DEPARTMENT OF NATURAL RESOURCES

Water-Quality Monitoring at State Fish Hatcheries

02/13/2026

Minnesota Department of Natural Resources
Division of Fish and Wildlife
500 Lafayette Road
St. Paul, MN 55155-4020
(651) 259-5229
bradford.parsons@state.mn.us

As requested by Minnesota Statute 3.197: This report costs approximately $11,900 to prepare, including staff time, printing and mailing expenses.

Statutory References

Laws of Minnesota 2024, Chapter 116, Section 3, Subdivision 7:

$30,000 the second year is from the game and fish fund to test source water at state fish hatcheries and for reporting required under Minnesota Statutes, section 97C.202.

Minnesota Statutes, Section 97C.202 Water-Quality Monitoring at State Fish Hatcheries:

(a) The commissioner, in conjunction with the commissioners of health, agriculture, and the Pollution Control Agency, must test the source water at the state fish hatcheries located in the cities of Altura, Lanesboro, and Peterson monthly for nitrates and pesticides, including neonicotinoids. By February 15 each year, the commissioner must report the results of the previous calendar year's testing to the chairs and ranking minority members of the legislative committees and divisions with jurisdiction over environment and natural resources policy and finance and health policy and finance.

(b) Once construction of the state fish hatchery in the city of Waterville is completed, the commissioner must test the groundwater source water monthly and report the results as required for other hatcheries under paragraph (a).

Contents

Executive Summary

On July 1, 2024, the Minnesota Legislature directed the Commissioner of the Minnesota Department of Natural Resources (MN DNR), in conjunction with the commissioners of health, agriculture, and the Pollution Control Agency, to begin monthly testing of the source water at the state fish hatcheries located in the cities of Altura (Crystal Springs), Lanesboro, and Peterson for nitrates and pesticides, including neonicotinoids (neonics). The state fish hatchery near Waterville is still under construction and will also start monthly testing when construction is completed.

The Minnesota Department of Agriculture (MDA) has collected grab samples that were analyzed for nitrate from each of the hatchery springs since 2003. The Minnesota Pollution Control Agency (MPCA) installed continuous nitrate sensors at Crystal Springs, Lanesboro, and Peterson hatcheries in 2016, 2012, and 2022, respectively. These sensors measure nitrate every fifteen minutes year-round, and provide the data required to meet the nitrate monitoring component of the statute. The results are listed below in the Nitrate Monitoring section of this report.

The MDA has included Crystal Springs, Lanesboro, and Peterson hatcheries in its long-term ambient pesticide groundwater monitoring program since 2000, 2003, and 2003, respectively, and with Clean Water Fund support added the analysis of neonics starting in 2010. The MN DNR began conducting monthly pesticide water quality sampling in October 2024 and contracted with Michigan State University Veterinary Diagnostic Laboratory (MSU VDL) to process the samples and provide results. MDA and MN DNR both utilized the same sampling location at each hatchery. There were minor differences in sampling protocol (i.e., the amount of water collected, and the container used to collect the sample) based on the instructions of the receiving laboratory. Pesticide water quality monitoring results are listed below in the Pesticide Monitoring section of this report.

The MDA has only detected one neonic compound (clothianidin) at the Lanesboro hatchery. The MN DNR reported detections of acetamiprid at the Lanesboro hatchery, clothianidin and imidacloprid at all three locations, and thiamethoxam at the Lanesboro and Peterson hatcheries. Because of early 2025 detection differences, the MDA and MN DNR split samples in July, August and September 2025. MN DNR also contracted with and sent a split sample to the University of Wisconsin Stevens Point Water and Analysis Lab (UWSP WEAL) in September 2025. To provide additional quality checks on the neonic testing, the MN DNR submitted two sets of field blanks to MSU VDL along with spring water samples collected from all hatcheries on August 5, 2025, and November 12, 2025. A discussion of these results, and comparisons of these datasets are presented in the Laboratory Evaluation and Discussion sections below.

Background

The MDA is the lead state agency for the registration, management and regulation of pesticides, and activities are guided by the Pesticide Management Plan. The Pesticide Management Plan Committee (PMPC) is a volunteer committee representing many pesticide-related stakeholders including local governments, growers, extension, and pesticide registrants, with members appointed by the Commissioner of MDA (Pesticide Management Plan Committee | Minnesota Department of

Agriculture). The PMPC annually reviews MDA monitoring water quality data both in the context of human health and ecological risks.

Nitrate Monitoring

MDA Nitrate Monitoring (2010-2025)

The MDA collected and analyzed nitrate grab samples from the hatchery springs as part of its routine ambient groundwater monitoring program from 2010 through 2025 (Figure 1). Overall, nitrate averaged 4.5 mg/L in the spring at Crystal Springs (Spring #1), 6.9 mg/L at Lanesboro (Spring #2), and 4.3 mg/L at Peterson (Spring #1 - East Main Spring). No samples had a nitrate concentration above the human health drinking water reference value of 10 mg/L. The MDA will continue nitrate monitoring at these locations as part of its ambient groundwater monitoring program.

