

Date: November 9, 2021

SURFACE WATER MONITORING REPORT

I. Study Overview:

- **Study Title:** Preliminary Report to the Board on the 2021 Water Quality Scoping Study of Aerially Applied Herbicides in Forestry

- **Project Lead:** Mary Tomlinson, Water Quality Specialist

II. Objective:

Conduct a baseline assessment of the occurrence of herbicides known to be applied via aerial application in forest management.

III. Study Area:

County: Aroostook, Franklin, Piscataquis, Somerset

Waterbody/Watershed: Daigle Brook, Fourmile Brook, Kibby Stream, Moose Brook, Moose River, Reed Brook, South Branch Machias River, Tomhegan Stream, two unnamed brooks (Table 1 and Figure 1)

Based on aerial application plans submitted to the BPC by timber companies, ten sites likely to receive drainage from site preparation or conifer release preparation were selected.

Table 1. Sites sampled in July 2021 for aerially applied herbicides used in managed Maine timberlands during 2020. Surface water grab samples and composite sediment samples were collected from each site.

Map Key	Town of Sample	Water Body	Coordinates	
			Latitude (N)	Longitude (W)
1	T17 R5 WELS	Daigle Brook	47.150140°	68.381590°
2	T17 R4 WELS	Unnamed Brook	47.11900	68.24754
3	Westmanland	Unnamed Brook	47.01361	68.26597
4	Kibby Twp	Kibby Stream	45.37000	70.55780
5	Skinner Twp	Moose River	45.44800	70.57280
6	Soldiertown	Tomhegan Stream	45.770554	69.884443
7	Big W	Moose Brook	45.816843	69.767564
8	T9 R7 WELS	Fourmile Brook	46.41883	68.58545
9	T8 R10 WELS	Reed Brook	46.35997	69.0104
10	T10 R7 WELS	S. Branch Machias River	46.526568	68.679185

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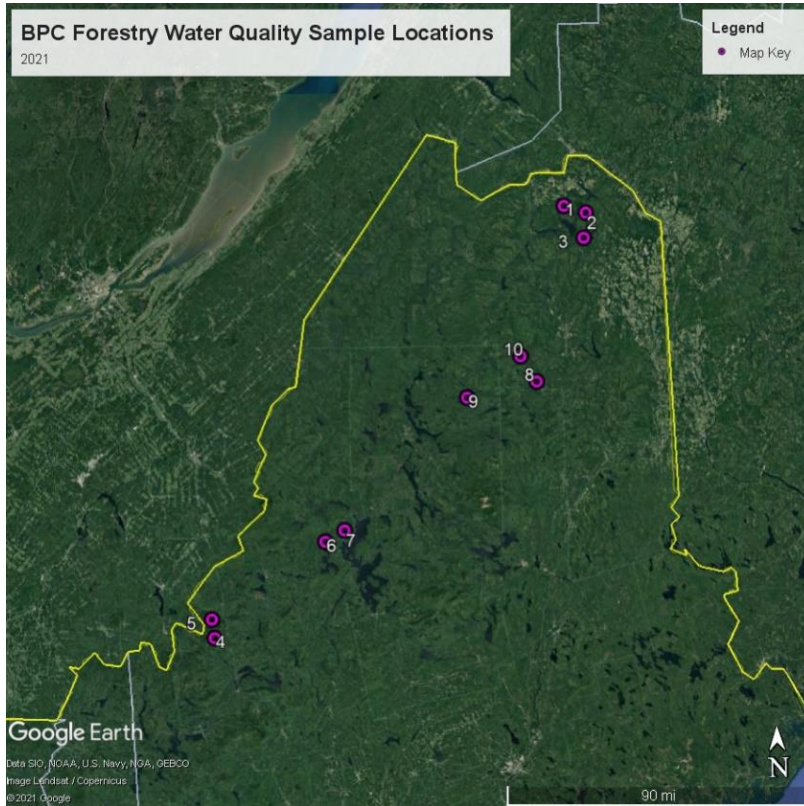


Figure 1. Location of sampling sites. Specific location information is displayed in Table 1.

