



# E-Cycle Wisconsin 2019 report

*Wisconsin DNR annual report to the Legislature and governor under s. 287.17(10), Wis. Stats.*

November 2019

## Executive summary

Wisconsin's electronics recycling law has produced many successes since it took effect in 2010, recycling more than 300 million pounds of electronics and expanding electronics recycling access for state residents. Most electronics collected under the manufacturer-funded E-Cycle Wisconsin program are processed in the state, contributing to capital investments and job growth at high-tech recycling facilities. Wisconsin has been a leader among state electronics recycling programs for the number of collection sites and weight collected per person, and stakeholders have praised the law's structure and its administration by the Department of Natural Resources (DNR).

Since 2010, however, both the nature of electronics being sold and the markets for materials electronics contain have changed dramatically. Due to the popularity of smaller and lighter devices and manufacturers' design improvements, the weight-based manufacturer recycling targets, set by a statutory formula, have declined by more than 10.1 million pounds (32%) since 2013. While some manufacturers have continued to voluntarily exceed their recycling targets, overall there were nearly 1.4 million pounds recycled during the 2018-19 program year for which manufacturers did not pay. Dwindling markets for leaded glass in cathode ray tubes (CRTs) and plastics used in electronics, along with lower commodity values in newer devices, have increased recyclers' per-pound costs, but manufacturer payments have not always risen to match.

As a result, unless manufacturer recycling obligations are increased or restructured, the manufacturer-funded recycling system will continue to fall short of the electronics recycling demand of Wisconsin households and schools. Since 2013, the number of registered electronics collection sites has dropped by 25%, and consumers are paying more to recycle TVs and other devices. Several large cases of irresponsible recycling threaten the environment and human health and are driven in part by higher costs for responsible recycling. These trends are increasing taxpayer costs to either collect electronics or clean up dumped devices.

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## More program results

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In conversations with the DNR, E-Cycle Wisconsin participants have been positive about many aspects of the law, but noted several areas of concern, including the lack of affordable, convenient recycling for some state residents; a lack of consumer awareness about the need to responsibly recycle electronics; a need for more actions to deter bad actors; and economic and safety issues the changing material stream has brought to collectors and recyclers. This report provides more detail on these topics and includes suggestions stakeholders made for possible actions to address the challenges.

### Successes for program year 10 (July 2018 to June 2019)

- Registered collectors took in 23.6 million pounds of electronics, or 4 pounds per Wisconsin resident. While the weight collected in urban counties declined from program year 9 to 10, the weight collected in rural areas increased.
- In total, between January 2010 and June 2019, Wisconsin households and schools recycled nearly 304 million pounds of electronics through E-Cycle Wisconsin.
- Nearly all electronics collected under E-Cycle Wisconsin were processed initially in Wisconsin or other Midwest states, contributing to continued growth in the region's electronics recycling industry. Wisconsin recyclers accounted for 79% of the weight processed.
- While the number of registered collection sites has declined overall, the number of counties with at least one registered collection site or event rose to 69 (compared with 65 in program year 9), representing 99.1% of the state's population.
- Most manufacturers met or exceeded their recycling targets.
- Nearly all manufacturers, recyclers and collectors are complying with the law, and the DNR continues to work to ensure a level playing field for program participants.

### Recommendations per s. 287.17(10), Wis. Stats.

The electronics recycling law directs the DNR to examine several aspects of the law within the annual report and make suggestions for possible changes. The following is a list for the Legislature's consideration, based on both formal and informal stakeholder input, of changes that could be made to improve administration of the electronics recycling law and ensure its continued effectiveness.

- To better meet the electronics recycling needs of Wisconsin households and schools, consider changing or replacing the manufacturer target formula and method of encouraging collection in rural areas. The Legislature could also request a study of alternative approaches to setting manufacturer obligations.
- Consider updating and clarifying device definitions to better fit the changing nature of electronics.
- To improve access to electronics collection in rural areas, consider authorizing the DNR to award small grants, using existing funds, to improve electronics recycling infrastructure in those areas.
- To better match the budget cycles of many manufacturers, recyclers and collectors, consider changing the E-Cycle Wisconsin program year to the calendar year (Jan. 1 to Dec. 31), rather than the state fiscal year, and adjusting reporting dates accordingly.
- Consider assisting small businesses by reducing or eliminating registration fees very small electronics manufacturers pay to the state under s. 287.17(4)(b).
- Consider modifying the definition of "school" under s. 287.17(1)(np) to allow all K-12 schools in Wisconsin to recycle electronics through E-Cycle Wisconsin.

In addition to these potential legislative changes, this report includes suggestions for collaborative efforts among stakeholders to improve consumers' awareness of and access to electronics recycling options, give consumers more value when they pay electronics recycling fees, and encourage development of new and expanded recycling markets for materials like plastics and CRT glass.

## Introduction

Wisconsin's electronics recycling law establishes a statewide program to collect and recycle certain electronics. Under this product stewardship-based law, manufacturers of TVs, computers, monitors and desktop printers must register with the Department of Natural Resources (DNR) the brands they sell to Wisconsin households and schools. Those manufacturers also must recycle a target weight of electronics each year based on their sales. Manufacturers contract with state-registered recyclers and collectors to meet their targets. This manufacturer-funded recycling program is called E-Cycle Wisconsin. The law also banned landfill and incinerator disposal of many electronics.

This report fulfills the annual reporting obligation in s. 287.17(10), Wis. Stats., which specifies several metrics on which the DNR must report to the Legislature and governor. These include the weight of electronics collected and other information provided by program participants, an outline of electronics recycling outside of E-Cycle Wisconsin, a summary of compliance and enforcement actions related to the electronics disposal ban, and suggestions for changes needed.

To help evaluate the law and the DNR's administration of it, the DNR also examines whether the law is meeting these six general criteria:

- Keeping electronics out of landfills and the environment.
- Using a market-based approach to manage e-waste in the most efficient and cost-effective manner possible, with minimal government intervention.
- Reducing electronics recycling costs and improving recycling convenience for consumers.
- Reducing the financial and administrative burden on local and state governments of managing e-waste.
- Ensuring a level playing field for all participants in the electronics recycling program, including accountability for environmental and worker safety, along with other standards.
- Encouraging and supporting a strong electronics recycling industry in Wisconsin and the Midwest.

Wisconsin's electronics recycling law has produced many successes. Over the last several program years, however, changing market conditions and other challenges have made it more challenging for E-Cycle Wisconsin and the disposal ban to fulfill the first four of the above criteria. The biggest obstacles to meeting these goals have been the changing economics of electronics recycling and changing nature of electronics being sold, which have combined to push more electronics recycling costs onto collectors and consumers, reduce electronics recycling options (particularly for large TVs), and increase the potential for e-waste mismanagement.

The DNR has continued to engage with program stakeholders and the

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## E-Cycle Wisconsin program years

Program years run from July 1 to June 30. The first program "year" lasted just six months, to get the program on this calendar. Here are the dates for program years referenced in this report.

### Program year 1

January 1 to June 30, 2010

### Program year 2

July 1, 2010, to June 30, 2011

### Program year 3

July 1, 2011, to June 30, 2012

### Program year 4

July 1, 2012, to June 30, 2013

### Program year 5

July 1, 2013, to June 30, 2014

### Program year 6

July 1, 2014, to June 30, 2015

### Program year 7

July 1, 2015, to June 30, 2016

### Program year 8

July 1, 2016, to June 30, 2017

### Program year 9

July 1, 2017, to June 30, 2018

### Program year 10

July 1, 2018, to June 30, 2019

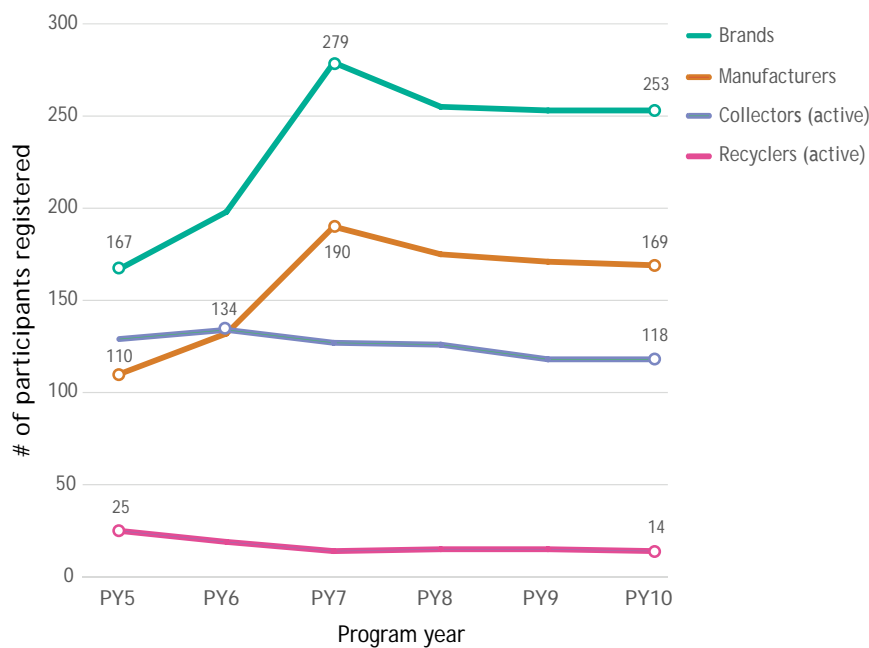
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**Table 1: Program year 10 registration and participation**