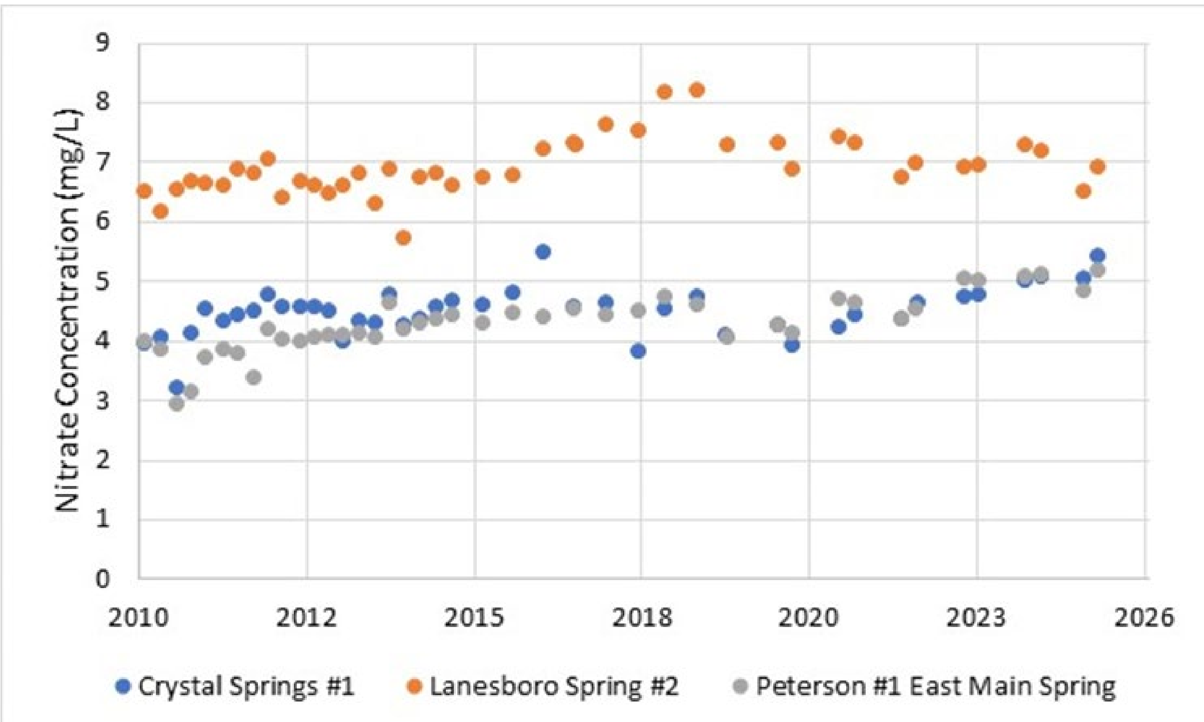

Figure 1. Long-term MDA nitrate monitoring of DNR hatchery springs.

MPCA Nitrate Sensors (2012-2025)

The MPCA installed continuous nitrate sensors at Crystal Springs, Lanesboro, and Peterson hatcheries in 2016, 2012, and 2022, respectively. These sensors measure nitrate every fifteen minutes year-round. The MDA partnered with MPCA in 2023 to install dataloggers with modems to transmit the data in near-real time on the MDA website (mda.onerain.com). The intense monitoring frequencies allow for extremely accurate characterization of nitrate conditions in the water of each spring. Figure 2 shows the nitrate concentrations at each hatchery.

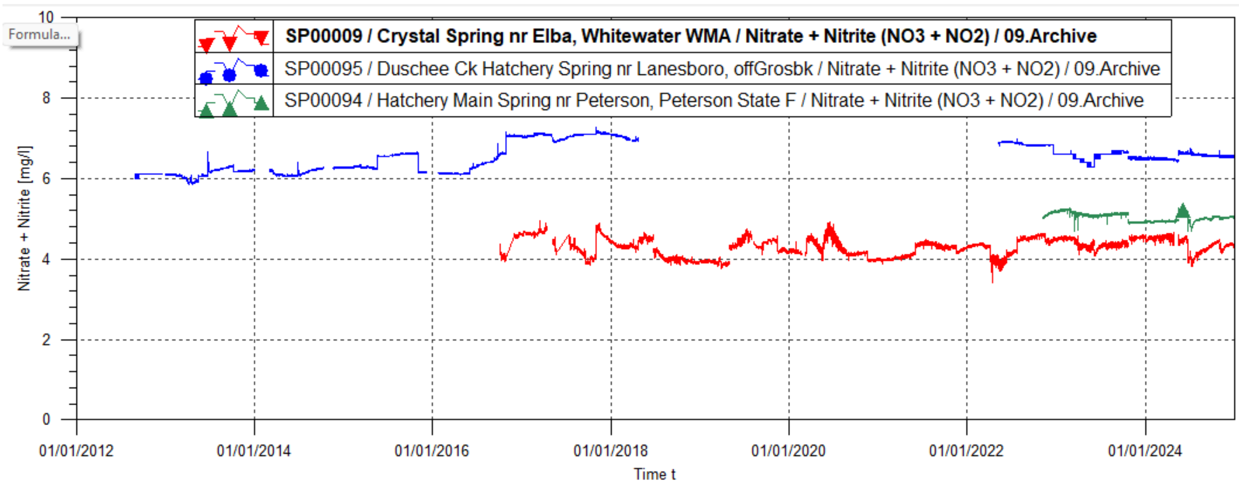

Figure 2. Provisional MPCA continuous nitrate sensor data for DNR hatchery springs.