IV. Land use type: Ag Urban Forest Mixed Other _____

V. Waterbody type:

Brook River Pond Lake Drainage Ditch/Culvert Storm drain outfall
 Other _____

VI. Sampling period: July 12, 2021 – July 13, 2021

VII. Target pesticides monitored: glyphosate, AMPA, imazapyr, metsulfuron methyl, sulfometuron methyl, and triclopyr (Table 2). A list of additional pesticides analyzed is located in Section XIII.

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Table 2. Aerially applied pesticides used by Irving Inc., Seven Islands Land Company, and Weyerhaeuser Timberlands in 2020 for site preparation and/or conifer release preparation.

Product Brand Name	EPA Reg. No.	Active Ingredient	Percent AI	Maximum Labeled Site Prep Rate/Acre	Maximum Labeled Release Rate/Acre
Accord XRT II	62719-556	glyphosate	50.20%	8 qts unless specified by species, 3-3.75 qts by species	Not labeled
Arsenal AC	241-299	imazapyr	53.1	12 oz	16 oz
Escort XP	432-1549	metsulfuron methyl	60	2 oz	Not labeled
Forestry Garlon XRT	62719-553	triclopyr	83.9	2.5-4.0 qts	1-2 qts
Oust XP	432-1552	sulfometuron methyl	75	3 oz (white spruce)	4 oz
Rodeo	62719-324	glyphosate	53.08	1.0-7.5 qts aerially	2.25 qts

VIII. Definitions:

- Analyte: Chemical compound that is the subject of chemical analysis
- Detection limit: The lowest concentration at which the presence of an analyte can confidently be identified by the laboratory
- Metabolite: An intermediate substance or end product formed when a chemical breaks down
- Nondetect (ND): Chemical is not detected; concentration is below the laboratory detection limit
- Q: Positive detection of the chemical, but concentration is below the reporting limit (RL)
- QA/QC: Quality assurance/quality control; performed to provide greater confidence in the data
- Quantifiable: Measurable
- Reporting limit (RL): Lowest concentration of a compound that can be measured and confirmed by the laboratory method
- US EPA Aquatic Life Benchmarks (ALB): Used as a screening tool to estimate risk of pesticides and their metabolites (degradates) to aquatic life in surface water. Concentrations below the ALB are not expected to represent a risk to aquatic life.

IX. Major findings:

Target pesticides not detected

Glyphosate, metsulfuron methyl, or triclopyr were not detected in any water or sediment samples collected. AMPA (a glyphosate metabolite) also was not detected. Analysis of samples from two of the ten study sites indicated no detections of any pesticides or their metabolite in water or sediment.

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Detections in water

Table 3 displays all pesticidal compounds detected in surface water grab samples by site; target pesticides of the study are shaded. Of the six compounds detected, imazapyr and sulfometuron methyl were the only two target compounds detected. There were 11 detections from six sites, three of which were above the RLs.

Four pesticidal compounds unrelated to aerial application in forest management were detected in water samples from six sites: 2,4-D, atrazine, deethyl atrazine (a metabolite of atrazine), and MCPP. There were 12 detections, two of which were above the RLs. Deethyl atrazine was the most frequently detected compound, present in water from six sites, but all detections were below the RL.

Table 3. Pesticide and metabolite detections in surface water samples collected July 2021 in managed northern Maine timberlands. The metabolite is indicated by an asterisk. Target analytes are shaded. Reporting limits are provided in Section XIII.