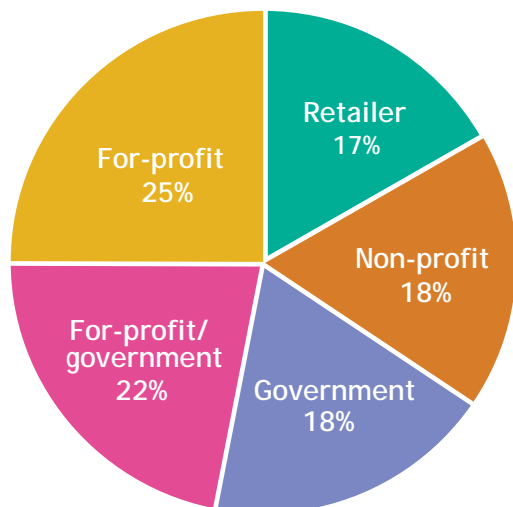
Category	Registered	Active
Collectors	128	118 (92%)
Recyclers	16	14 (88%)
Manufacturers	169	n/a
Brands	253	n/a

*“Active” means a collector that sent electronics to a registered recycler or a recycler that received electronics from registered collectors.*

**Figure 1: Summary of E-Cycle Wisconsin registrations**



**Figure 2: Program year 10 collection sites, by type**



public to get feedback on challenges facing E-Cycle Wisconsin and potential solutions. Input from stakeholders contributed to the sections of this report concerning current challenges, opportunities for addressing the challenges through the DNR’s administration of the program, voluntary stakeholder actions and potential legislative changes.

## Program participation

Table 1 shows program year 10 registrations, and Figure 1 illustrates registration trends over the seven most recent program years.

In program year 10, the number of registered collectors fell slightly, continuing a downward trend for the last few years, perhaps reflecting the challenging economics for electronics recycling. Registered collectors include local governments, electronics retailers, other for-profit businesses and non-profits.

The number of registered collection sites decreased slightly in program year 10, with 509 total permanent sites and one-day events. After an approximately 25% decline in the number of registered sites between program years 4 and 7, the number has remained relatively steady for the last few years. For-profit collectors registered the highest number of sites (239, or just under half), though many of these (particularly one-day events) were at government-owned locations, as shown in Figure 2.

Program year 10 recycler registrations were also down slightly, to 16 (with 14 active). The number of registered recyclers has dropped 50% from the high of 32 in program year 3, due to several companies going out of business or discontinuing their recycler registrations because of economic challenges. Seven of the 16 recyclers (44%) were in Wisconsin, representing Wisconsin’s highest share of the total since program year 2.

The number of registered manufacturers dropped slightly in program year 10, but the number of registered brands remained steady at 253.

## Collection and recycling totals and analysis

Wisconsin households and schools have recycled nearly 304 million pounds of electronics through E-Cycle Wisconsin since 2010. From July 2018 through June 2019 (program year 10), registered collectors took in 23.6 million pounds of electronics from Wisconsin households and schools (see Table 2). This was equivalent to 4 pounds per capita.

As shown in Figure 3, the weight of eligible electronics collected during program year 10 dropped by about 2 million pounds, or 8%, from program year 9, though the weight collected in rural counties increased slightly (see Appendix A for a map of urban and rural counties). This followed a steep drop between program years 8 and 9. The weight collected in program year 10 was down about 40% from the peak collection total of 39.1 million pounds in program year 3.

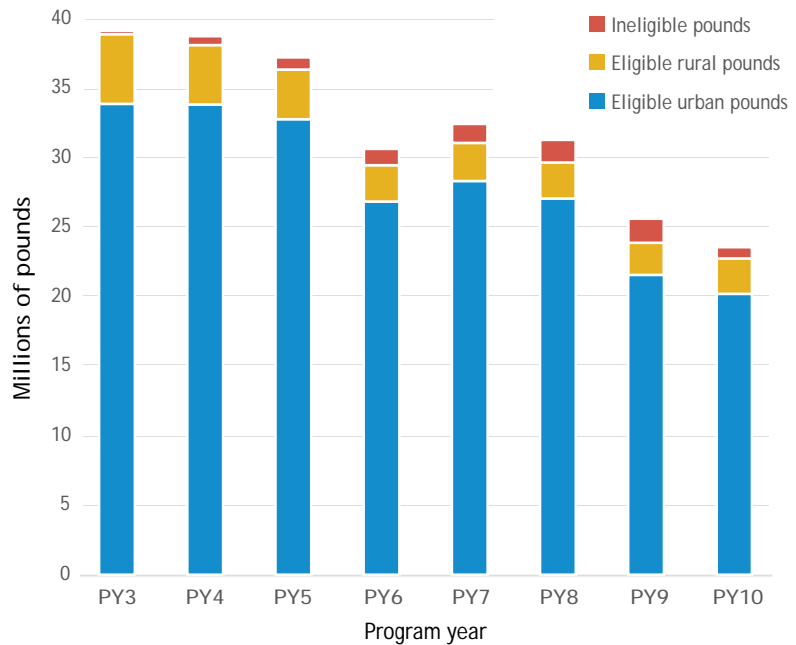
A significant part of the decline in weight collected between program years 9 and 10 was a drop in the weight collected by registered collectors but going to non-registered recyclers, from 1.7 million pounds in program year 9 to just over 810,000 pounds in program year 10. This was the lowest weight diverted from registered recyclers since program year 4, and nearly all (87%) was dismantled by registered collectors that divert a portion of what they collect—usually the more valuable IT equipment—to their own dismantling and recycling operations (see Table 2).

The decline in collected weight does not appear to be due to a major change in the mix of devices collected under E-Cycle Wisconsin. TVs continue to dominate the weight collected, accounting for 65% of the total in program year 10, up slightly from the previous few program years (see Figure 4).

The downward trend in weight collected mirrors many other states' electronics recycling programs. This may indicate that, under many mature state recycling programs, some of the backlog of electronics stored in homes has been cleaned out.

With the rural credit (1.25 pounds counted for each pound collected in a rural county) included and non-recycled

Figure 3: Pounds collected by registered collectors



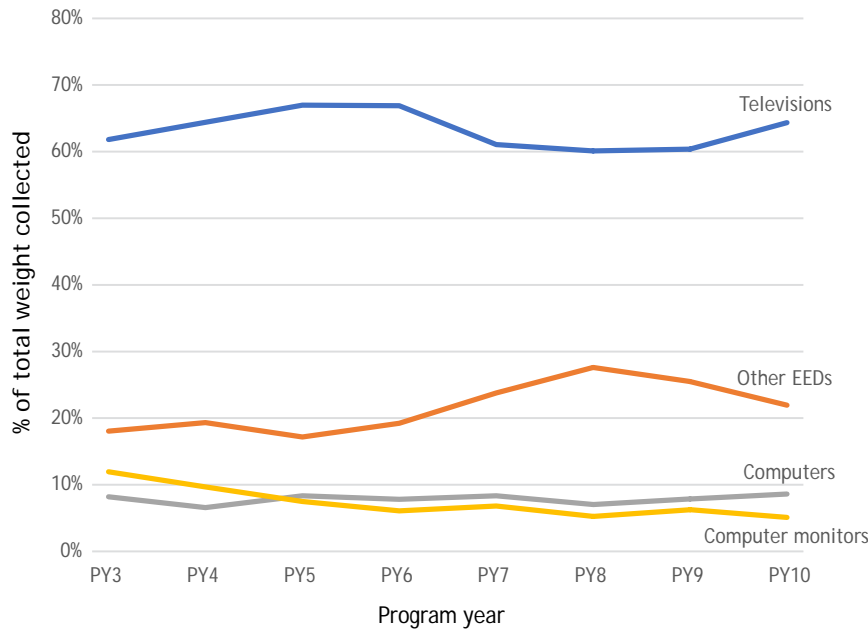
*"Ineligible pounds" means pounds that would have been eligible for manufacturer credit if sent to a registered recycler, but that collectors dismantled themselves or sent to a non-registered recycler.*

Table 2: Pounds collected by registered collectors, program year 10

Type	Pounds
Eligible urban	20,193,562
Eligible rural	2,547,765
Dismantled by collector	707,038
Sent to non-registered recycler	105,625
<b>Total collected</b>	<b>23,554,009</b>



**Figure 4: E-Cycle Wisconsin collection, by product type**



EEDs are eligible electronic devices. Other EEDs include printers, computer accessories, DVD players, VCRs and fax machines.

**Table 3: Pounds of electronics reported by registered recyclers, program year 10**

Type	Pounds
Urban received	20,556,037
Rural received	2,185,310
Rural credit	546,327
Non-eligible glass	(4,382)
Diverted for reuse	(15,509)
Available for manufacturers	<b>23,267,783</b>
Sold to manufacturers	(21,912,012)
Not sold to manufacturers	<b>1,355,771</b>

Rural credit is 1.25 pounds per pound collected. Urban and rural pounds differ slightly from Table 2 because some recyclers count all pounds as urban.

Non-eligible glass is CRT glass the recycler received but that was not recycled, under the definitions in s. 287.17, Wis. Stats.

