

- Dichlorvos
 - One sample from Battle Creek (urban) had a dichlorvos detection greater than the USEPA OPP 5.8 ng/L benchmark.
- Imidacloprid
 - One sample each collected from the Beauford Ditch (PMR 8), Silver Creek (PMR 10), and Basset Creek (urban) had an imidacloprid detection greater than the USEPA OPP 10 ng/L benchmark.
- Metolachlor
 - One sample collected from the Root River-South Fork (PMR 9) had a metolachlor concentration greater than 50%, but below the MPCA 23,000 ng/L chronic standard.

3.1.3 Pesticide water quality impairments

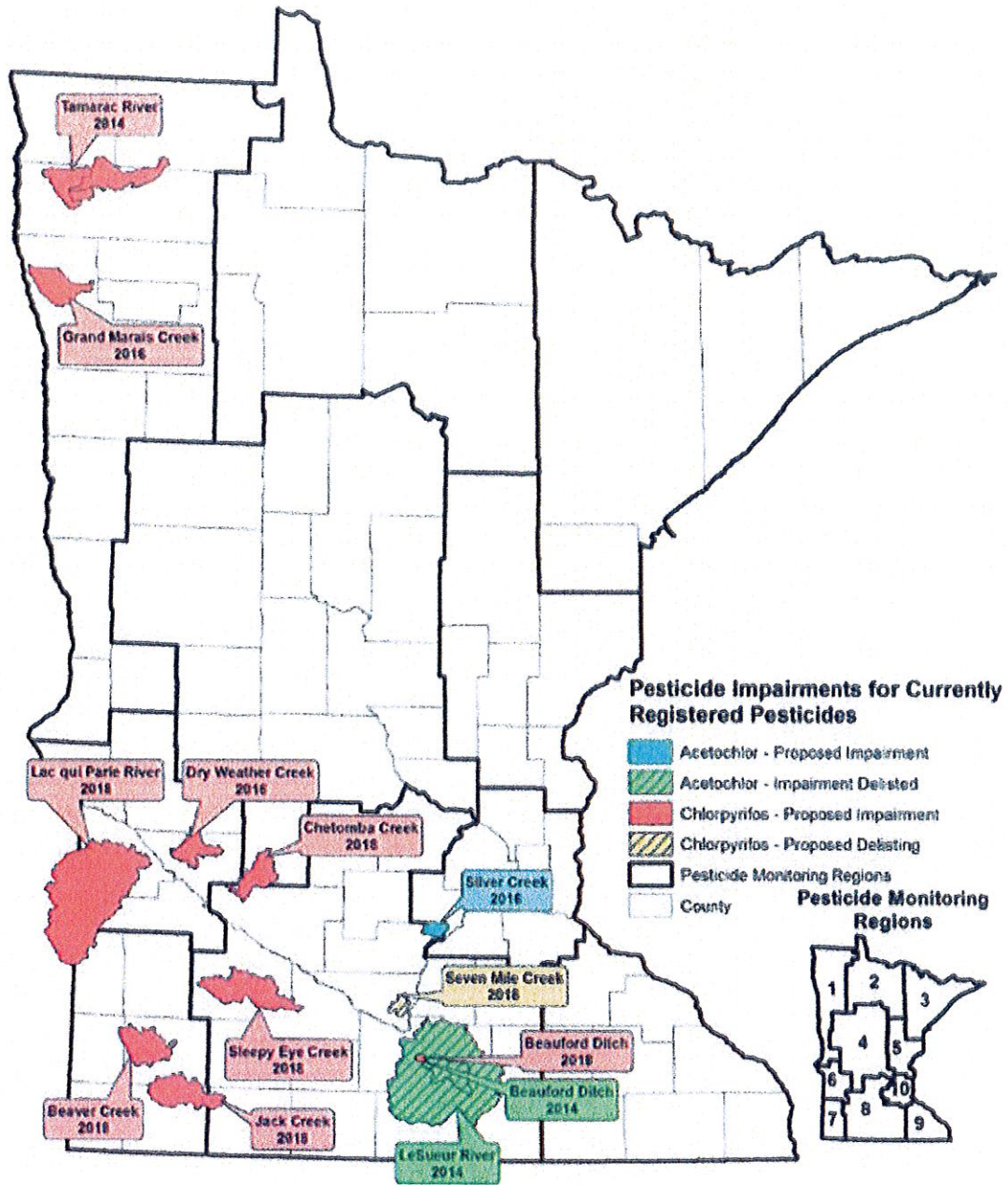
There are ten waterbodies in Minnesota that are either designated, or proposed to be designated, by the MPCA as impaired on the USEPA 303(d) Impaired Waters List for currently registered pesticides. These listings are a result of the MPCA assessment of the MDA collected surface water pesticide data (Table 3-1 and Figure 3-0). The 2017 and 2018 MDA pesticide water quality data will be reviewed by MPCA as part of the 2020 USEPA 303(d) Impaired Waters List assessment process.

