Groundwater Pesticide Results

2004/05 – 2015/16

Water and Air Monitoring Section
PEI Department of Environment, Water and Climate Change

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Executive Summary

The Prince Edward Island Department of Environment, Water and Climate Change collects annual groundwater samples as part of the PEI Pesticide Monitoring Program.

The on-going program has two goals;

- To provide on-going surveillance of public exposure to pesticides.
- To provide empirical evidence on the behaviour of pesticides with respect to their ability to leach to groundwater.

At the time of writing, the program had twelve years of data; this report provides key findings up to the 2015/2016 sampling period.

One hundred and fifteen sites were sampled as part of the program and were a mixture of private residences, seniors housing facilities, municipal water systems and public schools. All of the wells were operating drinking water wells, with the sites remaining relatively consistent from year to year.

Each of the samples was analysed for a suite of pesticide compounds.

A total of 513 pesticide detections were made out of 31,268 tests.

There was a statistically significant upward trend present in both annual detections and sites with detections. In 2015-16 pesticides were detected at 57.3% of the sites in the monitoring program and 65.2% of all sites had at least one detection over the twelve years covered by this report. Much of this increasing trend was due to pesticides being added to the analytical suite starting in 2007-08 and the lowering of the laboratory detection limits on a few pesticides starting in 2012-13. This contributed to the overall increase in the number of detections observed, even when calculated using the original detection limits.

Island-wide concentrations for individual pesticides were difficult to report. For most pesticides most results were below detection. Only a few pesticides had average concentration values above their detection limits.

Concentration trends were examined at the 14 sites with the greatest number of detections overall. Concentration trends at each of these sites for 8 individual pesticides were variable: most had no trend but a few were increasing and a few were decreasing. Pesticides in the program since the beginning of the program tended to have either no trend or a decreasing trend while the more recently added pesticides tended to have either no trend or an increasing trend.

Pesticide detections were compared to their respective recommended drinking water maximum concentration. No detection exceeded its maximum recommended concentration; indeed most detections were well below their respective maximum recommended concentration.

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1. Introduction

The Prince Edward Island Department of Environment, Water and Climate Change (EWCC) has been collecting groundwater samples for the PEI Pesticide Monitoring Program since the fall of 2004. A total of 115 sites were sampled between 2004-05 and 2015-16 (Figure 1). The sites are a mixture of private residences, seniors housing facilities, municipal water systems and public schools. All of the wells are operating drinking water wells but, although the sites remained relatively constant from year to year, not all sites were sampled in all years.

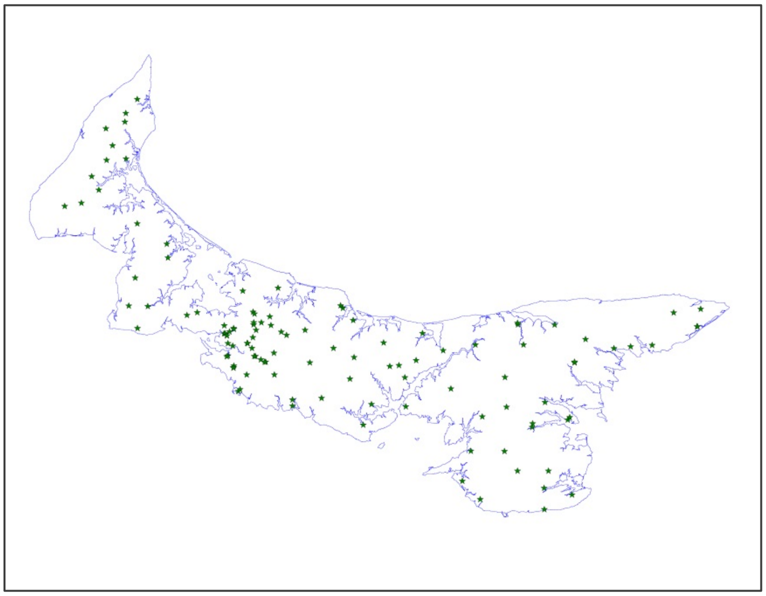


Figure 1 Location of the 115 Ground Water Sites (Wells) Monitored Between 2004-05 and 2015-16

There are two goals for the PEI Pesticide Program:

- To provide on-going surveillance of public exposure to pesticides
- To provide empirical evidence on the behaviour of pesticides with respect to their ability to leach to groundwater.