Electronics diverted for reuse are not eligible for manufacturer recycling credit.

pounds subtracted, Table 3 shows 23.3 million eligible pounds were available for purchase by manufacturers—to fund the recycling of the electronics—in program year 10. This was down about 4% from the weight available in program year 9. However, registered recyclers sold only 21.9 million pounds to manufacturers. There was a significant gap—1.4 million pounds—between what recyclers processed and what manufacturers purchased. Even though the weight recycled in program year 10 dropped by more than a million pounds, this gap was larger than in program year 9 (though still much smaller than the 7 million pounds in program year 8).

During program year 10, Wisconsin recyclers accounted for 79% of the total weight recycled, up from 62% in program year 7. Essentially all electronics collected under E-Cycle Wisconsin continue to be processed in the Midwest, as shown in Figure 5 (nearly all in the “Other” category were processed in Ohio).

The overall manufacturer target, set by a statutory formula, for program year 10 was 21.8 million pounds, down slightly from 22 million pounds in program year 9. The manufacturer targets in recent years have been significantly lower than in the first few years of E-Cycle Wisconsin, due primarily to consumers buying lighter products, and manufacturers finding ways to reduce the weight of larger devices, such as TVs. The estimated manufacturer target for program year 11 is 21.8 million pounds, nearly the same as program year 10 but down about 32% from the peak target of 32 million pounds in program year 4.

Figure 6 shows manufacturer recycling targets and weight purchased by program year. It also illustrates the gap between pounds recycled and pounds paid for by manufacturers.

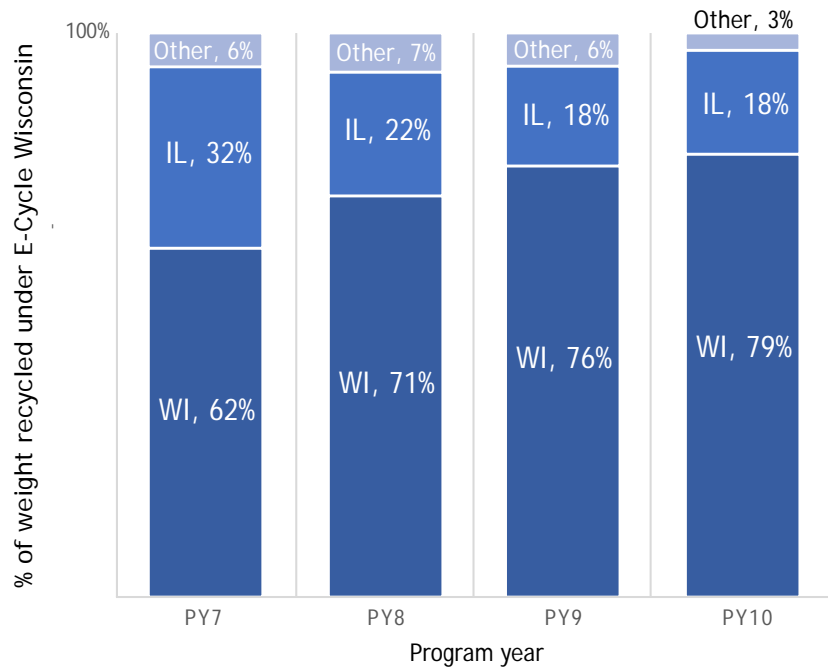
Based on DNR surveys of registered manufacturers and discussions with stakeholders, most manufacturers rely on recyclers to find and/or set up collection networks. Prominent exceptions include the Dell Reconnect program, in which Dell works with several networks of Goodwill stores; Best Buy’s in-store collection program; a partnership between Hewlett Packard and Staples; and Apple’s recycling program for schools.

During program year 10, 40 registered manufacturers participated in a collective that contracted with recyclers for a large total sum of pounds and distributed the pounds among its members. The two collectives during program year 10 were MRM (24 manufacturers) and Reverse Logistics Group America (16). These collectives were responsible for about 35% of pounds purchased by manufacturers during program year 10, slightly higher than program year 9. A dozen other manufacturers worked through brokers to purchase weight from a recycler.

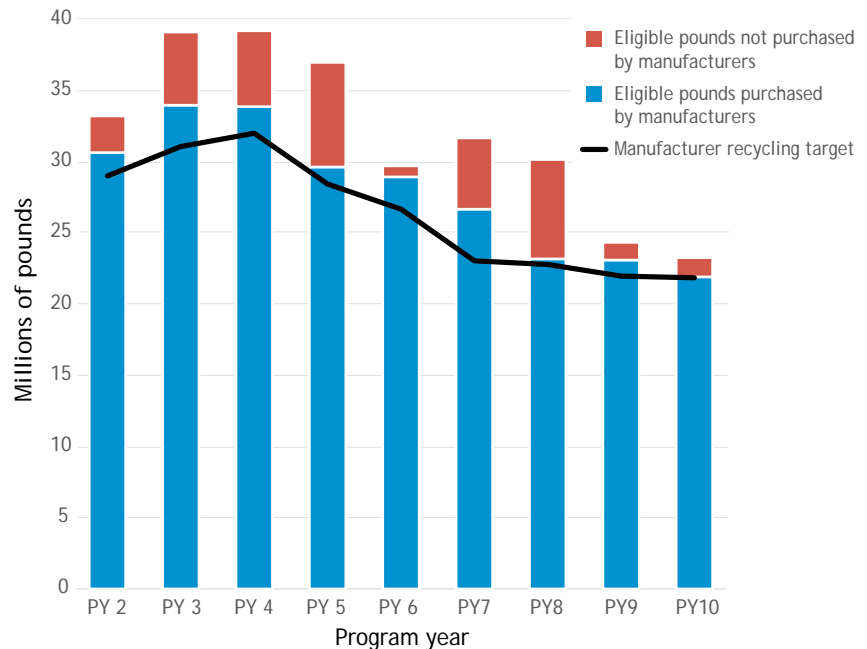
Most manufacturers continued to meet or exceed their sales weight-based recycling targets in program year 10. Seven manufacturers recycled more than their targets and therefore earned a total of just under 450,000 credits that can be used during the next three program years (see Table 4). Eighteen manufacturers used just under 1.1 million credits from previous years to meet their targets. At the end of program year 10, just over 1.3 million credits were available to manufacturers for future use. This was the lowest balance since program year 1. Figure 7 summarizes credits applied or expired, credits earned, and total credits available from program years 3 to 10.

During program year 10, fewer manufacturers went significantly above and beyond their recycling targets than in previous years. The most notable exceptions were Best Buy, which recycled nearly 1 million extra pounds (77% more than its recycling target) through its collection program, and TTE Technology, which recycled just under 140,000 extra pounds (20% more than its recycling target).

**Figure 5: Percent of pounds received by registered recyclers, by state**



**Figure 6: Comparison of weight recycled and manufacturer targets, by program year**



**Table 4: Program year 10 manufacturer credit transactions**

	Credits
Beginning balance	2,091,189
Credits applied	(1,087,566)
Credits expired	(124,229)
New credits earned	445,207
<b>Total available for future use</b>	<b>1,324,602</b>

**Table 5: Manufacturer registration and shortfall fees**

Program year	Registration fees	Shortfall fees
1	\$261,250	n/a
2	\$270,000	\$8,453
3	\$275,000	\$19,210
4	\$310,000	\$10,105
5	\$310,000	\$9,467
6	\$328,750	\$12,379
7	\$408,750	\$8,812
8	\$375,000	\$8,124
9	\$370,000	\$13,389
10	\$338,750	\$6,553

*Shortfall fees for program year 10 as of November 2019. The law did not assess shortfall fees for program year 1.*

Each year, the DNR encourages manufacturers to purchase eligible recycled pounds rather than pay a shortfall fee, but several with very small targets have said it is more convenient to pay the fee than to go through the process of contracting with a recycler. For program year 10, 47 manufacturers paid or owed a shortfall fee as of November 2019. The amounts ranged from \$3 to \$1,544.

Table 5 summarizes registration and shortfall fees paid under E-Cycle Wisconsin.

## Ensuring a level playing field within E-Cycle Wisconsin

Much of the DNR’s administration of the electronics recycling law focuses on maintaining a level playing field for E-Cycle Wisconsin participants and identifying problems at collectors or recyclers that might endanger human health or environmental quality. Many stakeholders have cited Wisconsin as a national leader in these efforts, particularly in online registration and reporting and careful accounting of collection and recycling transactions among program participants.

