



This interim mitigation procedure provides Fisheries and Oceans Canada's (DFO) national guidance on the implementation of planning and implementing riparian zone re-vegetation when conducting works, undertakings and activities (projects) on land, near water.

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1.0 About this mitigation procedure

A mitigation procedure specifies how to implement a specific mitigation measure to achieve its objective and maximize its effectiveness. This mitigation procedure provides national guidance from Fisheries and Oceans Canada (DFO) on how to implement the following mitigation measure:

- Re-vegetate the affected [riparian zone](#) with native species suitable for the project site.

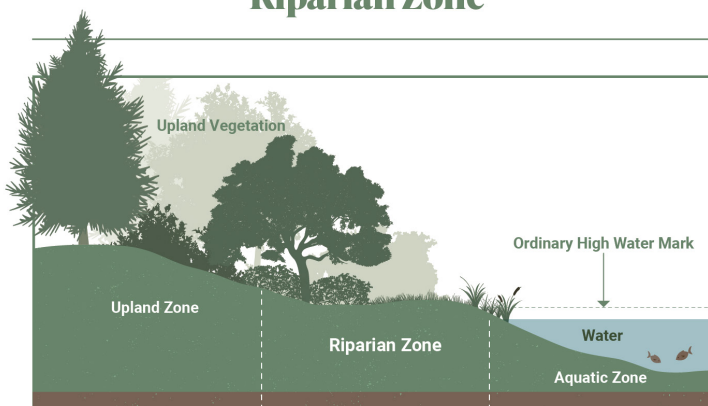
It is intended for use in planning and implementing riparian zone re-vegetation when conducting works, undertakings and activities (projects) on land, near water.

By following this mitigation procedure, project proponents can reduce the risk of harmful impacts to fish and fish habitat to an acceptable level. When the affected riparian zone occurs within critical habitat of species at risk, ensure alignment with the *Species at Risk Act* (SARA) by referring to species-specific recovery strategies during re-vegetation plan development.

The riparian zone is defined as the area located between a water body's [ordinary high water mark](#) (OHWM) and the upland area. The width of the riparian zone may be further defined by provincial, territorial or municipal regulations or guidelines. The riparian zone has unique physical, geomorphological, and chemical properties that support fish habitat (meaning, functions) by providing habitat structure and cover, water temperature regulation, food supply, contaminant and excess nutrient uptake, bank stabilization, noise and light buffering, and wood recruitment and is sensitive to environmental change. Activities that occur in the riparian zone may have direct and indirect effects on fish and fish habitat.

Riparian re-vegetation is a mitigation measure used when riparian zones associated with fish bearing waters are temporarily disturbed or changed by works, undertakings, and activities (projects), such as construction of new infrastructure or maintenance or removal activities associated with existing projects (for example, bridge, culvert, or outfalls), and bank stabilization.

Riparian Zone





2.0 User guide

Mitigation procedures are one of a suite of tools used by the Fish and Fish Habitat Protection Program (FFHPP) to manage the risk of harmful impacts to fish and fish habitat from projects carried out in or near water. They create efficiencies in the regulatory process by standardizing requirements for certain types of common projects.

Mitigation procedures **are not considered stand-alone documents**. The conditions under which they can be applied, other applicable management measures (for example, carry out the project in accordance with [timing windows](#)), and any engagement or consultation requirements are dictated by the instrument within which it is referenced (for example, *Fisheries Act* Authorization).

DFO, as part of the Crown, is bound under Section 35 of the *Constitution Act*, 1982 to uphold and respect the full spectrum of Indigenous rights. DFO also has a duty to consult and accommodate Indigenous Peoples when carrying out Crown conduct or a decision, such as a *Fisheries Act* authorization. Input from Indigenous Peoples, including Indigenous Knowledge, when provided, plays a vital role in regulatory decision-making. Indigenous input and knowledge may offer insights into Aboriginal and treaty rights, increase understanding of potential risks, impacts and concerns, and inform the design of avoidance and mitigation measures. Proponents should consider this in determining their approach to mitigating risks to fish and fish habitat from projects and incorporate these into their request for review or application for authorization regardless of the approaches outlined in the mitigation procedure.

Project proponents can indicate their intention to follow one or more DFO mitigation procedures in their project submission or when submitting an [application for authorization](#). Submission should indicate specific sections of the mitigation procedures that apply to the proposed project and include any additional site-specific management measures related to the method used.

The type of riparian zone and site-specific conditions will often inform the preferred method(s) for re-vegetation following disturbance or changes to the existing riparian vegetation. Some examples include:

- **Previously disturbed sites**
May require extensive management of invasive plants, import of clean soil, and ongoing maintenance.
- **Projects adjacent to aquatic habitat**
May require monitoring to manage and maintain [erosion](#) and sediment control measures.

