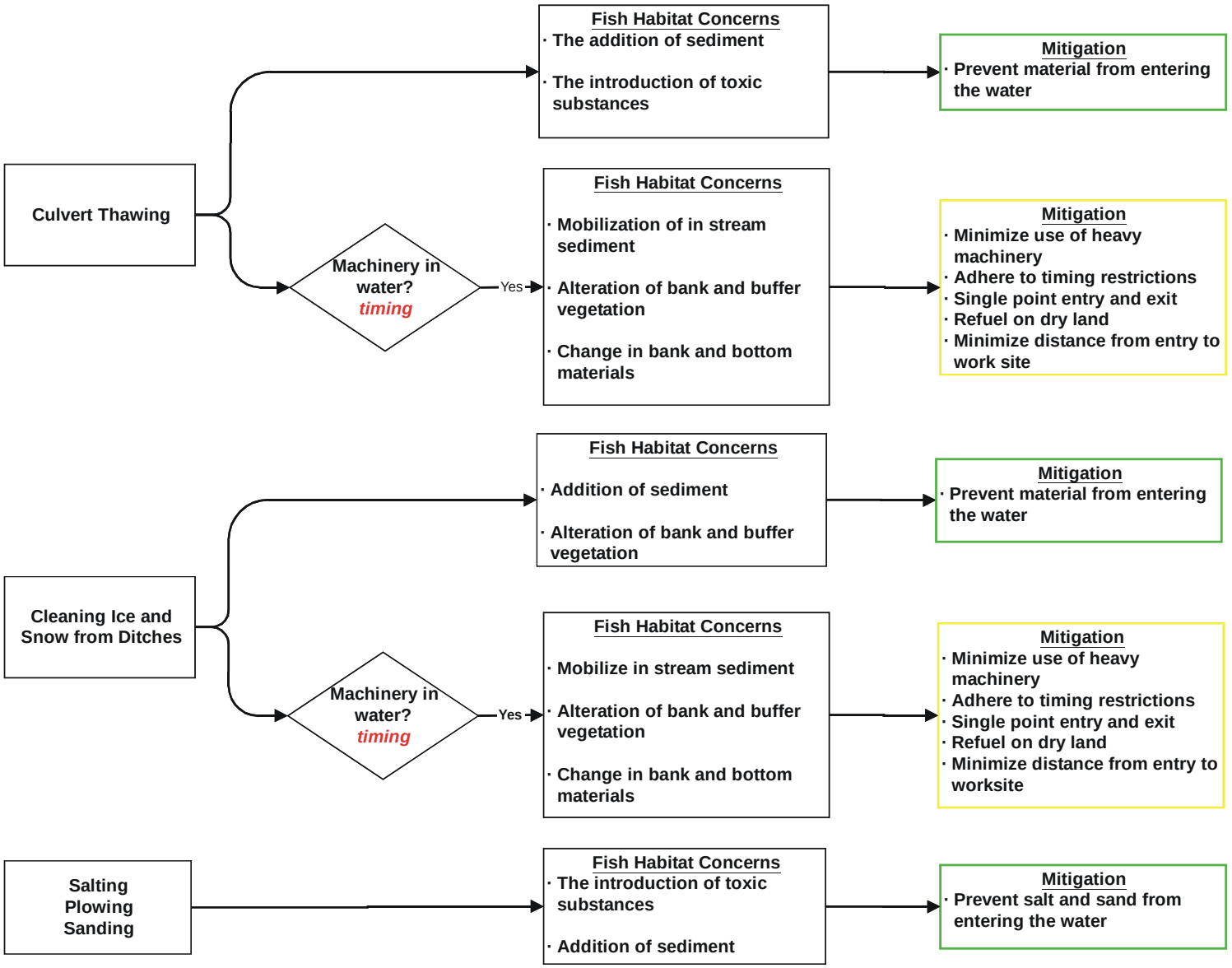



Proceed with work