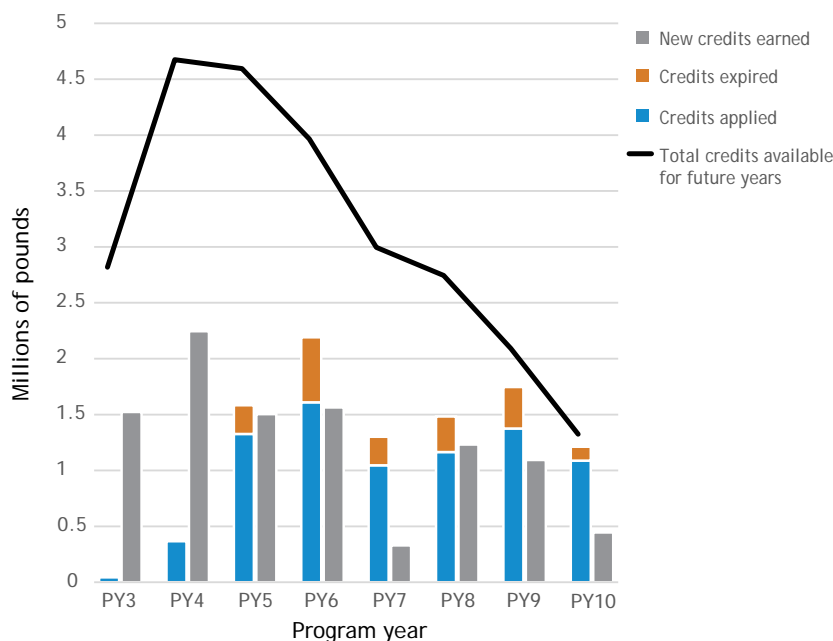
### Manufacturer registration compliance

Manufacturers must comply with Wisconsin’s electronics recycling law by registering their covered electronics and paying applicable registration and shortfall fees. During program year 10, the DNR revoked 15 manufacturers’ registrations for failure to submit required forms or payments, and issued 10 notices of noncompliance (NONs) for incomplete registrations. Six manufacturers that received NONs returned to compliance.

The remaining manufacturers had either stopped selling covered electronics, the DNR could not find current contact information for them, or the cases were still going through the stepped enforcement process as of October 2019.

To ensure a level playing field among electronics manufacturers, the DNR continued its effort to bring manufacturers of unregistered brands into compliance. In addition to retailer compliance efforts described below, the DNR contacts manufacturers directly to inform them of their obligation to register, and communicates with other state programs

**Figure 7: Manufacturer credit use, by program year**





about brand status. The DNR maintains lists of registered and unregistered brands on its website to help retailers and manufacturers stay up-to-date with brand registration status. As of October 2019, there were 162 unregistered and 244 registered brands tracked by the DNR.

### Electronics retailer compliance

Under Wisconsin’s electronics recycling law, retailers must sell only registered brands to Wisconsin households and schools, and must inform customers that electronics may not go into the trash and provide information about how to recycle electronics. These requirements apply to brick-and-mortar stores as well as online stores. The DNR reviews electronics retailer inventory online and in stores, and checks stores and websites for compliance with the customer education requirements.

In program year 10, the DNR conducted two rounds of online brand checks and 28 in-store inspections of brick-and-mortar stores. Unregistered brands are most commonly found online, where inventory changes quickly, and there are several large, exclusively online retailers. The DNR notified retailers of the results of these checks, with a reminder of retailer requirements under the law. The DNR also continued to follow up with retailers regarding customer education requirements and suggested changes to ensure full compliance with Wisconsin’s law. During program year 10, the DNR sent a NON to one retailer to address unregistered brands and lack of consumer education, which the retailer addressed.

### Registered recycler compliance

All electronics recyclers operating in Wisconsin must comply with solid and hazardous waste regulations. Registered E-Cycle Wisconsin recyclers, whether located in-state or not, must meet additional requirements, including maintaining financial assurance to cover facility closure; at least \$1 million in pollution liability insurance; reporting to the DNR twice a year; and providing information on the weight of electronics recycled, sources of those electronics and downstream vendors.

The DNR conducts annual inspections of all in-state registered recyclers. The inspector reviews inventory, shipping and downstream vendor records to determine whether electronics are flowing through the facility in a timely manner and ending up at a legitimate end market or properly disposed. The inspector also reviews the facility’s closure plan and owner financial responsibility (OFR) to ensure the amount of funds set aside is adequate to properly close the facility.

Table 6 lists the number of collection site and recycler inspections the DNR has conducted each program year.

During program year 10, DNR E-Cycle Wisconsin staff inspected all seven in-state recyclers and one recycler in Illinois. Since it is not possible to visit most out-of-state recyclers, staff assess compliance for these recyclers through annual reports, phone calls, email conversations and discussions with regulators in those states to verify the recyclers’ environmental compliance. The DNR worked closely with two registered recyclers for issues regarding their OFR. Both recyclers returned to compliance.

**Table 6: DNR inspections conducted, by program year**

Time period	Recyclers	Collection sites
July 1, 2010, to June 30, 2011	8	20
July 1, 2011, to June 30, 2012	8	29
July 1, 2012, to June 30, 2013	10	65
July 1, 2013, to June 30, 2014	10	116
July 1, 2014, to June 30, 2015	18	28
July 1, 2015, to June 30, 2016	7	37
July 1, 2016, to June 30, 2017	8	73
July 1, 2017, to June 30, 2018	9	60
July 1, 2018, to June 30, 2019	8	64

### Registered collector compliance

The DNR also assesses collector compliance through annual reports and inspections. There are several hundred collection sites, so E-Cycle Wisconsin staff focus on new sites, consolidation sites, large collectors that operate multiple sites or are also recycling non-program material, and sites that have had complaints. Occasionally, staff inspect non-registered collection sites to provide technical assistance or investigate complaints.

To ensure collectors understand how to effectively manage their sites, the DNR provides technical assistance during inspections and through emails, phone calls and collector workshops. In program year 10, the DNR held workshops in Kenosha County, with approximately 30 participants; and in Dunn County, with approximately 45 participants. Participants gave positive feedback, and the DNR will continue offering workshops around the state.

During program year 10, the DNR revoked one collector's E-Cycle Wisconsin registration for failure to submit annual registration and report forms.

## Electronics recycling separate from E-Cycle Wisconsin

Currently, collectors and recyclers that perform basic disassembly of electronics are treated as exempt from most solid and hazardous waste requirements, if the materials are handled appropriately. Consequently, only recyclers participating in E-Cycle Wisconsin are operating under DNR regulatory oversight. Monitoring recycling activities that occur outside of E-Cycle Wisconsin has been challenging; often these activities only come to the DNR's attention when a problem occurs.

During 2019, DNR e-cycling, solid waste and hazardous waste staff updated external guidance documents outlining requirements and best management practices for all electronics collectors, transporters and recyclers to follow, regardless of their participation in E-Cycle Wisconsin.

The cost for recycling electronics continues to rise, and it is likely the declining markets for metals, plastics and CRT glass have led to fewer people being interested in starting an electronics recycling company, so the number of inquiries from aspiring recyclers has declined in recent years. However, DNR staff continue to receive a few contacts each year from people interested in starting a new electronics recycling business. Staff explain the rules, provide guidance documents for managing electronics and encourage them to develop a business plan that will ensure they have legitimate outlets for all electronic components. Staff encourage others who may have contact with small-scale recyclers—such as local governments, other recyclers and collectors, and salvage yard operators—to help advise small recyclers about the proper way to manage electronics.

### Illegal disposal and irresponsible electronics processing

The DNR investigated approximately a dozen formal electronics-related complaints during the 2018-2019 program year. Complaints included burning electronics, stockpiling, illegal dumping and other mismanagement of electronics and their components. The DNR addresses cases through letters, phone calls and/or visits by staff. DNR staff often work with municipalities to address these issues.

For example, one complaint was from the city of Green Bay regarding a facility that had started stockpiling electronics in the city's right of way. DNR staff provided the city and the recycler with technical assistance. The city zoning department had stronger enforcement tools that were instrumental in requiring the materials to be moved off-site and properly managed.

Another complaint concerned a site operating a recycling business and taking electronics, other recyclables (e.g., appliances,) and waste materials from area businesses. The business was operating out of a home and the town where it was located raised concerns because the property was not zoned for that type of operation. The town and the DNR have been working cooperatively to resolve the issues, and the property owner is continuing to work on returning to compliance. However, a lot of materials remained on the property in October 2019.



*The DNR received a complaint about electronics from a recycling business that were stored in a city's right of way. The DNR worked with the city to inspect the site and provided technical assistance, and the city used its enforcement tools to have the material cleaned up.*

Another complaint was about a site reportedly burning light bulbs and electronics. The property owner received a notice of noncompliance for hazardous waste violations. The case had not been resolved as of October 2019.

These types of cases show the need for DNR to continue a strong outreach campaign to ensure that the public and municipalities understand the issues regarding electronics mismanagement. Because of the high cost of recycling electronics responsibly, DNR has a great concern that collectors and individuals may turn to irresponsible, unregistered recyclers. Staff continue to reach out to collectors, governments and businesses to educate them about the importance of working with responsible recyclers and the potential consequences if their electronics are mismanaged.