Town	Analyte [$\mu\text{g/L}$ (ppb)]					
	Imazapyr (RL=0.0035)	Sulfometuron methyl (RL=0.0025)	2,4-D (RL=0.0090)	Atrazine (RL=0.0022)	*Deethyl atrazine (RL=0.0017)	MCPP (RL=0.0044)
T17 R5 WELS	Q	Q	ND	ND	ND	ND
T17 R4 WELS	0.033	Q	ND	Q	Q	ND
Westmanland	Q	Q	ND	ND	ND	ND
Kibby Twp	ND	ND	ND	ND	Q	ND
Skinner Twp	Q	Q	0.014	ND	Q	Q
Soldiertown	Q	ND	0.0091	Q	Q	Q
Big W	ND	ND	ND	ND	ND	ND
T9 R7 WELS	ND	ND	ND	ND	ND	ND
T8 R10 WELS	0.016	0.0035	ND	ND	Q	ND
T10 R7 WELS	ND	ND	ND	ND	Q	ND

Table 4 compares the detections in water samples with the associated US EPA Aquatic and Ecological Risk Assessments for Registered Pesticides (2021). There were no pesticides detected above their associated Aquatic Life Benchmark.

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Table 4. Pesticide and metabolite detections in surface water, collected July 2021 from ten sites in northern Maine timberlands, compared with US EPA Aquatic and Ecological Risk Assessments for Registered Pesticides (2021). The lowest Aquatic Life Benchmark (ALB) for each pesticide detected is presented with its benchmark type. Target pesticide are shaded.

Pesticide	Number of Detections	Reporting Limit ug/L (ppb)	Lowest US EPA Benchmark (ALB) ¹ ug/L	ALB Type ¹	Number of ALB Exceedances
Imazapyr	6	0.0035	24	VA	0
Sulfometuron methyl	5	0.0025	0.45	VA	0
2,4-D	2	0.0090	299.2	VA	0
Atrazine	2	0.0022	<1	NA	0
Deethyl atrazine	6	0.0017	See atrazine		0
MCPP	2	0.0044	14	VA	0

¹Aquatic Life Benchmark Type: NA - non-vascular plants acute; VA - vascular plants acute

Detections in sediment

Sediments were analyzed for glyphosate, imazapyr, metsulfuron methyl, sulfometuron methyl, triclopyr, and AMPA (Table 4). There was a single detection each of imazapyr and sulfometuron.

Table 5. Analysis results for five pesticides and AMPA (glyphosate metabolite) in sediment, collected July 2021 in managed northern Maine timberlands. Results were reported as µg/L (ppb) on a dry weight basis. Reporting limit for glyphosate and AMPA in T17 R4 WELS was raised from 0.05 ppm to 0.25 ppm due to high moisture content.

Town	Analyte [µg/L (ppb)]					
	AMPA (RL=0.050)	Glyphosate (RL=0.050)	Imazapyr (RL=0.50)	Metsulfuron methyl (RL=0.50)	Sulfometuron methyl (R=0.050)	Triclopyr (RL=10.00)
T17 R5 WELS	*ND	ND	ND	ND	ND	ND
T17 R4 WELS	ND	ND	0.71	ND	ND	ND
Westmanland	ND	ND	ND	ND	0.14	ND
Kibby Twp	no sample	no sample	ND	ND	ND	ND
Skinner Twp	no sample	no sample	ND	ND	ND	ND
Soldiertown	no sample	no sample	ND	ND	ND	ND
Big W	no sample	no sample	ND	ND	ND	ND
T9 R7 WELS	ND	ND	ND	ND	ND	ND
T8 R10 WELS	ND	ND	ND	ND	ND	ND
T10 R7 WELS	ND	ND	ND	ND	ND	ND

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X. Conclusions:

1. Of the 104 pesticides analyzed for, six compounds (pesticides and metabolites) were detected either in water or sediment. Three were above the RLs and three below the RLs.
 2. There were 23 detections (active ingredients and metabolites combined) in water and two in sediment out of 1,032 and 46 possible detections for water and sediment respectively. Seven detections were above the RLs and 18 below the reporting limits.
 3. There were no exceedances of the US EPA Aquatic Life Benchmarks.
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XI. QA/QC: The relative percent difference analysis indicates duplicates and split samples were within the acceptable range as established for this study. No pesticides were detected in blank samples.

