

3.0 IMPACTS OF WATERCOURSE ALTERATIONS

Any alteration to, near, or in a watercourse may impact the watercourse and its aquatic habitat negatively. Alterations must therefore be carefully planned before they begin. The following information describes potential negative impacts and their effects on the aquatic environment.

3.1 BASIC WATER QUALITY PARAMETERS

The following information highlights some basic water quality parameters that can be impacted by watercourse alterations. It is important to keep in mind that these parameters can differ greatly (e.g. the Petitcodiac River and the Miramichi River) and the value of each of the parameter listed below is evaluated on a case by case during the permitting review process.

- **Water clarity** is essential for fish to find food, food production, oxygen up-take, and migration.
- **Dissolved oxygen** levels must be optimal for fish survival throughout all stages of life.
- **Water temperature** needs to remain cool and at an optimal temperature to maintain fish and fish habitat. The range of optimal temperature depends on the fish species that are present in the watercourse. Warmer temperatures decrease the level of dissolved oxygen.
- **Gravel substrate** must remain clean for spawning to be successful and incubating eggs to survive.
- **Fish passage** must remain unobstructed for successful migration to occur.

3.2 EROSION

Erosion is the detachment of soil particles and loss of surface material from the Earth's surface by the action of gravity, ice, water, wind, or as a result of other natural occurrences or human-induced events. Throughout an alteration, exposed soil may accelerate the rate of erosion if protective measures are not properly employed.

If erosion does occur at an alteration site, it could have the following impacts on:

- Fish/Fish Habitat
 - Disruption of migration patterns due to large amounts of erodible material blocking the upstream and downstream reaches
 - Reduction in the food supply as a result of a loss of vegetation along the banks and adjacent areas
 - Reduction in areas providing shelter to small fish

- Elimination of rearing pools, holding areas, and spawning grounds as a result of sediment deposition
- Water Quality
 - Increase in water temperature and decrease in the amount of cover, shade, and food for aquatic organisms due to the loss of vegetation along the banks and adjacent areas, and/or bank failure
 - Changes in the water chemistry and aquatic species in response to increased levels of nutrients such as nitrogen and phosphorus

3.3 SEDIMENTATION

Sedimentation is the deposition of fine particles, such as sand, silt and clay, which have been dislodged from exposed soils and transported by water. It is a natural but potentially serious consequence of erosion, which may be accelerated by an alteration. Sedimentation is divided into two categories based on how the stream flow propels it:

- **Suspended sediment:** Soil particles suspended in the water column. Suspension is dependent on particle size.
- **Bedload movement:** Soil particles that slide, roll, or bounce along the bed of the watercourse. These particles may be too heavy, or the stream flow velocity is too slow to be suspended in the water column.

If sediment is present in a watercourse, it may have the following impacts on:

- Fish/Fish Habitat
 - Suffocation of fish due to the clogging of the gill surface membranes
 - Suffocation of fish eggs and fry due to sediment filling the interstitial spaces in the gravel
 - Hyperventilation in response to extreme stress causing an increase in mucus production
 - Abrasion or scraping of gill membranes and fish scales
 - Disruption of spawning activities due to stress
 - A negative impact on feeding efficiency due to decreased visibility
 - Reduction in food supply due to a decrease in photosynthesis affecting algae and other aquatic plants
 - Reduction in food supply due to a decrease in aquatic invertebrate populations
 - Reduction in suitable spawning areas due to the interstitial spaces between rocks, rubble, and gravel being filled in

- Water Quality
 - Increased water temperature and decreased oxygen levels due to changes in water depth as a result of sediment deposition
 - Decreased visibility as water clarity diminishes due to an increase in turbidity

3.4 METHOD OF DEFENSE

Detrimental effects can occur as a result of short term or continuous long term exposure to varying levels of erosion or sedimentation. The best method of defence is to ensure that all protective measures are planned before commencing work and properly utilized/maintained throughout the work. The first step of planning is choosing an appropriate crossing location.