*The DNR received a complaint about a business recycling electronics out of a home in an area not zoned for that type of activity. The DNR and township are working cooperatively to resolve the issue.*

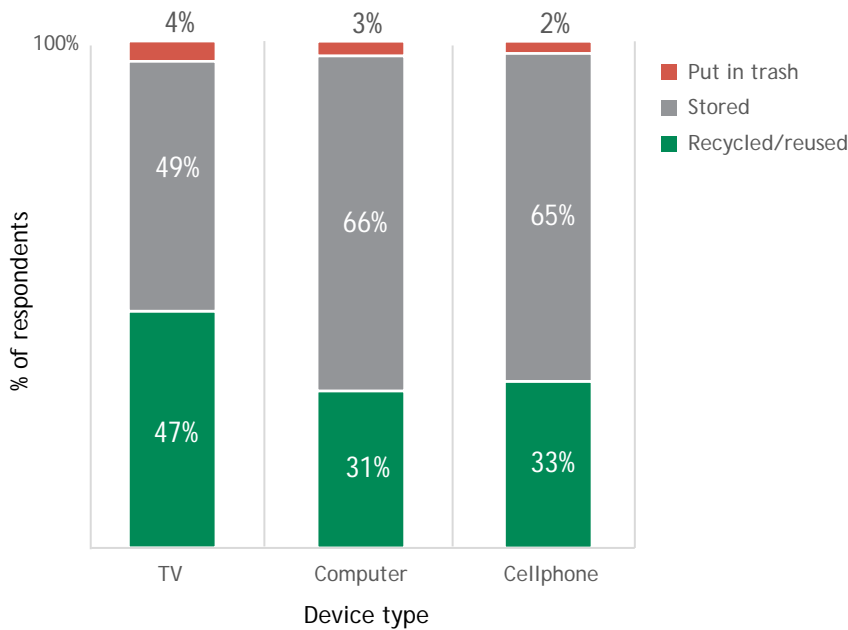
## Disposal ban compliance and public awareness

In addition to the cases of irresponsible recycling discussed above, the DNR continues to receive reports of electronics being dumped on public lands, in ditches and in vacant lots, along with reports of electronics put in the trash. Often, these are cases of an individual dumping one or two items, most commonly TVs, and are difficult to track in a systematic way.

In fall 2018, the DNR conducted its fifth statewide household survey on electronics recycling since E-Cycle Wisconsin began. As in previous surveys, the 2018 results helped the DNR measure awareness of Wisconsin's electronics recycling law and compliance with electronics disposal bans.

The survey asked, "In the last 12 months, what did you do with each of the following electronic items that you no longer wanted?" Among households that had a device they no longer wanted, about two-thirds stored unwanted cellphones and computers and about half stored unwanted TVs during the previous 12 months. The percentage of households that had stored unwanted devices increased more than 10 percentage points for

**Figure 8: What respondents did with unwanted devices during previous 12 months, 2018**



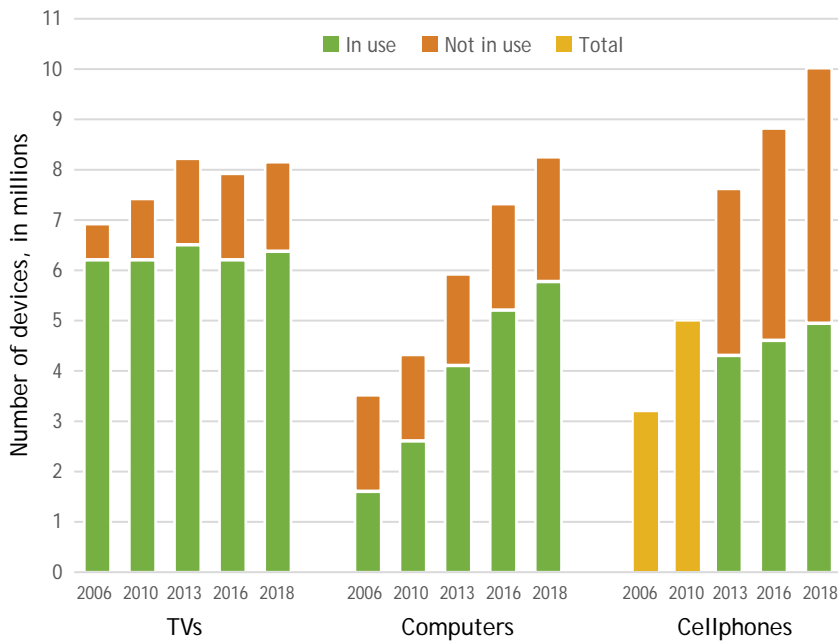
all three device types from 2016 to 2018.

Nearly all households that did not store an unwanted device opted to recycle or reuse it. Figure 8 shows all the recycling/reuse options combined. Only a small percentage of households reported putting a cellphone (2%), computer (3%) or TV (4%) in the trash.

**Public awareness efforts**

The electronics recycling law requires the DNR to promote public participation in electronics recycling and facilitate communication among local governments and electronics collectors, recyclers and manufacturers. The DNR meets this requirement through advertising and social media campaigns, news releases, participation in outreach events, and providing outreach materials for local governments and E-Cycle Wisconsin participants to distribute. These efforts help ensure households and schools are aware of the disposal ban on electronic devices and that manufacturers meet their recycling targets.

**Figure 9: Estimated number of electronics in Wisconsin households, over time**



The “not in use” question was not asked for cellphones in 2006 and 2010.

10 million cellphones in 2018. Of those, survey responses indicated 22% of TVs, 30% of computers and 50% of cellphones in homes were not being used. This translates into approximately 1.8 million TVs, 2.4 million computers and 5.1 million cellphones ready for disposal (see Figure 9).

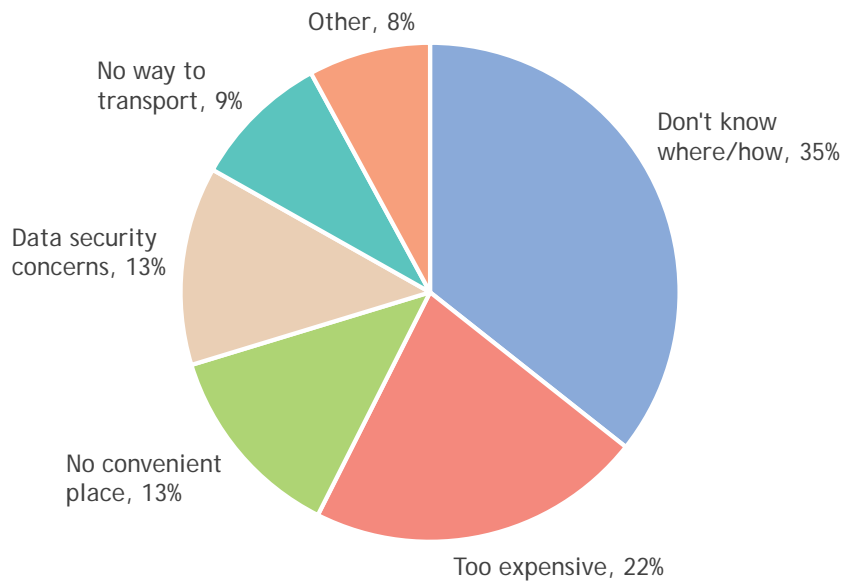
The survey also asked respondents about reasons they had been unable to recycle electronics despite wanting to do so. The top reasons were “Didn’t know where or how” (35%) and “It was too expensive” (22%). Tied

for the third most common reason at 13% were “I didn’t have a convenient place to recycle” and “I was concerned about my data security” (see Figure 10).

To help address the barriers of lack of awareness, cost and lack of convenient recycling locations, the DNR made significant upgrades to its online list of registered E-Cycle Wisconsin collection sites in late 2018 and early 2019, adding a mapping feature and manufacturer mail-back program information (most of the mail-back programs are free).

The DNR’s 2018-19 advertising campaign focused on winter holidays and spring cleaning time, along with a mini-campaign in February about safe handling of electronics that contain lithium ion batteries. The campaign used digital advertising, paid and unpaid social media, and sponsorship messages on Wisconsin Public Radio to drive Wisconsin residents to the DNR’s list of registered collection sites and mail-back programs. Overall, the DNR’s electronics recycling webpages received more than 190,000 visits between July 2018 and June 2019.

**Figure 10: Reason unable to recycle electronics during last 12 months, 2018**



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### Survey results

More detailed reports on E-Cycle Wisconsin surveys are available on the E-Cycle Wisconsin program results page at [dnr.wi.gov/topic/Ecycle/wisconsin.html#tabx2](http://dnr.wi.gov/topic/Ecycle/wisconsin.html#tabx2).

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## Program challenges

In evaluating whether changes are needed to make the electronics recycling law function better, the DNR has gathered input through surveys and conversations with program participants, other stakeholders and the public. In particular, stakeholder meetings (2014, 2015, 2016 and 2018), collector workshops (2015 through 2019), 2017 online surveys of registered E-Cycle Wisconsin participants, and statewide household surveys (2010, 2011, 2013, 2016 and 2018) have provided valuable input.

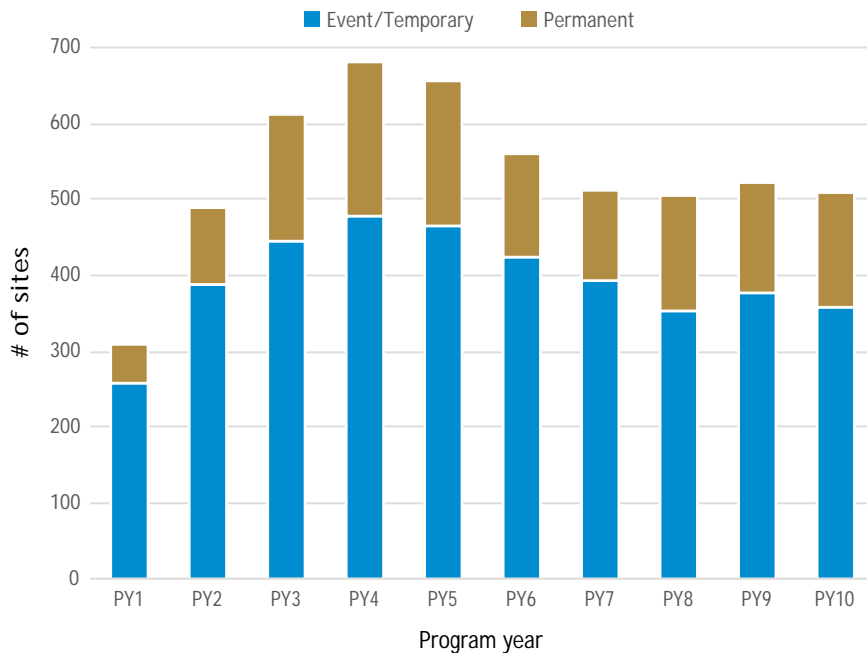
Wisconsin’s law is designed to operate on free-market principles, with collectors, recyclers and manufacturers conducting private negotiations to set recycling prices. However, decreasing manufacturer targets, combined with significant commodity market disruptions and continued collection of CRTs and other low-value devices, is distorting the market. In recent years, the program has seen increased consumer costs for recycling, decreased consumer access to recycling, decreased economic benefit for recyclers, and more illegal disposal and dumping.

