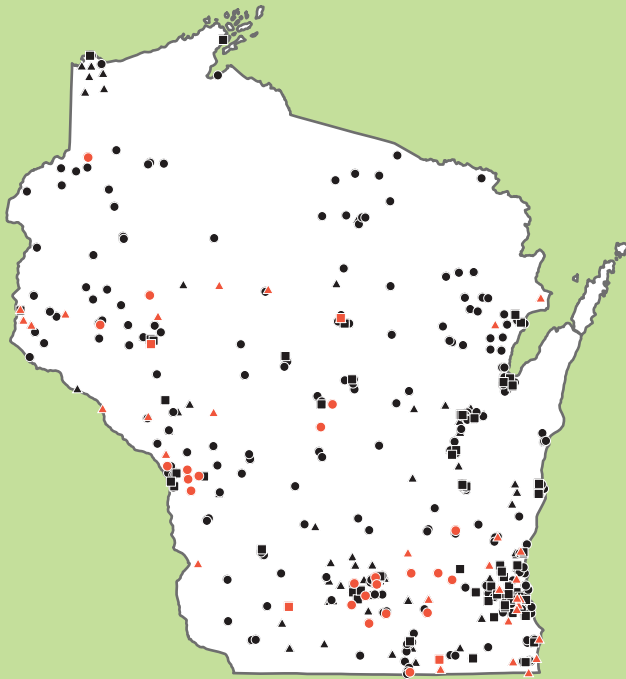




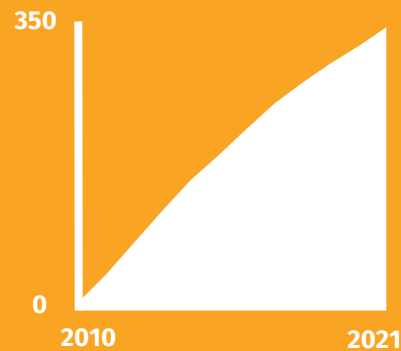
# E-CYCLE WISCONSIN 2021 REPORT

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

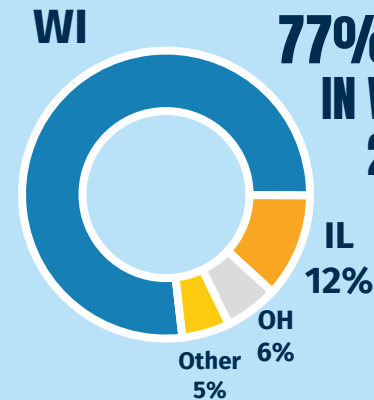
November 2021



**545**  
COLLECTION SITES IN  
67 COUNTIES



**350**  
MILLION  
POUNDS  
RECYCLED  
SINCE  
2010



**77% RECYCLED  
IN WISCONSIN  
2020-21**

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## Executive summary

Wisconsin's electronics recycling law has produced many successes since it took effect in 2010, recycling nearly 350 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.

Successes for program year 12 (July 2020 to June 2021) include the following:

- Registered collectors took in 23.4 million pounds of electronics, or 4 pounds per Wisconsin resident, an increase of 10% from the previous program year. This brought the total collected for recycling through E-Cycle Wisconsin since January 2010 to nearly 350 million pounds of electronics.
- 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 77% of weight processed.
- A Department of Natural Resources study that collected and sorted samples of waste going to Wisconsin landfills found the estimated weight of TVs and monitors arriving at landfills dropped 85% between 2009 and 2020.
- A 2021 DNR statewide household survey found fewer stored TVs, computers and cellphones in Wisconsin households compared with 2018, with more households reporting they had recycled or reused unwanted electronics instead of storing or trashing them.
- The number of registered collection sites increased from the previous year, and 99% of the state's population lived in a county with at least one collection site or event.
- 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.

### Addressing program challenges

In conversations with the DNR, E-Cycle Wisconsin participants have praised many aspects of the law, but noted several areas of concern, including a lack of affordable, convenient recycling in some areas; gaps in 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.

In 2021, the DNR worked with stakeholders, the Legislature and Gov. Evers to address many of these challenges. A bill, passed unanimously by the Legislature and signed into law by Gov. Evers as 2021 Wisconsin Act 79, included several changes that had been recommended in previous DNR annual reports. The most significant provisions included the expansion of E-Cycle Wisconsin to include all K-12 schools, a switch from the state fiscal year to a calendar year for the E-Cycle Wisconsin program year, reduction or elimination of annual registration fees for smaller manufacturers, and authorization for a new grant program the DNR will administer to provide support for electronics collection in underserved areas.

In addition, with input from stakeholders, the DNR drafted administrative rules to set standards for the collection, transportation and processing of electronics; require all Wisconsin-based electronics processors to set aside money for closure and cleanup costs; strengthen customer outreach requirements for electronics retailers; and expand the types of devices included in E-Cycle Wisconsin, among other things. If approved by Gov. Evers and the Legislature, the rules will likely take effect in mid-2022.

While the statutory changes and proposed administrative rules represent significant improvements that will address many stakeholders' concerns, there is still more work to be done to ensure the long-term success

of E-Cycle Wisconsin. Both the nature of electronics being sold and the markets for materials electronics contain have changed dramatically since 2010. Recyclers' costs for properly managing materials like leaded glass in cathode ray tubes (CRTs), lithium-ion batteries and plastics have increased, while manufacturers have pushed for lower per-pound payments to recyclers. This means more of the recycling cost is being passed on to collectors and, ultimately, consumers. Higher costs have also led to fewer municipalities, nonprofits and businesses offering permanent electronics collection sites, which has reduced consumer access to convenient electronics recycling.

The DNR's new grant program should improve access and may help reduce costs for consumers in underserved areas of the state, particularly in cases where high transportation costs may be adding to consumer charges. However, because of limited funding, this will only be a partial solution. As the overall manufacturer recycling target, set by a statutory formula, increases and collection weights drop, manufacturers could reduce consumer costs and ensure they are able to meet their targets by increasing the amount per pound they pay recyclers to cover the full cost of transportation and responsible recycling. It may also be necessary to adjust the statutory target formula to better meet the needs of all program participants and consumers.

### **Recommendations for potential legislative changes**

The electronics recycling law directs the DNR to examine several aspects of the law within the annual report and make suggestions for possible changes. Continued evolution in consumer electronics, along with fluctuations in sales of electronic devices, will present challenges unless the program can be made more adaptable and flexible. The following is a list for the Legislature's consideration, based on stakeholder input, of changes that could be made to improve the electronics recycling law and ensure its continued effectiveness.

- To better meet the electronics recycling needs of Wisconsin households and schools, and to make the program more predictable for recyclers and manufacturers, the Legislature could consider changing or replacing the manufacturer target formula and method of encouraging collection in rural areas.
- To improve the function of the market-based system Wisconsin's electronics recycling law creates, and to allow recyclers to recoup as much of their costs as possible, the Legislature could consider adding a provision to the law to allow registered E-Cycle Wisconsin recyclers to carry over credits for weight they have recycled, but not sold to manufacturers, for one or two program years.
- To make it easier for the DNR and manufacturers to determine whether the law covers newer devices and improve proper management of newer problem components, such as lithium-ion batteries, the Legislature could consider updating and clarifying device definitions to better fit the changing nature of electronics.

## **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 bans 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.

Several developments in 2021 will help Wisconsin achieve greater success in meeting these criteria. These included bipartisan legislation, 2021 Wisconsin Act 79, that fulfilled many of the recommendations from previous reports, along with proposed administrative rules the DNR drafted with stakeholder input. In addition, DNR studies showed the electronics recycling law has helped greatly reduce the number of TVs and monitors going to Wisconsin landfills, and more Wisconsin households have been recycling more of their unwanted electronics instead of storing them.

**Table 1: Program year 12 registration and participation**

Category	Registered	Active
Collectors	130	125
Recyclers	17	14
Manufacturers	152	n/a
Brands	228	n/a

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

The DNR continues to engage with program stakeholders and the 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 and opportunities for addressing them through the DNR’s administration of the program, voluntary stakeholder actions and potential legislative changes.

