E-Cycle Wisconsin 2018 report

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

November 2018

Executive summary

Wisconsin's electronics recycling law has produced many successes since it took effect in 2010, recycling more than 280 million pounds of electronics and expanding electronics recycling access for Wisconsin residents. A growing share of electronics collected under the manufacturer-funded E-Cycle Wisconsin program is 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).

Over the last few years, 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 to reduce product weight, the weight-based manufacturer recycling targets, set by a statutory formula, have declined by more than 10.5 million pounds (33 percent) since 2013. While some manufacturers have continued to voluntarily exceed their recycling targets, overall there were more than 1.2 million pounds recycled during the 2017-18 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 targets are updated or more manufacturers voluntarily exceed their targets, 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 nearly one-quarter, and collectors are passing higher recycling costs on to consumers. The DNR has seen several cases in the last few years of irresponsible recycling. These cases threaten the environment and human health and

Table of contents

More program results

Find earlier annual reports, survey summaries and other program results at dnr.wi.gov/topic/Ecycle/

are driven in part by higher costs for responsible recycling. These trends are increasing costs shouldered by taxpayers to either collect electronics or clean up dumped devices.

At a May 2018 E-Cycle Wisconsin stakeholder meeting, participants were positive about 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 9 (July 2017 to June 2018)

- Registered collectors took in 25.6 million pounds of electronics, or 4.4 pounds per Wisconsin resident. In total, between January 2010 and June 2018, Wisconsin households and schools recycled more than 280 million pounds of electronics through E-Cycle Wisconsin.
- More than 99 percent of the 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 76 percent of the weight processed. One Wisconsin recycler completed a major expansion, and two Wisconsin companies launched new electronics recycling operations registered with E-Cycle Wisconsin.
- While the number of registered collection sites has declined overall, there was a slight increase from program year 8 to 9. There was at least one registered electronics collection site or event in 65 of Wisconsin's 72 counties, representing 99 percent of the state's population.
- Most manufacturers met or exceeded their recycling targets, with a handful voluntarily going well above their 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 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.
- To better meet the electronics recycling needs of Wisconsin households and schools, consider changing the manufacturer target formula so that the aggregate target is based on the total weight of electronics received for recycling under the program during previous years. The Legislature could also request a study of alternative approaches to setting targets as suggested by stakeholders.
- To ensure access to electronics collection in rural areas, consider replacing the current rural collection incentive with an alternative method to ensure manufacturers and recyclers provide attention to rural areas.
- 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.
- Consider updating and clarifying device definitions to better fit the changing nature of electronics.

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 few program years, however, changing market conditions and other challenges have made it difficult for E-Cycle Wisconsin and the disposal ban to fulfill the first four of the above criteria. The biggest ob-

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

stacles 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 public to get feedback on challenges facing E-Cycle Wisconsin and potential solutions. In May 2018, the DNR held a well-received stakeholder meeting that identified current challenges and opportunities for addressing the challenges through the DNR's administration of the program, voluntary stakeholder actions and potential legislative changes. Further discussion of these issues and policy recommendations are included at the end of this report.

Program participation

Table 1 shows program year 9 registrations, and Figure 1 illustrates registration trends over the seven most recent program years.

Table 1: Program year 9 registration and participation

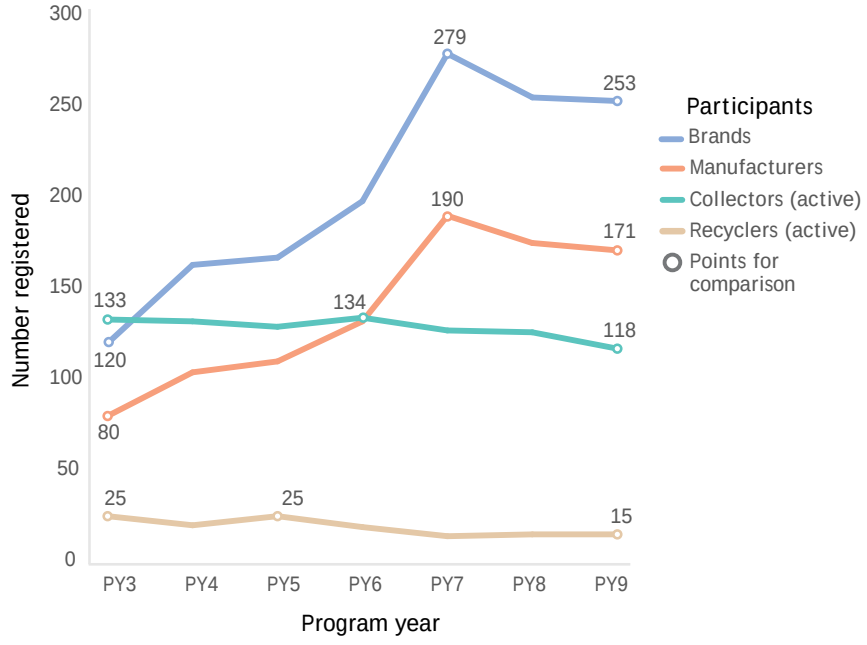
Category	Registered	Active
Collectors	132	118 (89%)
Recyclers	17	15 (88%)
Manufacturers	171	n/a
Brands	253	n/a

"Active" means a collector that sent electronics to a registered recycler or a recycler that received electronics from registered collectors.

In program year 9, 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 mix of collectors has remained relatively stable over the past few program years.

The number of registered collection sites increased slightly in program year 9, with 522 total permanent sites and one-day events, though the number of sites was still down about 23 percent from its peak of 681 in program year 4. For-profit collectors registered the highest number of sites (245, or just under half), though many of these (particularly one-day events) were at government-owned locations, as shown in Figure 2.

Figure 1: Summary of E-Cycle Wisconsin registrations



Program year 9 recycler registrations were also down slightly, to a total of 17. The number of registered recyclers has dropped almost 50 percent 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 17 recyclers (41 percent) were in Wisconsin, representing Wisconsin's highest share of the total since program year 1.

The numbers of registered manufacturers and brands were down just slightly in program year 9, following a sharp increase due to DNR compliance and enforcement efforts.

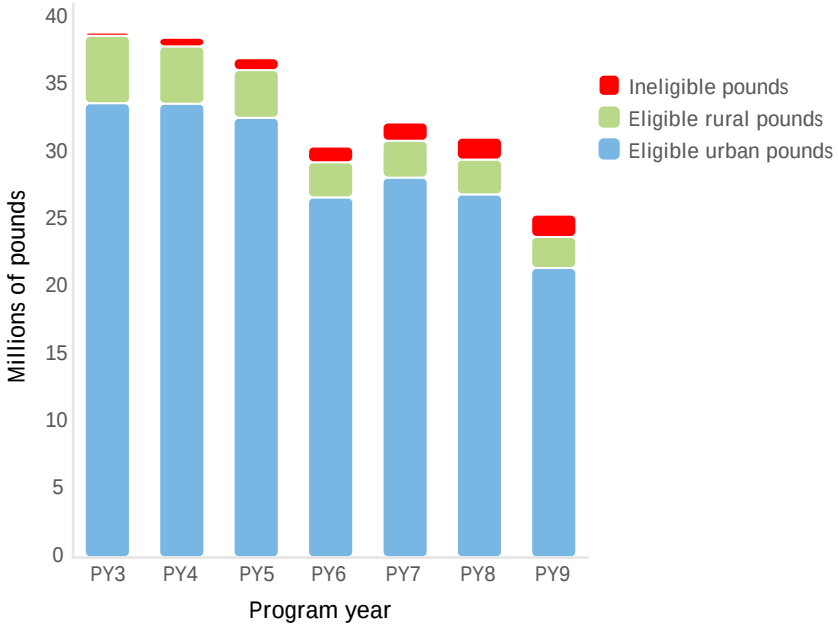
Collection and recycling totals and analysis

Wisconsin households and schools have recycled more than 280 million pounds of electronics through E-Cycle Wisconsin since 2010. From July 2017 through June 2018 (program year 9), registered collectors took in 25.6 million pounds of electronics from Wisconsin households and schools (see Table 2). This was equivalent to 4.4 pounds per capita.

