

Wetland Habitat Quality Study - Potential effects of glyphosate herbicide applications on forest wetland habitat and amphibian breeding success

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This study was initiated in April 2008 by a research team from the Canadian Forest Service who partnered with the University of Guelph, Tembec Inc and the Canadian Ecology Centre – Forestry Research Partnership.

This is a three year study with the objective of investigating the potential effects of aerial the herbicide (glyphosate) on the quality of ephemeral wetland habitats in forest cutovers typical of the boreal forest region in northern Ontario. The project focuses on potential effects relative to the sustainability of local populations of wood frogs (*Rana sylvatica*). The study will specifically examine the wood frogs breeding efforts, reproductive success, and early life stage abundance as well as potential sub-lethal effects in populations found within ephemeral pools of untreated versus treated sites.



Identification of suitable sites and essential pre-treatment information was collected on early spring breeding wood frog populations in March/April of 2008. Twelve experimental sites within or proximal to the spray blocks scheduled to receive aerial application treatments of glyphosate were identified and intensively monitored.

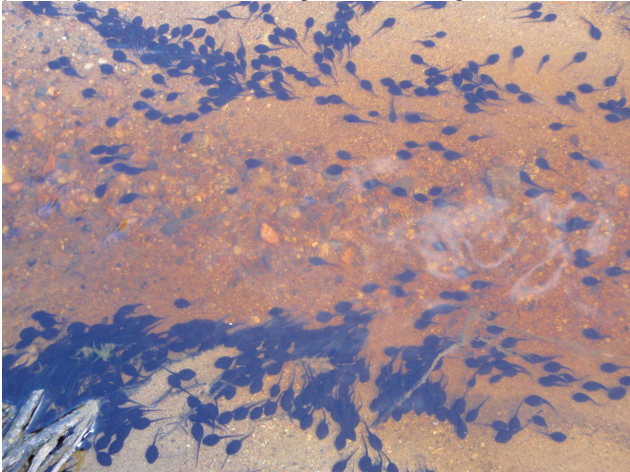
A monitoring area consisting of 25 metre radius circles encompassing numerous shallow ephemeral pools were established. Crucial habitat quality variables (pool number, size and depth), water quality (pH, and dissolved oxygen), vegetation cover (dominant species, percent cover), site moisture regime and biological response parameters for local wood frog populations (breeding efforts, reproductive success and adult abundance) were intensively monitored prior to herbicide application. Remote acoustic recording devices were also positioned at each site to determine the onset and duration of the active wood frog breeding season as well as a potential index of breeding effort at each site. Egg mass surveys and in situ cages were implemented in each site to monitor the egg hatch success, growth, and survival rate of pre-metamorphic wood frogs to gain a better understanding of how silviculture practices affect the early development (pre-metamorphosis) of the wood frog eggs.



Each monitoring area was visually surveyed to estimate the number of wood frogs two weeks prior to the spray application. Individual frogs were captured from each site and were weighed, measured and classified as juvenile or adult. A subsample of 10 individuals were uniquely marked using visible implant elastomer dyes. The purpose of marking these individuals was to

assess the potential sublethal growth and development effects following exposure to the aerial glyphosate treatment.

In September 2008, applications of the herbicide glyphosate (Forza®, Vision®) were made to the spray blocks using fixed-wing aircraft. Detailed meteorological and aerial spray application parameter data were collected from the electronic guidance system of the aircraft and from a meteorological monitoring tower on site respectively. Quantitative assessment of glyphosate deposition to the monitoring area and concentrations in surface waters were also collected. This data will allow for full characterization of exposure scenarios for metamorphs and adults remaining on the sites at the time of treatment, as well as herbicide deposition levels as the primary determinant of vegetation change on treated as compared to untreated sites.



Additional monitoring areas associated with spray blocks scheduled for aerial glyphosate treatment in the 2010 spray season, are now being selected such that the full experimental compliment of 24 monitoring areas (12 treated and 12 untreated) will be realized over the two year treatment period.

Initial results from this study indicate that these microsites are used extensively as breeding sites by local populations of wood frogs. Preliminary analysis suggests that prior to treatment there were no significant differences in the number of egg masses in treated versus non treated sites. Similarly, there were no significant pre-treatment differences in terms of tadpole snout-vent length, vent-tail length, total length, sub-lethal parameters, pigmentation, or survival. While it is far too early to draw any conclusions from this study as yet, we anticipate that results from this study will contribute significantly to determining the potential effects of aerial herbicide (glyphosate) treatment on the quality of ephemeral wetland habitat in forest cutovers typical of the boreal forest region in the northern Ontario, as related to the sustainability of local breeding populations of wood frogs.