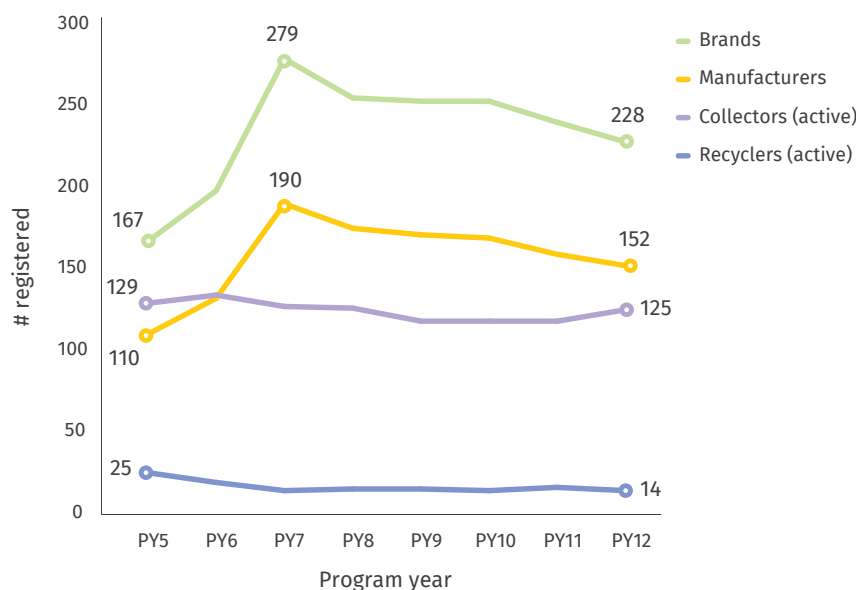
## Program participation

Table 1 shows program year 12 (July 2020 through June 2021) registrations, and Figure 1 illustrates registration trends over time. Recycler registrations dropped from 18 to 17, with seven of the 14 active recyclers in Wisconsin.

The number of registered manufacturers and brands dropped slightly, continuing a trend over the last few program years.

The number of active registered collectors—including local governments, retailers, other businesses and non-profits—increased slightly, from 118 to 125. As shown in Figure 2, the number of registered collection sites also increased, with 545 total permanent sites, one-day events and other temporary sites, compared with 477 in program year 11. The increase was largely due

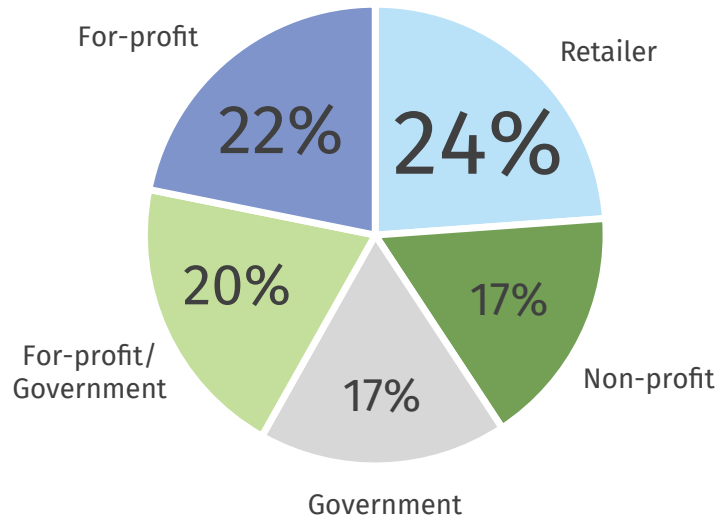
**Figure 1: Summary of E-Cycle Wisconsin registrations**



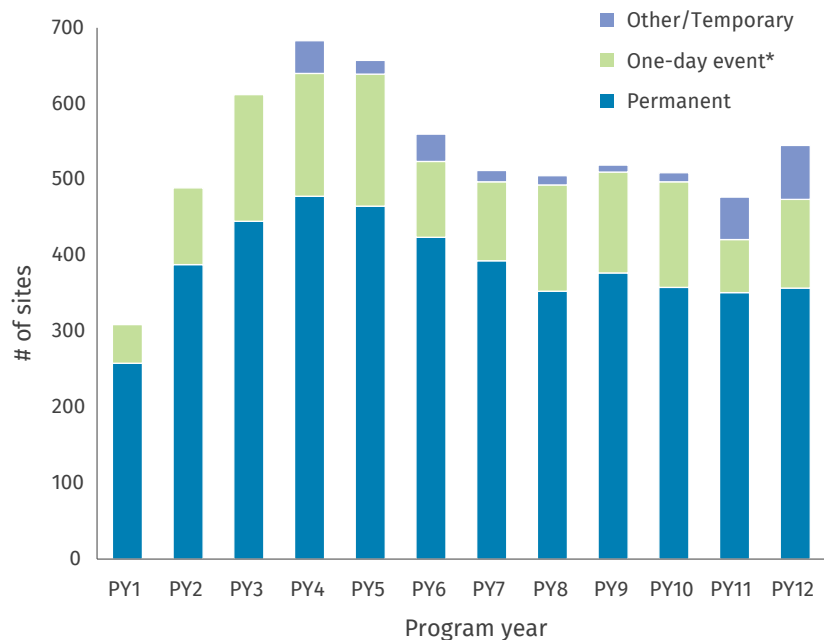
to a more typical schedule of collection events, after many were canceled in spring 2020 due to the pandemic. For-profit collectors registered the highest number of sites (228, or 42%), though about half of these—particularly one-day events—were at government-owned locations, as shown in Figure 3.

During program year 12, there were E-Cycle Wisconsin collection sites in 67 of Wisconsin’s 72 counties, covering 99% of the state’s population. The map in Appendix B shows permanent and temporary collection sites registered during program year 12. Each site is surrounded by shading in a radius of 10 miles in the northeastern and southeastern parts of the state, 15 miles in western and south-central areas, and 20 miles in the northern part of the state, reflecting the median distance respondents reported they were willing to drive to recycle electronics on the 2021 DNR household survey. These illustrate the mostly rural portions of the state that lack convenient access to collection sites.

**Figure 2: Program year 12 collection sites, by type**



**Figure 3: Registered collection sites over time**



\* Sites were registered only as “Temporary” from program year 1 to 3.

## Collection and recycling totals and analysis

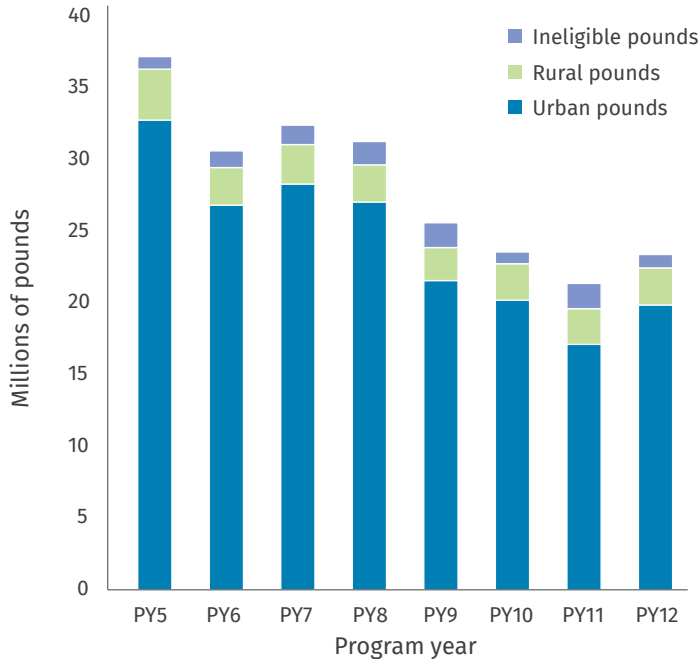
From July 2020 through June 2021 (program year 12), registered collectors took in 23.4 million pounds of electronics from Wisconsin households and schools (see Table 2), roughly equal to 4 pounds per capita.

As shown in Figure 4, the weight of eligible electronics collected increased by about 2.1 million pounds, or 10%, from program year 11. The rebound in collection was likely due in part to a return to more normal operations after pandemic-related shutdowns in spring 2020, along with an increase in manufacturer targets.