As shown in Figure 3, the weight of eligible electronics collected during program year 9 fell sharply (about 5.7 million pounds, or 18 percent) from program year 8, and was down 35 percent from the peak collection total of 39.1 million pounds in program year 3. Figure 3 also shows the weight of material collected by registered collectors but going to non-registered recyclers has increased significantly, from about 231,000 pounds in program year 3 (less than 1 percent of the total collected) to nearly 1.7 million pounds in program year 9 (nearly 7 percent of the total collected). Much of this can be attributed to registered collectors that divert a portion of what they collect—usually the more valuable IT equipment—to their own dismantling and recycling operations. During program year 9 (the first year the DNR collected this information), this accounted for nearly half of the total not recycled by registered recyclers (see Table 2).

Figure 2: Program year 9 collection sites, by type

Figure 3: Pounds collected by registered collectors

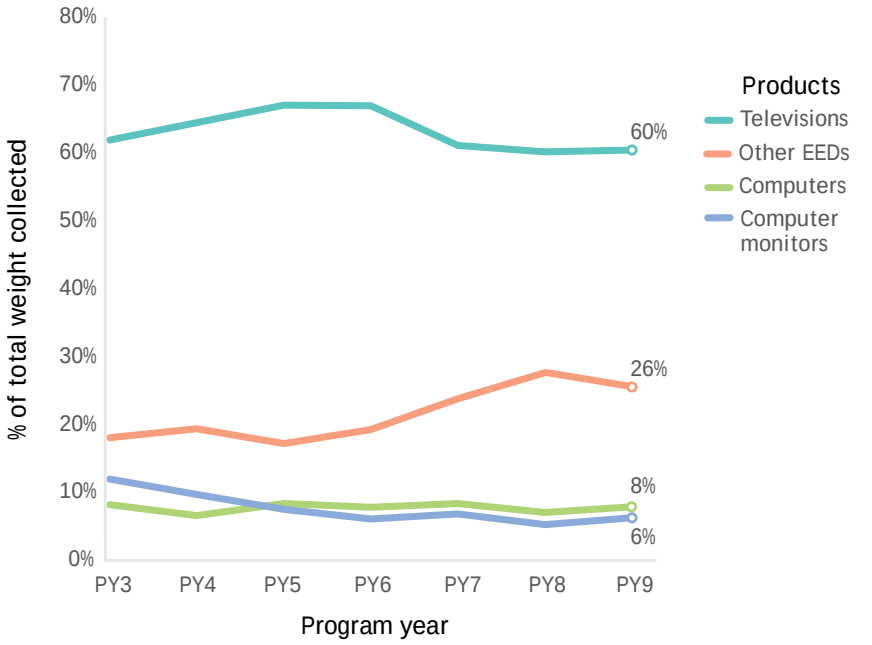


"Ineligible pounds" means pounds that would have been eligible for manufacturer credit if sent to a registered recycler, but that collectors dismantled themselves or sent to a non-registered recycler.

Table 2: Pounds collected by registered collectors, program year 9

Type	Pounds
Eligible urban	21,560,931
Eligible rural	2,303,715
Dismantled by collector	791,237
Sent to non-registered recycler	935,161
Total collected	**25,591,044**

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.

There does not appear to be one clear reason for the significant drop in collected weight from program year 8 to 9. Many collectors that have increased fees in recent years, including Best Buy and several municipalities, saw a drop in weight collected. However, collected weights also declined at some sites offering free recycling, such as Goodwill stores in south central Wisconsin, Staples stores and the city of Milwaukee. The decline in collected weight also 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 60 percent of the total in program year 9, matching program year 8 and just slightly down from program year 7 (see Figure 4). Registered recyclers report that the mix of TVs collected has begun to shift from CRTs to flat panel displays, but CRTs still dominate by weight.

Table 3: Pounds of electronics reported by registered recyclers, program year 9

Type	Pounds
Urban received	21,784,390
Rural received	2,080,256
Rural credit	520,064
Non-eligible glass	(1,491)
Diverted for reuse	(55,554)
Available for manufacturers	24,327,665
Sold to manufacturers	23,098,194
Not sold to manufacturers	1,229,471

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.

The downward trend in weight collected mirrors many other states' electronics recycling programs. Figure 5 illustrates trends in per capita collection rates for other high-performing state programs. All began seeing a noticeable drop in collected weights over the last two or three years. This may indicate that, under several mature state recycling programs, including Wisconsin's, 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 pounds subtracted, Table 3 shows 24.3 million eligible pounds were available for purchase by manufacturers—to fund the recycling of the electronics—in program year 9. However, registered recyclers sold only 23.1 million pounds to manufacturers. There was a significant gap—1.2 million pounds—between what recyclers processed and what manufacturers purchased. Due to the lower weight collected in program year 9, however, this gap was much smaller than the 7 million pounds in program year 8.

The overall manufacturer target, set by a statutory formula, for program year 9 was just under 22 million pounds, down from 22.8 million pounds in program year 8. The manufacturer targets in recent years have been significantly lower than in the first few years of E-Cycle Wisconsin,

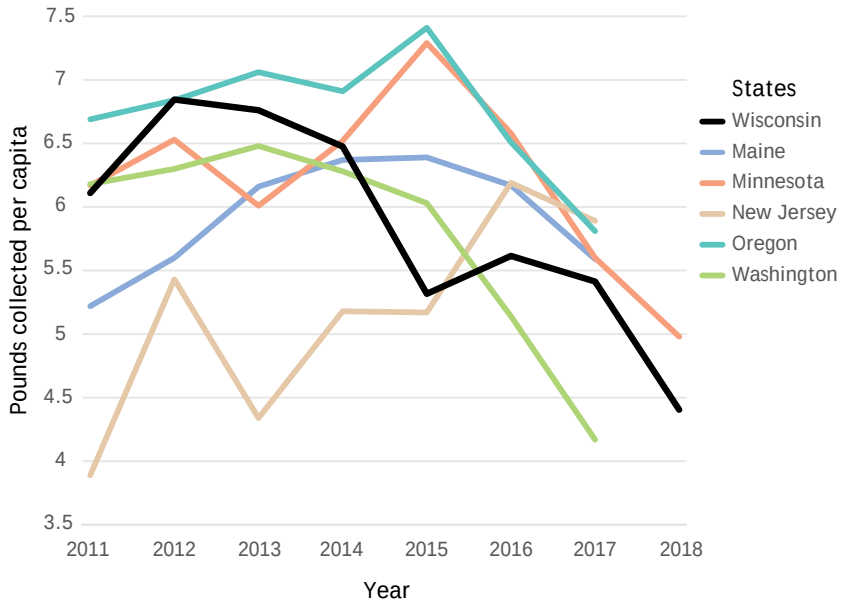
due primarily to consumers buying smaller and lighter products, and manufacturers finding ways to reduce the weight of larger devices, such as TVs. The estimated manufacturer target for program year 10 is 21.5 million pounds, down about 33 percent from the peak target of 32 million pounds in program 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 a September 2017 DNR survey 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 9, 40 registered manufacturers participated in a manufacturer 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 9 were MRM (25 manufacturers) and Reverse Logistics Group America (15). These collectives were responsible for about 30 percent of pounds purchased by manufacturers during program year 9, similar to program year 8. A dozen other manufacturers worked through brokers to purchase weight from a recycler.

Figure 5: Comparison of state per capita collection



Wisconsin and Minnesota have program years that run from July to June; the other states have program years running January to December. Each state collects a slightly different mix of electronics under its program.

