



Summary of MDA Imidacloprid, Clothianidin, and Thiamethoxam Water Quality Data Collected from Rivers and Streams

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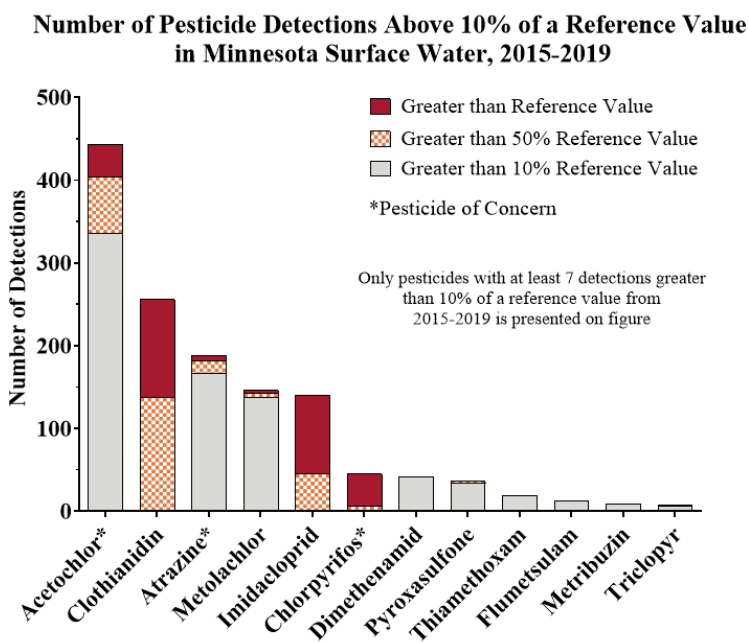
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The Minnesota Department of Agriculture (MDA) proposed to designate imidacloprid, clothianidin, and thiamethoxam as “surface water pesticides of concern” in February 2020 based on water quality data collected from 2010 through 2018. Since the initial proposal of these neonicotinoid insecticides as “surface water pesticides of concern”, the MDA has summarized the 2019 water quality data. This document will review the MDA water quality data relative to the acute and chronic United States Environmental Protection Agency (USEPA) aquatic life benchmarks (ALBs).

Designation as a “surface water pesticide of concern” is a proactive step that results in the development and promotion of voluntary Best Management Practices (BMPs) to reduce the potential impacts to aquatic life while the pesticide(s) continues to be used. The state Pesticide Management Plan (PMP) states that the MDA should consider designating a pesticide as a “surface water pesticide of concern” if the pesticide exceeds 10-50% of a state standard or other appropriate reference value with consideration for trends, use and other relevant factors. The MDA also considers comments from members of the Pesticide Management Plan Committee (PMPC) which meets annually to review water quality monitoring data. Designation as a “surface water pesticide of concern” does not require the exceedance of a standard or reference value since the goal is to develop and promote protective BMPs to minimize or prevent exceedances of standards or reference values.

Proposing to designate imidacloprid, clothianidin, and thiamethoxam as “surface water pesticides of concern” was in large part a result of the reduction in the USEPA ALBs for these insecticides in 2017. In response, the MDA collected additional samples in 2018 and 2019 and conducted additional assessment of the available data. From 2015 through 2019, the number of detections nearing (greater than 50% of the reference value) and above the applicable reference values were the highest for clothianidin and imidacloprid compared to over 150 pesticide compounds analyzed (see figure below). Thiamethoxam is an active ingredient that partially degrades to clothianidin. Atrazine and acetochlor were designated as “surface water pesticides of concern” in 2003 and chlorpyrifos was designated in 2012.



Two types of ALBs for aquatic invertebrates were considered during the review:

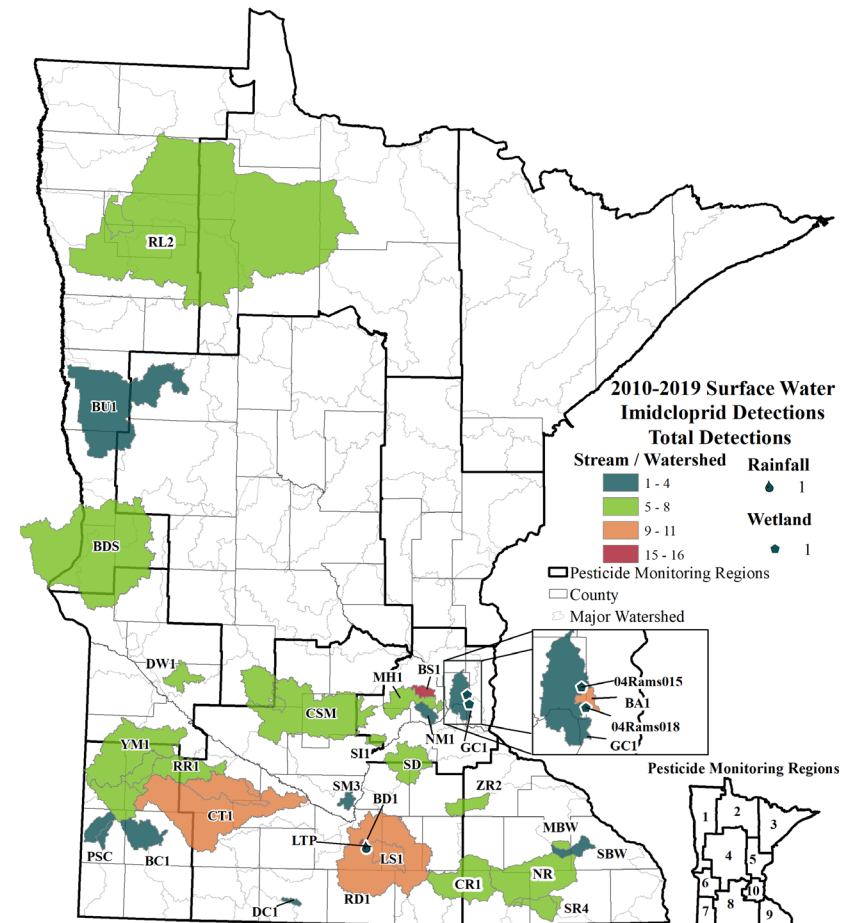
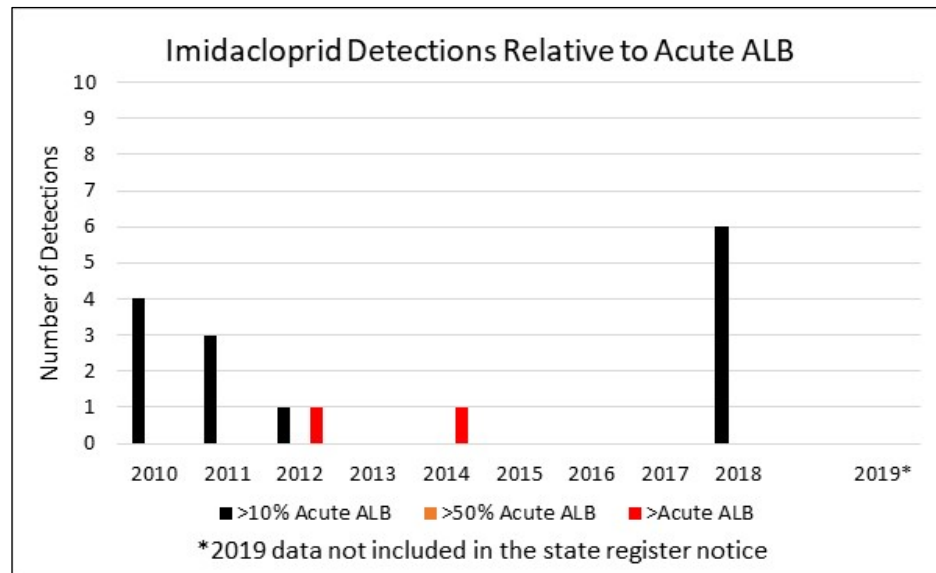
- Acute ALB
 - Acute ALBs are generally used to assess short duration exposure, and concentrations in water quality grab samples can be directly compared to the acute ALB.
 - The water quality data is compared directly to three thresholds: 10% of the acute ALB, 50% of the acute ALB, and above the acute ALB.
 - The MDA acknowledges that focusing on acute exposures likely under-estimates the risks to aquatic life because it does not include long-term (chronic) exposure that may also occur in the waterbody, discussed below.
- Chronic ALB
 - Chronic ALBs are typically developed from several toxicological studies that have varying duration exposure periods (typically 14 to 60 days based on the lifecycle of the species in the study).
 - In the past, the MDA has used a 4-day duration period for comparisons with chronic standards. In this instance, the MDA chose to use a 21-day duration for comparison with the chronic ALB.
 - The MDA first presented the number of detections over 10%, 50%, and above the chronic ALB without consideration of the duration component as a conservative estimate of the waterbodies that may have impacts to aquatic life.
 - The MDA calculated 21-day average concentrations at locations with at least 8 samples collected annually during the monitoring season. This captures the vast majority of MDA river and stream data.
 - To compare the water quality grab sample concentrations over a 21-day period, each water quality sample concentration was extended to the mid-point of the previous and next sample.
 - Non-detection (<MRL) was assigned a concentration of zero, which may underestimate the effects of sustained concentrations to aquatic life below the laboratory method reporting limit (MRL).
 - The MDA then calculated 21-day average concentrations beginning on May 1st (when monitoring began) through August 31st.
 - The MDA feels this conservative approach to protect aquatic life is valid. The MDA recognizes some potential concerns with this approach; however, the MDA does not have to document specific exceedances of an ALB to designate a “surface water pesticide of concern”. Limitations in the data may include:
 - Water quality samples are often collected during runoff events (storm flow) that generally have the potential to indicate higher concentrations than non-runoff periods.
 - The number of samples collected during some of the 21-day periods may be limited.