Participation in the program is voluntary however the location of each private well is kept confidential. All raw data, including the names and locations of the public buildings (schools and seniors housing facilities), are posted on the EWCC website.

This summary report provides information on the key results of the sampling program up to the 2015/2016 sampling period.

2. Methods

In the initial stages of planning the PEI Pesticide Program groundwater sites were chosen from the intensive, potato farming region in eastern Prince/western Queens Counties, PEI. Additional sites were then added to provide an Island-wide distribution of sites. Municipal water supplies and public institutions were included in the sampling sites in order to both gauge the exposure risk from public water supply and to also guarantee access to, and therefore continuity in, sampling locations.

Each site was sampled once per year in the late fall/early winter. The samples were collected by EWCC staff, normally within a seven week window which occasionally bridged the calendar year. Since 2010/2011 sampling was conducted between mid-January and early February. This timing is to ensure that the collection reflects the fall groundwater recharge period.

Each sample was analyzed for between 30 and 36 pesticide compounds, with some compounds tested only every 3 years. The list of compounds was reviewed annually, and pesticides are selected for inclusion based on usage across PEI, groundwater leaching potential, and toxicity.

The collected water samples were sent to an accredited private commercial laboratory for analysis.

The analysis method varied by pesticide[1]. Glyphosate was converted to its N-isobutoxycarbonyl methyl ester derivative and measured by gas chromatography (GC) equipped with a DB-5 capillary column and a mass selective detector (MSD). Mancozeb and metriram were digested in a stannous chloride HCL solution. The CS2 generated by the sample hydrolysis was trapped in iso-octane and analyzed by GC/ MSD. The organochlorine pesticides were extracted by shaking with DCM in a separatory funnel. The concentrated extract was then fractionated on a florisil column (when necessary) and analyzed by capillary GC-electron Capture Detection (ECD). General pesticides were analysed by liquid chromatography (LC)/ (MSD). A portion of the extract of the organo-chlorine test was analysed by high performance liquid chromatography (HPLC)/tandem MSD. Thiophanate methyl was analyzed as the breakdown product carbendazim and reported as carbendazim equivalents.

Twelve years of data were available at the time of writing. During this time frame 31,268 pesticide analyses were performed and 115 sites were sampled overall; however the actual number of sites sampled varied slightly from year to year (Table 1). In addition, not all pesticides were sampled in all years of monitoring and some additional pesticides were added to the program in 2007-08, 2008-09, 2009-10 and in 2015-16 (Table 2).

The detection limits[2] for some pesticides decreased in 2012-13 due to changes in lab procedures. This led to detections of some pesticides between 2012-13 and 2015-16 that would not have been

[1] Provided by Josh Perry, RPC Laboratories, Fredericton N.B.

[2] The detection limit reported by a laboratory for a particular substance is the minimum concentration at which that substance can be accurately measured under routine laboratory operating conditions (APHA, 1995).

seen previously using the original limits (Table 2). As a result some data was censored[3] to reflect the original detection limits for proper statistical analysis.

Basic statistics were prepared using Excel 2010. For statistics on concentration, values equal to one half of the detection limit were used in cases where the pesticide was tested but not detected. Trend statistics were done with a Mann-Kendall[4] test using the statistical analysis software Systat 13. Trend lines for graphs were generated using a Sen's-slope[5] estimator using the Excel application MakeSens (Version 1.0). These methods were chosen because of the small amount of data available, a non-parametric distribution and the regular (annual) nature of the sampling.

Graphs were prepared using SigmaPlot (Version 11.2).

3. Results

3.1. Summary Statistics

There were a total of 513 pesticide detections up to 2015/2016 (Table 1). This number includes 372 detections using the original detection limits and 141 detections using the lower detections adopted in 2012-13 (Table 2). Detections were a small percentage of the pesticide analyses performed (Table 1). Both the number of detections and the percentage of tests with detections have increased steadily since the beginning of the program (Table 1).

2015-16 had the greatest number of detections with 111, representing approximately 4% of all pesticide analyses conducted. The number of detections might have been slightly higher in 2015-16 if a consistent detection limit had been in place for imidacloprid. In 2015-16, 20 of the sampled sites had a higher detection limit, varying between 2x – 20x the 0.02 ppb detection that had typically been used since 2012-13. Of these 20 sites, 5 had frequent previous detections for imidacloprid that were lower in concentration than the detection limit used. Imidacloprid may have been detected at these sites if the usual 0.02 ppb detection limit had been used.