**Table 2: Pounds collected by registered collectors, program year 12**

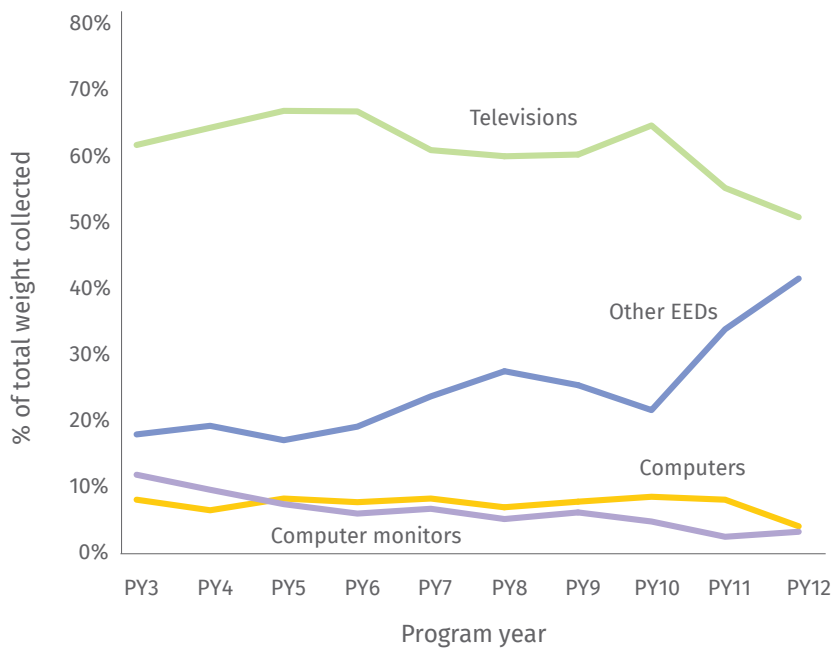
Type	Pounds
Eligible urban	19,858,702
Eligible rural	2,592,591
Dismantled by collector	755,557
Sent to non-registered recycler	172,390
<b>Total collected</b>	<b>23,379,239</b>

**Figure 4: 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.*

**Figure 5: E-Cycle Wisconsin collection, by device type**



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

Table 3 shows 23.1 million eligible pounds were available for purchase by manufacturers—to fund the recycling of the electronics—in program year 12. This was up about 7% from the weight available in program year 11 and slightly higher than in program year 10.

During program year 12, Wisconsin recyclers processed 77% of the total weight recycled. Essentially all elec-

The increase from program year 11 to 12 was larger—2.8 million pounds, or 15%—if only eligible pounds are considered, excluding electronics collectors dismantled or sent to a non-registered recycler. In program year 12, approximately 930,000 pounds of eligible electronics collectors received did not go to registered recyclers. As the weight of electronics collected has begun to more closely match manufacturer recycling targets, there may be additional economic incentive for collectors that dismantle electronics to either register as recyclers or send all eligible electronics to registered recyclers.

TVs continued to dominate the weight collected, accounting for 51% of the total in program year 12, though this was the lowest share since the program began (see Figure 5). Reasons for this likely include the shift from heavier, tube-style TVs to flat panels in the waste stream, and also the high prices many collectors are charging consumers to recycle older TVs. The proportion of other eligible electronic devices (EEDs) such as printers and other computer peripherals, continued to increase.

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

tronics collected under E-Cycle Wisconsin continue to be processed in the Midwest, as shown in Figure 6 (nearly all in the “Other” category were processed in Indiana).

## Manufacturer recycling targets and programs

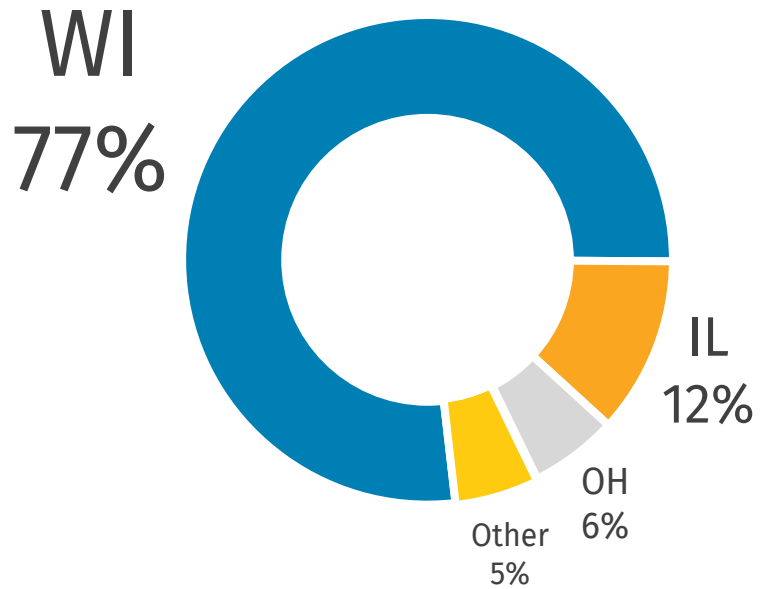
The overall manufacturer target, set by a statutory formula that uses manufacturer-reported sales of covered devices in Wisconsin, was 23.7 million pounds in program year 12, up from 22.2 million pounds in program year 11. The manufacturer targets in recent years have been lower than in the first few years of E-Cycle Wisconsin, due primarily to consumers buying lighter products, but have begun to increase. The estimated manufacturer target for program year 13 is 24.6 million pounds, the highest since program year 6.

Figure 7 shows manufacturer recycling targets and weight manufacturers purchased from recyclers by program year to meet their targets. It also illustrates the gap between pounds recycled and pounds paid for by manufacturers in the years before program year 11. Due in part to COVID disruptions and in part to increasing manufacturer targets with

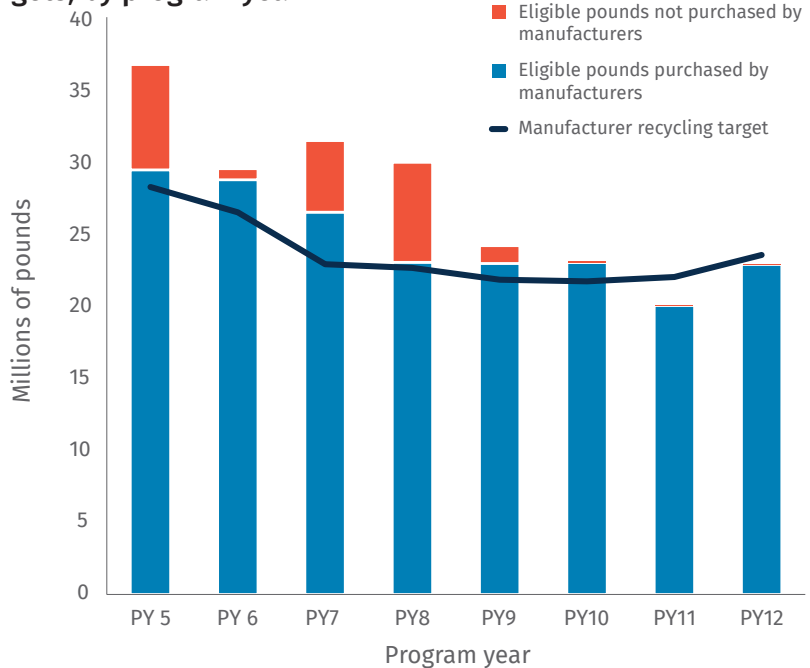
continued high recycling fees charged to consumers, the weight recycled during program years 11 and 12 was less than the overall manufacturer target. Nearly all weight recycled was sold to manufacturers during both years. As discussed below, manufacturers used credits earned during previous program years to make up most of the difference, and paid higher shortfall fees for program year 12 than in previous years.

Based on DNR surveys of registered manufacturers and discussions with stakeholders, most manufacturers

**Figure 6: Percent of pounds received by registered recyclers, by state, program year 12**



**Figure 7: Comparison of weight recycled and manufacturer targets, by program year**



**Table 3: Pounds of electronics reported by registered recyclers, program year 12**

Type	Pounds
Urban received	19,851,259
Rural received	2,593,055
Rural credit	648,264
Diverted for reuse	(2,382)
Available for manufacturers	23,090,196
Sold to manufacturers	(23,024,237)
<b>Not sold to manufacturers</b>	<b>65,959</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. Electronics diverted for reuse are not eligible for manufacturer recycling credit.*

**Table 4: Program year 12 manufacturer credit transactions**

	Credits
Beginning balance	553,469
Credits applied	(353,335)
Credits expired	(25,365)
New credits earned	34,651
<b>Total available for future use</b>	<b>209,420</b>

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

Program year	Registration fees	Shortfall fees
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	\$9,565
11	\$358,750	\$20,495
12	\$361,250	\$61,438

*Shortfall fees for program year 12 as of November 2021.*

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 12, 71 registered manufacturers participated in collectives—similar to “group plans” in other states—that contracted with recyclers for a large total sum of pounds and distributed the pounds among its members. The collectives were administered by DNA Group, Dynamic Lifecycle Innovations, Electronics Recyclers International, MRM, Reverse Logistics Group Americas and Sims Recycling Solutions. These collectives were responsible for about 81% of pounds purchased by manufacturers.