All aspects of this mitigation procedure are expected to be applied by, or in consultation with, a [qualified environmental professional](#) with demonstrated re-vegetation expertise and experience relevant to the project type and project location.

Mitigation procedures do not remove nor replace the obligation to comply with all applicable statutory and regulatory requirements of the *Fisheries Act*, the *Species at Risk Act*, the United Nations Declaration on the Rights of Indigenous Peoples Act, or other federal, provincial, territorial, or municipal legislation and policy including guidance regarding species and habitats managed by these jurisdictions.



Up-to-date information on DFO mitigation procedures can be found on the [Projects near water](#) website.

3.0 Methods

This riparian re-vegetation mitigation procedure is structured in four phases and associated sub-steps within each phase:

1. Baseline information and planning
2. Site preparation
3. Planting
4. Monitoring and maintenance

3.1 Baseline information and planning

3.1.1 Baseline Information

Collect baseline information about the site and surrounding area to be re-vegetated including pre-project elevation, slope, aspect, soil properties, drainage class, rooting depth and restrictive layers, water table and seepage, and native vegetation (for example, species, density, structure) to inform the re-vegetation plan.

- Identify re-vegetation planting zones (for example, low benches prone to flooding, mid-slope areas, or upper banks, based on their hydrologic regime tolerance and rooting depth).
- Identify pre-project site conditions using [reference sites](#), when necessary to inform vegetation selection.
- Identify areas on the site that may not be appropriate for re-vegetation due to ongoing disturbance (for example, right of ways for highway maintenance and transmission or other utility lines, safe sight lines, agricultural use, wildlife conflict) or other constraints.
- Identify invasive plant species to be managed within the project site.
- Identify climate change effects (for example, consideration of sea level rise, shifts in weather patterns, growing season) to inform re-vegetation prescriptions.

3.1.2 Planning

When planning work that may occur in the riparian zone and any post-construction re-vegetation activities, it is important to take into account the overall objective of avoiding risks to fish and fish habitat before considering mitigating for project activities. Re-vegetation should be part of the overall plan to retain or replace functions provided by the riparian zone when risks are expected.

To ensure adequate planning, riparian zone re-vegetation should be carried out through an inclusive process, actively involving local Indigenous communities in planning activities, such as the selection of plant species. The participation of Indigenous communities can help preserve and enhance local biodiversity and strengthen the ecological sustainability of re-vegetation efforts, while respecting their rights as stewards of the land. This collaboration also promotes social acceptability of projects by integrating traditional knowledge adapted to



regional ecosystems.

- Using baseline information, prepare a re-vegetation plan led by a qualified environmental professional that encompasses the plan elements that are discussed in more detail below and within sections 3.2, 3.3 and 3.4.
 - o Describe clear [expected outcomes](#) to be monitored and achieved within a defined timeframe.
 - o Identify [contingency measures](#).
 - o Identify responsible parties for all aspects of the plan.

3.2 Site preparation

Prepare the site according to specifications identified in the re-vegetation plan to create optimal conditions for plants to establish quickly, improve survivorship, deter invasive plant establishment, and provide riparian functions to fish habitat with minimal lag time.

3.2.1 Plant salvage

Salvaging native plants prior to disturbance helps preserve natural plant diversity and reduce project costs.

- Salvage plants and harvest live stakes during their dormant period, when possible.
- Protect roots of salvaged plants during excavation by maximizing the size of the root ball and trim any damaged roots to promote rapid healing.
- Store salvaged plants and live stakes in a cool, shaded, and moderately humid environment, as required.
- Obtain all applicable federal, provincial or territorial permits, licenses, and authorizations for collection of rare or endangered plant species.

3.2.2 Soil salvage

Salvaging soil helps conserve healthy soil in the re-vegetation area by maintaining nutrient cycling, organic material, soil microbes, and plant propagules.

- Salvage topsoil where there are no invasive plants or other deleterious materials present.
- Salvage and stockpile topsoil separately from subsoil.
- Stabilize temporary soil stockpiles (for example, cover with polyethylene sheeting or tarps).
- Locate temporary soil stockpiles above the ordinary high water mark.
- Salvage soil that meets appropriate standards for growing media as confirmed by soil testing from an accredited commercial soil specialist laboratory, when required by the relevant federal, provincial or territorial requirements.

3.2.3 Invasive plant management

The appropriate management of invasive plants during site preparation is critical to limit the potential for recolonization post-planting.



- Transport and dispose of invasive plant material and associated soil in accordance with federal, provincial or territorial requirements.
- Select treatment methods (for example, mechanical, chemical, ecological, and/or biological) in accordance with site conditions, timing, regional best management practices or applicable federal, provincial or territorial requirements.
- Re-vegetate or mulch exposed ground after treatment of invasive plants to prevent re-establishment.