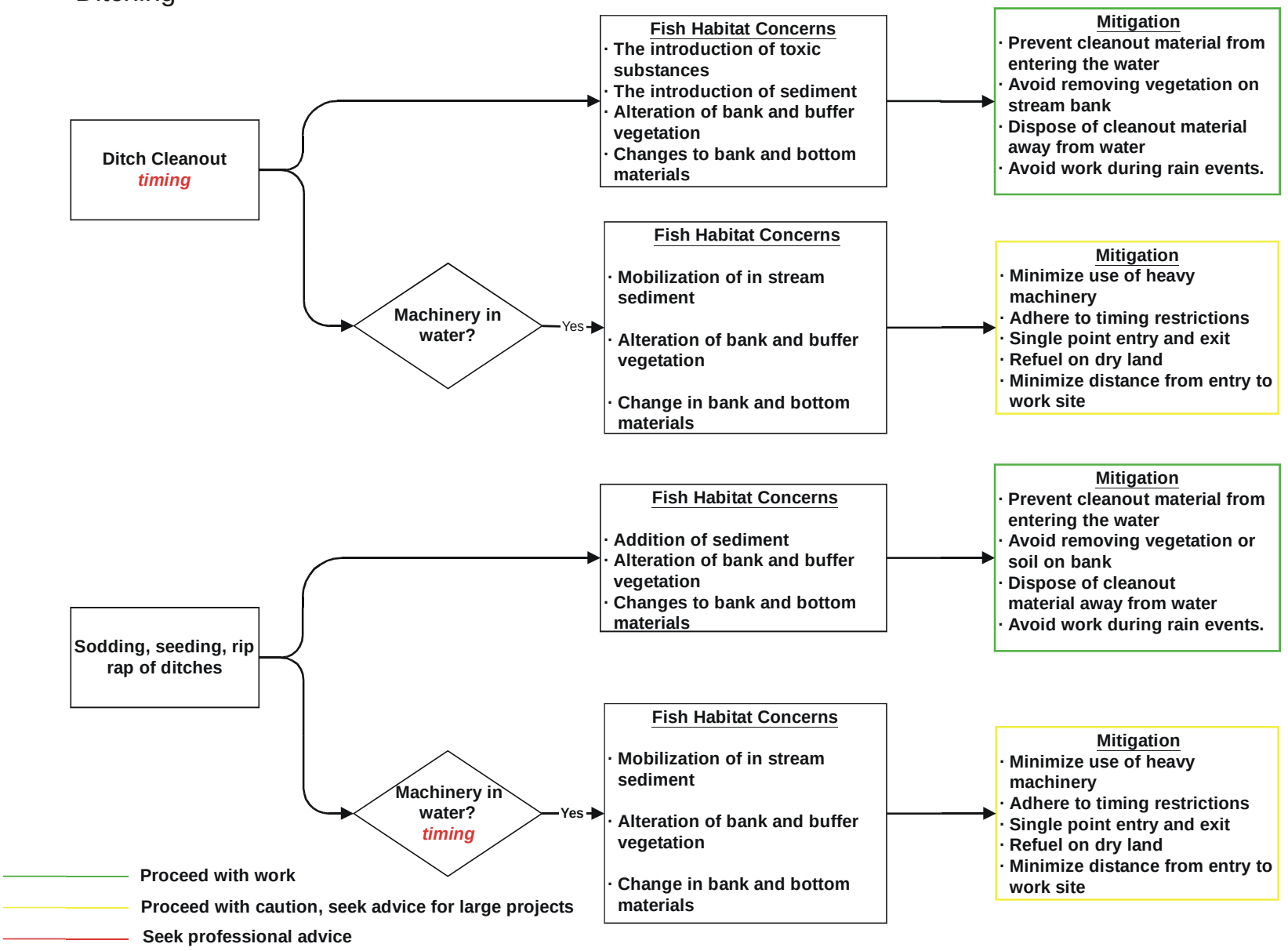
Proceed with caution, seek advice for large projects