Table 3-1. Minnesota pesticide impairments for currently registered pesticides.

| Pesticide | Impaired Waters List Year | Stream | County | Violation that Resulted in Impairment |
|--------------|---------------------------|---------------------|---------------|---|
| Acetochlor | 2016 | Silver Creek | Carver | chronic (3,600 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Beauford Ditch | Blue Earth | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Beaver Creek | Murray | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Chetomba Creek | Renville | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2016 | Dry Weather Creek | Chippewa | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2014/2016 | Grand Marais Creek | Polk | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Jack Creek | Jackson | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Lac qui Parle River | Lac qui Parle | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2018 | Sleepy Eye Creek | Redwood | maximum (83 ng/L) Minnesota water quality standard |
| Chlorpyrifos | 2014 | Tamarac River | Marshall | maximum (83 ng/L) Minnesota water quality standard |

Three waterbodies have been removed from the USEPA 303(d) Impaired Waters List for currently registered pesticides. The Le Sueur River and Beauford Ditch were designated as impaired for acetochlor in 2008 and were removed from the USEPA 303(d) Impaired Waters List in 2014. Seven Mile Creek was designated as impaired on the 2012 Impaired Waters List for chlorpyrifos and has been proposed for removal from the proposed 2018 Impaired Waters List. Removal from the USEPA 303(d) Impaired Waters List followed several years of water quality monitoring without elevated pesticide detections.

Figure 3-0. Minnesota pesticide water quality impairments, and delisted impairments, for currently registered pesticides. Year indicates most recent inclusion on USEPA 303(d) Impaired Waters List.



3.3.4 Long-term MDA chlorpyrifos detections

Chlorpyrifos is an organophosphate insecticide with water quality standards (MPCA (7050) chronic = 41 ng/L; MPCA (7050) maximum = 83 ng/L) near the current MDA Laboratory MRL (40 ng/L). As a result, all chlorpyrifos detections are of concern for Minnesota surface waters. The chlorpyrifos MRL was reduced to 40 ng/L from 100 ng/L in 2008, and the MDA Laboratory stopped reporting detections of all pesticide analytes as “present (P) < MRL” in 2012. The MRL and reporting has been consistent since 2013.

The MDA designated chlorpyrifos as a “surface water pesticide of concern” in 2012, and extended the Tier 2 and Tier 1 seasons into July and August in 2012 and 2013, respectively. The additional monitoring aligns with the typical Minnesota fungicide and insecticide application period. Additionally, each location with a chlorpyrifos detection(s) in the previous five years received an additional monitoring round in August with the Enhanced Tier 2 monitoring level introduced in 2015.

All MDA chlorpyrifos detections in surface water (all monitored rivers, streams, and lakes) are presented in Table 3-6. From 2005 through 2009, chlorpyrifos was detected as “present < MRL” once or twice annually. There was a single chlorpyrifos detection in 2013 and there were eight chlorpyrifos detections annually in 2010, 2011, 2012, 2014, 2015, and 2016. There were 19 chlorpyrifos detections in rivers, streams and lakes in 2017, the largest number of annual detections ever reported by MDA. Figure 3-5 presents the number of chlorpyrifos detections by location from 2005 through 2017.