Pesticide Monitoring

MDA Pesticide Monitoring

The MDA has included Crystal Springs, Lanesboro, and Peterson fish hatchery springs in its long-term ambient pesticide groundwater monitoring program since 2000, 2003, and 2003, respectively. With the support of the Clean Water Fund, neonics monitoring started in 2010. The MDA collects and analyzes two pesticide grab samples from each hatchery spring annually as part of a long-term ambient groundwater monitoring program. The samples are analyzed for 185 different pesticide analytes, including 6 neonics and 2 neonic breakdown compounds (Appendix 1) at the MDA Laboratory, which is ISO/IEC 17025 accredited. The MDA Laboratory is nationally renowned for pesticide analysis, and the MDA has the most comprehensive neonic water quality dataset in the United States. The 2025 Method Reporting Limit (MRL) for the neonics ranged from 5 ng/L to 50 ng/L.

The MDA detected 10 different pesticide compounds at the 3 hatchery springs since 2010 (Table 1). Only 1 neonic, clothianidin, was detected at Lanesboro with the first detection in 2024 after the MRL was reduced from 25 ng/L to 5 ng/L. All pesticide detections, and total atrazine (parent plus its degradates), were low relative to the human health reference value, the MPCA aquatic life standard/the USEPA aquatic life benchmark, and the USEPA fish aquatic life benchmark. Relative to the lowest applicable reference value, the greatest relative pesticide detection to its reference value was a clothianidin detection that was 21% of the USEPA chronic aquatic life benchmark for aquatic invertebrates and <0.0001% of the USEPA fish benchmark.

Neonics were first analyzed by the MDA Laboratory in water samples in 2010. Currently, the MDA Laboratory analyzes water samples for 6 neonic parent pesticides and 2 degradates (breakdown products): acetamiprid (analysis began in 2010), clothianidin (analysis began in mid-2011), dinotefuran (analysis began in 2012), imidacloprid (analysis began in 2010), thiacloprid (analysis began in 2014), thiamethoxam (analysis began in 2010), and the degradates imidacloprid-urea and imidacloprid-olefin (analysis began in 2017). One notable change to MDA neonic monitoring beginning in 2024 was the reduction in the clothianidin MRL from 25 ng/L to 5 ng/L. The only MDA neonic detections in the hatchery springs occurred at the Lanesboro hatchery where clothianidin was detected in 2024 and 2025 above the reduced MRL (5 ng/L), but below the historical MRL (25 ng/L). Prior to the MRL change in 2024, these clothianidin results would have been reported as not detected (<25 ng/L).

The MDA will continue to analyze pesticide water quality samples from these springs moving forward as part of the long-term ambient pesticide groundwater monitoring program.

Table 1. 2010-2025 MDA Pesticide Detections in MN DNR Hatchery Springs (Analyzed at the MDA Laboratory).

		Acetochlor ESA	Alachlor ESA	Atrazine	Clothianidin	Desethyl-atrazine	Didealkyl-atrazine	Dimethenamid ESA	Hydroxy-atrazine	Metolachlor ESA	Metolachlor OXA
Human Health Drinking Water Reference Value (ng/L)[B]		300,000	50,000	3,000[A]	200,000	3,000[A]	3,000[A]	300,000	20,000	1,000,000	1,000,000
MPCA standard or USEPA Aquatic Life Benchmark (ng/L)		9,900,00	3,600,000	10,000	50	1,000,000	>50,000,000	Not available	>10,000,000	4,000,000	7,700,000
USEPA Fish Benchmark (ng/L)		>90,000,000	>52,000,000	5,000	9,700,000	Not available	>50,000,000	8,900	>1,500,000	24,000,000	>46,500,000
Crystal Springs (Spring #1)											
2010-2025	Samples	44	44	42	38	42	44	44	44	44	44
	Detections	4	43	18	0	26	40	1	44	44	2
	Detection Frequency (%)	9	98	43	0	62	91	2	100	100	5
	90th percentile (ng/L)	< 30	238	35.5	<25	71.5	110	< 6.7	15.8	259	< 10
	Maximum (ng/L)	184	280	52.4	<25	110	148	7.07	17.8	355	14.4
Lanesboro (Spring #2)											
2010-2025	Samples	45	45	43	39	43	45	45	45	45	45
	Detections	0	37	18	6	27	44	0	45	44	24
	Detection Frequency (%)	0	82	42	15	63	98	0	100	98	56
	90th percentile (ng/L)	< 30	102	50	8.7	88	150	< 6.7	10.8	580	27
	Maximum (ng/L)	< 30	123	60	10.4	120	199	< 6.7	11.7	638	541
Peterson (Spring #1 - East Main Spring)											
2010-2025	Samples	44	44	42	38	42	44	44	44	44	44
	Detections	0	44	26	0	39	34	0	0	44	0
	Detection Frequency (%)	0	100	62	0	93	77	0	0	100	0
	90th percentile (ng/L)	< 30	244	42.4	<25	90.5	87.8	< 6.7	< 6.7	334	< 10
	Maximum (ng/L)	< 30	257	50	<25	120	104	< 6.7	< 6.7	365	< 10