Seventy-five (65.2%) sites had at least one pesticide detection in the last twelve years (Table 1). There was a single detection at 16 sites, 2-5 detections at 32 sites, 6-12 detections at 14 sites and 13-21 detections at 11 sites. Two single sites have had 30 and 41 detections. Both the number of

[3] Beginning in 2012-13 some detection limits were lowered for some pesticides due to improved precision at the laboratory. This resulted in detections of some pesticides between 2012-13 and 2015-16, at concentrations that were below the original detection limit. Trend statistics using the detections which were below the original limit would have been incorrect because the number of annual detections recorded before 2012-13 could have been higher had the lower detection limits been available at that time. In statistics the standard way to deal with this situation is a process called left censoring. The original detection limit is used as the cut off line and any reported values below this limit are then considered non-detections. The graphs and summary statistics shown in this report show all of the data available however, statistical trends are calculated using only the censored data.

[4] The Mann-Kendall test is a statistical test for trend which is used where data does not follow a particular distribution (non-parametric). The Mann-Kendall tests for a general upward or downward trend. It produces a value called the Kendall's Tau. A negative value indicates a downward trend and a positive value indicates an upward trend. All statistical tests were conducted at the 0.95 confidence level ($p \leq 0.05$ indicate a statistically significant trend).

[5] A Sen's Slope estimator is an accepted way to estimate the slope of a trend for non-parametric data in order to draw the trend on a graph. It is calculated from the median of all possible lines through any two pairs of sample points in the data.

sites with detections and the percentage of sites with detections have increased steadily since the beginning of the program (Table 1).

Forty-four pesticides were sampled over the course of the program in the twelve years covered by this report. Some of these pesticides were sampled in all years of the investigation, while others were added in later years and some were sampled only in particular years (Table 2). Sixteen of these pesticides had at least 1 detection over the course of the investigation and 9 of these pesticides have had more than 5 detections over the years. The 3 pesticides with the greatest number of detections were either added to the sample program since 2007-08 (chlorantraniliprole and clothiainidin) or were not sampled in all years of the program (imidacloprid). Pesticides were added to the program as their usage increased; these pesticides were not sampled in years in which they were not in use in the province.

Table 1 Basic Statistics for the Results of the Groundwater Pesticide Monitoring Program

Reporting Year	Tests Performed	Number of Detections	% Detections	Number of Sites Sampled	Number of Sites with Detections	% of Sites with Detections
2004-05	2544	9	0.35%	106	8	7.55%
2005-06	1956	16	0.82%	103	12	11.65%
2006-07	1916	20	1.04%	96	14	14.58%
2007-08	2581	20	0.77%	103	17	16.50%
2008-09	2571	14	0.54%	102	10	9.80%
2009-10	2849	25	0.88%	95	15	15.79%
2010-11	2876	29	1.01%	99	21	21.21%
2011-12	2882	21	0.73%	99	13	13.13%
2012-13	2715	73	2.69%	96	35	36.46%
2013-14	2759	85	3.08%	97	44	45.36%
2014-15	2812	90	3.20%	91	45	49.45%
2015-16	2807	111	3.95%	96	55	57.29%
Totals	**31268**	**513**	1.64%	**115**	**75**	**65.22%**