Key findings for this data analysis include:

- Detections have ranged from “present < 40 ng/L” to 240 ng/L (2010).
- Chlorpyrifos was detected 19 times in 2017 at 12 different locations (PMRs 1, 6, 7 and 8).
 - It was detected for the first time at six of the 12 locations.
- The 2017 chlorpyrifos detections occurred over a 36-day period (July 26 through August 30).
 - Detection periods in 2014, 2015, and 2016 occurred over 15, 11, and 4 days, respectively.
- There were two chlorpyrifos detections in lakes (PMR 6 and 8).
 - There were only two lakes monitored for chlorpyrifos in southwest Minnesota in 2017 and both had detections of chlorpyrifos.
 - This is the first time MDA has reported a chlorpyrifos detection in a lake, including lake monitoring efforts in 2007 through 2010, 2012, and 2017.
- Three samples from PMR 8 had chlorpyrifos concentrations greater than 50%, but below the MPCA 41 ng/L chronic standard in 2017.

- Fourteen samples from PMRs 1, 6, 7, and 8 had chlorpyrifos concentrations greater than the MPCA 41 ng/L chronic standard but below the MPCA 83 ng/L maximum standard in 2017.
- One sample each from PMRs 6 and 7 had chlorpyrifos concentrations greater than the MPCA 83 ng/L maximum standard in 2017.
- Chlorpyrifos was detected 68 times from 2010 through 2017. In contrast, chlorpyrifos was detected only eight times from 2005 through 2009.
- Chlorpyrifos detections from 2005 through 2011 occurred most frequently at locations in northwest Minnesota. Since 2012, detections have occurred most frequently at locations in southwest and south central Minnesota.
- Chlorpyrifos has not been detected by the MDA with routine monitoring in PMRs 2, 3, 5, 9, and 10, including urban locations.

Table 3-6. MDA detections of chlorpyrifos in Minnesota surface waters since 2005.

| Location Name | Site Code | PMR | Date | Chlorpyrifos (ng/L) | MRL (ng/L) |
|---|-----------|-----|-----------|---------------------|------------|
| Beauford Ditch | BD1 | 8 | 5/13/2005 | P <100 | 100 |
| Snake River | SNA | 1 | 7/5/2005 | P <100 | 100 |
| Buffalo River | BU1 | 1 | 7/17/2006 | P <100 | 100 |
| Snake River | SNA | 1 | 7/18/2006 | P <100 | 100 |
| Buffalo River | BU1 | 1 | 5/23/2007 | P <100 | 100 |
| Le Sueur River | LS1 | 8 | 8/2/2007 | P <100 | 100 |
| Buffalo River | BU1 | 1 | 6/9/2008 | P <40 | 40 |
| Buffalo River | BU1 | 1 | 9/3/2009 | P <40 | 40 |
| Grand Marais Creek | GM1 | 1 | 5/25/2010 | 50 | 40 |
| Tamarac River | TM1 | 1 | 6/23/2010 | 60 | 40 |
| Snake River | SNA | 1 | 6/28/2010 | 40 | 40 |
| Black River (EMAP) | 10EM176 | 1 | 6/30/2010 | 110 | 40 |
| Snake River | SNA | 1 | 6/30/2010 | P <40 | 40 |
| Unnamed Ditch; Tamarac River (EMAP)* | 10EM128 | 1 | 6/30/2010 | P <40 | 40 |
| Unnamed Ditch; South Fork Crow River (EMAP) | 10EM147 | 4 | 8/5/2010 | 50 | 40 |
| Seven Mile Creek | SM3 | 8 | 9/2/2010 | 240 | 40 |
| Tamarac River | TM1 | 1 | 6/23/2011 | 100 | 40 |
| Tamarac River | TM1 | 1 | 7/12/2011 | 110 | 40 |
| Buffalo River | BU1 | 1 | 7/21/2011 | P <40 | 40 |
| Grand Marais Creek | GM1 | 1 | 7/25/2011 | 80 | 40 |
| Grand Marais Creek | GM1 | 1 | 7/27/2011 | 80 | 40 |
| Grand Marais Creek | GM1 | 1 | 8/11/2011 | 160 | 40 |
| Snake River | SNA | 1 | 8/11/2011 | 50 | 40 |
| Jack Creek | JC1 | 8 | 8/15/2011 | 50 | 40 |