[A] This reference value is for "Total Atrazine" which includes the parent atrazine, plus select atrazine breakdown products including desethyl-atrazine and didealkyl-atrazine, and others

[B] Health risks from exposure from fish consumption were not considered.

MN DNR Pesticide Monitoring

The MN DNR began conducting monthly pesticide water quality sampling in October 2024 and contracted with Michigan State University Veterinary Diagnostic Laboratory (MSU VDL), which is AAVLD (American Association of Veterinary Laboratory Diagnosticians) accredited, to process the samples and provide results. MN DNR utilized the same sampling locations as MDA at each hatchery, however there were minor differences in sampling protocol (i.e., the amount of water collected, and the container used to collect the sample) based on the instructions of the receiving laboratory. The samples were analyzed for seven parent neonics, six breakdown compounds, and three other compounds (Appendix 2). The 2024-2025 MRL for all analytes was 20 ng/L. The pesticide sampling results for detected compounds in samples collected from October 2024 to December 2025 are presented below in Table 2. The MSU VDL reported detections of acetamiprid at the Lanesboro hatchery, clothianidin and imidacloprid at all three locations, and thiamethoxam at the Lanesboro and Peterson hatcheries.

To provide quality checks on the MSU VDL neonic testing, the MN DNR submitted two sets of field blanks along with spring water samples to MSU VDL collected from all hatcheries on August 5, 2025, and November 12, 2025. The field blanks consisted of certified ultrapure water that was free from all pollutants. While MSU VDL reported to MN DNR that they had lost three of the six samples submitted in August 2025, based on the labeling of the results, it appears one field blank submitted in August was analyzed. The MSU VDL reported detections of both imidacloprid and clothianidin from the field blanks (Table 4).

MN DNR also contracted with, and sent a split sample to, the University of Wisconsin Stevens Point Water and Analysis Lab (UWSP WEAL) in September 2025 to help evaluate the differences in neonic detections between the MDA lab and the MSU VDL. The UWSP WEAL maintains certification from the Wisconsin Department of Natural Resources and the Wisconsin Department of Agriculture, Trade, and Consumer Protection. Spring water samples were again collected from the same location at the same time, with minor differences in sampling protocol (the amount of water collected, and the container used to collect the sample) based on the instructions of the receiving laboratory. The samples sent to UWSP WEAL were analyzed for five parent neonics (Appendix 3). The MRL for the neonics ranged from 2 to 7.2 ng/L. No neonics were detected in the samples.

Further discussion is available in the Laboratory Evaluation and Discussion sections.

Table 2. 2024-2025 DNR Pesticide Detections in MN DNR Hatchery Springs (Analyzed at the Michigan State University Veterinary Diagnostic Laboratory).

		Acetamiprid	Clothianidin	Imidacloprid	Thiamethoxam
Human Health Drinking Water Reference Value (ng/L)[A]		100,000	200,000	2,000	200,000
MPCA standard or USEPA Aquatic Life Benchmark (ng/L)		2,100	50	10	740
USEPA Fish Benchmark (ng/L)		19,200,000	9,700,000	9,000,000	20,000,000
Crystal Springs (Spring #1)					
2024-2025	Samples	14	14	14	14
	Detections	0	5	5	0
	Detection Frequency (%)	0	36	36	0
	90th percentile (ng/L)	<20	45.4	68	<20
	Maximum (ng/L)	<20	47	78	<20
Lanesboro (Spring #2)					
2024-2025	Samples	15	15	15	15
	Detections	7	9	5	9
	Detection Frequency (%)	47	60	33	60
	90th percentile (ng/L)	45.2	55	60.4	34.6
	Maximum (ng/L)	50	67	62	35
Peterson (Spring #1 - East Main Spring)					
2024-2025	Samples	15	15	15	15
	Detections	0	7	6	3
	Detection Frequency (%)	0	47	40	20
	90th percentile (ng/L)	<20	61.4	36.5	41.2
	Maximum (ng/L)	<20	68	38	45

[A] Health risks from exposure from fish consumption were not considered.

Laboratory Evaluation

There was a stark contrast in neonic detections between the MDA and MSU VDL labs. The MDA only detected one neonic, clothianidin, at the Lanesboro hatchery. Whereas, the MSU VDL reported detections of acetamiprid at the Lanesboro hatchery, clothianidin and imidacloprid at all three locations, and thiamethoxam at the Lanesboro and Peterson hatcheries. Recognizing the detection differences early in 2025, the MDA and MN DNR split samples in July, August and September 2025 to better assess for neonic presence differences between the labs. MN DNR also contracted with, and sent a split sample to, the University of Wisconsin Stevens Point Water and Analysis Lab (UWSP WEAL) in September 2025 to help evaluate the differences in neonic detections between the MDA lab and the MSU VDL.