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

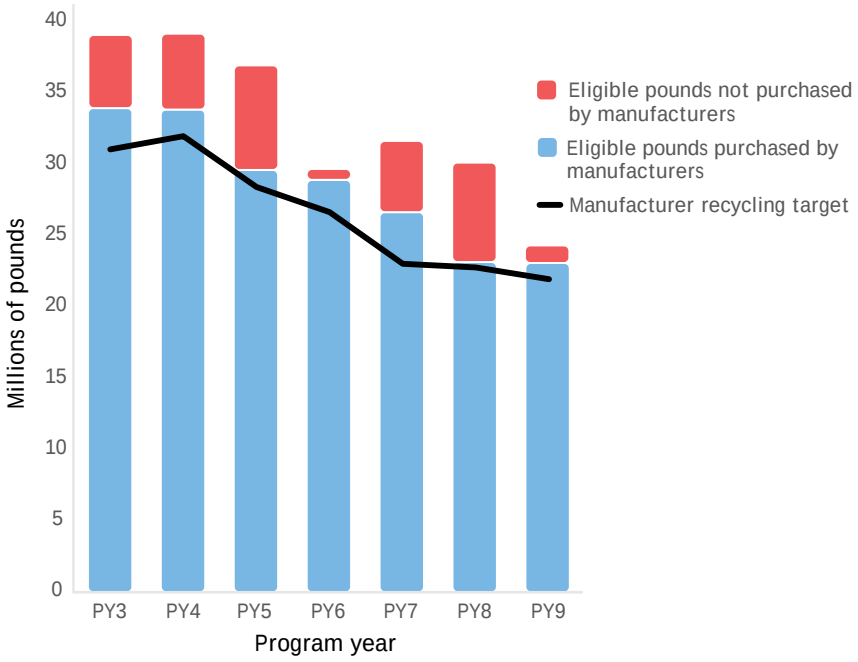
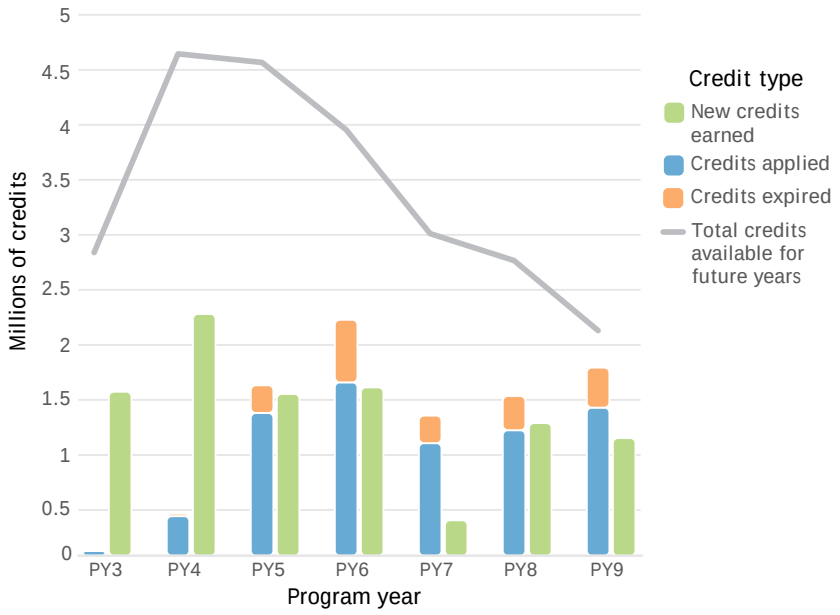


Figure 7: Manufacturer credit use, by program year



Most manufacturers continued to meet or exceed their sales weight-based recycling targets in program year 9. Thirty manufacturers recycled more than their targets and therefore earned a total of just under 1.1 million credits that can be used during the next three program years (see Table 4). Ten manufacturers used just over 1.4 million credits from previous years to meet their targets. At the end of program year 9, just under 2.1 million credits were available to manufacturers for future use. Figure 7 summarizes credits applied or expired, credits earned, and total credits available from program years 3 to 9.

Table 4: Program year 9 manufacturer credit transactions

	Credits
Beginning balance	2,744,221
Credits applied	(1,375,459)
Credits expired	(370,848)
New credits earned	1,093,275
Total available for future use	**2,091,189**

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	$9,393

Shortfall fees for program year 9 as of November 2018. The law did not assess shortfall fees for program year 1.

During program year 9, several manufacturers went significantly above and beyond their recycling obligations. Most notable were Best Buy and TTE Technology, which each recycled more than twice their recycling targets. Together, they paid to recycle more than 1.5 million extra pounds. Other manufacturers that recycled a large number of extra pounds (about 782,000 pounds collectively) were Apple, Funai Corp, Hisense USA, Hitachi, LG Electronics, Sceptre, Sharp and Toshiba.

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 9, 48 manufacturers paid or owed a shortfall fee as of October 2018. The amounts ranged from $2 to $2,202.

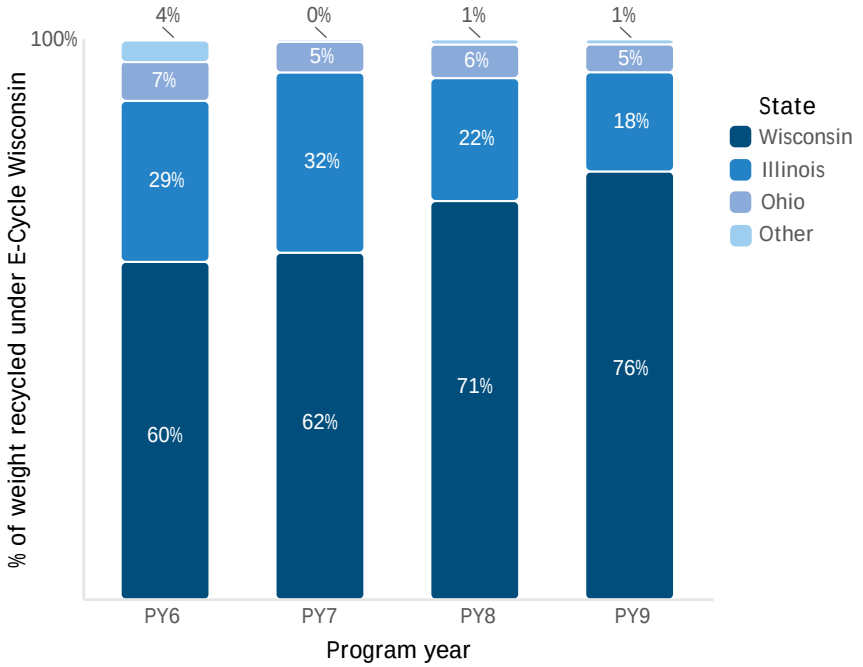
Table 5 summarizes registration and shortfall fees paid under E-Cycle Wisconsin.

Economic benefits of E-Cycle Wisconsin

As the electronics recycling industry has consolidated, a growing share of electronics collected under E-Cycle Wisconsin has stayed within the state for processing. During program year 9, Wisconsin recyclers accounted for 76 percent of the total recycled, up from 71 percent in program year 8 and 62 percent in program year 7. Essentially all electronics collected under E-Cycle Wisconsin continue to be processed in the Midwest, as shown in Figure 8.

Despite economic challenges discussed later in this report, E-Cycle Wisconsin has helped provide a steady stream of material that has led to more business opportunities and jobs in Wisconsin and nearby states. In an August 2017 DNR survey of registered recyclers, nearly all said E-Cycle Wisconsin had "increased or otherwise helped our business" (the others were unsure of the program's effect). One Wisconsin recycler completed a major expansion in 2018, and two Wisconsin companies launched new electronics recycling operations registered with E-Cycle Wisconsin.

Figure 8: Percent of pounds received by registered recyclers, by state



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.

A major theme heard from attendees of the 2018 E-Cycle Wisconsin stakeholder meeting was the need for strong enforcement to ensure a level playing field and fulfill the law's objectives. Stakeholders asked for more enforcement against "bad actor" collectors and recyclers that mismanage electronics, and more enforcement of retailer customer education requirements. The DNR has followed up on these requests by expanding and re-focusing some of its compliance efforts described below, such as notifying retailers of missing or incomplete customer education language on their websites.

Manufacturer registration compliance

Manufacturers of all major brands have complied with Wisconsin's electronics recycling law by registering their covered electronics and paying applicable registration and shortfall fees.

During program year 9, the DNR revoked the registrations of seven manufacturers for failure to submit required forms or payments, and followed up with one notice of noncompliance (NON) for a revoked brand. Two manufacturers (including the one that had received the NON) returned to compliance. The remaining five had either stopped selling covered electronics, or the DNR could not find current contact information for them.