Most manufacturers continued to meet or exceed their sales weight-based recycling targets in program year 12. Twenty-four manufacturers recycled more than their targets and therefore earned a total of just under 35,000 credits that can be used during the next three program years (see Table 4). Six manufacturers used just over 350,000 credits from previous years to meet their targets, the most in any program year. At the end of program year 12, just over 200,000 credits were available to manufacturers for future use, the lowest since program year 1. Figure 8 summarizes credits applied or expired, credits earned, and total credits available from program years 5 to 12.

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. In addition, the tight supply of pounds in program year 12 made it more difficult for manufacturers to make last-minute weight purchases after the end of the program year. In total, 44 manufacturers paid or owed a shortfall fee as of November 2021. The amounts ranged from \$0.30 to \$33,141.23.

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

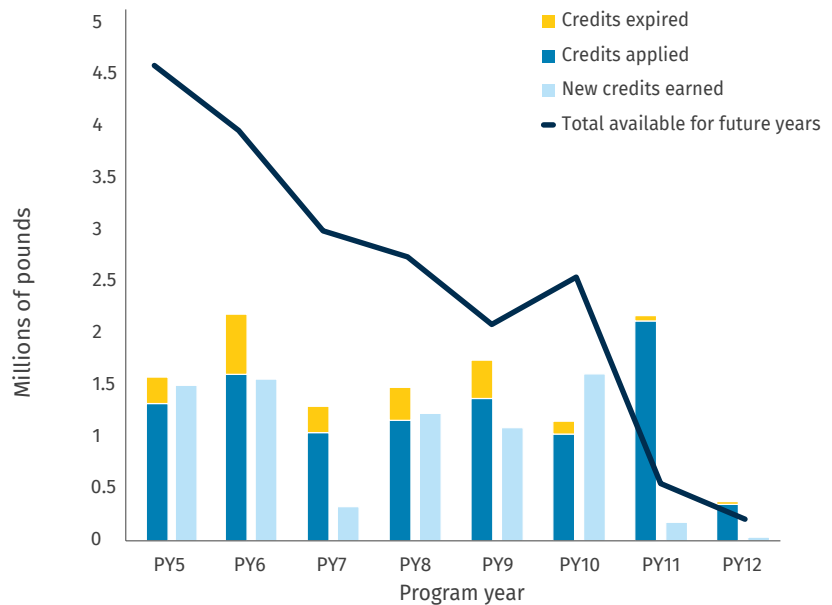


and recycling transactions among program participants.

### 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 12, the DNR revoked 15 manufacturers’ registrations for failure to submit required forms or payments. Six returned to compliance. The remaining manufacturers had either stopped selling covered electronics, the DNR could not find current contact information for them, or they remained out of compliance as of October 2021.

**Figure 8: Manufacturer credit use, by program year**



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 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 registration status. As of October 2021, there were 175 unregistered brands tracked by the DNR, primarily from manufacturers selling a low volume of covered electronics through online retailers.

### 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 12, the E-Cycle Wisconsin program conducted three rounds of online brand checks and eight 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 about retailer requirements under the law. Several manufacturers registered or re-registered with the program after retailers contacted them based on the DNR’s checks. The DNR also continued to follow up with retailers regarding customer education requirements and suggested changes to ensure full compliance with Wisconsin’s law.

### Registered recycler compliance

All electronics recyclers operating in Wisconsin must comply with solid and hazardous waste regulations. Registered E-Cycle Wisconsin recyclers must meet additional requirements, which apply whether the facility is located in-state or out-of-state. These requirements include maintaining owner financial responsibility

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

Time period	Recyclers	Collection sites
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
July 1, 2019, to June 30, 2020	3	24*
July 1, 2020, to June 30, 2021	7	71

\* Includes 13 in-person inspections of collection sites and 11 phone inspections with

(OFR) 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 which downstream vendors received the electronics and their components.

The DNR ensures compliance with program requirements through desktop record reviews for closure cost estimates, OFR and pollution liability insurance.

In addition, DNR staff check in with recyclers if questions arise regarding downstream vendors, sources of materials received or changes to their recycling process. Typically, DNR staff conduct annual inspections for in-state recyclers. Some out-of-state recyclers are also inspected on occasion; however, those occur less often because of travel constraints. Due to restriction on indoor, in-person facility inspections because of the COVID-19 pandemic, E-Cycle Wisconsin staff conducted virtual recycler inspections in program year 12.

During program year 12, the DNR conducted two facility closure inspections, one for a facility that closed in summer 2020 to verify that the facility was emptied, cleaned and the materials sent to appropriate downstream vendors., and one for a facility that changed ownership, with the new owner discontinuing the recycler registration, to confirm there was no stockpiling of electronics inside or outside of the facility.

Five of the six remaining active in-state recyclers received virtual inspections, which included a walk-through, with facility staff streaming video, a review of the facility's safety plan and a discussion of training to ensure staff understand the procedures. The inspector also reviewed closure plans and cost estimates to verify that the types of materials, amount of inventory and available storage space are accurately represented in the plan and the amount of OFR was adequate to properly close the facility. In addition, the inspector reviewed 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 are properly disposed of. The remaining in-state recycler received an inspection when staff were able to resume on-site inspections in July 2021.

Table 6 lists the number of collection site and recycler inspections the DNR has conducted for the last several program years.

### Registered collector compliance

The DNR assesses collector compliance through annual reports and inspections. Due to the large number of collection sites (averaging between 350 and 400 permanent sites), E-Cycle Wisconsin staff are unable to inspect all sites on a routine basis, and therefore prioritize inspections on sites where they can have the most impact. E-Cycle Wisconsin staff typically inspect new sites to provide technical assistance during the start-up phase, collectors that receive large amounts of electronics either on their own site or by operating as a consolidation point, and collectors that also dismantle some electronics. In addition, if the DNR receives complaints about sites, they are addressed through an inspection or phone call. Occasionally, staff inspect non-registered collection sites to provide technical assistance or investigate complaints.

In program year 12, E-Cycle Wisconsin staff conducted 71 in-person inspections at registered collection sites and one at a non-registered site. Nearly all sites were meeting program requirements and following best management practices. A handful of sites had broken glass that had not been cleaned up.

DNR staff help collectors understand how to effectively manage their sites by providing technical assistance during inspections, through emails, phone calls and collector workshops. In program year 12, the DNR held three virtual workshops, with more than 40 participants in each workshop. Due to COVID-19, no in-person workshops were held.

## **Electronics recycling separate from E-Cycle Wisconsin**

Currently, collectors and recyclers that perform basic disassembly of electronics are currently considered to be 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.

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. In 2022, DNR staff will be increasing outreach to electronics recyclers outside of E-Cycle Wisconsin to notify them of new requirements for all electronics recyclers to obtain a solid waste processing license, if the proposed administrative rules are approved.

### **Illegal disposal and irresponsible electronics processing**

Over the years, DNR staff have worked on several enforcement cases for alleged hazardous waste violations related to cathode ray tube (CRT) storage and improper management of leaded CRT glass.

One case involved a rural property in central Wisconsin rented to individuals who dismantled CRT TVs and monitors and smashed much of the glass. Whole tubes, broken glass and other waste materials were stockpiled on the property. The landlord evicted the individuals, and eventually the county foreclosed for unpaid taxes and became responsible for cleanup. In July 2021, the county approved a proposal for cleanup, and as of October 2021, much of the work had been completed and the CRT glass prepared for transportation. The case remains open, since there is additional work to be done, including disposal of the CRT glass.

In 2020, a U.S. District Court judge accepted guilty pleas from former leaders of 5R Processors, based in Ladysmith, Wisconsin, related to mismanagement of hazardous waste (leaded glass from CRTs). 5R was registered as a collector and recycler under E-cycle Wisconsin from 2010 until 2014, when questions arose about its handling of CRT glass. According to the charging documents filed in the case, 5R had accumulated and stored more than 7 million pounds of leaded CRT glass at a facility in Tennessee and 1.3 million pounds of leaded glass at several sites in Wisconsin as of November 2016. Sentences in the case ranged from five to 18 months imprisonment, with one defendant still awaiting sentencing as of November 2021, and restitution totaling \$3.9 million.