The notice in the state register included data collected from 2010 through 2018. Since the “surface water pesticides of concern” posting, the MDA has also obtained an additional year of monitoring data for 2019. The 2019 data are included in the figure above and are presented separately below. Examples of annual river discharge and imidacloprid, clothianidin and thiamethoxam for various locations are presented in the appendix. These figures show sustained detections in the spring and summer.

Imidacloprid: Detections Compared to Acute USEPA ALB

Acute USEPA ALB = 385 ng/L

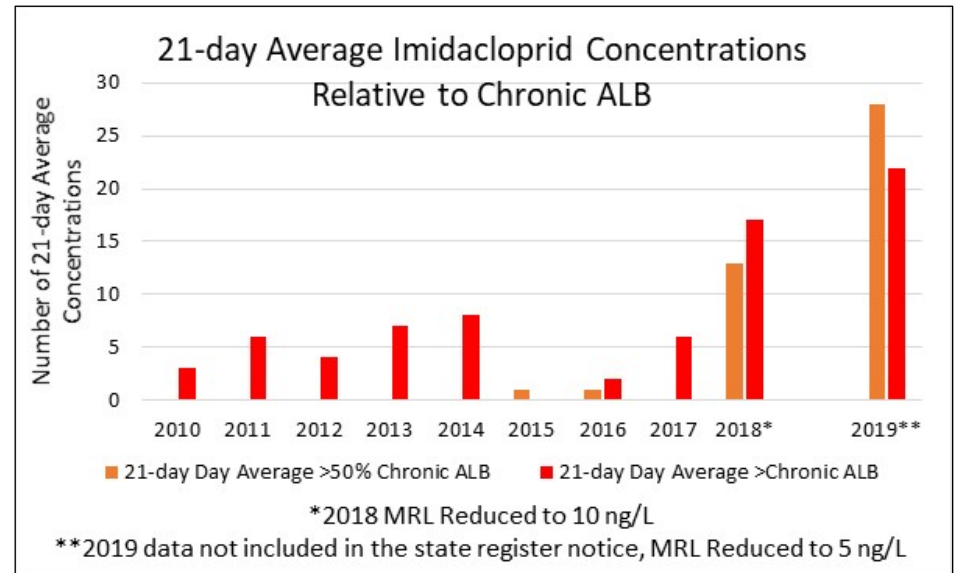
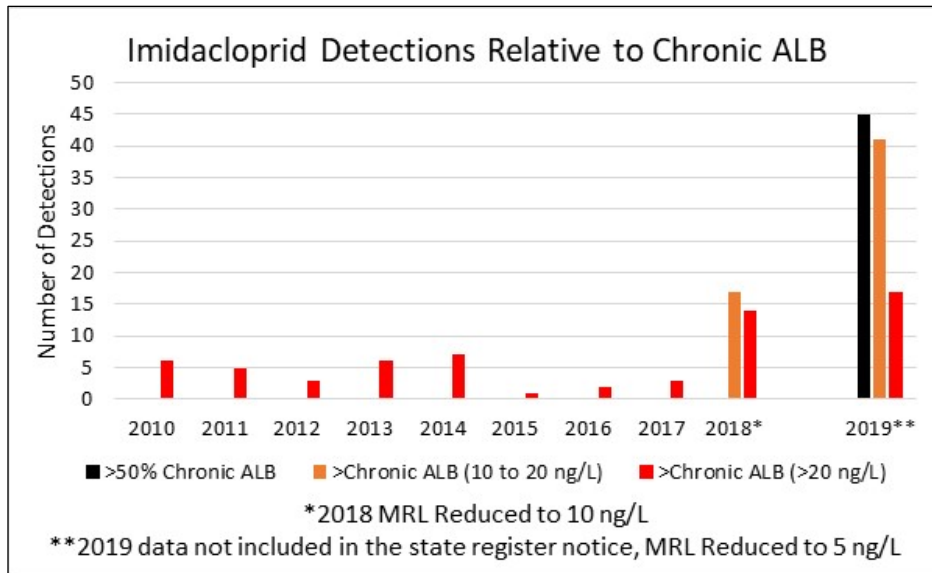
- The MDA has detected imidacloprid above the acute ALB at two different locations in 2012 and 2014.
- The MDA has detected imidacloprid at a concentration greater than 10% (and below 50%) in 14 samples from 2010 through 2018 from 11 different river and stream locations located in urban and agricultural areas.
- The map shows all imidacloprid detections (including those below the acute ALB).