To ensure a level playing field among electronics manufacturers, in 2017 and 2018 the DNR continued its

effort to bring unregistered manufacturers of unregistered brands into compliance. As of October 2018, there were 128 unregistered brands and 235 registered brands tracked by the DNR.

Under Wisconsin's electronics recycling law, retailers must sell only registered brands. This is a powerful incentive for manufacturers to register in Wisconsin. Retailers reach out to manufacturers with information about Wisconsin's law, and this often results in manufacturers contacting the DNR to begin the registration process. The DNR also reaches out directly to manufacturers to inform them of their obligation to register, and communicates with other state programs 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.

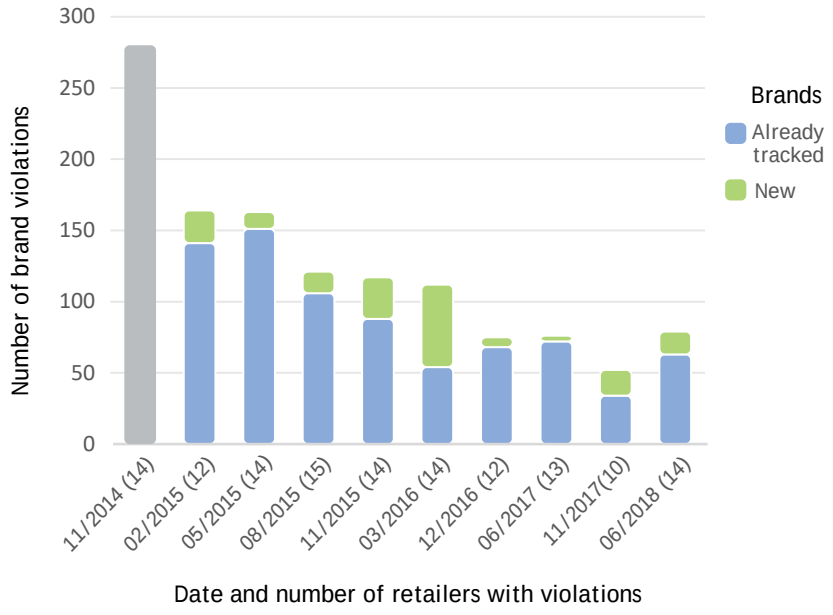
In addition to informal emails and phone calls to unregistered manufacturers and the registration revocations described above, the DNR sent NONs to four unregistered manufacturers in May 2018. One subsequently registered, and the other three were going through DNR's stepped enforcement process as of October 2018.

Electronics retailer compliance

In addition to requiring that electronics retailers sell only registered brands, Wisconsin's electronics recycling law requires retailers to 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 9, the DNR conducted three rounds of online brand checks and 30 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. Figure 9 highlights results of these unregistered brand checks over the last four years.

Figure 9: Electronics retailer unregistered brand violations, 2014-2018



For program year 9, the DNR focused on the online recycling and disposal ban information retailers provide to customers. Stakeholder input drove this effort. Several large retailers were providing education online, but many had inadequate or no information posted. The DNR sent six NONs to six retailers to address this issue. All had returned to compliance as of November 2018. The DNR reminded other retailers of customer education requirements and suggested changes to existing website language to ensure full compliance with Wisconsin's law. Retailer compliance with educational requirements will continue to be a focus of the DNR's efforts.

The DNR will continue to work with retailers to understand and address barriers to compliance, including making improvements to existing DNR outreach materials and working with other states to make it easier for retailers to comply with multiple states' laws.

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

Compliance assistance efforts and inspections of registered recyclers and collectors

All electronics recyclers 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. They must carry adequate owner financial responsibility (OFR) for facility closure and at least $1 million in pollution liability insurance. They must report to the DNR twice a year and provide information on the weight of electronics recycled, sources of those electronics and downstream vendors.

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

The DNR inspects in-state registered recyclers at least annually. The inspection consists of paperwork review and visual inspection of the facility. The inspector reviews inventory, shipping and downstream vendor records to ensure electronics and their components are being properly managed and sent to legitimate downstream vendors in a timely manner. DNR staff also review documents to ensure the facility maintains adequate insurance and OFR to close the facility if necessary. During the visual inspection, the amount of material on-site is evaluated against the funds held by a third party for closure to ensure that it is adequate.

During program year 9, DNR E-Cycle Wisconsin staff inspected all eight in-state recyclers. DNR staff also inspected one recycler in Illinois and visited a potential downstream recycler in Iowa. When it is not possible to visit 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 also assesses collector compliance through annual reports and inspections. A registered collector should be working with at least one registered recycler to provide electronics that will be recycled on behalf of manufacturers, but there aren't other limits regarding who can be a registered collector if they follow program requirements. Registered collectors need to maintain records, report to the DNR annually, and comply with all other state and local laws.

Registered collectors are inspected less frequently than recyclers due to the high number of sites. E-Cycle Wisconsin staff focus inspection efforts on new collection sites, collectors that consolidate material for other collectors, large collectors operating multiple sites, and collectors that staff have concerns about due to reporting issues or complaints against them. In addition to determining whether collection sites are following requirements and best management practices, inspections provide an opportunity to receive feedback and learn how different sites operate. Therefore, the DNR plans to inspect collectors not fitting one of above categories at least once every 10 years.

To ensure collectors understand how to effectively manage their sites, the DNR uses methods beyond inspec-

tions to provide technical assistance, such as mailing information, emails, phone calls and collector workshops. Workshops include presentations on requirements, best management practices and choosing a reputable recycler. These sessions are also a valuable opportunity for e-cycling professionals to share successes and help one another with challenges. In program year 9, the DNR held workshops in Green Bay, with approximately 40 participants plus another dozen attending via webinar; and in Plover (central Wisconsin), with more than 50 participants (no webinar option was available). Participants gave positive feedback, and the DNR will continue offering workshops around the state, including in November 2018 in Kenosha County.

Compliance among registered collectors and recyclers

DNR staff continue to track electronics and components from collection to end markets by working with collectors and recyclers to verify weights of materials received and shipped out by recyclers. Staff also review documentation and contact downstream recyclers to verify weights of materials received and pounds eligible for manufacturer credit.

In recent years, it has become more challenging to track materials through the first steps in the recycling process. As the number of registered recyclers has decreased and recycling costs have increased, more collectors have sent electronics to larger collectors that consolidate the materials and ship full loads to recyclers. These arrangements can make recordkeeping difficult and create room for error. To ensure that electronics are counted accurately, in 2017 the DNR updated a guidance document that clarifies recordkeeping and reporting requirements for registered recyclers and collectors. Collector reports for program year 9 reflected these updated procedures for accurately tracking weights collected under E-Cycle Wisconsin.

Since E-Cycle Wisconsin began, several recyclers and collectors have been removed from the program through suspension or revocation of their registrations. In all cases, the DNR gave collectors and recyclers extra time to submit paperwork and offered assistance to help them comply.

During program year 9, the DNR suspended four collectors' E-Cycle Wisconsin registrations for failure to submit annual registration and report forms. Three subsequently registered and returned to compliance, and one notified the DNR that it no longer wished to participate in the program.

The DNR sent one registered recycler an NON during program year 9 for failure to maintain adequate OFR, and the recycler was working with the DNR to resolve the issue as of October 2018. DNR staff also continue to work on ongoing enforcement cases for former recyclers.

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.

Inquiries from aspiring recyclers

Electronics recycling has appealed to some as a business opportunity. Many people believe that recycling electronics is simple and don't understand that electronics contain hazardous materials, such as lead and mercury, that can cause health issues for people who are exposed to those materials through the dismantling process. There is also potential for environmental harm that could result in costly cleanups on their property.

DNR staff continue to receive inquiries each year from people interested in recycling electronics. 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 government recycling programs, other recyclers and collectors, and salvage yard operators—to help advise small recyclers about the proper way to manage electronics. During 2018, DNR e-cycling, solid waste and hazardous waste staff have also been working to update external guidance documents to make them easier for small-scale recyclers to follow.

The DNR received a complaint in fall 2018 about a former auto salvage yard that had been improperly managing CRT TVs and other materials.