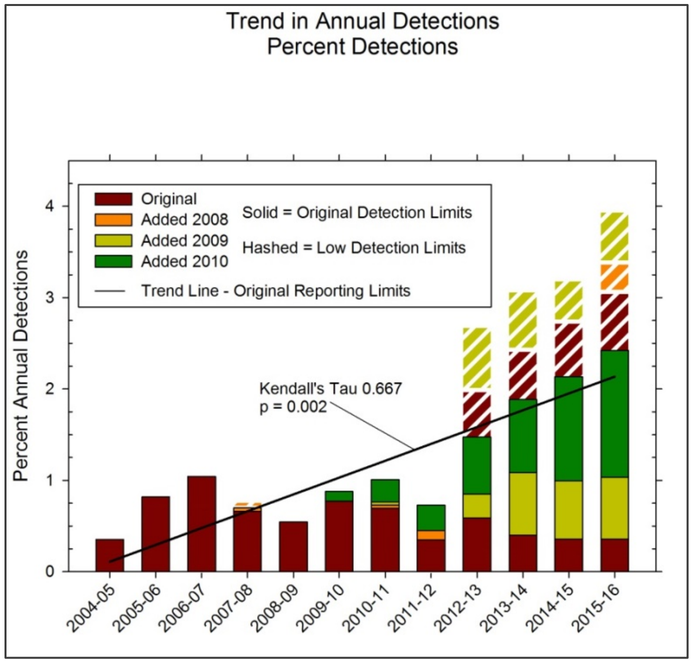
3.2. Trend in Detections

A significant upward trend in both annual detections (Figure 2a) and the number of sites with detections annually was found (Figure 2b). Percentages were used to show these trends (Figure 2) as this normalized any variation in relative bar height resulting from differences in the number of sites and pesticides sampled from year to year.

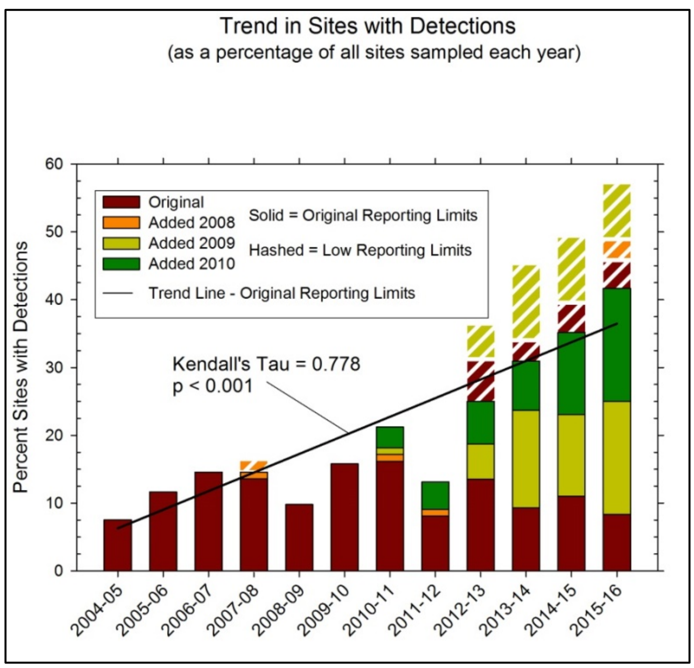
Figure 2 is shown with two groupings of data. The solid bars indicate the number of detections that that would have occurred if only the original (highest used) detection limits had been used over the entire study. The trend line shown is based on this data. The hatched bars represent the additional detections made with the new (lower) detection limits. The bars in Figure 2 are also coloured to represent the year some groups of pesticides were added to the program. This illustrates that most of the detections observed between 2013-14 and 2015-16 are from "new" pesticides added since 2008-09. Two pesticides in particular, chlorantraniliprole, added in 2008-09 and clothianidin, added in 2009-10, are responsible for most of these “new” detections (Table 2). In contrast the percentage for pesticides that have been sampled since the beginning of the study (plus imidacloprid) appeared to increase and then decrease over time (Figure 2).