Imidacloprid: Detections Compared to Chronic USEPA ALB

Chronic USEPA ALB = 10 ng/L

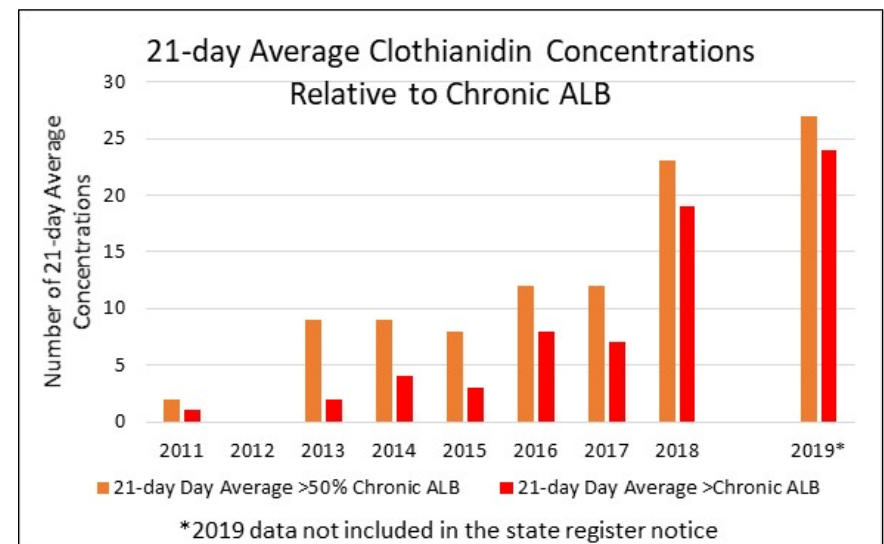
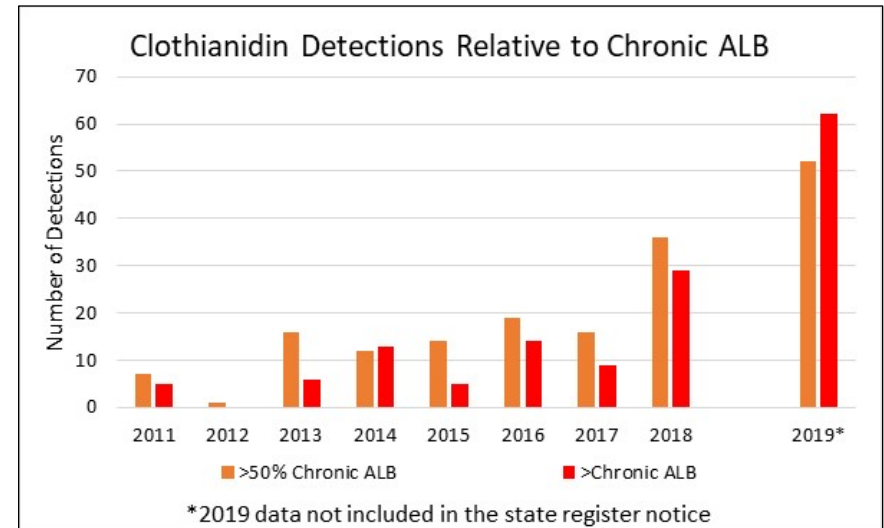
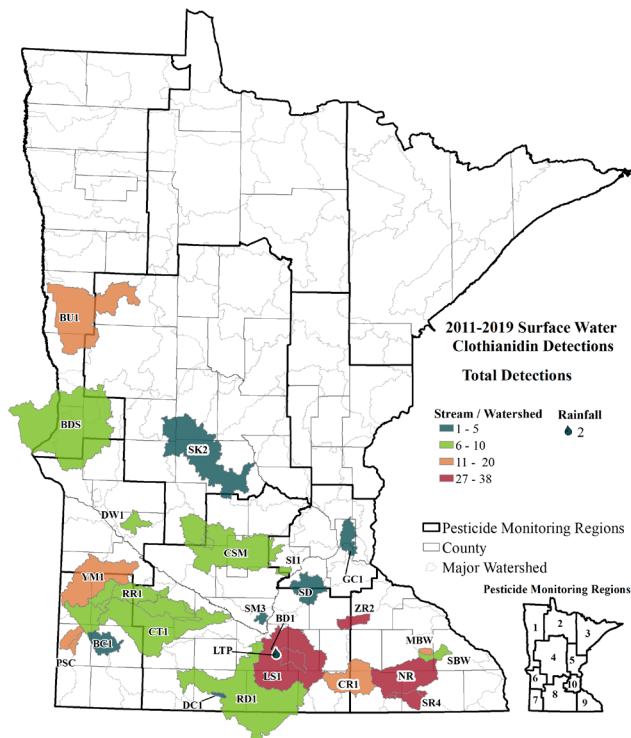
- The MDA detected imidacloprid in 64 samples at a concentration greater 20 ng/L, or twice the chronic ALB (2010-2019).
- The MDA detected imidacloprid in 58 samples at a concentration greater than the chronic ALB (below 20 ng/L; 2018-2019).
- The MDA detected imidacloprid in 45 samples at a concentration greater than 50% (but below) the chronic ALB (2019).
- The MDA estimates that the 21-day average imidacloprid concentration was greater than the chronic ALB 75 times, and greater than 50% (but below) of the chronic ALB 43 times (2010-2019).