Illegal disposal and irresponsible electronics processing

The DNR received approximately 10 formal electronics-related complaints during the 2017-2018 program year. Two were complaints received about salvage yards allegedly mismanaging electronics, which were still under investigation as of October 2018. The DNR referred one complaint to the U.S. Occupational Safety and Health Administration because the primary concerns were regarding health issues employees were experiencing. The remaining complaints were minor, involving small amounts of electronics that were not being handled properly. The DNR addressed those cases through letters, phone calls and/or visits by DNR staff. In most cases, the people involved did not understand laws related to electronics management and were quick to comply when they learned they could not continue operating in the same manner.

Although DNR staff did not receive any significant electronics-related complaints during 2018, they continue to be concerned about collectors turning to irresponsible, unregistered recyclers because of the high cost of recycling electronics responsibly. 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. This topic is addressed during the DNR's site inspections.

DNR staff continue to pursue ongoing enforcement cases as well. The DNR estimates more than 5 million pounds of CRTs and CRT glass were dumped and stockpiled in the six largest enforcement cases since 2015, and cleanup is underway or has yet to begin at some sites.

Disposal ban compliance and public awareness

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 will help the DNR measure awareness of Wisconsin's electronics recycling law and compliance with electronics disposal bans. A full report on the survey results will be available on the DNR's website in early 2019.

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.

Public awareness efforts

The need for continued and expanded consumer education—to reduce illegal dumping, encourage responsible

recycling and reduce the volume of unused electronics stored in people's homes—was a major theme during discussions at the 2018 E-Cycle Wisconsin stakeholder meeting. Based on the stakeholder feedback and suggestions, the DNR is expanding its public outreach efforts during the 2018-19 state fiscal year and will work with stakeholder to identify additional opportunities for effective education. Results from the DNR's 2018 household survey will also inform these 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 campaigns, participation in outreach events, and providing outreach materials to local governments and E-Cycle Wisconsin participants. These efforts help ensure households and schools are aware of the statewide disposal ban on electronic devices and that manufacturers meet their recycling targets.

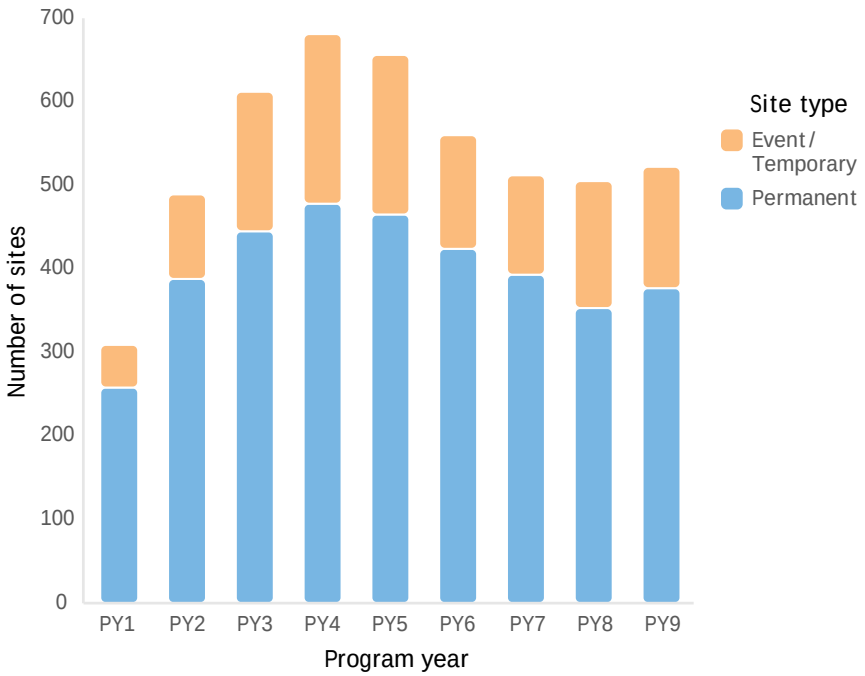
The DNR's 2017-18 advertising campaign was focused on winter holidays and spring cleaning time. The DNR's 2016 household survey showed many residents were storing unused electronics and that the primary reason for not recycling was that they did not know where or how to do so. The campaign used advertising on internet radio, Wisconsin Public Radio and digital platforms to drive Wisconsin residents to the DNR's list of registered collection sites. Overall, the DNR's electronics recycling webpages received more than 140,000 visits between July 2017 and June 2018.

In 2018, the DNR expanded use of social media to reach the general public. The initial results showed active engagement and increased traffic to the DNR's electronics recycling pages. The DNR's 2018-19 outreach effort will make more use of social media and use results from the 2018 household survey to improve the campaign's effectiveness.

Program challenges

In evaluating whether changes might be 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, 2016, 2017 and 2018), 2017 online surveys of registered E-Cycle Wisconsin participants, and statewide household surveys (2010, 2011, 2013, 2016 and 2018) have provided valuable input.

Figure 10: Registered collection sites over time



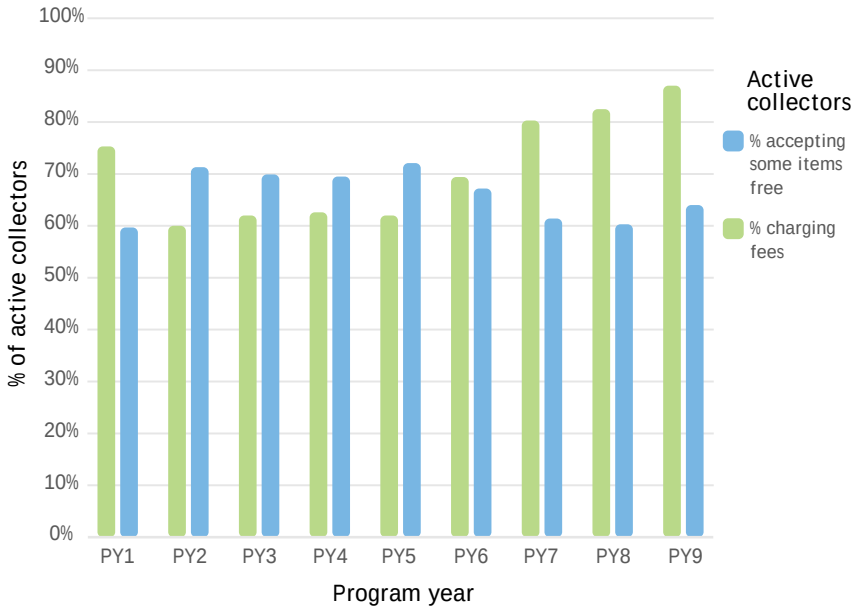
Wisconsin's law is designed to operate on free-market principles, with collectors, recyclers and manufacturers conducting private negotiations to set recycling prices. However, decreasing man-

ufacturer targets, combined with significant commodity market disruptions and steady 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

Over the past few years, challenging economics for electronics recycling have affected Wisconsin residents' access to responsible recycling. This lack of convenient and affordable consumer access was a major topic of discussion at the 2018 E-Cycle Wisconsin stakeholder meeting.

Figure 11: Percent of registered collectors charging fees and accepting some items for free



As shown in Figure 10, the number of collection sites registered with E-Cycle Wisconsin increased through program year 4, but then declined, though the number has stabilized. In program year 9, there were 377 permanent and 145 temporary or event collection sites registered with E-Cycle Wisconsin, a total of 522 (a slight increase from program year 8, but down 23 percent from the program year 4 high of 681).

The reduction in collection opportunities has affected residents in both rural and urban areas. During program year 9, there were E-Cycle Wisconsin collection sites in 65 of Wisconsin's 72 counties, covering 99 percent 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 A shows permanent and temporary collection sites registered during program year 9. Each site is surrounded by shading in a radius of 10 miles in the southern half of the state and 15 miles in the northern half, reflecting the average distance respondents reported they were willing to drive to recycle electronics on a 2010 DNR statewide household survey. These illustrate the mostly rural portions of the state that lack convenient access to collection sites. The map in Appendix B illustrates the average number of residents per collection site in each county.