Seek professional advice

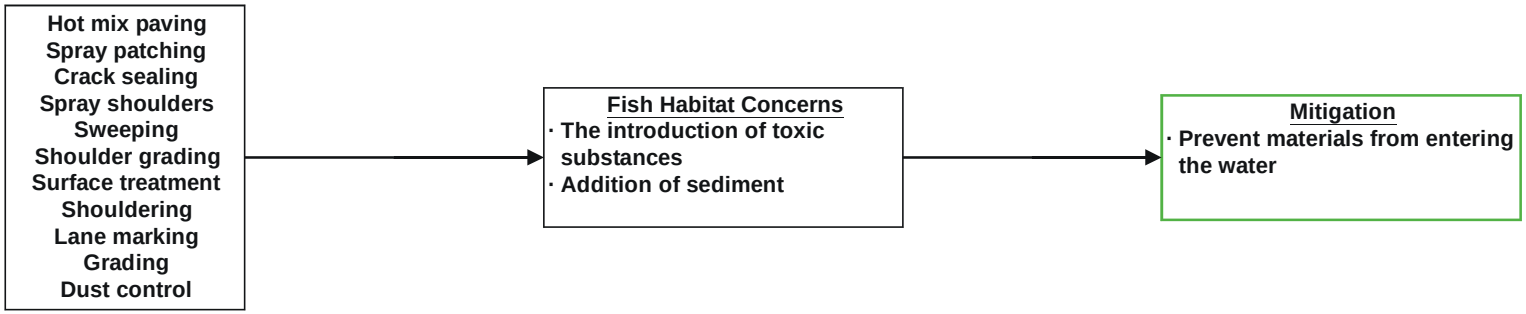
## Winter Maintenance



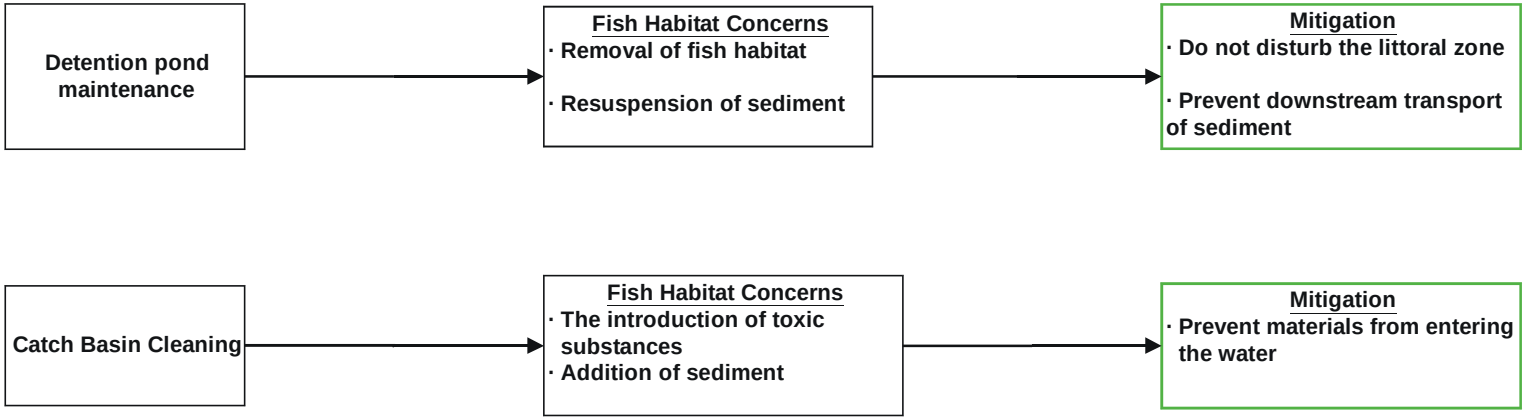
## Ditching


Ditch Cleanout
timing
Fish Habitat Concerns
· The introduction of toxic substances
· The introduction of sediment
· Alteration of bank and buffer vegetation
· Changes to bank and bottom materials
Mitigation
· Prevent cleanout material from entering the water
· Avoid removing vegetation on stream bank
· Dispose of cleanout material away from water
· Avoid work during rain events.
Machinery in water?
Yes
Fish Habitat Concerns
· Mobilization of in stream sediment
· Alteration of bank and buffer vegetation
· Change in bank and bottom materials
Mitigation
· Minimize use of heavy machinery
· Adhere to timing restrictions
· Single point entry and exit
· Refuel on dry land
· Minimize distance from entry to work site
Sodding, seeding, rip rap of ditches
Fish Habitat Concerns
· Addition of sediment
· Alteration of bank and buffer vegetation
· Changes to bank and bottom materials
Mitigation
· Prevent cleanout material from entering the water
· Avoid removing vegetation or soil on bank
· Dispose of cleanout material away from water
· Avoid work during rain events.
Machinery in water?
timing
Yes
Fish Habitat Concerns
· Mobilization of in stream sediment
· Alteration of bank and buffer vegetation
· Change in bank and bottom materials
Mitigation
· Minimize use of heavy machinery
· Adhere to timing restrictions
· Single point entry and exit
· Refuel on dry land
· Minimize distance from entry to work site
Proceed with work
Proceed with caution, seek advice for large projects
Seek professional advice