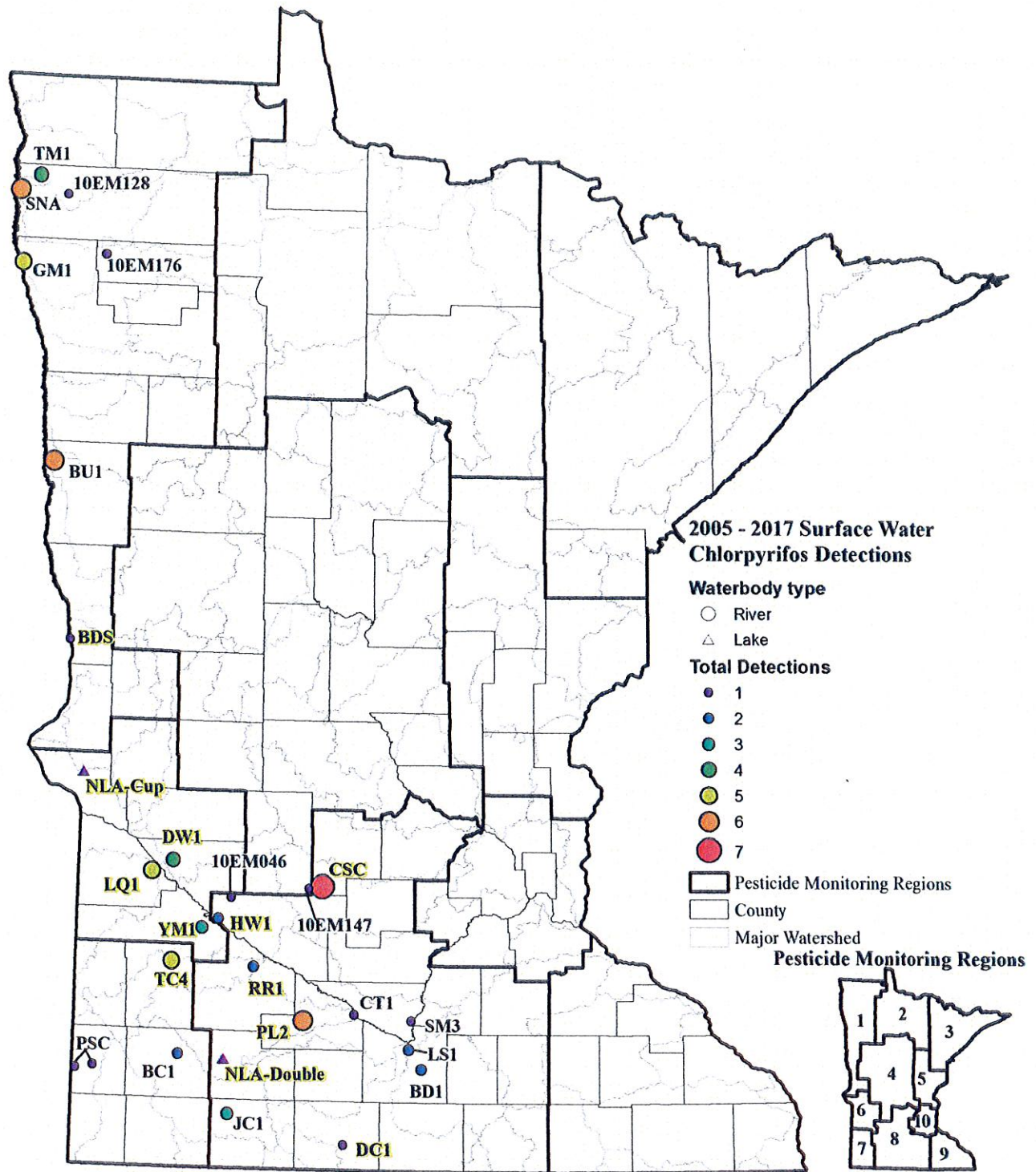
| Location Name | Site Code | PMR | Date | Chlorpyrifos (ng/L) | MRL (ng/L) |
|------------------------|-----------|-----|-----------|---------------------|------------|
| Buffalo River | BU1 | 1 | 8/3/2012 | P <40 | 40 |
| Le Sueur River | LS1 | 8 | 8/3/2012 | P <40 | 40 |
| Crow River, South Fork | CSC | 8 | 8/13/2012 | 50 | 40 |
| Tamarac River | TM1 | 1 | 8/14/2012 | 110 | 40 |
| Crow River, South Fork | CSC | 8 | 8/15/2012 | 50 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/21/2012 | 80 | 40 |
| Pipestone Creek | PSC | 7 | 8/28/2012 | P <40 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/29/2012 | P <40 | 40 |
| Three Mile Creek | TM4 | 7 | 8/15/2013 | 53.4 | 40 |
| Lac qui Parle River | LQ1 | 6 | 8/11/2014 | 42.6 | 40 |
| Three Mile Creek | TM4 | 7 | 8/13/2014 | 68 | 40 |
| Beaver Creek | BC1 | 7 | 8/15/2014 | 49 | 40 |
| Crow River, South Fork | CSC | 8 | 8/19/2014 | 46.9 | 40 |
| Dry Weather Creek | DW1 | 6 | 8/19/2014 | 88.9 | 40 |
| Dry Weather Creek | DW1 | 6 | 8/21/2014 | 65.6 | 40 |
| Jack Creek | JC1 | 8 | 8/22/2014 | 74.2 | 40 |
| Grand Marais Creek | GM1 | 1 | 8/26/2014 | 68.6 | 40 |
| Chetomba Creek (EMAP) | 10EM046 | 8 | 8/3/2015 | 94.5 | 40 |
| Lac qui Parle River | LQ1 | 6 | 8/5/2015 | 196 | 40 |
| Pipestone Creek | PSC | 7 | 8/5/2015 | 40.8 | 40 |
| Dry Weather Creek | DW1 | 6 | 8/7/2015 | 77.5 | 40 |
| Beaver Creek | BC1 | 7 | 8/10/2015 | 184 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/10/2015 | 99 | 40 |
| Three Mile Creek | TC4 | 7 | 8/10/2015 | 70.4 | 40 |
| Beauford Ditch | BD1 | 8 | 8/14/2015 | 117 | 40 |
| Lac qui Parle River | LQ1 | 6 | 8/11/2016 | 52.2 | 40 |
| Redwood River | RR1 | 8 | 8/11/2016 | 63.3 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/12/2016 | 121 | 40 |
| Lac qui Parle River | LQ1 | 6 | 8/13/2016 | 97.8 | 40 |
| Cottonwood River | CT1 | 8 | 8/15/2016 | 48.1 | 40 |
| Crow River, South Fork | CSC | 8 | 8/15/2016 | 40.4 | 40 |
| Jack Creek | JC1 | 8 | 8/15/2016 | 137 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/15/2016 | 42.4 | 40 |
| Snake River | SNA | 1 | 7/26/2017 | 61.8 | 40 |
| Hawk Creek | HW1 | 8 | 8/9/2017 | 49.6 | 40 |
| Yellow Medicine River | YM1 | 6 | 8/9/2017 | 83.3 | 40 |
| Crow River, South Fork | CSC | 8 | 8/14/2017 | 74.9 | 40 |
| Lac qui Parle River | LQ1 | 6 | 8/14/2017 | 45.6 | 40 |
| Bois de Sioux River | BDS | 1 | 8/15/2017 | 66.8 | 40 |