As shown in Figure 11, there has been a substantial increase in the percentage of collectors charging consumers fees for electronics. In program year 9, 87 percent of active E-Cycle Wisconsin collectors charged consumers a collection fee of some sort, compared with 62 percent in program year 5. The percentage of active collectors taking at least some items for free fell from 72 percent in program year 5 to 64 percent in program year 9. 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.

The fees consumers pay reflect charges recyclers pass on to collectors. In August 2017 DNR surveys of registered collectors and recyclers, virtually all E-Cycle Wisconsin collectors were 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). More than 90 percent of collectors reported paying recyclers for these items, which helps explain why there are few free recycling options for TVs and monitors around the state. Collectors have also reported problems attracting and retaining workers due to the overall strength of the economy, potentially leading to higher collection costs if collectors need to raise wages to compete with other employers.

Getting electronics to registered recyclers

At the 2018 E-Cycle Wisconsin stakeholder meeting, participants identified dealing with electronics "scrappers" and other illegal or irresponsible recycling practices as a major challenge. For a discussion of enforcement cases related to electronics recycling, see the earlier sections of this report.

Besides illegal dumping or disposal, one consequence of having fewer registered collection sites and more fees is that individuals or collectors look for cheaper alternatives. Evidence from the last few years suggests this is indeed happening in some cases. As shown in Figure 3, the amount of material collected by registered collectors but going to non-registered recyclers has increased significantly, from about 231,000 pounds in program year to program year 9. In most cases, the material is still being managed properly, but because the law does not require registered collectors or facilities not participating in #-Cycle Wisconsin to meet the same standards as registered recyclers, there is greater potential for collectors to stockpile material and/or send it to non-legitimate downstream vendors, which can lead to costly cleanups if these businesses abandon the material.

The diversion of more valuable materials also affects costs for registered recyclers and manufacturers. If the bulk of what is sent to registered recyclers is CRTs, flat-panel displays and low-grade electronics with minimal commodity value, it means recycling costs for program-eligible ma-terials are higher than if the true mix of electronics, including computers, were 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 are dismantling electronics.

Economic challenges for responsible recyclers

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.

At the 2018 E-Cycle Wisconsin stakeholder meeting, recyclers also identified a lack of funding for research and development of new or more reliable end markets for materials derived from electronics, such as CRT glass, plastics containing flame retardants and low-grade plastics. More investment in this area, including funding to help offset capital costs for installing or upgrading processing equipment, could help address some of the market challenges discussed below.

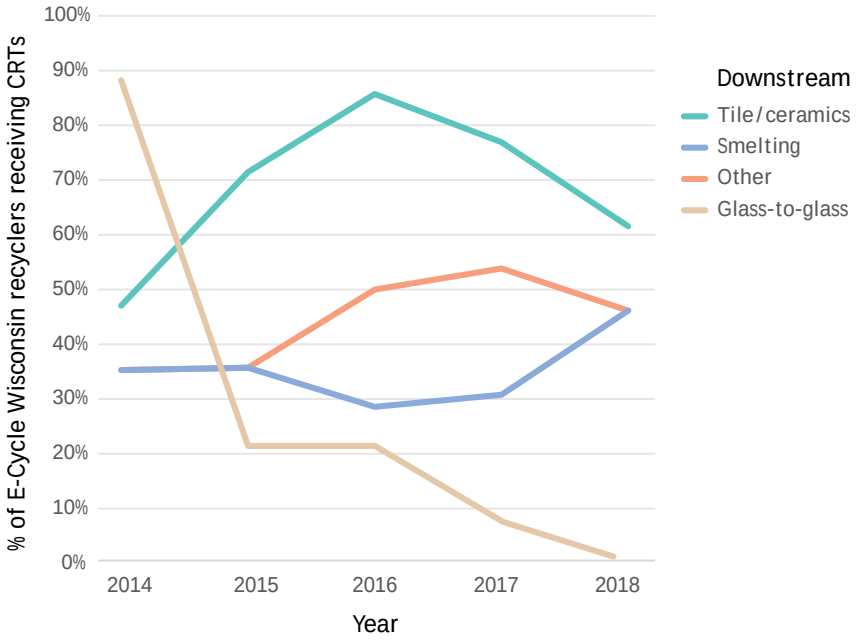
Cathode ray tubes

CRT-containing devices (TVs and monitors) make up the majority of weight collected under E-Cycle Wiscon-

sin (see Figure 4). They are also some of the most difficult and expensive devices to recycle.

Historically, primary options for recycling the leaded portion of the glass have been the manufacture of new CRTs (called glass-to-glass) or smelting. Since a 2015 maintenance shutdown, the one remaining glass-to-glass furnace facility in the world (India's Videocon) has accepted only limited glass volumes on an intermittent basis. Many recyclers began sending glass to Spain and Brazil for use in tile and other ceramics (see Figure 12). Smelting has remained a limited but steady end market for CRTs from E-Cycle Wisconsin, but became the primary outlet for several recyclers in October 2018 after Spanish companies stopped accepting CRT glass for tile manufacturing. 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.

Figure 12: End-market destinations for E-Cycle Wisconsin CRT glass, 2014-2018



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.

The high cost of CRT recycling has led several recyclers—including some involved in E-Cycle Wisconsin as registered recyclers or downstream markets—to mismanage or abandon stockpiles of glass. The DNR has spent considerable time during the past few years following up on these cases and making sure mismanaged glass is not counted for manufacturer credit under E-Cycle Wisconsin.

E-Cycle Wisconsin collection sites continue to see a large volume of CRT devices, including this TV from the 1940s that Brown County received in fall 2018. Photo courtesy Brown County Port & Resource Recovery.

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) because of the high number of screws in the devices and risk of lamps breaking. One recycler in Wisconsin is using automated processing technology to help address 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 commodity value of newer devices has dropped as manufacturers make products lighter and use fewer precious metals, and many commodity markets have remained low. This means there is less commodity value in electronics to offset recycling costs.

China, one of the largest importers of recycled material from the United States, implemented an import ban on many types of materials, including plastics, in January 2018, and other Southeast Asia countries implemented their own temporary or permanent restrictions on plastics imports after quickly becoming overwhelmed by high volumes of material. By late 2018, nearly all registered recyclers reported problems finding markets for at least some plastics, particularly low-grade plastics coming out of shredding operations and plastics containing flame retardant chemicals. If recyclers were able to ship plastics to downstream markets, prices were much lower than in recent years.

Several recyclers were exploring or beginning to implement new procedures and install new equipment to improve the marketability of plastics, and a handful of electronics manufacturers have been working to incorporate recycled plastics into new products. However, the market volatility, overall price drop and lack of ready sources 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

Another quickly emerging issue has been the increased presence of lithium ion batteries in the e-waste stream. The 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. Recyclers are spending additional money to train workers, revise procedures and invest in fire-suppression systems. The challenge is likely to grow worse as more and smaller electronics containing these batteries enter the waste stream.

Manufacturer share of recycling costs

Recyclers have said the 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 cost of recycling 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 reported that manufacturer payments covered all recycling costs, while other recyclers reported that manufacturer payments covered just a portion of their 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, especially CRTs, 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 consistently collecting more than their recycling targets. Absent 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 per s. 287.17(10), Wis. Stats.

Based on the first nine years of implementation and continued 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 electronics recycling. These ideas for the Legislature's consideration are based on extensive conversations with stakeholders over the last several years, including at face-to-face meetings the DNR hosted in 2015, 2016 and 2018 that were attended by representatives from all major stakeholder groups.

Consider updating or replacing the manufacturer target formula

As discussed above, the weight of electronics collected has consistently been higher than overall manufacturer recycling targets. To better balance the weight of electronics that need to be recycled with manufacturer target weights, the manufacturer target formula could be adjusted to be based on weight received for recycling under the program during previous years.

At the 2018 E-Cycle Wisconsin stakeholder meeting attended by collectors, recyclers and manufacturers, 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 incorporate recycled content in new products. The Legislature could request a study of the feasibility and implementation steps for these and other alternative manufacturer target-setting methods in Wisconsin.