One of the sites has been rented by an electronics recycler. The bank paid the new operator to remove and



*The photos above are from a property in central Wisconsin whose occupants were accepting TVs and other electronics for free. After several years, contractors made progress on a cleanup in 2021.*

recyclers, DNR staff continue to reach out to collectors, government entities and businesses to educate them about the importance of working with responsible recyclers and the potential consequences if their electronics are mismanaged.

## Disposal ban compliance and outreach

### Illegal electronics dumping

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.

### Electronics in Wisconsin landfills

The DNR hired a contractor to conduct a statewide waste characterization study from fall 2020 to spring

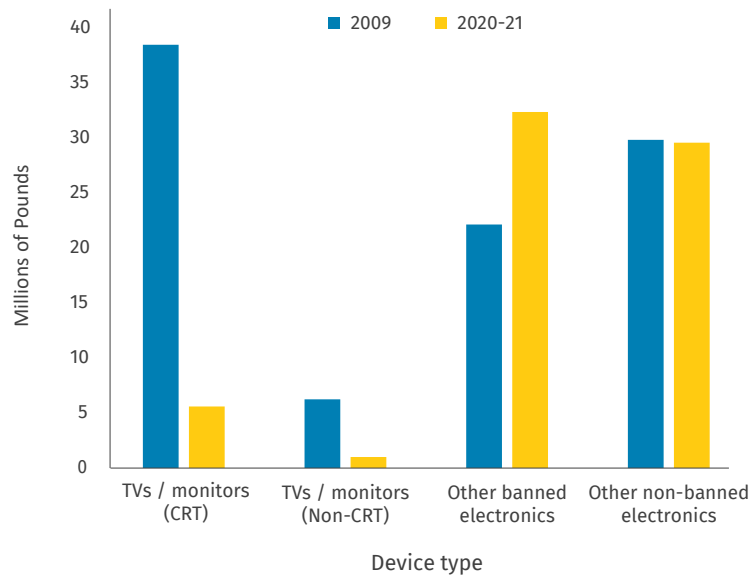
recycle the materials abandoned by 5R, which has been completed. The remaining sites still need to be cleaned up, and the DNR is continuing to work on these cases.

DP Electronic Recycling was another former E-Cycle Wisconsin recycler and collector that abandoned approximately 1.5 million pounds of CRTs at their leased facility in Elkhorn, Wisconsin. The landlord signed the property over to the lender in lieu of foreclosure. The bank evicted DP in June 2020. The bank has since sold the building and the new owner is working to remove and properly recycle the CRTs and other materials abandoned by DP.

DNR staff investigated a few electronics-related complaints during 2020-21. The majority were about CRTs being dismantled and the glass being improperly managed, such as being disposed in dumpsters, landfilled or buried on private property. The DNR addresses cases through letters, phone calls and/or visits by staff. To reduce the availability of materials going to disreputable

2021 to assess the types of materials being sent to municipal solid waste landfills in Wisconsin. During the study, workers sorted 398 samples of solid waste at 15 different Wisconsin landfills. The samples were sorted into 85 waste components, including several categories of electronics, to determine the proportion each material represented in the overall mix within the state’s landfills. The state’s most recent waste characterization study was conducted in 2009, just before the electronics disposal ban took effect, making the two studies a good before-and-after picture for Wisconsin’s electronics recycling law.

**Figure 9: Estimated weight of electronics in Wisconsin landfills, 2009 and 2020-21**



In the 2020-21 study, only two of the 398 samples (0.5%) contained a TV or monitor, while 62 samples (16%) contained other banned electronics (such as computers and computer and TV peripherals) and 125 samples (32%) contained other electronics not banned from landfills. CRT and non-CRT TVs and monitors each made up less than 0.1% of the materials going to Wisconsin landfills by weight, while other banned electronics made up 0.4% and non-banned electronics accounted for 0.3%. The study translated these percentages into tons (using the total weight of municipal solid waste landfilled in Wisconsin in 2020), though because electronics made up such a small proportion of waste, caution should be used when considering the estimated weights.

Figure 9 illustrates the changes in estimated pounds of electronics sent to landfills in the 2009 and 2020-21 studies. The estimated weight of TVs and monitors (both CRT and non-CRT) fell by 85% from 2009 to 2020-21, while the weight of other banned electronics increased by 46% and the weight of non-banned electronics remained flat.

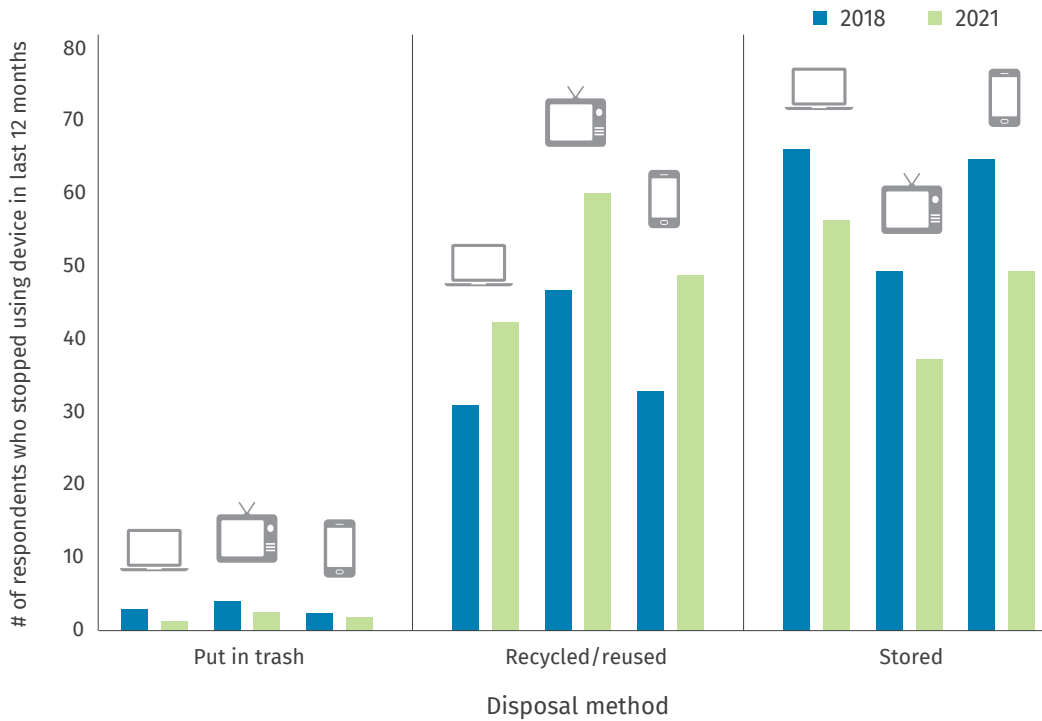
The increase in landfilling of smaller banned electronics is somewhat understandable, due to the increased use of electronics and the fact that these are easier to fit in trash containers. However, because many of these contain potentially flammable batteries, and proper recycling is often free or low-cost for these items, these results indicate more work is needed to promote recycling of electronics other than TVs and monitors.