Table 2 Detections by Pesticide in the Groundwater Pesticide Monitoring Program

Pesticide	Trade Name	Years Sampled	Number of Analyses Completed	Total Detections	% Detections	Detections - Using Original Detection Limits	Additional Detections - Using Lowest Used DLs
Chlorantraniliprole	Coragen	2008-09 to 2015-16	750	130	17.33%	64	66
Imidacloprid	Admire	2004-05, 2007-08 to 2015/16	982	94	9.57%	34	60
Clothianidin	Titan	2009-10 to 2015-16	671	94	14.01%	94	
Metalaxyl	Ridomil	2004-05 to 2015-16	1181	42	3.56%	42	
Metribuzin	Sencor	2004-05 to 2015-16	1181	37	3.13%	36	
Atrazine	Aatrex	2004-05 to 2015-16	1181	37	3.13%	37	
Thiamethoxam	Actara	2004-05 to 2015-16	671	31	4.62%	31	
Hexazinone	Velpar, Pronone	2004-05 to 2015-16	1181	19	1.61%	15	4
Thiabendazole	Mertect	2004-05 to 2015-16	876	14	1.60%	5	9
Chlorothalonil	Bravo	2004-05 to 2015-16	1181	5	0.42%	5	0
Azinphos-methyl	APM, Guthion	2004-05 to 2015-16	1181	2	0.17%	2	
Carbofuran	Furadan	2004-05 to 2015-16	1181	2	0.17%	2	0
Fludioxonil	Maxim	2004-05 to 2015-16	575	2	0.35%	2	
Glyphosate	Round-up	2004-05 to 2015-16	658	2	0.30%	0	2
Phorate	Thimet	2004-05 to 2015-16	671	1	0.15%	1	
Dimethoate	Lagon	2004-05 to 2015-16	1181	1	0.08%	1	
AMPA		2009-10, 2013-14	97	0		0	
Azoxystrobin	Quadris	2004-05 to 2015-16	1181	0		0	0
Carbaryl		2004-05 to 2006/07	303	0		0	
Chlorpyrifos		2014-15	90	0		0	
Cypermetherin		2004-05 to 2006-07, 2014-15 to 2015-16	491	0		0	
Dicamba		2004-05	106	0		0	
Diquat	Reglone	2007-08 to 2015-16	241	0		0	
Dithiocarbam		2004-05 to 2006-07	302	0		0	
Endosulfan I	Thiodin	2004-05 to 2015-16	1181	0		0	
Endosulfan II	Thiodin	2004-05 to 2015-16	1181	0		0	
Fluazifop-p-butyl	Venture	2004-05 to 2015-16	876	0		0	0
Fonofos		2004-05 to 2006-07	305	0		0	
Heptachlor-E		2004-05 to 2006-07	305	0		0	
Linuron	Lorox	2004-05 to 2006-07	1181	0		0	0
Mancozeb	Dithane	2004-05 to 2006-07	253	0		0	
MCPA	MCPA	2004-05,2007-08 to -2015-16	349	0		0	
Methamidiphos	Monitor	2007-08 to 2015-16	876	0		0	
Metiram	Polyram	2007-08 to 2015-16	253	0		0	
Metobromuron	Patoran	2007-08 to 2015-16	1181	0		0	
Paraquat	Gramoxone	2007-08 to 2015-16	241	0		0	
Permethrin		2004-05 to 2006-07, 2015-16	491	0		0	
Propiconazol	Tilt	2007-08 to 2015-16	876	0		0	0
Rimsulfuron	Prism	2007-08 to 2015-16	876	0		0	0
Terbacil		2004-05, 2006-07	202	0		0	
Thifensulfuron methyl	Pinnacle	2008-09 to 2015-16	773	0		0	0
Thiophanate-methyl	Easeout	2007-08 to 2015-16	876	0		0	0
Tribenuron methyl	Refine Extra	2008-09 to 2015-16	773	0		0	0
V-2-4-D		2004-05	106	0		0	
		TOTALS	**31268**	**513**	**1.64%**	**371**	**141**



a.



b.

Figure 2 Trends in Annual Pesticide Detections. a. Percent annual detections for the groundwater pesticide monitoring program. A statistically significant upward trend in detections is present. b. Percent site detections for the groundwater pesticide monitoring program. A statistically significant upward trend is present.

3.3. Pesticide Concentrations

Concentration trends were examined using average annual concentrations for each pesticide. Most of the pesticides had results which were below detection limits (Tables 1 and 2) so most pesticides were not considered in this analysis. Of the eight most commonly detected pesticides only two (clothianidin and thiamethoxam) produced any annual average concentrations which were above their detection limit (Table 3).

Table 3 Average Concentrations by Year for the Eight Most Commonly Detected Pesticides