Consider changing the method for encouraging rural collection

The current rural incentive allows manufacturers to count 1.25 pounds for every pound collected in a county designated as rural under the law. Since the overall weight collected has consistently exceeded manufacturer targets, however, this incentive appears to have done little to encourage rural collection.
One way to ensure residents in rural Wisconsin have access to electronics recycling opportunities could be to replace the current rural incentive with an alternative method to ensure that, regardless of the overall manufacturer target, manufacturers and recyclers would provide attention to rural areas. For a map of urban and rural counties under s. 287.17(1), Wis. Stats., see Appendix C.

Another option would be to allow the DNR to award grants to create more electronics recycling opportunities in underserved areas of the state, using money received from manufacturer shortfall fees. While the amount of money available each year would be relatively small (around $10,000), it could be used to defray expenses for improvements at permanent collection sites or for planning and executing collection events.

Consider changing program year dates

The current program year runs from July 1 through June 30. In many cases, contracts and pricing agreements among collectors, recyclers and manufacturers change at the beginning of a new program year. Since many of them—especially local governments and manufacturers—budget on a calendar year basis, this makes it hard for them to anticipate and manage pricing changes that happen in the middle of the calendar year. To address this, the program year could be changed so it corresponds to a calendar year (Jan. 1 to Dec. 31). This would require switching annual report/re-registration deadline for collectors and recyclers to Feb. 1 and for manufacturers to March 1, switching the recycler mid-year report deadline to Aug. 1, and changing the due date of this report to June 1. One way to accomplish the transition would be to have program year 11 run from July 1, 2019, through

Dec. 31, 2020, with manufacturer targets adjusted accordingly.

Consider reducing manufacturer registration fees

The graduated fee system ($0 if fewer than 25 covered devices sold in Wisconsin; $1,250 if 25 to 249 devices sold; and $5,000 if 250 or more devices sold) has generally worked well. Some small manufacturers, however, have said paying these registration fees across many states can be difficult. If the thresholds for not paying a registration fee and the reduced fee level were raised, it could encourage compliance among smaller manufacturers and make the per-unit costs more equitable. To do this, registration fee levels in s. 287.17(4)(b) could be changed to the following:

- $5,000 if the manufacturer sold 500 or more covered electronic devices in this state during the last program year.
- $1,250 if the manufacturer sold 250 to 499 covered electronic devices.
- $0 if the manufacturer sold fewer than 250 covered electronic devices.

Consider updating device definitions

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. The following adjustments could help make definitions easier to consistently apply:

- 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.
- Update the definition of consumer printer to explicitly include new types, such as small photo printers.
- 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.

In addition, to make the collection and recycling process easier for consumers and recyclers, the DNR suggests broadening the definition of "peripheral" in s. 287.17(1) 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.

Consider adding covered schools

Currently, E-Cycle Wisconsin includes only K-12 public schools and private schools participating in the Parental School Choice Program. Making all K-12 schools eligible under E-Cycle Wisconsin would be a more consistent approach, make outreach simpler and provide recyclers with another source of potentially higher-value material. To accomplish this, 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.

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

Through conversations with stakeholders in recent years, most notably at the 2018 stakeholder meeting, 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 and/or the DNR could reach out to parts of the state that have had few collection sites or events and try to work with local governments, non-profits or businesses to organize collection events or permanent sites. In some cases, there may already be collection efforts taking place 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 collections sites.

More value for consumers

On its household surveys, the DNR has asked residents about the amount they are willing to pay to recycle electronics and reasons they were unable to recycle electronics. The answers point to steps collectors and recyclers could take to make consumers more willing to pay recycling fees, and to encourage consumers to recycle more valuable items like computers and other data-containing devices, which could help reduce overall recycling costs.

On the DNR's 2016 survey, concern about data security was one of the top barriers to recycling electronics, and earlier surveys found many residents were willing to pay more to recycle electronics with a guarantee of safe data destruction. Collectors can look at their operations to ensure they are securely handling 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 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.

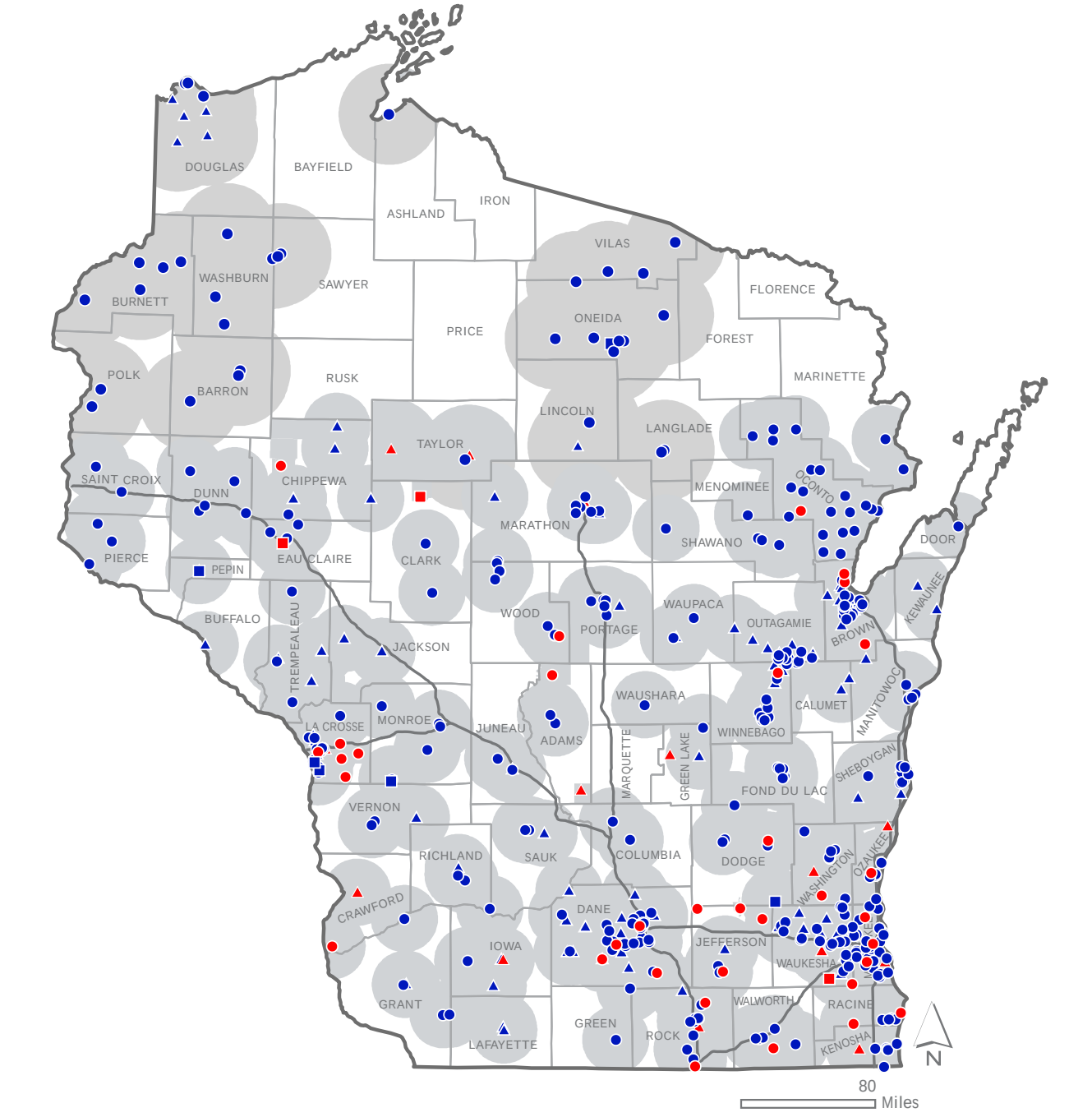
Improving consumer awareness

At the 2018 E-Cycle Wisconsin stakeholder meeting, a major theme was expanding public awareness of the need to recycle electronics and the cost associated with responsible recycling. As discussed above, the DNR continues to explore new ways to fulfill its statutory obligation to educate the public about electronics recycling. Local governments and electronics retailers also have statutory requirements to educate residents and customers on this topic, and both groups could take a fresh look at their efforts as the electronics recycling law nears its 10th anniversary. Manufacturers, recyclers and collectors could also add to existing consumer education efforts.