| Location Name | Site Code | PMR | Date | Chlorpyrifos (ng/L) | MRL (ng/L) |
|------------------------|-----------|-----|-----------|---------------------|------------|
| Dutch Creek | DC1 | 8 | 8/15/2017 | 60 | 40 |
| Crow River, South Fork | CSC | 8 | 8/16/2017 | 40 | 40 |
| Dry Weather Creek | DW1 | 6 | 8/17/2017 | 53.2 | 40 |
| Sleepy Eye Creek | PL2 | 8 | 8/17/2017 | 53.9 | 40 |
| Three Mile Creek | TC4 | 7 | 8/17/2017 | 65.5 | 40 |
| Yellow Medicine River | YM1 | 6 | 8/17/2017 | 67.3 | 40 |
| Redwood River | RR1 | 8 | 8/18/2017 | 40.2 | 40 |
| Three Mile Creek | TC4 | 7 | 8/18/2017 | 135 | 40 |
| Hawk Creek | HW1 | 8 | 8/20/2017 | 47 | 40 |
| Yellow Medicine River | YM1 | 6 | 8/20/2017 | 52.3 | 40 |
| Crow River, South Fork | CSC | 8 | 8/21/2017 | 40.9 | 40 |
| Cup Lake | NLA | 6 | 8/21/2017 | 44.6 | 40 |
| Double Lake | NLA | 7 | 8/30/2017 | 68.8 | 40 |