The results from the split samples reported by each laboratory aligned with the results each lab reported from previous monitoring (Table 3). The MDA Laboratory only detected clothianidin in the split samples collected from the Lanesboro hatchery. The MSU VDL reported detection of acetamiprid in the Lanesboro spring, clothianidin and imidacloprid at all three hatchery springs, and thiamethoxam from both Lanesboro and Peterson Springs. No neonics were detected in the samples sent to UWSP WEAL.

To provide additional quality checks on the neonic testing, the MN DNR submitted two sets of field blanks along with spring water samples to MSU VDL collected from all hatcheries on August 5, 2025, and November 12, 2025. The field blanks consisted of certified ultrapure water that was free from all pollutants. MSU VDL reported to MN DNR that they had lost three of the six samples submitted in August 2025. However, based on the labeling of the results received, it appears that two of the spring water samples and one field blank were analyzed. The MSU VDL reported detections of both imidacloprid and clothianidin from the field blank submitted in August. No neonics were detected in the samples submitted in November (Table 4).

Since 2010, the MDA has had more than 1,700 field blank neonic results without a reported neonic detection. Program wide, annually the MDA collects 5% of samples as replicates, and 5% of samples as blanks. Neonics results between the sample and replicate have very strong correlations [coefficient of determination (R^2) >0.99].

To continue monitoring potential lab result differences, the MDA and MN DNR will collect split samples that will be run at each laboratory twice annually.

Table 3. 2025 Split Sample Pesticide Results in the MN DNR Hatchery Springs (MDA Laboratory, Michigan State University Veterinary Diagnostic Laboratory (MDU VDL), and University of Wisconsin Stevens Point Water and Analysis Lab (UWSP WEAL)).

		Acetamiprid (ng/L)			Clothianidin (ng/L)			Dinotefuran (ng/L)			Imidacloprid (ng/L)			Thiacloprid (ng/L)		Thiamethoxam (ng/L)		
Hatchery	Date	MDA	MSU VDL	UWSP WEAL	MDA	MSU VDL	UWSP WEAL	MDA	MSU VDL	UWSP WEAL	MDA	MSU VDL	UWSP WEAL	MDA	MSU VDL	MDA	MSU VDL	UWSP WEAL
Crystal Springs	7/8/2025	< 25	<20	N/A	< 5	**43**	N/A	< 25	<20	N/A	< 5	**43**	N/A	< 50	<20	< 25	<20	N/A
Crystal Springs	8/5/2025	< 25	A	N/A	< 5	A	N/A	< 25	A	N/A	< 5	A	N/A	< 50	A	< 25	A	N/A
Crystal Springs	9/2/2025	< 25	<20	<5.1	< 5	**29**	<4.5	< 25	<20	<2.0	< 5	**32**	<2.4	< 50	<20	< 25	<20	<4.5
Lanesboro	7/8/2025	< 25	**42**	N/A	**8.69**	**52**	N/A	< 25	<20	N/A	< 5	**48**	N/A	< 50	<20	< 25	**30**	N/A
Lanesboro	8/5/2025	< 25	**31**	N/A	**9.28**	**45**	N/A	< 25	<20	N/A	< 5	**39**	N/A	< 50	<20	< 25	**35**	N/A
Lanesboro	9/2/2025	< 25	**27**	<5.1	**10.4**	**26**	<4.5	< 25	<20	<2.0	< 5	**29**	<2.4	< 50	<20	< 25	**22**	<4.5
Peterson	7/8/2025	< 25	<20	N/A	< 5	**52**	N/A	< 25	<20	N/A	< 5	**38**	N/A	< 50	<20	< 25	**24**	N/A
Peterson	8/5/2025	< 25	<20	N/A	< 5	**56**	N/A	< 25	<20	N/A	< 5	**33**	N/A	< 50	<20	< 25	**26**	N/A
Peterson	9/2/2025	< 25	<20	<5.1	< 5	**23**	<4.5	< 25	<20	<2.0	< 5	<20	<2.4	< 50	<20	< 25	<20	<4.5

[A] MSU VDL reported that they lost the sample submitted on 8/5/25.

Table 4. Results of MN DNR Field Blanks Submitted in 2025 (Michigan State University Veterinary Diagnostic Laboratory (MDU VDL)).

Hatchery	Date	Acetamiprid (ng/L)	Clothianidin (ng/L)	Dinotefuran (ng/L)	Imidacloprid (ng/L)	Thiacloprid (ng/L)	Thiamethoxam (ng/L)
Crystal Springs	8/5/2025	<20	**45**	<20	**46**	<20	<20
Crystal Springs	11/12/2025	<20	<20	<20	<20	<20	<20
Lanesboro	8/5/2025	A	A	A	A	A	A
Lanesboro	11/12/2025	<20	<20	<20	<20	<20	<20
Peterson	8/5/2025	A	A	A	A	A	A
Peterson	11/12/2025	<20	<20	<20	<20	<20	<20

[A] MSU VDL reported that they lost the samples submitted on 8/5/25.