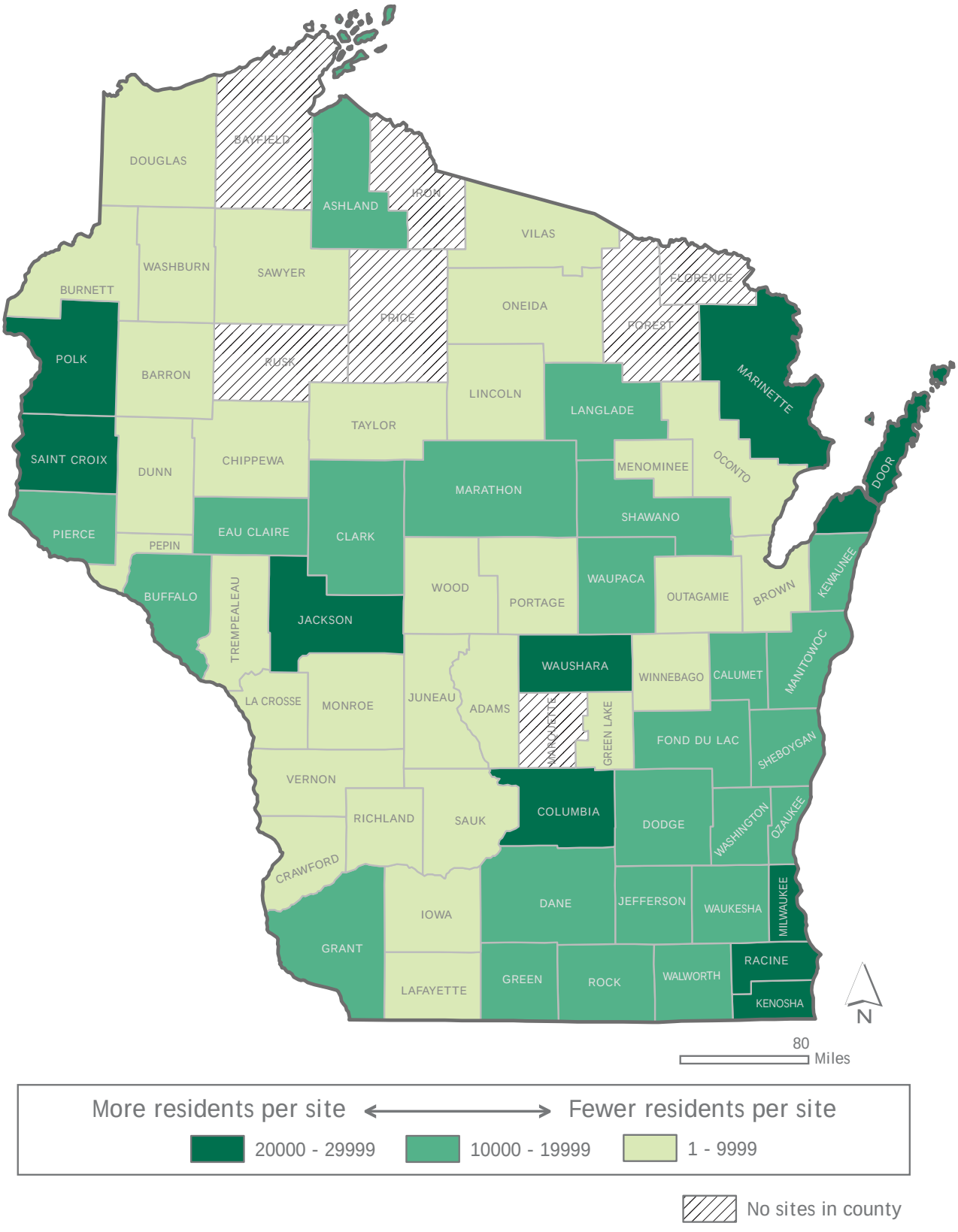
Recycling market development

Recyclers have identified as a challenge the lack of funding for research and development of new or more reliable end markets for materials derived from electronics, such as CRT glass, plastics containing flame retardants and low-grade 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.

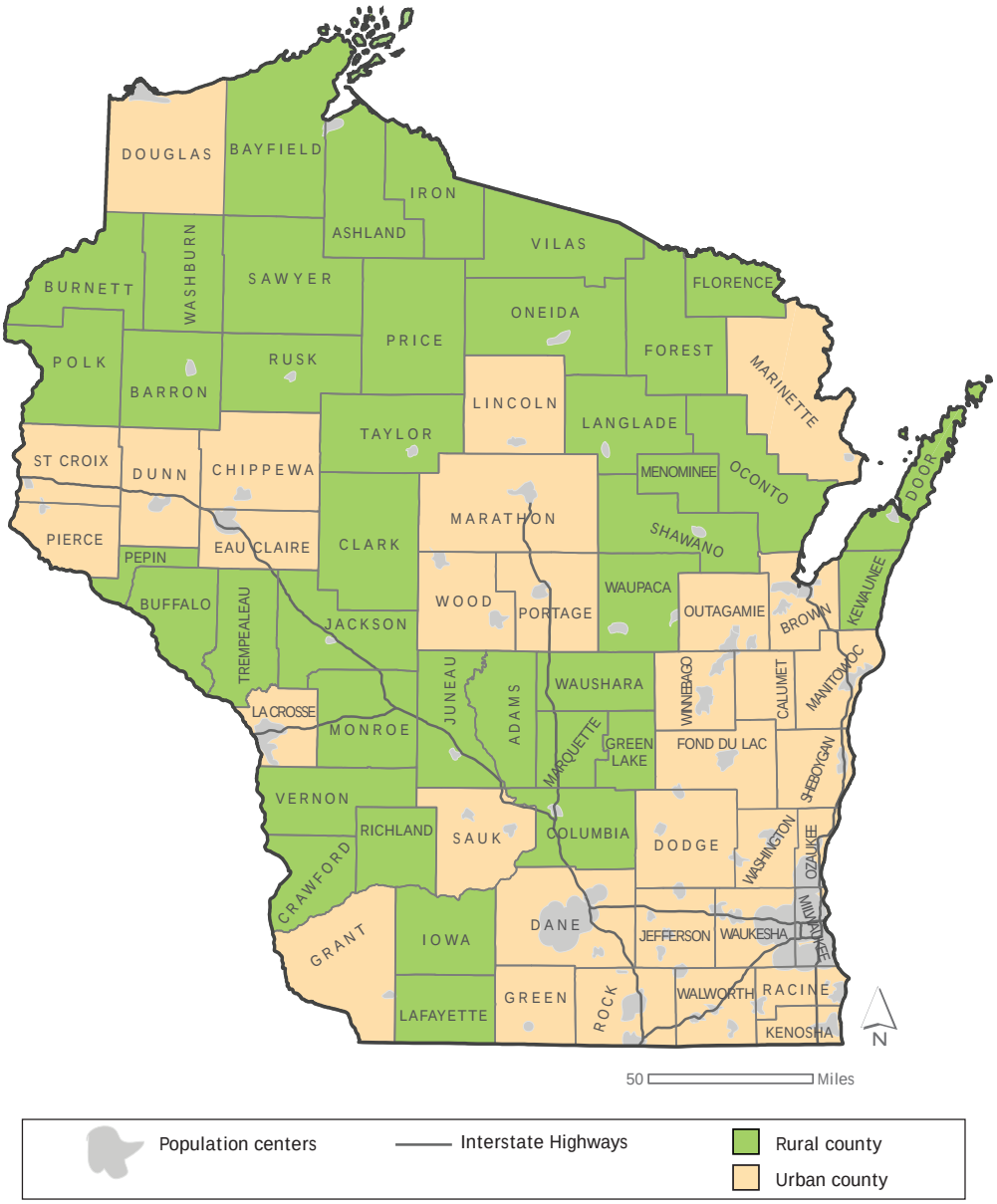
Appendix A: Map of collection sites registered under E-Cycle Wisconsin during program year 9



Appendix B: Map of county residents per registered collection site, program year 9



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



Wisconsin Department of Natural Resources
Bureau of Waste and Materials Management
P.O. Box 7921, Madison, WI 53707 | DNRWIe-cycling@wisconsin.gov

PUB-WA 1873 2018