### Declining access and rising costs for consumers

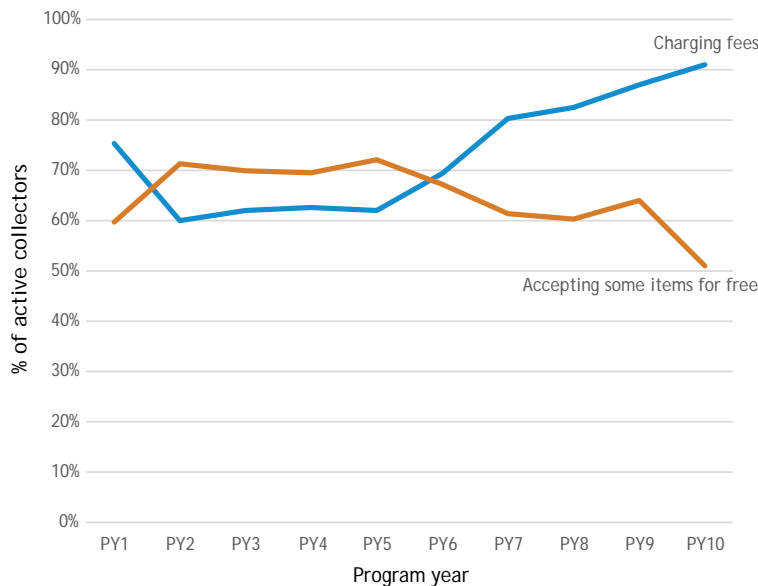
As shown in Figure 11, the number of collection sites registered with E-Cycle Wisconsin increased through program year 4, but then declined steeply, though the number has stabilized. In program year 10, there were 358 permanent and 151 temporary or event collection sites registered with E-Cycle Wisconsin, a total of 509 (down 25% from the program year 4 high of 681). With the addition of a site in Florence County in 2019, all Wisconsin counties have now had at least one registered collection site or event since 2010.



**Figure 11: Registered collection sites over time**



**Figure 12: Percent of registered collectors charging fees and accepting some items for free**



The reduction in collection opportunities has affected residents in both rural and urban areas. During program year 10, there were E-Cycle Wisconsin collection sites in 69 of Wisconsin’s 72 counties, covering 99.1% of the state’s population. While this means that only a small portion of residents lived in counties without registered collection sites, there are parts of the state where residents would have to drive a very long distance to properly recycle electronics, increasing the likelihood of illegal dumping or disposal. And while urban areas generally had sites available, they were sometimes limited to residents of specific municipalities, leaving residents outside of those municipalities without options.

The map in Appendix B shows permanent and temporary collection sites registered during program year 10. Each site is surrounded by shading in a radius of 10 miles in the northeastern and southeastern parts of the state, and 15 miles in the northern, western and south-central areas, reflecting the median distance respondents reported they were willing to drive to recycle electronics on the 2018 DNR statewide household survey. These illustrate the mostly rural portions of the state that lack convenient access to collection sites.

As shown in Figure 12, there has been a substantial increase in the percentage of collectors charging consumers fees for electronics. In program year 10, 91% of active E-Cycle Wisconsin collectors charged consumers a collection fee of some sort, compared with 62% in program year 5. The percentage of active collectors taking at least some items for free fell from 72% in program year 5 to 52% in program year 10. Most collectors charged a per-item fee, with a smaller portion charging a per-pound fee or using a combination of fee types. Nearly all sites that charged a fee did so for TVs, and some limited the size or type of TVs accepted, or did not accept TVs at all.

These fees reflect charges recyclers pass on to collectors. In the last few years, virtually all E-Cycle Wisconsin collectors have been paying for packaging, transportation and/or recycling of eligible electronics under the program. The most common charges were for recycling TVs and monitors (both CRTs and flat panels).

### Getting electronics to registered recyclers

At the 2018 E-Cycle Wisconsin stakeholder meeting, participants identified electronics “scrapers” and other illegal or irresponsible recycling as a major challenge. Besides illegal dumping or disposal, higher fees can lead individuals or collectors to look for cheaper alternatives.

As shown in Figure 3, there has been a significant amount of electronics collected by registered collectors but sent to non-registered recyclers over the last several years. In many cases, the material is still managed properly, but because the law doesn’t require registered collectors or facilities not participating in E-Cycle Wisconsin to meet the same standards as registered recyclers, there is greater potential for these facilities to stockpile material and/or send it to non-legitimate downstream vendors, which can lead to costly cleanups. Diversion of more valuable devices also affects costs for registered recyclers and manufacturers. When the bulk of material sent to registered recyclers is CRTs, flat-panel displays and low-grade electronics, recycling costs for program-eligible materials are higher than if the true mix of collected electronics was reaching registered recyclers.

These issues point to the need to improve the economics of E-Cycle Wisconsin to ensure registered recyclers are the first choice for registered collectors and consumers, along with the need for more uniform regulations for all facilities in Wisconsin that dismantle electronics.

### Economic challenges for electronics recycling

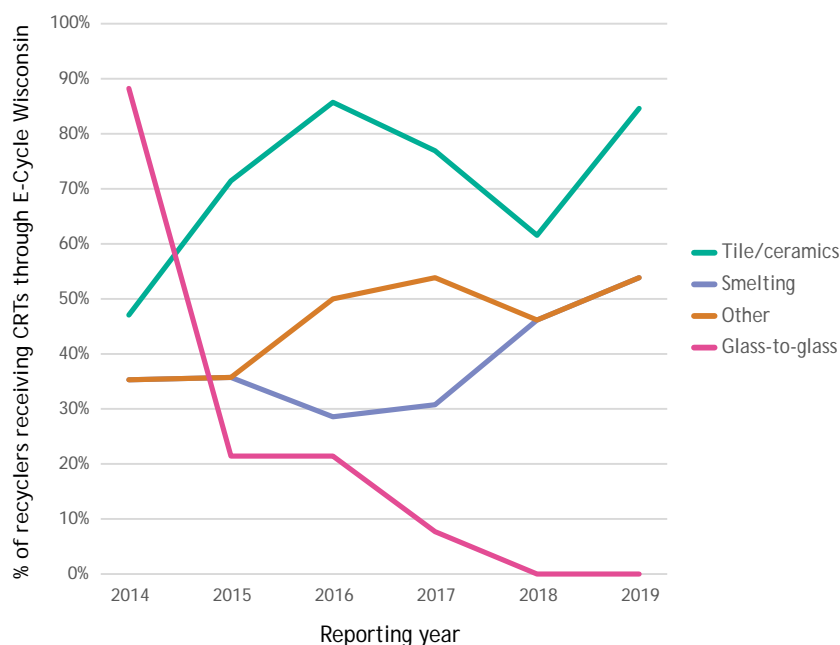
Changes in markets for commodities derived from electronics are a major cause of higher costs—along with increased labor costs due to a tight employment market—and manufacturer payments have not necessarily kept pace with these market shifts.

#### Cathode ray tubes

CRT-containing devices (TVs and monitors) make up the majority of weight collected under E-Cycle Wisconsin (see Figure 4). They are also some of the most difficult and expensive devices to recycle, and several recyclers—including some involved in E-Cycle Wisconsin—have mismanaged or abandoned stockpiles of glass. The DNR has spent considerable time following up on these cases and making sure mismanaged glass is not counted for manufacturer credit under E-Cycle Wisconsin.

Figure 13 shows CRT end markets under E-Cycle Wisconsin since 2014. Historically, primary options for recycling the leaded portion of the glass

Figure 13: End-market destinations for E-Cycle Wisconsin CRT glass, 2014-2019



Many recyclers have multiple downstream vendors, so percentages do not add up to 100. Downstreams are based on what recyclers report during an annual fall survey.

have been the manufacture of new CRTs (called glass-to-glass) or smelting. In 2015, the lone remaining glass-to-glass furnace in the world stopped accepting more glass. Many recyclers began sending glass overseas for use in tile and other ceramics. Use of this option dropped during 2017-2018, especially when Spain stopped accepting CRT glass for tile in fall 2018, but rebounded in 2019 due to expanding markets in Brazil and other countries. Smelting has remained a limited but steady end market for CRTs from E-Cycle Wisconsin. In 2018, about half of recyclers sent a portion of CRT glass to other end markets, mainly non-leaded glass used in applications such as road base aggregate.