Discussion

There were differences in the reported detections between the MDA and MSU VDL in 2025. While it is important to note that both laboratories are reporting the low parts-per-trillion range and the relative differences are small, these differences are important when evaluating results to water quality standards and/or benchmarks.

The hatchery springs are unique in that the MDA has monitored many pesticides at these locations for more than 20 years. This dataset allows the MDA to evaluate not only the current neonic conditions but also allows for deeper analyses. For example, a breakdown product of the herbicide alachlor was widely used through the 1980s and use completely ended in the late 1990s. This scenario creates an opportunity to use alachlor ESA (a form of alachlor) as a groundwater age tracer and evaluate whether concentrations are increasing (aquifer dominated by older, pre-2000, groundwater) or decreasing (younger, post 2000, groundwater mixing in the aquifer) to determine a relative age of groundwater at each location. Using this approach, the only spring with decreasing alachlor ESA concentration is Lanesboro which indicates post 2000 groundwater is mixing in the aquifer. Alachlor ESA concentration at Crystal Springs is increasing and Peterson is stable, indicating post 2000 age groundwater is not mixing in the aquifer. Neonics were first registered in 1994 and use increased post 2000.

Based on groundwater age using alachlor ESA as a tracer, detections of neonic(s) are most likely to occur at the Lanesboro Spring and would not be expected at Crystal Springs and Peterson hatcheries. The MDA has only detected clothianidin at the Lanesboro hatchery spring when evaluating neonic detections at these 3 hatcheries. The MSU VDL reported detections of acetamiprid at the Lanesboro hatchery, clothianidin and imidacloprid at all three locations, and thiamethoxam at the Lanesboro and Peterson hatcheries. The neonic detection pattern of the MSU VDL results appear suspect based on groundwater age.

The MSU VDL acetamiprid detections also appear suspect based on previous water monitoring and sales. The MDA has an extensive neonic water quality dataset that can provide context for the hatchery springs. Statewide, the MDA has never detected acetamiprid in 3,695 groundwater samples (<25 ng/L) collected in areas with vulnerable groundwater resources since 2010. Statewide sales of acetamiprid are very low (<400 pounds each in 2023 and 2024).

The MDA conducts extensive water monitoring in southeast Minnesota each year. The MDA did not detect imidacloprid or thiamethoxam in any springs/wells in its regional groundwater monitoring network in southeast Minnesota in 2024 (43 samples), which included the hatchery springs. The MSU VDL detections of imidacloprid and thiamethoxam do not align with the broader MDA groundwater quality conditions in southeast Minnesota.

The MDA did detect clothianidin in 58% of the 43 samples collected from springs/wells in its regional groundwater monitoring network in southeast Minnesota in 2024. The MDA laboratory widely reports detections of clothianidin across Minnesota, above 5 parts per trillion. The MSU VDL reported detections of clothianidin at all three springs at concentrations at an order magnitude above the MDA reporting limits.

Overall, there was a marked difference in neonic detections between simultaneously collected samples analyzed by the MDA and MSU VDL, and the MSU VDL results do not align with groundwater age estimates. In addition, samples sent to the UWSP WEAL did not detect neonics, and the field blanks sent to MSU VDL should have shown no detections but indicated that both imidacloprid and clothianidin were present. Based on the suspect nature of the results received from the MSU VDL, the 2025 MSU VDL results should be considered invalid. The MN DNR will be utilizing a different testing laboratory beginning in February 2026.

Appendix 1. MDA 2024 list of target pesticide and pesticide degradate analytes with associated Method Reporting Limits (MRL).

Neonicotinoid insecticide analytes shaded in grey.

Analyte	Analyte Type	Method Reporting Limit (ng/L)
2,4-D	Herbicide	8.3
2,4-DB	Herbicide	20
Acetamiprid	Neonicotinoid Insecticide	25
Acetochlor	Herbicide	30
Acetochlor ESA	Acetochlor Degradate	30
Acetochlor OXA	Acetochlor Degradate	33.3
Acifluorfen	Herbicide	25
Afidopyropen	Insecticide	50
Alachlor	Herbicide	30
Alachlor ESA	Alachlor Degradate	41.6
Alachlor OXA	Alachlor Degradate	33.3
Aldicarb Sulfone	Aldicarb (Insecticide) Degradate	15
Aldicarb Sulfoxide	Aldicarb (Insecticide) Degradate	50
Aminopyralid	Herbicide	25
Atrazine	Herbicide	30
Deisopropylatrazine	Atrazine/Cyanazine Degradate	25
Desethylatrazine	Atrazine Degradate	50
Didealkylatrazine	Atrazine/Cyanazine Degradate	50
Hydroxyatrazine	Atrazine Degradate	6.7
Azoxystrobin	Fungicide	10
Benfluralin	Herbicide	25
Bensulfuron-methyl	Herbicide	16.7
Bensulide	Herbicide	250
Bentazon	Herbicide	5
Bentazon AIBA	Bentazon Degradate	10
Benzovindiflupyr	Fungicide	50
Bicyclopyrone	Herbicide	10
Bicyclopyrone SYN503780	Bicyclopyrone Degradate	100
Bifenthrin	Insecticide	20
Bixafen	Fungicide	100
Boscalid	Fungicide	50
Bromacil	Herbicide	30
Bromoxynil	Herbicide	25
Carbaryl	Insecticide	25
Carbendazim	Fungicide	10
Chlorantraniliprole	Insecticide	50
Chlorimuron-ethyl	Herbicide	20