"P < MRL" indicates a detection below the applicable MRL, and was used through 2012.

*Environmental Monitoring and Assessment Program (EMAP) is part of the USEPA National Aquatic Resource Survey program. EMAP locations were randomly selected from all streams in Minnesota, and included two or fewer sample collection events.

Figure 3-5. Number of chlorpyrifos detections by location, 2005 through 2017.



Note: Highlighted labels indicate a 2017 detection

The MDA operates a rainfall pesticide monitoring network (See [Section 3.5](#) for more details). Chlorpyrifos was detected in rainfall in six of 176 rainfall samples collected since 2008. Detections have occurred at the Little Cobb River and Buffalo River monitoring locations (Table 3-7). All of these detections have occurred in a sample with a collection end date in July or August. The Minnesota surface water chronic and maximum standards do directly apply to rainfall; however, five of the six detections have been above the Minnesota maximum standard of 83 ng/L since 2005. While detections are infrequent, detection in rainfall indicates a potential transport pathway into surface waters.

Table 3-7. MDA detections of chlorpyrifos in Minnesota rainfall 1998 through 2005 and 2008 through 2017.

| Location Name | Site Code | PMR | Sample End Date | Chlorpyrifos (ng/L) | MRL (ng/L) |
|-------------------|-----------|-----|-----------------|---------------------|------------|
| Little Cobb River | LTP | 8 | 8/1/2008 | 100 | 40 |
| Little Cobb River | LTP | 8 | 8/24/2009 | 260 | 40 |
| Little Cobb River | LTP | 8 | 8/23/2011 | 90 | 40 |
| Little Cobb River | LTP | 8 | 8/10/2012 | P <40 | 40 |
| Buffalo River | BRP | 1 | 8/19/2014 | 83.4 | 40 |
| Buffalo River | BRP | 1 | 8/15/2017 | 612 | 40 |

3.4 Review of pesticide detections in Minnesota surface water greater than 10% of an applicable reference value, 2013 through 2017.

This section provides an overview on all pesticide compounds that were detected, at least once, greater than 10% of their lowest applicable reference value in the last five years. This section is generated to assist the members of the Pesticide Management Plan Committee (PMPC) when the preparing written recommendations to the MDA Commissioner, as defined in the PMP.

The PMP was developed by the MDA following the passage of the Minnesota Pesticide Control Law that charged the MDA Commissioner to ensure pesticides are used “in a manner that will not cause unreasonable adverse effects on the environment.” The PMP states the PMPC should meet to review water quality monitoring data and to provide comments related the designation of “surface water pesticides of concern.” Designation as a “surface water pesticides of concern” initiates the development of pesticide specific best management practices (BMPs) and increased water quality data collection and analysis by the MDA. The PMP recommends the use of three thresholds, relative to the lowest applicable reference value, to evaluate possible designation as a “surface water pesticides of concern:” concentration greater than 10%, concentration greater than 50% and concentration greater than the lowest applicable water quality reference value. This evaluation *does not* include a duration assessment that is required for assessing chronic standards in the determination of impaired waters.

Using the thresholds defined in the PMP, all water quality data collected by the MDA from 2013 through 2017 from Tier 1 through Tier 3 locations (rivers and streams), including urban locations, were evaluated for all detections greater than 10% of the lowest applicable aquatic life or human health