### Household electronics disposal choices

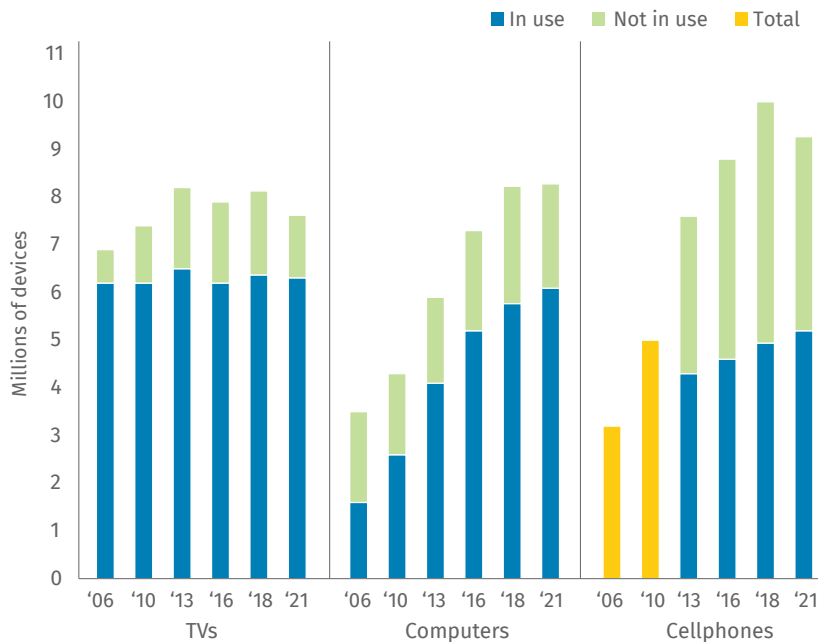
In addition to the waste characterization study, in spring 2021 the DNR conducted its sixth statewide household survey on electronics recycling since E-Cycle Wisconsin began. As in previous surveys, the 2021 results helped the DNR measure awareness of Wisconsin’s electronics recycling law and compliance 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 respondents who had a device they no longer wanted, about half of households had stored unwanted cellphones and computers and 37% had stored unwanted TVs during the previous 12

**Figure 10: Wisconsin household electronics disposal choices, 2018 and 2021**



**Figure 11: Estimated number of electronics in Wisconsin households, over time**



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

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 and providing outreach materials for local governments and E-Cycle Wisconsin participants to distribute. These ef-

months. The percent of households that had stored unwanted devices decreased substantially for all three device types from 2018 to 2021, while the percent of households that recycled or reused devices increased, as shown in Figure 10.

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 (1%) or TV (3%) in the trash.

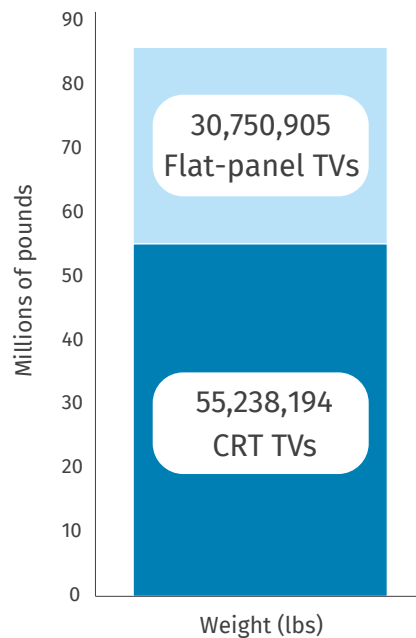
**Public awareness efforts**

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.

forts 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 2021 household survey results highlighted the importance of continuing public awareness campaigns. Based on the survey, the DNR estimates Wisconsin households had, in use and in storage, a total of 7.6 million TVs, 8.3 million computers (including desktops, laptops and tablets) and 9.3 million cellphones in 2021. Of those, survey responses indicated 17% of TVs, 26% of computers and 44% of cellphones in homes were not being used. This translates into approximately 1.3 million TVs, 2.2 million computers and 4 million cellphones ready for disposal (see Figure 11).

**Figure 12: Estimated weight of unused TVs in Wisconsin households, 2021**



*Estimate based on 2021 DNR household survey and average unit weights provided by the Electronics Recycling Coordination Clearinghouse.*

For the first time, the DNR asked respondents to report the numbers of cathode-ray tube (CRT) and non-CRT TVs separately, to gauge how many of the heavy, costly-to-recycle CRTs remain in state homes. The results showed that, while flat-panel TVs (6.7 million) now outnumber CRTs (960,00) by nearly 7 to 1, CRTs still account for two-thirds of the estimated weight of unused TVs in Wisconsin households. As shown in Figure 12, the DNR estimates there are a total of 86 million pounds of unused TVs in Wisconsin households, with CRTs accounting for 55 million pounds.

Overall, the 2021 survey results showed progress in reducing the number of unused electronics in Wisconsin households and in increasing public awareness of E-Cycle Wisconsin.

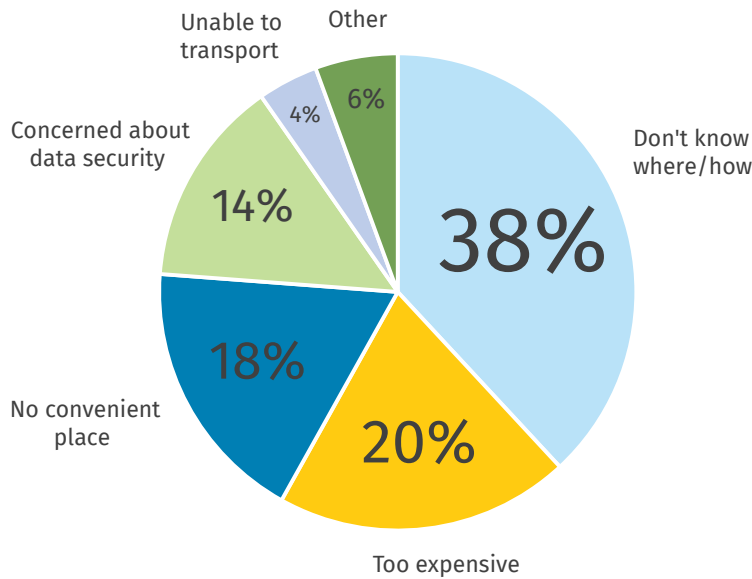
The 2021 survey showed awareness of the electronics disposal ban increased from 42% in 2018 to 48% of respondents. Awareness of E-Cycle Wisconsin increased from 18% in 2018 to 31% of respondents in 2021, the highest level since 2011.

The estimated number of unused TVs, computers and cellphones in Wisconsin households fell from 9.4 million in 2018 to 7.6 million in 2021, and was also lower in 2021 than in the 2016 survey (8.0 million). This could indicate more households are recycling old electronics, rather than storing them (which is supported by the disposal method data discussed above). It might also indicate some people are using electronics for longer.

## Addressing 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

**Figure 13: Reason unable to recycle electronics during last 12 months, 2021**



the public. In particular, stakeholder meetings, collector workshops, surveys of registered E-Cycle Wisconsin participants, and statewide household surveys 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. In recent years, consumers and collectors have been paying an increasing share of the costs of recycling. Combined with limited access to registered collection sites in some parts of the state, this has led to instances of illegal disposal and dumping, stockpiling

by irresponsible recyclers and, recently, challenges for manufacturers in meeting their recycling targets.

The DNR has worked with the Legislature, Gov. Evers and program stakeholders to identify and implement policy solutions for these challenges, and the DNR’s E-Cycle Wisconsin staff have focused their work on addressing barriers to electronics recycling and providing technical assistance.

### Identifying and addressing electronics recycling barriers

The DNR’s household recycling surveys have asked respondents about reasons they were unable to recycle electronics despite wanting to do so. As shown in Figure 13, the top reasons on the 2021 survey were “Didn’t know where or how” (38%), “It was too expensive” (20%) “I didn’t have a convenient place to recycle” (18%) and “I was concerned about my data security” (14%).

To help address the barriers of lack of awareness, cost and lack of convenient recycling locations, the DNR continues to maintain and promote its online list of registered E-Cycle Wisconsin collection sites and manufacturer mail-back programs, including updating it throughout the year with information about one-day collection events.

The DNR’s 2020-21 advertising campaign focused on the 10-year anniversary (in September 2020) of the electronics disposal ban, winter holidays and spring cleaning time. The campaign used digital advertising, paid search ads, paid and unpaid social media, sponsorship messages on Wisconsin Public Radio and ads on Spanish-language radio stations 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 nearly 440,000 visits between July 2020 and June 2021, an increase of more than 250,000 from the previous year.

To address concerns about data security, collectors can ensure their operations securely handle data-containing devices and work with recyclers to provide customers 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.



## Improving access to responsible electronics recycling in underserved areas

As shown in Figure 3, the number of collection sites registered with E-Cycle Wisconsin increased through program year 4, then declined steeply before leveling off. While all Wisconsin counties have had at least one registered collection site or event since 2010, the reduction in collection opportunities has affected residents in both rural and urban areas. Though 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 significant distance to properly recycle electronics, increasing the likelihood of illegal dumping or disposal (see map in Appendix B). And while urban areas generally had sites available, they were sometimes limited to residents of specific municipalities, leaving residents outside of those municipalities without convenient recycling options.

