

Practice stream bank stabilization activities...

Roots and organic matter help to bind soil, and vegetation slows surface water run-off and traps sediment. A mix of deep rooted native trees/shrubs with an understory of herbaceous vegetation is ideal. Erosion can change stream flow, causing subsequent damage to additional farmland. In cases where severe de-vegetation and erosion has taken place, structures like a live sill may be an option. When re-vegetation is not an option, rip rap (angular rock), or gabion baskets may be an alternative.



Fish habitat enhancement options

Digger logs → re-establish the natural meander of the stream, and create pools and gravel beds for spawning.



Wing deflectors → deflect the flow in the desired direction, protect the bank from the erosive force of the flow and raise the water level by constricting the channel to its ideal width.

Submerged brush shelters and large woody debris → Logs and fallen trees can be anchored into place at strategic locations to perform a variety of tasks: stream bank protection, creation of overhead cover for fish, creation of spawning beds and pools.

Retaining Walls → built against the streambank to support areas of heavy erosion, and provide opportunity for vegetation to re-establish.

Pool Riffle Re-construction → make use of boulders, logs, or other natural materials to increase habitat complexity.



About Clean Annapolis River Project

Clean Annapolis River Project (CARP) is a community based environmental non-government organization working towards a mission of enhancing the ecological health of the Annapolis watershed through science, leadership, and community engagement. CARP implements a variety of projects that target key environmental issues within the Annapolis watershed. This publication was produced in support of CARP's ongoing fish and fish habitat restoration programs.

Clean Annapolis River Project

314 St. George St., PO Box 395,
Annapolis Royal, NS, B0S 1A0
(902)-532-7533 1-888-547-4344
www.annapolisriver.ca
carp@annapolisriver.ca

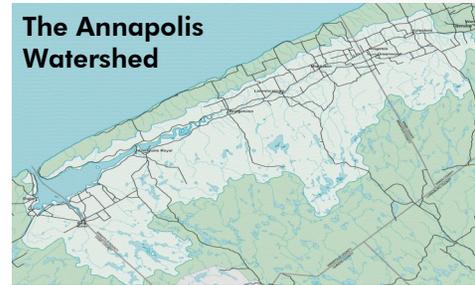


This project was undertaken with the financial support of the Government of Canada.
Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.

Best Management Practices for Salmonid Habitat Stewardship on Agricultural Land



The Annapolis Watershed



What is a watershed? A watershed is the entire region from which rainfall and snow-melt drains into a single water body. The high degree of interconnectivity within watersheds means that activities occurring anywhere within its borders can impact ecological conditions.

The Annapolis River watershed runs from Caribou Bog outside of Aylesford down to Digby. It is about 2000 km² in size, making it the third largest in the province.

Native Salmonids in Nova Scotia: Brook Trout and Atlantic Salmon

Salmonids are a family of fish that includes salmon, trout and char. Salmonids depend on freshwater to spawn, but may spend other parts of their life cycle in salt or freshwater. Native salmonids to Nova Scotia include the Atlantic salmon (*Salmo salar*) and brook trout (*Salvelinus fontinalis*). Other species of salmonids that have been introduced and/or are actively stocked include the brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), and lake trout (*Salvelinus namaycush*).

Salmonids are cold water species, and each individual species has slightly different water temperature preferences. Water temperatures around 10-15°C are ideal for Nova Scotia's native salmonids, but they can survive in water up to 20°C. Temperatures above this point cause lethal stress.

Atlantic Salmon *Salmo salar*



Brook Trout *Salvelinus fontinalis*



What does good quality salmonid habitat include?

Salmonids require several habitat types in order to complete key stages in their lifecycles, including breeding, rearing, feeding and overwintering.

Characteristics of a healthy trout stream...