3.2.4 Site stabilization

Erosion control and site stabilization helps prevent sediment and other deleterious substances from entering aquatic habitat. Refer to the interim mitigation procedure: [Planning for land-based erosion and sediment control](#).

- Prepare ground to re-vegetation plan specifications to ensure bank stability.
 - Emphasize soil deconsolidation and rough grading.
- Remove materials that may interfere with re-vegetation establishment (for example, construction and demolition debris, landscaping debris, garbage).
- Immediately seed and/or plant disturbed banks to promote quick growing native vegetative cover and minimize exposed soils.

3.2.5 Planting medium

Providing an appropriate planting medium reduces transplant stress and facilitates survivorship and healthy plant growth.

- Use planting medium that is free of invasive or undesirable plants and plant parts, and other deleterious materials.
- Ensure soil (salvaged or imported) meets appropriate standards for growing media (for example, percent sand/silt/clay, and gravel, pH, organic content, and nutrients) as confirmed by soil testing from an accredited commercial soil specialist laboratory, when required by the relevant federal, provincial or territorial requirements.
- Amend planting medium to meet site conditions, as required.
- Consider options other than fertilizers to promote growth and plant health, such as mycorrhizae.

3.3 Planting

Install plants according to the re-vegetation plan, which should include specifications for:

- species and stock type (for example, seeds, cuttings, stakes, fascines (wattles or bundles), plugs, bare root, pots/containers, balled and burlap, vegetation mats, salvaged plants), plant spacing by stratum (meaning, herbaceous, shrub, tree), and seeding specifications, where applicable

The re-vegetation plan may also specify features to enhance habitat complexity and measures to protect newly established plantings.



3.3.1 Species selection

Selecting species that are appropriate for the re-vegetation area and sourced locally can improve plant survival and support the objectives of the re-vegetation plan.

- Select native plant species and native seed mixes according to re-vegetation objectives, site growing conditions (for example, shade tolerance, water and nutrient availability, invasive plant competition), and seasonal timing for re-vegetation.
 - Select plant species that have a wide tolerance to growing conditions and traits that can thrive in response to climate change (for example, drought and heat tolerance, low flammability characteristics, resilient to extreme weather events).
 - Select native plant species that can establish quickly and compete with invasive plant species (meaning, early successional or pioneer species, or species that have a greater growing condition tolerance).
 - Select native seed mixes that can minimize invasive plant establishment and prevent surface erosion of growing medium but not outcompete planted native species.
- Incorporate a diversity of species representing different form and functional groups (for example, deep-rooted stabilizers, thicket forming, nitrogen-fixers when it will not promote proliferation of invasive species).
- Install features to enhance habitat complexity and promote ecosystem productivity (for example, coarse woody debris, snags, rock piles), if applicable.
- Match plant species to the appropriate planting zone (for example, low benches prone to flooding, mid-slope areas, or upper banks) based on their tolerance to site hydrology and rooting requirements.
- Consider plant species that are culturally significant to local Indigenous communities.
- Select plants that are not palatable to wildlife if animal browse is expected.
- Use nursery stock with healthy and vigorous roots.
- Use tree and shrub species of guaranteed nursery stock unless using locally harvested plants.

3.3.2 Plant establishment

Factors, such as plant spacing and quantity, are important to ensure plants have adequate access to suitable growing conditions (meaning, sunlight, water, nutrients) especially during plant establishment. The proper approach allows plants to thrive, reduces competition and susceptibility to pests and disease, and minimizes the need for maintenance.

- Determine plant spacing and quantity, stock type and size.
 - By plant stratum (for example, 0.3 to 0.6 m centre-to-centre spacing for grasses (excluding seeding), forbs and plugs; 0.5 to 1 m centre-to-centre spacing for shrubs; and 2 to 5 m centre to centre spacing for trees).
 - By site conditions (for example, the site has areas of exposed bedrock, existing vegetation, tree



root protection zones, recreational trails, invasive plant species).

- Size the planting hole 2 to 3 times the size of the roots and plant flush with the finished grade.
- Loosen soil in the planting hole.
- Use stock size and stake length (where applicable when using live stakes) that will have greater survivorship for site conditions.
- Prescribe shrub planting in clusters as opposed to a grid, if gaps are desirable.
- Broadcast seed density to suit site conditions (for example, temporary cover on erodible slopes not within the re-vegetation planting area).
- Use mulch where moisture retention is a concern (meaning, mulch type and thickness).

3.3.3 Schedule

Timing re-vegetation activities is important to improve survivorship of installed plants and minimize transplant stress in addition to reducing invasive plant colonization.