#### *Flat-panel displays*

Liquid crystal display (LCD) monitors and TVs, sold primarily between 2001 and 2014, have up to 20 thin, mercury-containing fluorescent tubes and represent another problematic portion of the waste stream. Manual disassembly of the displays is time-consuming (and thus expensive). One recycler in Wisconsin uses automated processing technology to reduce costs, but the value of commodities in flat panels is less than the cost of processing and handling the mercury.

#### *Low-grade electronics and plastics import bans*

Recyclers have traditionally relied on non-hazardous and more valuable materials in electronics—including steel, aluminum, precious metals and plastics—to offset costs for recycling materials like CRT glass. However, the value of commodities recovered from newer devices has dropped as manufacturers make products lighter and use fewer precious metals, and many commodity markets have decreased sharply in recent years. This means there is less commodity value in electronics to offset recycling costs.

Over the last two years, many countries have either stopped accepting—or placed significant restrictions on—imports of plastics derived from electronics. As a result, electronics recyclers have had trouble marketing their plastics, and prices in remaining markets are much lower than in recent years. More countries are expected to add or increase restrictions on plastic imports in the coming years, as new provisions concerning plastics take effect in the international Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. Several recyclers have implemented new procedures and installed new equipment to improve the marketability of plastics, and a handful of electronics manufacturers incorporate recycled plastics into new products. However, the market volatility, overall price drop and lack of funding for capital investments at electronics recycling facilities have put new economic pressures on recyclers that will likely lead to higher costs for collectors, consumers and manufacturers.

#### *Safe handling of lithium batteries*

Lithium ion batteries—used in many portable electronics—can retain a considerable charge even after a consumer has discarded a device, and can spark and cause fires if damaged. Lithium batteries from devices thrown in the trash, curbside recycling bins and even those properly brought to electronics drop-off sites have caused several fires throughout the country, including in Wisconsin. Recyclers are spending additional money to train workers, revise procedures and invest in fire-suppression systems. The challenge will grow worse as more electronics containing these batteries enter the waste stream.

### **Manufacturer share of recycling costs**

Feedback from recyclers has noted that consistent oversupply of eligible pounds, rising manufacturer compliance costs across programs in all states and competition among recyclers has led many manufacturers to push for lower per-pound payments. This means more of the recycling cost is passed on to collectors and, ultimately, consumers. In the DNR's 2017 survey of registered recyclers, only recyclers directly supporting manufacturers' own collection programs said manufacturer payments covered all recycling costs, while for other recyclers,

manufacturer payments covered just a portion of costs. Manufacturers could help improve the economics of E-Cycle Wisconsin by increasing the amount per pound they pay recyclers to cover the full cost of transportation and responsible recycling.

### **Declining manufacturer targets and collection gap**

Additional economic pressure has come from collection significantly outpacing the overall manufacturer recycling target (see Figure 6). The DNR expects the weight of recycled electronics to exceed manufacturer targets under the current formula for at least the next few years, due mainly to the lighter weight of electronics being sold today compared with heavier items in the recycling stream.

Since E-Cycle Wisconsin began, a few manufacturers have gone beyond the electronics recycling requirements in Wisconsin's law, sponsoring robust collection efforts and collecting more than their recycling targets. Without more of this voluntary action, however, a legislative change to the target formula or funding method is needed to ensure convenient, affordable consumer access to responsible electronics recycling.

## **Recommendations for potential legislative changes**

Based on the first 10 years of implementation and positive feedback from stakeholders, most of the fundamental elements of Wisconsin's electronics recycling law are sound. The changing nature of electronics and recycling markets, however, are producing the challenges discussed above and risk further reducing consumer access to responsible and affordable electronics recycling. These ideas for the Legislature's consideration, submitted under s. 287.17(10), Wis. Stats., are based on extensive conversations with stakeholders over the last several years, in addition to analysis of program data.

The following previously recommended changes have been included in companion state Senate and Assembly bills during the 2019-20 legislative session. The DNR continues to support these changes.

- Change the program year to a calendar year (Jan. 1 to Dec. 31), with reporting deadlines adjusted accordingly. To accomplish the transition, program year 12 would run from July 1, 2020, through Dec. 31, 2021, with reporting manufacturer targets adjusted accordingly.
- Modify the definition of "school" under s. 287.17(1)(np) could be modified to allow all K-12 schools in Wisconsin to recycle electronics through E-Cycle Wisconsin.
- Reduce registration fees for smaller manufacturers by adjusting fee levels in s. 287.17(4)(b).

### **Consider updating or replacing the manufacturer target formula to ensure consistent and affordable consumer access to electronics recycling**

As noted, the weight of electronics collected has consistently been higher than overall manufacturer recycling targets, and there remains a large stock of unused electronics in Wisconsin households that could be recycled. In addition, many rural parts of the state lack consistent, affordable access to electronics recycling, and the current rural incentive—which allows manufacturers to count 1.25 pounds for every pound collected in a county designated as rural under the law—has done little to encourage rural collection.

To better balance the supply of electronics that need to be recycled with manufacturer obligations, the Legislature could consider adjusting the manufacturer target formula. For example, the multiplier in the formula could be increased from 0.8 to 0.9, or weight received for recycling under the program could be allocated among manufacturers by market share. In addition, the current rural incentive could be replaced with an alternative method to ensure that, regardless of the overall manufacturer target, manufacturers and recyclers would provide attention to rural areas.

At the 2018 E-Cycle Wisconsin stakeholder meeting, many participants suggested an alternative approach, moving to a system where manufacturers assess a recycling fee when new electronics are purchased and use the resulting funds to pay for recycling. Other options stakeholders have suggested include moving to a “convenience model,” where manufacturers work together to provide collection at sites throughout the state, and incentivizing manufacturers to incorporate recycled content (especially plastics) into their products by reducing recycling targets for those that have invested time and money to use recycled content in new products. The Legislature could request a study of the feasibility and implementation steps for these and other alternative methods of funding electronics recycling in Wisconsin.

### Consider updating device definitions to address today’s consumer electronics

As technology changes, it has been difficult for the DNR to determine whether devices are covered by the definitions in s. 287.17(1). Examples of these “gray area” products include smartphones, digital picture frames, photo printers, portable DVD players and video game consoles. In addition, the increased use of lithium ion batteries in consumer electronics, along with the fact that the majority of these devices store personal data, make this a good time for the Legislature to take a fresh look at which devices are included in E-Cycle Wisconsin and banned from disposal in landfills or incinerators.

Device definitions and program requirements could be revamped to:

- Update the definition of consumer computer so that it is easier to determine whether new or updated products with video displays smaller than 7 inches, such as smartphones, are included, and add video game consoles to the list of covered electronics.
- Broaden the definition of video display device so that it includes items with screen sizes greater than 7 inches, such as portable DVD players, that are very similar to TVs and monitors but not currently included.
- Broaden the definition of “peripheral” to include items used with video display devices, not just computers. This would allow items such as coaxial cables and digital converter boxes to count toward a manufacturer’s recycling target, making the recycling program clearer for consumers and requiring less sorting by recyclers.
- Include more devices with lithium ion batteries in disposal bans and set standards for how battery-containing and data-containing devices must be managed under E-Cycle Wisconsin.

### Consider creating a grant program to improve electronics recycling infrastructure

In addition to updating the manufacturer target formula and rural incentive, legislation could authorize the DNR to award small grants to create more electronics recycling opportunities in underserved areas of the state, using money already received from existing manufacturer fees. A similar program in Michigan is helping rural areas to set up viable permanent electronics collection sites or plan collection events.

## Recommendations for non-legislative actions to improve electronics recycling in Wisconsin

Through conversations with stakeholders in recent years, the DNR has identified areas where collaboration or voluntary actions could improve consumer access to electronics recycling, reduce costs for consumers or collectors, or make consumers more willing to recycle electronics through E-Cycle Wisconsin. The suggestions below are in addition to the DNR’s efforts to enhance public outreach and improve compliance.

### Collection site consolidation and collaboration

Registered recyclers have said being able to pick up full semi loads of sorted, well-packaged electronics reduces costs. There is a tradeoff, however, in ensuring convenient consumer access to collection sites. Especially in



rural areas, collecting full semi loads at a municipal drop-off site is not feasible. Collectors (with support from recyclers and/or manufacturers) could explore forming voluntary partnerships and doing local consolidation of materials before sending to a recycler.

### Addressing underserved areas

Registered manufacturers could reach out to parts of the state that have had few collection sites or events and work with local governments, non-profits or businesses to organize collection events or permanent sites. In some cases, there may already be collection efforts outside of E-Cycle Wisconsin, and helping these join the program would ensure materials are sent to responsible recyclers and improve public awareness of these sites through the DNR's online list of registered collection sites.

### More value for consumers

On the DNR's 2018 household survey, concern about data security was one of the top barriers to recycling electronics, and many respondents were willing to pay more to recycle electronics with a guarantee of safe data destruction. Collectors can ensure their operations securely handle data-containing devices, and work with recyclers to provide information on how data are kept secure and destroyed. Collectors and recyclers could also explore options like hosting events with on-site hard drive shredding.