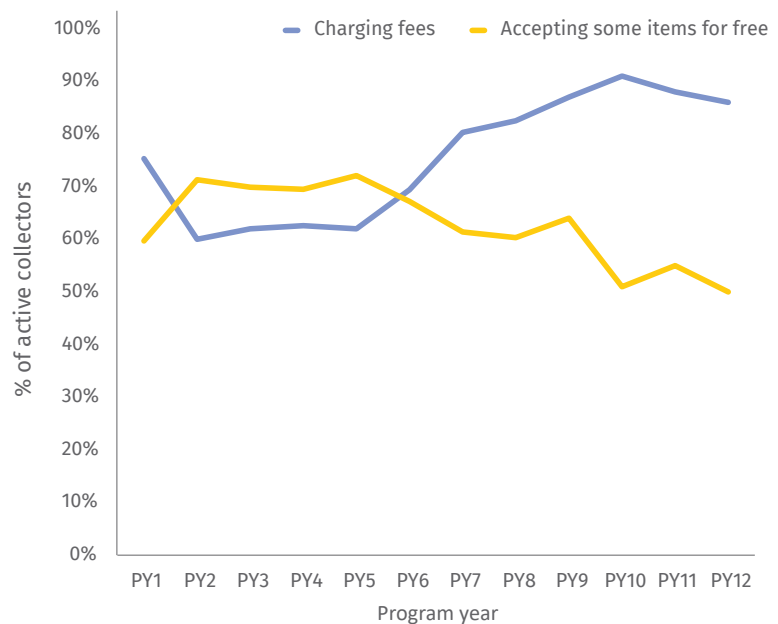
In an effort to provide more collection opportunities in underserved areas, the DNR worked with legislators to draft language for a grant program, modeled on a successful Michigan effort, to direct some of the funds the DNR receives from registered manufacturers toward collection efforts in counties or municipalities that have lacked consistent collection sites or events. This program was included in a bill passed unanimously in both the state Senate and Assembly in 2021, which Gov. Evers signed into law as 2021 Wisconsin Act 79 in August. The DNR hopes to issue the first round of grants under the program in 2022. In addition to providing collection opportunities in underserved areas, the grant program may be able to help collection sites collaborate or consolidate so that larger loads can be shipped to recyclers, increasing efficiency and reducing costs..

## Reducing costs for consumers and collectors

As shown in Figure 14, in recent years there has been a substantial increase in the percentage of collectors charging consumers fees for electronics. In program year 12, 86% 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 50% in program year 12. 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.

Other services/incentives DNR 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.

**Figure 14: Percent of registered collectors charging fees and accepting some items for free**



These fees reflect charges recyclers pass on to collectors. In the last few years, nearly 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).

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

In the past, consistent oversupply of eligible pounds, rising manufacturer compliance costs across programs in all states and competition among recyclers led many manufacturers to push for lower per-pound payments to recyclers. This means more of the recycling cost is passed on to collectors and, ultimately, consumers. As the overall manufacturer target increases and collection weights drop, manufacturers could reduce consumer costs and ensure they are able to meet their targets by increasing the amount per pound they pay recyclers to cover the full cost of transportation and responsible recycling.

In addition, the DNR's new grant program may help reduce costs for consumers in underserved areas of the state, particularly in cases where high transportation costs may be adding to consumer charges.

### **Getting electronics to registered recyclers**

In program year 12, approximately 930,000 pounds of eligible electronics collectors received did not go to registered recyclers. This brought the total since 2010 to 13.8 million pounds of electronics collected by registered collectors but not sent to registered recyclers. 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 were reaching registered recyclers.

The DNR's proposed administrative rules are designed to help address this problem by setting more uniform standards for all Wisconsin facilities that dismantle electronics, including requiring all—not just registered E-Cycle Wisconsin recyclers—to set aside money for closure and cleanup costs. Because more facilities will be closer to meeting the requirements to be a registered recycler, more may choose to participate in the program, thus making more of this “lost” material eligible for manufacturer targets. Manufacturers can also help ensure all eligible electronics count toward their targets by offering recyclers payments that fully cover recycling costs, thus reducing the incentive for collectors to divert some of the more valuable devices from the program.

### **Ensuring safe management of hazardous materials in consumer electronics**

#### *Video display recycling costs*

Video display devices (TVs and monitors) have made up the majority of weight collected under E-Cycle Wisconsin (see Figure 5). They are some of the most difficult and expensive devices to recycle, particularly older CRT models, which contain leaded glass. Flat-panel liquid crystal display (LCD) devices are also costly to recycle, because they are lit by thin, mercury-containing fluorescent tubes. Manual disassembly of the displays is time-consuming and thus expensive). One Wisconsin recycler 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.

Several recyclers—including some involved in E-Cycle Wisconsin—have mismanaged or abandoned stockpiles of CRT glass. While there has been recent progress in cleaning up these hazardous stockpiles, 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.

The DNR’s proposed administrative rules are designed to help prevent future expensive cleanups and ensure proper management of hazardous materials in electronics by setting clear standards for collection and transportation of electronics and requiring a solid waste processing license, along with money set aside for closure and cleanup costs, for Wisconsin facilities that dismantle or process electronic waste.

#### *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 or curbside recycling bins, and even those properly brought to electronics drop-off sites, have caused many fires nationally in the last several years. A study published by the U.S. Environmental Protection Agency in July 2021 documented 245 fires between 2013-2020 that were likely attributed to lithium-ion batteries, and concluded that 89% of them were definitely caused by lithium-ion batteries. The number is likely far below the number of fires actually caused by lithium-ion batteries, since there is not a requirement to report fires and many, especially smaller ones, were unlikely to be counted. Although numbers have not been tracked, the DNR has received several reports of fires likely or definitively caused by lithium-ion batteries in recycling/trash collection trucks and at transfer stations, recycling facilities and landfills 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.

In recent years, the DNR has increased its outreach efforts to better inform Wisconsin residents of how to safely manage used batteries, particularly lithium-ion batteries and electronics that contain them. In an effort to reduce the risk of fires and encourage proper recycling, the DNR’s proposed administrative rules would add telephones with a video display, as well as phone accessories and video gaming devices/accessories that contain batteries, to the list of electronics that can be recycled through E-Cycle Wisconsin. The DNR will continue to work with stakeholders to increase public outreach about batteries and identify potential additional policy solutions.

## **Recommendations for potential legislative changes**

Based on the first 12 years of implementation and positive feedback from stakeholders, most of the fundamental elements of Wisconsin’s electronics recycling law are sound and have proven effective. The provisions included in 2021 Wisconsin Act 79 addressed several of the recommendations, based on stakeholder input, from previous DNR reports:

- Adjusting the manufacturer registration fee thresholds to make per-unit costs more equitable and reduce or eliminate fees paid by smaller manufacturers.
- Changing the E-Cycle Wisconsin program year to a calendar year, using an 18-month transition “year” beginning in July 2022.
- Making all Wisconsin K-12 schools eligible for E-Cycle Wisconsin.

Despite these positive changes, some challenges remain that could best be addressed through additional legislation. 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.

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

To better balance the supply of electronics that need to be recycled with manufacturer obligations, the Legislature could consider adjusting the manufacturer target formula. In earlier program years, the challenge was overcollection of pounds. More recently and going forward, it is becoming more difficult for manufacturers to meet their recycling targets as sales increase and the weight of devices stored in Wisconsin homes decreases. For this reason, it may work better to set targets by taking an average of weight received for recycling under the program over previous program years and allocating it among manufacturers by market share. Minnesota, which has a program similar to Wisconsin's, now uses this approach and its law could be used as a model. 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 more consistent opportunities for recycling in rural areas.

## Consider allowing registered recyclers to carry over credits

Allowing registered recyclers to carry over to the subsequent program year (or years) any eligible weight they recycled that was not purchased by manufacturers would help smooth out annual fluctuations in both manufacturer targets and collection weights. It could also reduce the number of "lost" pounds for which manufacturers do not cover any portion of recycling costs, thus reducing costs recyclers pass down to collectors and consumers. The Legislature could consider allowing recyclers to carry over excess eligible weight for one or two subsequent program years, after which point unused credits would expire, to reduce incentives for recyclers to pursue more weight than they have a realistic chance of selling to manufacturers.