- Avoid re-vegetating during extreme heat, prolonged drought, flood-prone periods, when there is risk of frost or snow, or when the ground is frozen.
- Re-vegetation should occur in late spring after the ground has thawed or early fall before the first frost.
- Seed when germination will be optimal.
- Consider timing of transporting, handling, and storage of plants and stakes to provide optimal conditions to preserve and protect stock.
- Coordinate planting with site access and construction schedules to ensure that re-vegetation occurs promptly.
- Implement temporary measures if construction schedule does not permit preferred re-vegetation timing to minimize erosion (for example, temporary seeding and erosion control products).

3.3.4 Protection

Planning for protection of the re-vegetation area and individual plants from human disturbance (for example, along frequently used trails, road or utility right of ways, and parks) and animal disturbance (for example, animal browse, livestock trampling) may need to be considered based on site conditions and should be identified in the re-vegetation plan.

- Clearly delineate areas with existing vegetation that are to be retained and require protection.
- Identify specifications for protection features, such as fences, stem collars, and signage.
- Install fencing, signage, or other barriers to protect the re-vegetation area from human and/or animal disturbance.
- Install stem collars, seedling covers, or tree guards, as required.
- Install protection materials that are non-toxic and untreated where possible.



3.4 Monitoring and maintenance

Re-vegetation success will be assessed through monitoring and maintenance. Regular monitoring will identify maintenance needs, contingency measures to address deficiencies, and compared to criteria developed during planning to determine expected outcomes have been achieved.

3.4.1 Monitor the re-vegetated area

- Conduct monitoring and maintenance of the re-vegetated area for a minimum of one year after planting, or longer if indicated in the re-vegetation plan, to determine that expected outcomes have been achieved.
- Schedule monitoring considering seasonal variations (for example, monitor in late spring during the active growing period and prior to summer drought conditions when some plants may become dormant).

3.4.2 Maintain the re-vegetated area

- Conduct maintenance soon after re-vegetation.
- Apply contingency measures to address deficiencies when monitoring indicates that the expected outcomes are not being met (for example, plant mortality or low vitality).
- Provide supplementary water to maintain soil moisture during drought conditions (hand watering, watering trucks, or irrigation).
- Inspect and repair irrigation systems, if applicable to the project.
- Repair fences or other protection measures, if applicable.
- Install supplemental barriers around plants if human disturbance or animal browse is observed.
- Remove or replace installed barriers that are interfering with plant form and growth.
- Replace dead plants with the same species or plant species substitutions with higher site-specific survivorship (informed by results of the monitoring program).
- Remove invasive plants in the re-vegetation area.
- Replace bark mulch where applicable.
- Prune live plants as needed.
- Re-seed exposed soil or areas affected by erosion.
- Remove refuse from the re-vegetation area.

Glossary

Contingency measures

Secondary actions implemented if the primary measures, such as avoidance, mitigation, or offsetting measures, fail to meet their expected outcomes.



Erosion

The wearing of soil from by wind, water, or gravity.

Expected outcome

States the required result of a management measure and is used to:

- establish a clear linkage to the policy objective
- frame the effectiveness science and monitoring

For example, survivorship of planted material within the re-vegetation area will be 100% for trees and 80% for shrubs at the end of Year 5 post construction; A minimum of 5 native species of trees and shrubs will be present in the re-vegetation area with at least 10% aerial cover of each species; Invasive plant species aerial cover will not exceed 10% cover during each monitoring year post construction.

Marine environment

Comprises all ocean, coastal waters and estuaries, including intertidal zones and salt water marshes, and extending, in the case of watercourses, up to the freshwater limit.

Ordinary high water mark

The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (for example, rivers and streams) this refers to the 'active channel/bank-full level' which is often the 1:2 year flood flow return level. In inland lakes, wetlands or [marine environments](#), it refers to those parts of the water body, bed and banks that are frequently flooded by water, leaving a mark on the land. It's where the natural vegetation changes from mostly aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (meaning, full supply level).

Qualified environmental professional

A person experienced in identifying and analyzing the risks to fish and fish habitat generated from various works, undertakings or activities conducted in or near water, and implementing management measures to avoid and mitigate these risks. They possess a post secondary degree or diploma in biological, geophysical or environmental sciences and are referred to as:

- applied scientists
- aquatic biologists
- environmental consultants
- fisheries biologists
- fisheries technicians



- fluvial geomorphologists
- natural resource consultants

Reference site

A natural or minimally disturbed area, in close proximity to the disturbed site and with similar ecological features that acts as a benchmark or model for assessing, restoring, or managing ecosystems.

Riparian zone

Area located between a water body's [ordinary high water mark](#) and upland area. The width of the riparian zone may be further defined by provincial, territorial or municipal regulations or guidelines.