Year	Average Island-wide Concentration (ppb) by Year							
	Atrazine	Hexazinone	Imidacloprid	Metalaxyl	Metribuzin	Chlorantraniliprole	Clothianidin	Thiamethoxam
2004-05	0.021	0.035	0.050	0.015	0.017	not sampled	not sampled	not sampled
2005-06	0.024	0.034	not sampled	0.018	0.019	not sampled	not sampled	not sampled
2006-07	0.019	0.035	not sampled	0.019	0.031	not sampled	not sampled	not sampled
2007-08	0.017	0.038	0.053	0.016	0.023	not sampled	not sampled	not sampled
2008-09	0.017	0.037	0.054	0.016	0.018	0.050	not sampled	not sampled
2009-10	0.018	0.033	0.055	0.018	0.024	0.050	0.005	0.005
2010-11	0.016	0.033	0.054	0.017	0.020	0.051	0.007	0.005
2011-12	0.016	0.031	0.052	0.017	0.017	0.050	0.007	0.005
2012-13	0.018	0.032	0.057	0.016	0.017	0.059	0.008	0.007
2013-14	0.016	0.031	0.056	0.015	0.016	0.078	0.009	0.008
2011-15	0.016	0.030	0.057	0.016	0.015	0.087	0.015	0.010
2015-16	0.016	0.030	0.056	0.016	0.015	0.079	0.020	0.013
Kendall's Tau	-0.606	-0.712	0.682	-0.227	-0.545	0.750	0.952	0.857
p	0.003	0.001	0.001	0.157	0.008	0.004	0.001	0.003
Trend	declining	declining	increasing	none	declining	increasing*	increasing*	increasing*
Detection Limit	0.03	0.06	0.10	0.03	0.03	0.10	0.01	0.01

Blue text indicates that a lower reporting limit was in place during these years – data shown in this table is censored[3] through use of the original detection limit.

Red text indicates that a variable detection limit was in place for 20 of 96 sites

* Indicates that the number of data points available was less than the 10 recommended for the Mann-Kendall test

Three of the eight most commonly detected pesticides (atrazine, hexazinone and metribuzin) have a declining trend in average annual concentration (Table 3). Four of the eight pesticides (imidacloprid, chlorantraniliprole, clothianidin and thiomethoxam) have an increasing trend in concentration but three (chlorantraniliprole, clothianidin and thiamethoxam) have less data than recommended for the statistical test used (Table 3) meaning these results should be considered with some caution. Metalaxyl was found to have no trend in concentration. Overall the pesticides which have been sampled since the beginning of the monitoring program are tend to have decreasing concentrations (imidacloprid and metalaxyl are exceptions) while pesticides added to the monitoring in later years tend to have increasing concentrations (Table 3).

During 2015-16 variable detection limits were used for imidacloprid at 20 sites. Five of these sites used detection limits which were higher than the concentration of imidacloprid detected at these sites in previous years. So it is possible that non-detections were recorded that would have been detections in previous years. The calculated annual average concentration for imidacloprid may have been higher in 2015-16 had usual detection limit for imidacloprid been in place at all sites.

Pesticide concentrations trends were also examined at individual sites. The 14 sites and the 8 pesticides with the greatest number of detections were used in this analysis (Table 4).

Table 4 Concentration Trends at the 14 sites with the Most Pesticide Detections

Site	Atrazine	Hexazinone	Imidacloprid	Metalaxyl	Metribuzin	Chlorantraniliprole	Clothianidin	Thiamethoxam
144	nt	-	nt	-	nt	nt	+	+
220	nt	nt	nt	nt	nt	+	+	+
166	nt	nt	nt	nt	-	nt	+	nt
191	nt	nt	+	nt	nt	nt	nt	nt
104	+	nt	nt	nt	nt	nt	nt	nt
196	nt	nt	+	-	-	nt	nt	nt
164	nt	nt	-	nt	nt	nt	nt	nt
174	nt	nt	nt	nt	nt	nt	+	nt
218	nt	nt	nt	nt	nt	+	nt	nt
206	nt	nt	nt	-	nt	+	+	+
153	nt	nt	nt	nt	nt	nt	nt	nt
172	nt	nt	nt	nt	nt	+	+	nt
209	nt	nt	nt	nt	nt	+	nt	nt
222	nt	nt	nt	nt	nt	nt	nt	nt

- refers to the presence of a statistically significant downward trend
\+ refers to the presence of a statistically significant upward trend
nt refers to no statistically significant upward or downward trend present.
red text indicates that the number of data points available is below the minimum recommended for the Mann-Kendall trend test so these results should be treated with caution.

Only 22 of the possible 112 trend results cases had enough data (a minimum of 10 data points, or no gaps in the data) to meet the requirements of the Mann-Kendall test (see black text in Table 4). Of these 22 cases no trend was found in pesticide concentration in the majority (16) of cases, an increasing trend was found in 2 cases and a declining trend in concentration was found in 4 cases (Table 4).