Analyte	Analyte Type	Method Reporting Limit (ng/L)
Chlorothalonil	Fungicide	50
4-Hydroxychlorothalonil	Chlorothalonil Degradate	100
Chlorpyrifos	Insecticide	25
Chlorpyrifos Oxon	Chlorpyrifos Degradate	40
Clethodim Sulfone	Clethodim (Herbicide) Degradate	100
Clethodim Sulfoxide	Clethodim (Herbicide) Degradate	50
Clomazone	Herbicide	15
Clopyralid	Herbicide	41.6
Cloransulam-methyl	Herbicide	100
Clothianidin	Neonicotinoid Insecticide	5
Cyanazine	Herbicide	25
Cyanazine Acid	Cyanazine Degradate	10
Cyanazine Amide	Cyanazine Degradate	10
Deethylcyanazine	Cyanazine Degradate	25
Deethylcyanazine Acid	Cyanazine Degradate	25
Deethylcyanazine Amide	Cyanazine Degradate	25
Cyantraniliprole	Insecticide	100
Cyfluthrin	Insecticide	100
Diazinon	Insecticide	30
Diazinon Oxon	Diazinon Degradate	75
Dicamba	Herbicide	50
Dichlobenil	Herbicide	5
Dichlorprop	Herbicide	50
Dichlorvos	Insecticide	15
Dicrotophos	Insecticide	25
Difenoconazole	Fungicide	25
Dimethenamid	Herbicide	15
Dimethenamid ESA	Dimethenamid Degradate	6.7
Dimethenamid OXA	Dimethenamid Degradate	10
Dimethoate	Insecticide	50
Dinotefuran	Neonicotinoid Insecticide	25
Disulfoton	Insecticide	60
Disulfoton Sulfone	Disulfoton Degradate	20
Dithiopyr	Herbicide	50
Diuron	Herbicide	13.3
EPTC	Herbicide	10
Esfenvalerate	Insecticide	150
Ethalfluralin	Herbicide	50
Ethofumesate	Herbicide	50
Fipronil	Insecticide	10
Fluazaindolizine*	Nematicide	25

Analyte	Analyte Type	Method Reporting Limit (ng/L)
Flufenacet OXA	Flufenacet (Herbicide) Degradate	8.3
Fluindapyr	Fungicide	50
Flumetsulam	Herbicide	50
Flupyradifurone	Insecticide	10
Flutriafol	Fungicide	10
Fluxapyroxad	Fungicide	10
Fomesafen	Herbicide	50
Fonofos	Insecticide	15
Glufosinate	Herbicide	1020
Glyphosate	Herbicide	1020
Aminomethylphosphonic acid (AMPA)	Glyphosate Degradate	5100
Halauxifen-methyl	Herbicide	10
Halauxifen Acid	Halauxifen-methyl Degradate	25
Halosulfuron-methyl	Herbicide	30
Hexazinone	Herbicide	10
Imazamethabenz-methyl	Herbicide	5
Imazamethabenz Acid	Imazamethabenz-methyl Degradate	10
Imazamox	Herbicide	13.3
Imazapic	Herbicide	10
Imazapyr	Herbicide	8.3
Imazaquin	Herbicide	16.7
Imazethapyr	Herbicide	6.7
Imidacloprid	Neonicotinoid Insecticide	5
Imidacloprid Olefin	Neonicotinoid Degradate	50
Imidacloprid Urea	Neonicotinoid Degradate	50
Inpyrfluxam	Fungicide	30
Isoxaflutole	Herbicide	40
Isoxaflutole DKN	Isoxaflutole Degradate	50
lambda-Cyhalothrin	Insecticide	75
Linuron	Herbicide	20
Malathion	Insecticide	40
Mandestrobin	Fungicide	25
MCPA	Herbicide	5
MCPB	Herbicide	20
MCPP	Herbicide	50
Mefentrifluconazole	Fungicide	25
Mesotrione	Herbicide	50
Metalaxyl	Fungicide	8.3
Metconazole	Fungicide	25
Methiozolin	Herbicide	30
Metolachlor	Herbicide	25