Other services/incentives survey respondents have said would make them willing to pay more to recycle electronics include receiving a gift card or coupon, or having electronics picked up from their homes. Collectors, recyclers, community organizations or manufacturers could consider sponsoring special incentives to encourage recycling, even if consumers are still paying some fees.

### Improving consumer awareness

The DNR's 2018 household survey showed receiving information recently about electronics recycling was the biggest factor in whether respondents knew where to recycle electronics. Local governments and electronics retailers have statutory requirements to educate residents and customers on this topic, and could take a fresh look at their efforts as the electronics recycling law marks its 10<sup>th</sup> anniversary in 2020. Manufacturers, recyclers and collectors could also add to consumer education efforts.

### Recycling market development

A challenge for recyclers has been the lack of funding for research and development of new or more reliable end markets for materials derived from electronics, such as CRT glass and plastics. More funding in this area, including investment to help offset capital costs for installing or upgrading processing equipment, could help address some of these market challenges.



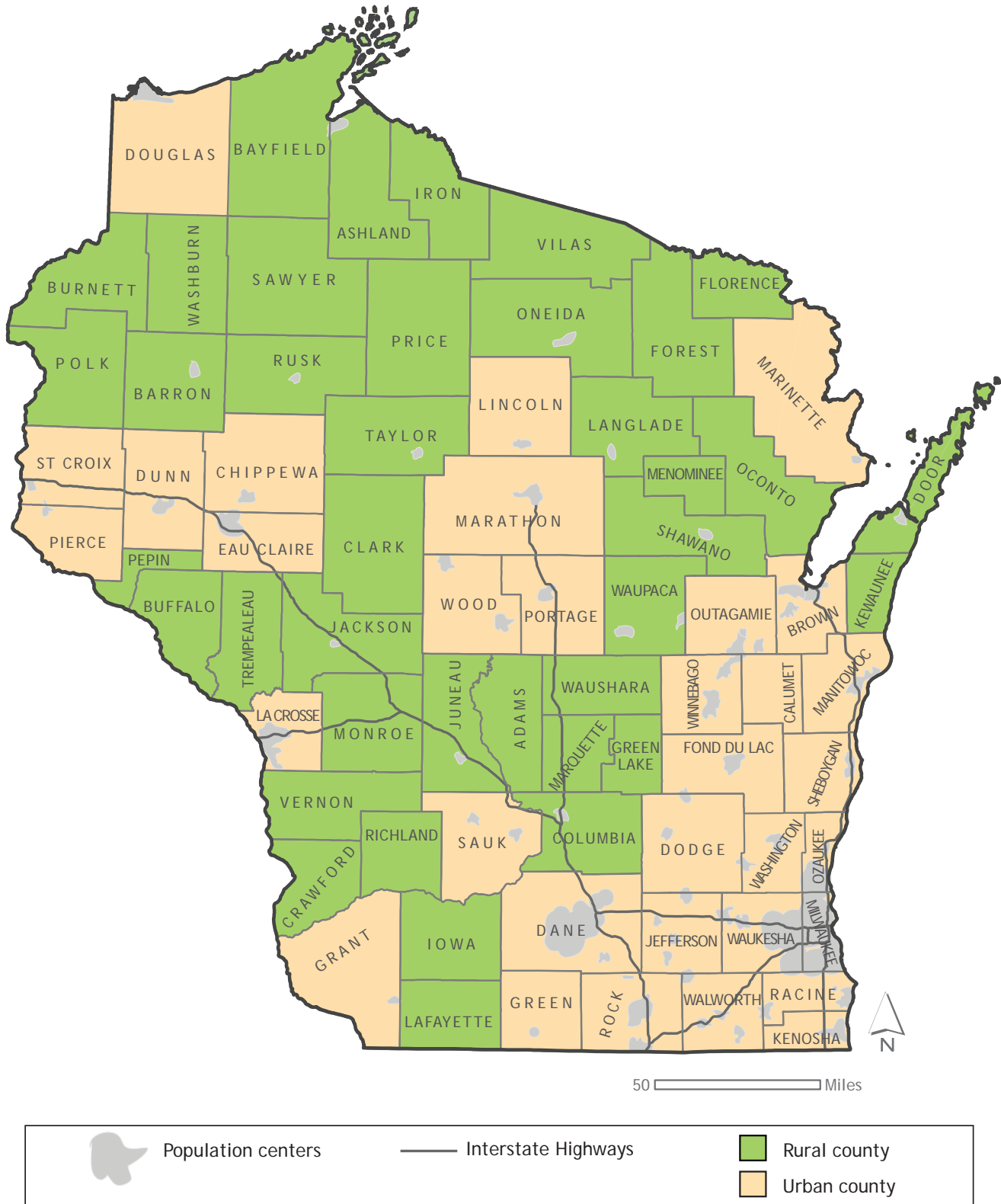
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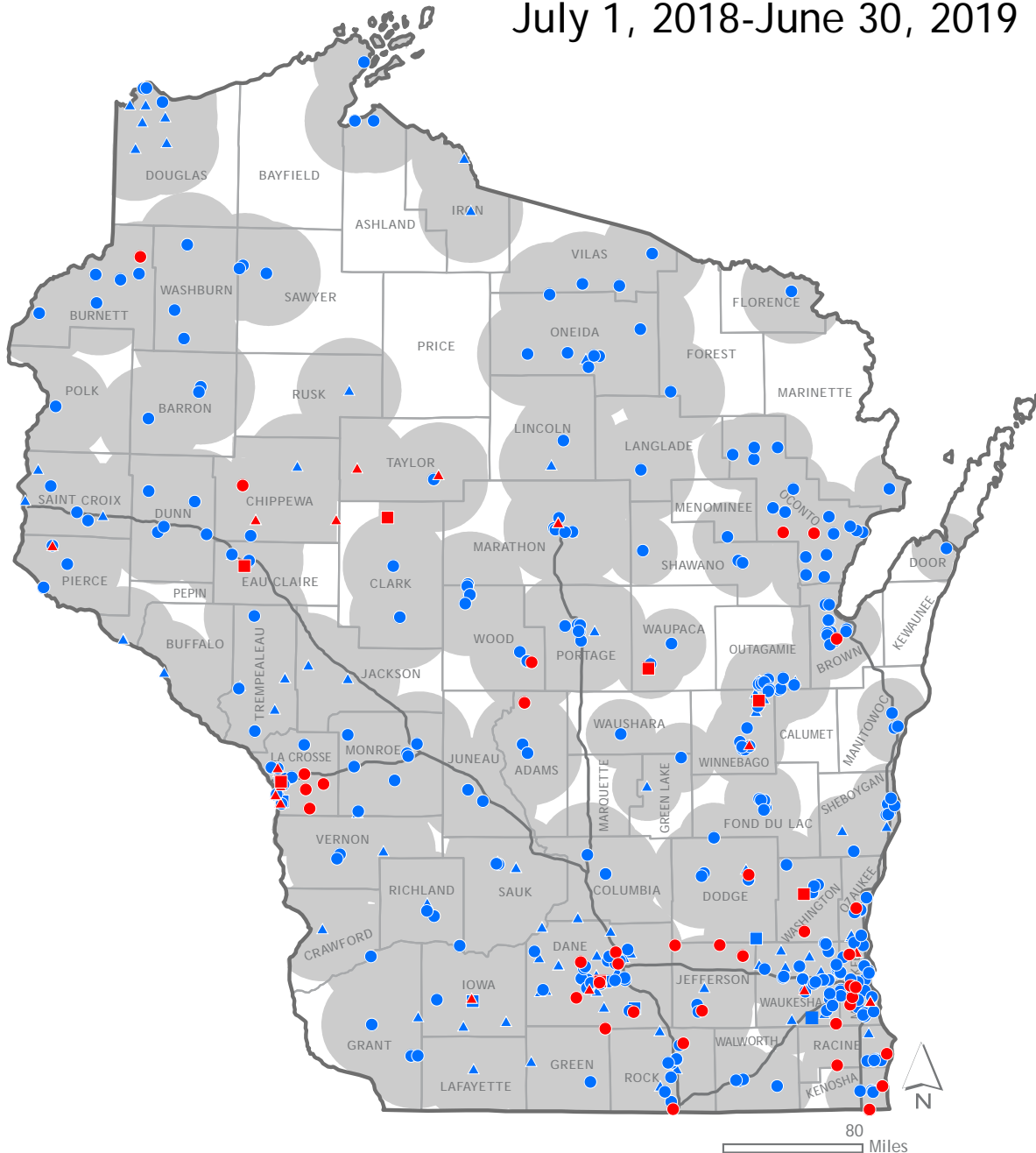
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








# Appendix A: Map of urban and rural counties under E-Cycle Wisconsin



# Appendix B: Map of collection sites registered under E-Cycle Wisconsin during program year 10

## Registered E-Cycle Wisconsin Collection Sites July 1, 2018-June 30, 2019



 <p>15-mile coverage area: Northern, South Central, West Central*</p>	 <p>Permanent collection sites</p>	 <p>Interstate highways</p>
 <p>10-mile coverage area: Northeast, Southeast*</p>	 <p>One-day collection sites</p>	
	 <p>Temporary collection sites</p>	
<p>*Based on the 2018 WDNR Household Survey question, "How far would you be willing to travel to recycle electronics?"</p>	   <p>Collection sites available only to employees and customers of a company or residents of a village, town, city or county.</p>	