Ninety of the one hundred and twelve cases had less than the recommended number of data points (see red text in Table 4) for the Mann-Kendall test. Of these 90 cases the majority (72) showed no trend and only 3 showed a declining trend (Table 4). An increasing trend was found in 15 of these 88 cases (Table 4); 14 of these were from pesticides added to the pesticide monitoring suite in 2008-09 (chlorantraniliprole) and 2009-2010 (clothianidin and thiamethoxam).

3.4. Comparison to the Recommended Maximum Concentrations for Drinking Water

To provide some context about the concentrations of the pesticides being detected the concentrations of the detected pesticides were compared to recommended maximum values used by the province. These recommended values are primarily derived either from the Guidelines for Canadian Drinking Water Quality or from guidance provided to the province by Health Canada (Table 5). Two guidance values were derived from the USEPA and one from Australia as corresponding Canadian Drinking Water Guidelines were not available and Health Canada advice was either unavailable or superseded by the availability of an approved guideline from another jurisdiction. Of the 16 pesticides with positive detections, only clothianidin has no recommended maximum value (Table 5). There were no instances where a pesticide detection exceeded its guideline/guidance value (Table 5). In fact the vast majority of detections were well below guideline/guidance values (Table 6).

Table 5 Comparison of Maximum Detected Concentration to the Recommended Maximum Concentration for Each Detected Pesticide

Pesticide	Number of Detections	Maximum Recorded Concentration (ppb)	Guideline/Guidance Value (ppb)
Chlorantraniliprole	130	0.43	15000 **
Clothianidin	94	0.35	n/a
Imidacloprid	94	0.31	426 **
Metalaxyl	42	0.15	501 **
Atrazine	37	0.65	5 *
Metribuzin	37	1.21	80 **
Thiamethoxam	31	0.38	6 **
Hexazinone	19	0.77	400 ***
Thiabendazole	14	0.78	210 ****
Chlorothalonil	5	0.08	70 **
Azinphos-methyl	2	0.08	20 *
Carbofuran	2	0.14	90 *
Fludioxonil	2	0.05	200****
Glyphosate	2	0.05	280 *
Dimethoate	1	0.1	20 *
Phorate	1	0.02	2 *

* Canadian Drinking Water Guideline
** Advice/guidance provided to EWCCby Health Canada
*** Australian Drinking Water Guideline
**** USEPA Human Health Benchmark for Pesticides

Table 6 Separation between Detected Pesticide Concentrations and the Recommended Maximum Concentrations

Description	Number of Detections	Percentage of Detections
Concentration < 1/1000th of guideline	316	61.6%
Concentration between 1/100th and 1/1000th of guideline	70	13.6%
Concentration between 1/10th and 1/100th of guideline	31	6.0%
Concentration >1/10th of guideline	2	0.4%
No guideline for comparison	94	18.3%

4. Summary of Conclusions

- There is an increasing trend in overall annual detections.
- There is also an increasing trend in the percentage of sites with pesticide detections each year. Pesticides have now been detected at more than 62% of all the sites in the monitoring program. Nearly 57% of the sites measured had at least one detection in 2015-16.
- The increasing number of detections seen in the last four years is due to “new” pesticides being added to the analytical suite and to the laboratory detection limit dropping on a few pesticides.
- Concentration trends were examined using the annual average of the eight most commonly detected pesticides in the monitoring program as well as the concentrations of the same eight pesticides at the fourteen individual sites with the most detections. The results indicate that of these 8 pesticides the ones that have been monitored since 2004-05 tend to have either no trend or a declining trend while those added to the program since 2007-08 tend to have either no trend or an increasing trend.
- No detected pesticide in the survey has ever exceeded its recommended maximum value for drinking water.
  - The majority of pesticide detections are many times below their respective recommended maximum value for drinking water.

References

American Public Health Association (APHA) (1995) Standard Methods for Examination of Water and Wastewater, 19th ed. APHA, AWWA, WPCF, Washington

Contact Information

For information and questions about the pesticide sampling and results of the Groundwater Pesticide Monitoring Program contained in this report, please contact Glen Robertson, Water and Air Monitoring Specialist, PEI Department of Environment, Water and Climate Change at gsrobertson@gov.pe.ca or by calling 902-314-0046.

For information and questions about the data summaries and statistical analyses contained in this report, please contact Cindy Crane, Surface Water Biologist, PEI Department of Environment, Water and Climate Change at cscrane@gov.pe.ca or by calling 902-368-5179.