Analyte	Analyte Type	Method Reporting Limit (ng/L)
Metolachlor ESA	Metolachlor Degradate	10
Metolachlor OXA	Metolachlor Degradate	10
Metribuzin	Herbicide	75
Metribuzin DA	Metribuzin Degradate	25
Metribuzin DADK	Metribuzin Degradate	500
Metribuzin DK	Metribuzin Degradate	500
Metsulfuron-methyl	Herbicide	23.3
Momfluorothrin	Insecticide	50
Myclobutanil	Fungicide	10
Nicosulfuron	Herbicide	26.6
Norflurazon	Herbicide	20
Norflurazon-desmethyl	Norflurazon Degradate	50
Oxadiazon	Herbicide	75
Oxathiapiprolin	Fungicide	100
Oxydemeton-methyl	Insecticide	20
Parathion-methyl	Insecticide	100
Parathion-methyl oxon	Parathion-methyl Degradate	25
Pendimethalin	Herbicide	75
Phorate	Insecticide	25
Picarbutrazox	Fungicide	15
Picarbutrazox TZ-1E	Picarbutrazox Degradate	15
Picloram	Herbicide	41.6
Picoxystrobin	Fungicide	50
Piperonyl butoxide	Insecticide Synergist	30
Prometon	Herbicide	100
Prometryn	Herbicide	3.3
Propachlor	Herbicide	30
Propachlor ESA	Propachlor Degradate	30
Propachlor OXA	Propachlor Degradate	10
Propazine	Herbicide	25
Propiconazole	Fungicide	10
Prothioconazole - desthio	Prothioconazole (Fungicide) Degradate	15
Pydiflumetofen	Fungicide	25
Pyraclostrobin	Fungicide	25
Pyridafol	Pyridate (Herbicide) Degradate	25
Pyrimisulfan	Herbicide	25
Pyroxasulfone	Herbicide	50
Pyroxasulfone M1	Pyroxasulfone Degradate	15
Pyroxasulfone M3	Pyroxasulfone Degradate	25
Saflufenacil	Herbicide	15
Sedaxane	Fungicide	75

Analyte	Analyte Type	Method Reporting Limit (ng/L)
Siduron	Herbicide	6.7
Simazine	Herbicide	75
Sulfentrazone	Herbicide	50
Sulfentrazone-3-Carboxylic Acid	Sulfentrazone Degradate	150
Sulfometuron-methyl	Herbicide	8.3
Tebuconazole	Fungicide	10
Tebupirimfos	Insecticide	30
Tembotrione	Herbicide	50
Terbufos	Insecticide	30
Tetraconazole	Fungicide	10
Tetraniliprole	Insecticide	50
Tetraniliprole quinazolinone	Tetraniliprole Degradate	50
Thiacloprid	Neonicotinoid Insecticide	50
Thiamethoxam	Neonicotinoid Insecticide	25
Thifensulfuron-methyl	Herbicide	16.7
Thiobencarb	Herbicide	8.3
Tolfenpyrad	Insecticide	80
Tolpyralate	Herbicide	50
Topramezone	Herbicide	100
Triallate	Herbicide	50
Triasulfuron	Herbicide	23.3
Triclopyr	Herbicide	50
Trifloxystrobin	Fungicide	80
Trifluralin	Herbicide	50
zeta-Cypermethrin	Insecticide	500

Appendix 2. MSU VDL 2024-2025 list of target pesticide and pesticide degradate analytes with associated Method Reporting Limits (MRL).

Neonicotinoid insecticide analytes shaded in grey.

Analyte	Analyte Type	Method Reporting Limit (ng/L)
2-chloro-1,3-thiazole-5-carboxylic acid	Other Compound	20
2-imidazolidone	Other Compound	20
Acetamiprid	Neonicotinoid Insecticide	20
Clothianidin	Neonicotinoid Insecticide	20
Dinotefuran	Neonicotinoid Insecticide	20
Imidacloprid	Neonicotinoid Insecticide	20
5-hydroxy- imidacloprid	Neonicotinoid Insecticide Metabolite	20
6-chloronicotinic acid	Neonicotinoid Insecticide Metabolite	20
6-hydroxynicotinic Acid	Neonicotinoid Insecticide Metabolite	20
Desnitro- imidacloprid	Neonicotinoid Insecticide Metabolite	20
Imidacloprid Olefin	Neonicotinoid Insecticide Metabolite	20
Imidacloprid Urea	Neonicotinoid Insecticide Metabolite	20
Nitenpyram	Neonicotinoid Insecticide	20
Nitroguanadine	Other Compound	20
Thiacloprid	Neonicotinoid Insecticide	20
Thiamethoxam	Neonicotinoid Insecticide	20

Appendix 3. UWSP WEAL 2025 list of target pesticide and pesticide degradate analytes with associated Method Reporting Limits (MRL).

Neonicotinoid insecticide analytes shaded in grey.

Analyte	Analyte Type	Method Reporting Limit (ng/L)
Acetamiprid	Neonicotinoid Insecticide	5.1
Clothianidin	Neonicotinoid Insecticide	4.5
Dinotefuran	Neonicotinoid Insecticide	2.0
Imidacloprid	Neonicotinoid Insecticide	7.2
Thiamethoxam	Neonicotinoid Insecticide	4.5