## Hard and Loose top Maintenance




## Miscellaneous

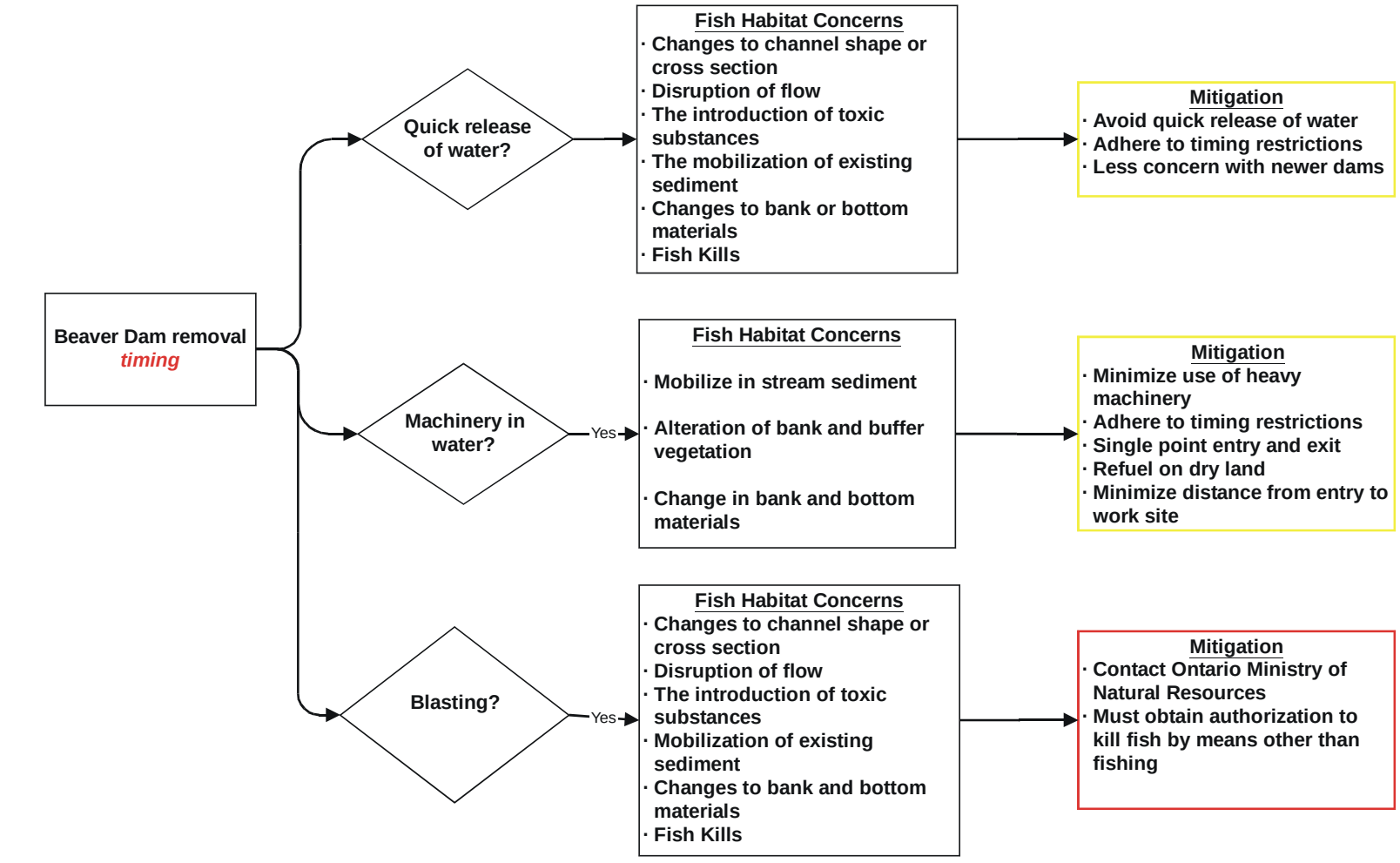


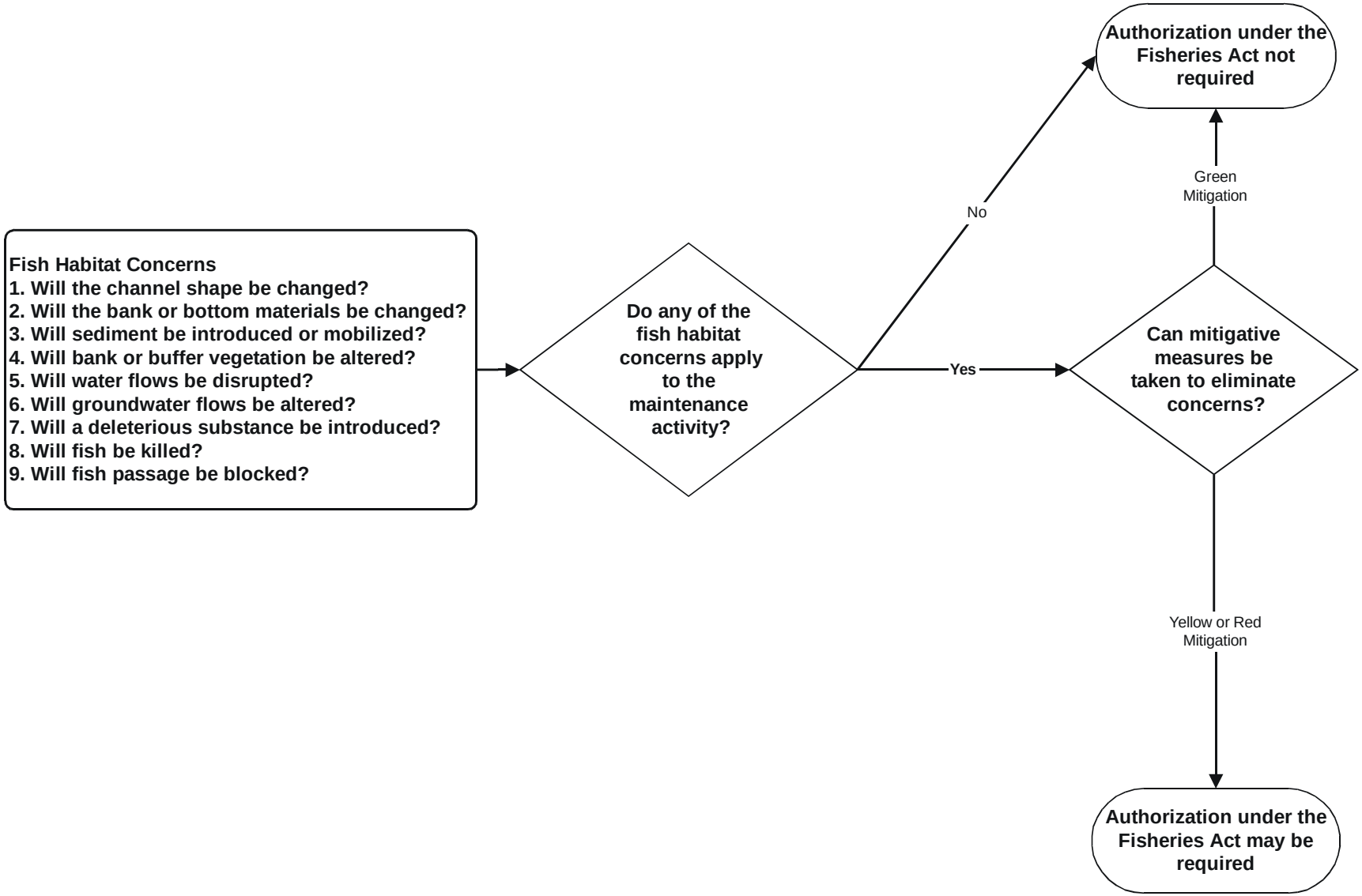

Proceed with work

Proceed with caution, seek advice for large projects

Seek professional advice

## Miscellaneous




Fish Habitat Concerns
1. Will the channel shape be changed?
2. Will the bank or bottom materials be changed?
3. Will sediment be introduced or mobilized?
4. Will bank or buffer vegetation be altered?
5. Will water flows be disrupted?
6. Will groundwater flows be altered?
7. Will a deleterious substance be introduced?
8. Will fish be killed?
9. Will fish passage be blocked?
Do any of the fish habitat concerns apply to the maintenance activity?
No
Yes
Authorization under the Fisheries Act not required
Green Mitigation
Can mitigative measures be taken to eliminate concerns?
Yellow or Red Mitigation
Authorization under the Fisheries Act may be required

## Acknowledgments

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