XII. Data: water quality, analytical chemistry results

Water quality and monitoring results are available upon request. Please contact the Maine Board of Pesticides Control for the complete data set.

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XIII. Tables

List of 102 pesticides analyzed by Montana Department of Agriculture Analytical Laboratory.

Method: Montana Department of Agriculture, MTUNIV_W1, Revision 11: March 2021, "Universal Method for the Determination of Polar Pesticides in Water Using Solid Phase Extraction and Liquid Chromatography/Mass Spectrometry/Mass Spectrometry."

Analyte	Reporting Limit ug/L (ppb)	Analyte	Reporting Limit ug/L (ppb)
2,4-D	0.009	Fipronil	0.0024
Acetochlor	0.14	Fipronil desulfinyl	0.14
Acetochlor ESA	0.02	Fipronil sulfide	0.08
Acetochlor OA	0.0084	Fipronil sulfone	0.04
Alachlor	0.11	Flucarbazone	0.0024
Alachlor ESA	0.044	Flucarbazone sulfonamide	0.0039
Alachlor OA	0.0068	Flumetsulam	0.029
AMBA	0.021	Flupyradifurone	0.045
Aminocyclopyrachlor	0.025	Fluroxypyr	0.035
Aminopyralid	0.03	Glutaric acid	0.03
Atrazine	0.0022	Hydroxy atrazine	0.004
Azoxystrobin	0.0052	Halosulfuron methyl	0.01
Bentazon	0.0022	Hexazinone	0.0015
Bromacil	0.0041	Imazamethabenz acid	0.0025
Bromoxynil	0.012	Imazamethabenz ester	0.001
Carbaryl	0.014	Imazamox	0.0057
Chlorpyrifos	0.06	Imazapic	0.003
Chlorsulfuron	0.0056	Imazapyr	0.0035
Clodinafop acid	0.013	Imazethapyr	0.004
Clopyralid	0.088	Imidacloprid	0.0018
Clothianidin	0.016	Indaziflam	0.002
Deethyl atrazine	0.0017	Isoxaben	0.003
DEDIA	0.1	Isoxaflutole	0.13
Deisopropyl atrazine	0.04	Malathion	0.028
Dicamba	0.88	Malathion oxon	0.0024
Difenoconazole	0.011	MCPA	0.0046
Dimethenamid	0.006	MCPP	0.0044
Dimethenamid OA	0.0072	Metalaxyl	0.0035
Dimethoate	0.0022	Methomyl	0.012
Disulfoton sulfone	0.0066	Methoxyfenozide	0.01
Diuron	0.0053	Metolachlor	0.024
FDAT (indaziflam met)	0.0051	Metolachlor ESA	0.005

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Analyte	Reporting Limit ug/L (ppb)
Metolachlor OA	0.042
Metsulfuron methyl	0.01
Nicosulfuron	0.011
NOA 407854	0.0052
NOA 447204	0.02
Norflurazon	0.02
Norflurazon desmethyl	0.02
Oxamyl	0.01
Parathion methyl oxon	0.012
Phorate sulfone	0.024
Phorate sulfoxide	0.003
Picloram	0.28
Picoxystrobin	0.0075
Prometon	0.001
Propiconazole	0.01
Prosulfuron	0.005
Pyrasulfotole	0.02
Pyroxsulam	0.013
Saflufenacil	0.01

Analyte	Reporting Limit ug/L (ppb)
Simazine	0.0026
Sulfentrazone	0.035
Sulfometuron methyl	0.0025
Sulfosulfuron	0.0054
Tebuconazole	0.014
Tebuthiuron	0.0011
Tembotrione	0.073
Terbacil	0.0048
Terbufos sulfone	0.011
Tetraconazole	0.0039
Thiamethoxam	0.02
Thiencarbazone methyl	0.04
Thifensulfuron methyl	0.022
Tralkoxydim	0.0051
Tralkoxydim acid	0.005
Triallate	0.3
Triasulfuron	0.0055
Triclopyr	0.022
Trifloxystrobin	0.02