# Monitoring of Wetland #1 on TransCanada Highway, Near Antigonish Nova Scotia

## Final Report 2014 (Year 3)

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**June 2016**

## SUMMARY

The Addington Forks wetland, (Wetland #1) is a marsh-swamp complex (0.78 km long, up to 0.22 km wide) lying in a depression on the south side of the TransCanada Highway, 2 km west of the Town of Antigonish. The wetland is a mixture of marsh and low-bush swamp, dominated by cat-tails, sweet gale, and other small woody plants growing on hummocks of saturated peat, interspersed with hollows or shallow pools (10-30 cm deep) of standing brown water. The wetland drains through a small channel at the west end, through which it connects with Brierly Brook.

Twinning of the Highway in 2010 was anticipated to require infilling 0.31 ha of low ground, reducing the original 13.7 ha area of the wetland by 2.3%. Because of a series of adjustments and misfortunes, the actual area disturbed was 2.07 ha, or 15.1% of the extant wetland. The wetland was monitored and explored from May through July 2014, after completion of the highway surface in 2012. This (2014) was the last of a planned three years of monitoring. In the first summer (2010) the general hydrology, chemistry and biology of the wetland was established and the effects of construction disturbance were quantified (Taylor 2011). The second summer of monitoring (2011) documented effects of continued disturbance associated with widening of the road berm and completion of the road bed. Infilling for the new roadbed in 2010 restricted the width of the narrowest part of the wetland to <20 m and altered the flow path.

Rainfall was relatively low in spring and summer 2014, leading to low discharge from the wetland and little sediment transport. Total load of suspended material delivered from the wetland was 700 kg in 2014, nearly identical to the load from an undisturbed control stream and two orders of magnitude less than in 2010, when construction was active. A conspicuous plume of silty water entering the wetland in 2011 was no longer present in 2014. As vegetation stabilizes disturbed ground after construction, the wetland appears to be approaching a new stable condition.

Water draining from the wetland in 2014 was dilute (mean conductivity 254 ± 64 μS/cm), mildly acidic (mean pH 6.2 ± 0.2), and persistently low in dissolved oxygen (2.9 ± 1.8 mg/L). Dissolved oxygen declines even further overnight and pre-dawn concentrations may approach

anoxia. Temperature of water leaving the wetland depends strongly on inflow of ground water, which has a uniform temperature near 11°C. Mean daily temperatures in the control stream were within 1°C of those at the wetland outflow in summer of 2011 and 2012, but during dry periods in 2014 the wetland outflow ran up to 6°C warmer because of sun exposure unbalanced by ground water. Water cools quickly downstream. Measurements within the wetland in 2014 confirmed the previously reported high temperatures (up to 30°C) and low dissolved oxygen tensions (<1 mg/L) in pools, as well as steep gradients of these variables between surface and bottom water. Pool surface water isolated in plastic basins from deeper water grew warmer and more well oxygenated, confirming that these depth gradients arise from suffusion of cool, anoxic ground water from the peat layer.

Biological survey work in 2014 was directed toward finding better ways to trap fish and to exploring the large, deep pools at the east end of the wetland that had not been investigated previously. While fish and other aquatic animals (tadpoles, various invertebrates) were observed in pools throughout the wetland, efforts to quantify populations were again unsuccessful. Modifying minnow traps with fine mesh to prevent escape by small fish, or using aeration as bait did not improve capture success, although the latter technique warrants further testing. Oddly, while small fishes, mostly northern red-belly dace and three-spined stickleback, are abundant in the west and central segments of the wetland, they are uncommon in the larger ponds of the east end, perhaps because the central channel becomes deranged past the narrows and there is no surface-water route to these pools.

Some of the disturbed wetland along the highway berm could be reclaimed by restoring the hydrological connection between this land and the extant wetland. A raised berm of peat and cattails currently prevents free water exchange, leading to a parallel drainage along the highway side that feeds into the wetland just above the outflow. Cattails and other wetland vegetation is beginning to recolonize this land, but the peat dries in summer because it is isolated from the springs in the wetland. Simple restoration work could significantly increase the extent of the remaining wetland, especially at the narrows where it is now only a few metres wide.