Clothianidin: Detections Compared to Chronic USEPA ALB

Chronic USEPA ALB = 50 ng/L

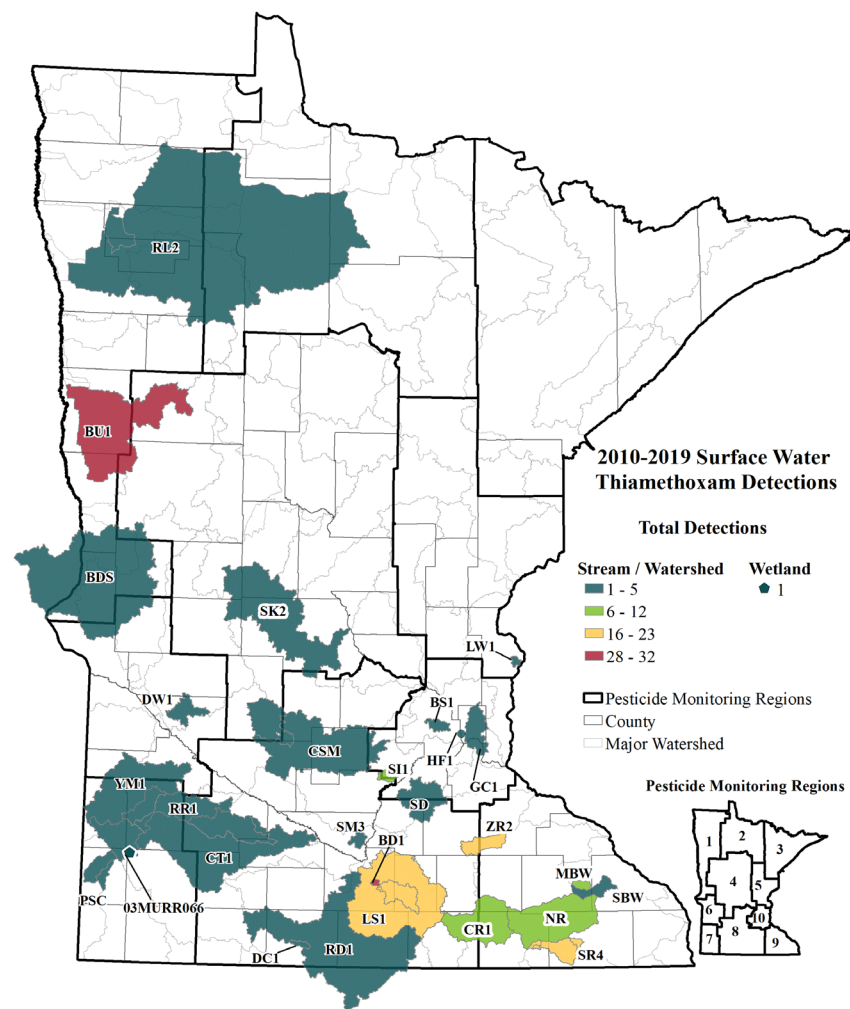
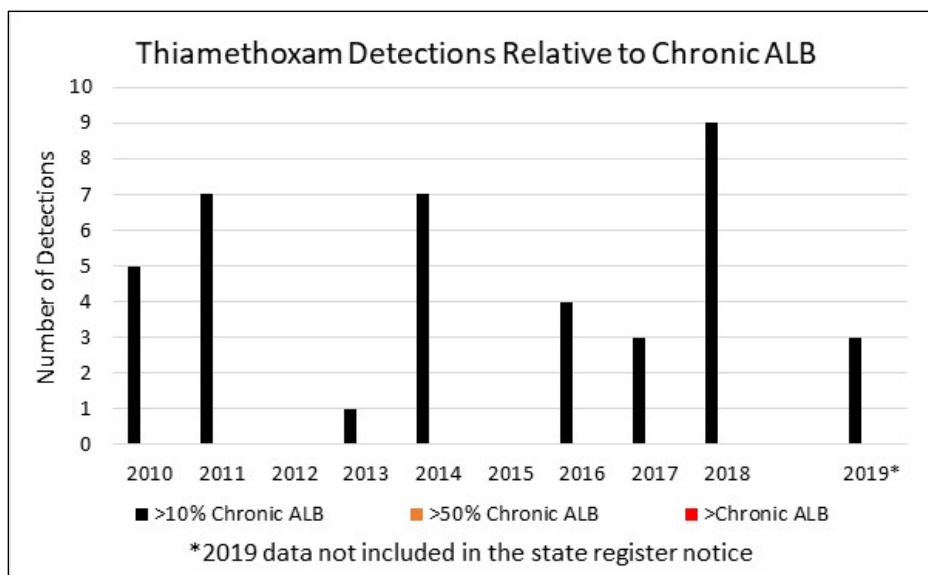
- The MDA has never detected clothianidin above 10% of the 11,000 ng/L acute USEPA ALB.
- The MDA detected clothianidin in 143 samples at a concentration greater than the chronic ALB (2010-2019).
- The MDA detected clothianidin in 173 samples at a concentration greater than 50% (but below) the chronic ALB (2010-2019).
- The MDA estimates that the 21-day average clothianidin concentration was greater than the chronic ALB 68 times, and greater than 50% (but below) of the chronic ALB 102 times (2010-2019).



Thiamethoxam: Detections Compared to Chronic USEPA ALB

Chronic USEPA ALB = 740 ng/L

- The MDA has never detected thiamethoxam above 10% of the 17,500 ng/L acute USEPA ALB.
- The MDA detected thiamethoxam in 39 samples at a concentration greater than 10% (but below 50%) of the chronic ALB (2010-2019).
- The MDA estimates that the maximum 21-day average thiamethoxam concentration was approximately 26% of the chronic ALB (2010-2019).
- A portion of thiamethoxam degrades to clothianidin.



Appendix. Example Annual River Discharge and Imidacloprid, Clothianidin and Thiamethoxam Concentrations and 21 Day Estimates