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

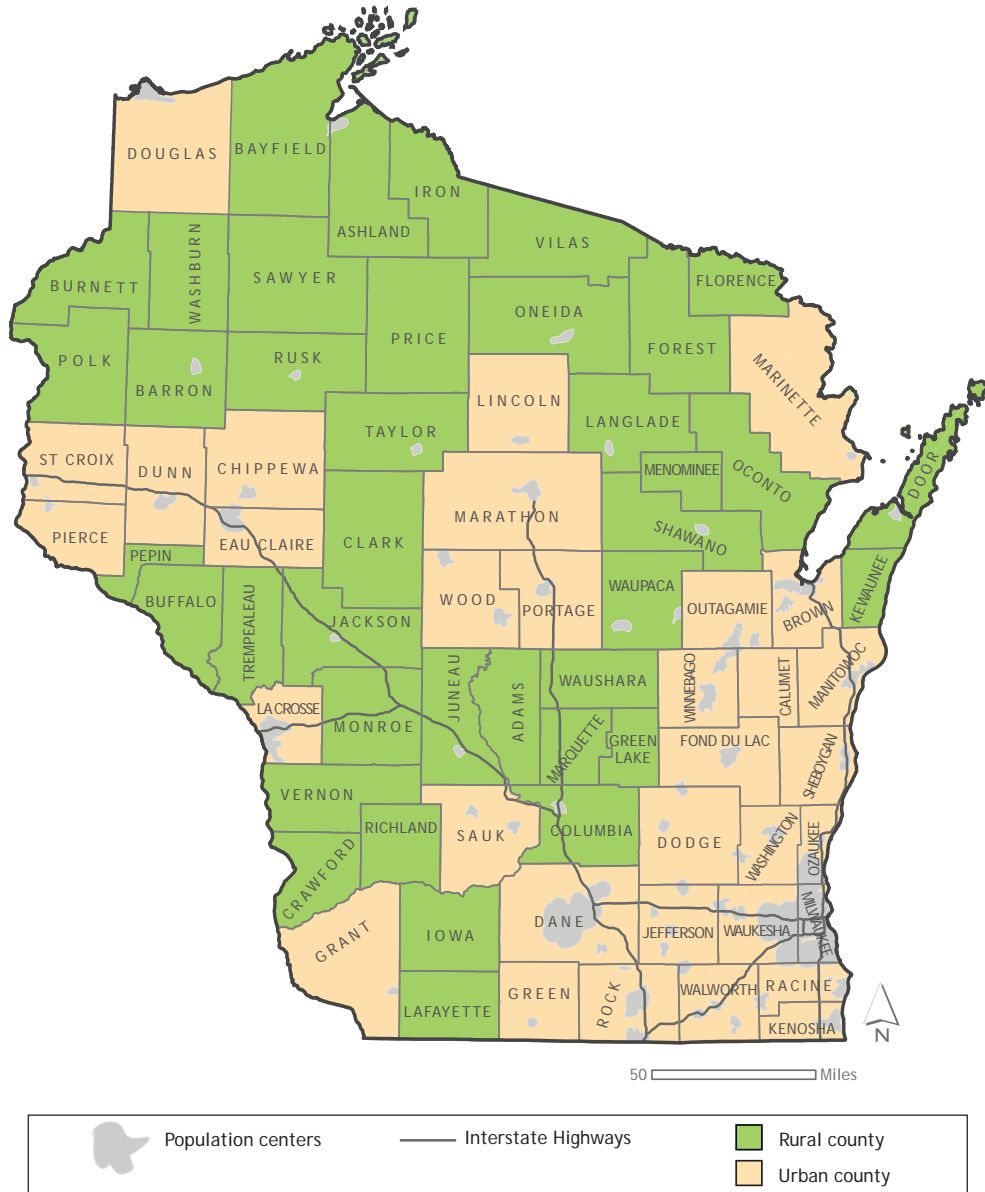
As technology changes, it has been difficult for the DNR to determine whether devices are covered by the definitions in s. 287.17(1), Wis. Stats. Examples of these "gray area" products include smartphones, digital picture frames, photo printers and portable DVD players. In addition, the increased use 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 are therefore 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 are included.

- 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.

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



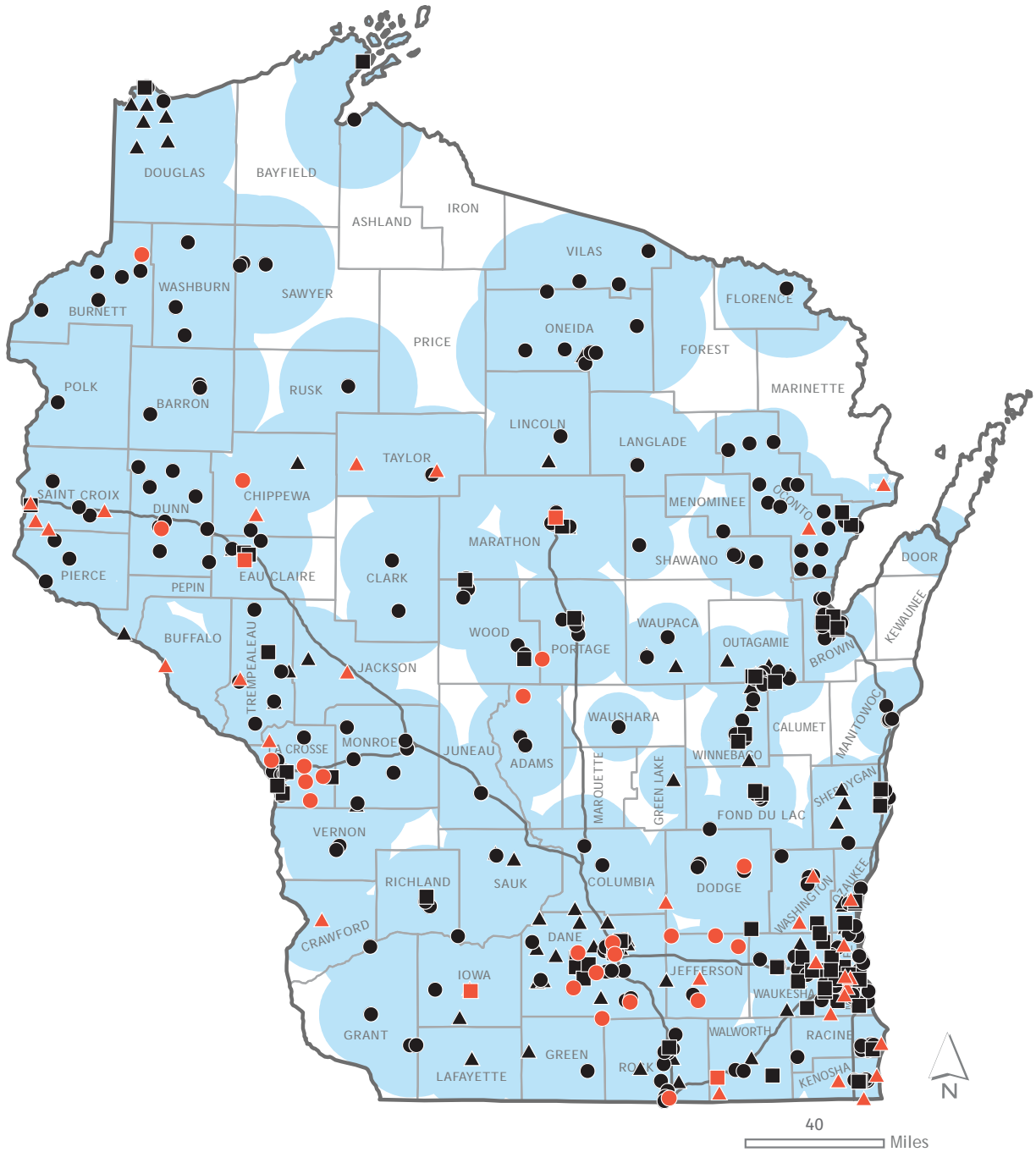
**Wisconsin Department of Natural Resources  
Bureau of Waste and Materials Management**  
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# Appendix B: Map of collection sites registered under E-Cycle Wisconsin during program year 12



<p>20-mile coverage area: Northern*</p> <p>15-mile coverage area: South Central, West Central*</p> <p>10-mile coverage area: Northeast, Southeast*</p>	<p>● Permanent collection sites</p> <p>▲ One-day collection sites</p> <p>■ Temporary collection sites</p> <p>● ■ ▲ Collection sites available only to employees and customers of a company or residents of a village, town, city or county.</p>	<p>— Interstate highways</p>
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\*Based on the 2021 DNR Household Recycling Survey question, "How far would you be willing to travel to recycle electronics?"