- Well oxygenated water (cold water can hold more oxygen than warm water)
- Healthy streamside vegetation, providing the shade necessary to keep water temperatures optimum for trout & salmon habitat
- Large woody debris to provide cover from predators and shade to help keep water temperatures cool
- An assortment of stream bed materials (sand, gravel, cobble)
- Meandering stream channel with well defined pools and riffle sections
- Undercut banks on the outside bends with sufficient vegetation to prevent erosion and bank failure



How can agricultural practices affect salmonid habitat?

- Erosion of stream banks
- Increased sedimentation
- Increased water temperatures (thermal pollution)
- Nutrient pollution
- Loss of habitat and fragmentation

Agricultural Best Management Practices

Install appropriate water crossings for machinery and livestock in order to prevent transiting through watercourses...

Crossings should be constructed in areas that machines or livestock need to access, with consideration given to minimize sedimentation and erosion of streambanks during construction, potential for debris or ice jams, and damage to fish habitat. Crossings need to be installed so that they continue to permit the migration of fish seeking spawning/rearing/feeding/wintering areas.

Respect and maintain buffer zones... See illustration

Riparian Buffer Zones for Agricultural Land

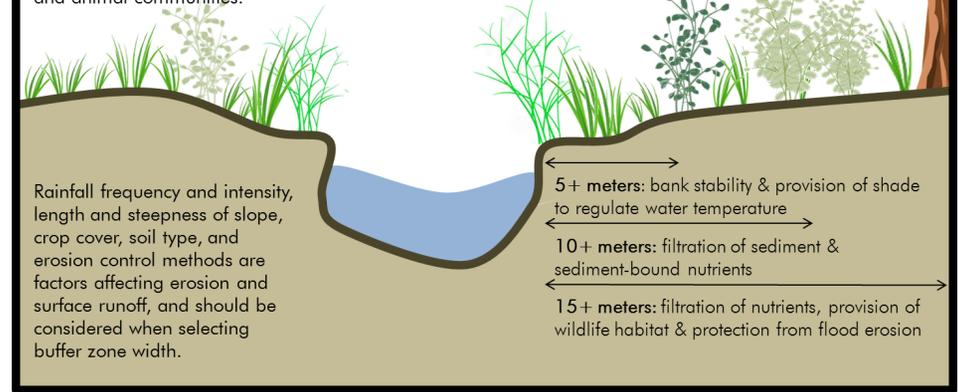
Not all buffer zones are created equal...

What are riparian zones?

They are the lands adjacent to streams, rivers, lakes, ponds, and wetlands. These areas are frequently flooded transitional lands, with no definite boundaries, between the body of water and drier upland areas. Included in the riparian zone are stream banks, the floodplain and plant and animal communities.

What is a riparian buffer?

It is a natural or managed strip of vegetation adjacent bodies of water that are covered in trees, shrubs, or grasses to protect those natural areas from adjacent and surrounding land use activities.



Keep livestock away from streams or riparian areas...

Fencing can be used to exclude livestock from sensitive habitats, preventing erosion of stream banks/streambeds and allowing vegetation to recover and provide additional filtration services. A variety of alternate watering systems exist, however in the case that an alternate watering system is not feasible, access should be limited to certain areas of a streambed to minimize damage.

Consider manure and fertilizer application and storage practices...

Minimize nutrient input into waterways and groundwater. Manure storage facilities must be selected based on site specific needs with considerations made to nutrient concentration, proximity to water sources, and manure form and consistency. Prevailing winds, slope, and soil type are also factors. Lined systems, concrete pads and covers are good options to prevent nutrients from leaching into groundwater.

When manure must be spread under less favourable conditions, select level fields with the lowest seasonal risk to fish habitat. On higher risk fields, apply only when soil is dry and runoff can be avoided. If your manure storage is full and you must spread in winter, choose level fields and avoid water courses, wetlands, or catch-basins. Flexibility in the timing of application will allow adjustments to be made to accommodate weather conditions in order to avoid soil compaction and run-off. The development of a Nutrient Management Plan is good option for optimizing nutrient application while minimizing the risk of pollution.