



# Toxics and Pollution Prevention Evaluation Report

December 2013



Minnesota Pollution  
Control Agency

This new report includes

- Reducing toxics in products and packaging
- Electronics Recycling Act program evaluation
- Pollution Prevention program evaluation

## Legislative Charge

### *Minn. Statutes § 115A.121 Toxics and Pollution Prevention Evaluation Report*

*The commissioner shall prepare and adopt a report on pollution prevention activities required in chapters 115A, 115D, and 325E. The report must include activities required under section 115A.1320. The commissioner must submit the report to the senate and house of representatives committees having jurisdiction over environment and natural resources by December 31, 2013, and every four years thereafter.*

*History: 2012 c 272 s 63*

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## Minnesota Pollution Control Agency

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# List of Acronyms

<b>ASTM</b>	<b>American Society for Testing and Materials</b>
<b>BPA</b>	<b>Bisphenol A</b>
<b>CED</b>	<b>Covered electronic device</b>
<b>CFL</b>	<b>Compact fluorescent lamp</b>
<b>CONEG</b>	<b>Coalition of Northeastern Governors</b>
<b>CRT</b>	<b>Cathode ray tube</b>
<b>ECOS</b>	<b>Environmental Council of States</b>
<b>EPCRA</b>	<b>Emergency Planning and Community Right-to-Know Act</b>
<b>IMERC</b>	<b>Interstate Mercury Education and Reduction Clearinghouse</b>
<b>MDH</b>	<b>Minnesota Department of Health</b>
<b>MnTAP</b>	<b>Minnesota Technical Assistance Program</b>
<b>MPCA</b>	<b>Minnesota Pollution Control Agency</b>
<b>MSW</b>	<b>Municipal solid waste</b>
<b>OEA</b>	<b>Office of Environmental Assistance</b>
<b>PBT</b>	<b>Persistent Bioaccumulative Toxic</b>
<b>PMI</b>	<b>Purchasing Manager Index</b>
<b>TFKA</b>	<b>Toxic Free Kids Act</b>
<b>TPPA</b>	<b>Toxic Pollution Prevention Act</b>
<b>TPCH</b>	<b>Toxics in Packaging Clearinghouse</b>
<b>TRI</b>	<b>Toxic Release Inventory</b>
<b>TSCA</b>	<b>Toxic Substances Control Act</b>
<b>U.S. EPA</b>	<b>U.S. Environmental Protection Agency</b>
<b>VDD</b>	<b>Video display device</b>
<b>XRF</b>	<b>X-ray fluorescent</b>

# Summary

Report to the Legislature

## Toxics & Pollution Prevention Evaluation



### What is the issue?

Hazardous chemicals are used in our manufacturing processes, in packaging, and in the products we use. These chemicals can cause concern to humans and the environment when we are exposed to them.

Minnesota's policy is to eliminate or reduce at the source the use, generation, or release of toxic pollutants and hazardous wastes.

The MPCA works to address the challenges our use of chemicals creates by:

- Working with manufacturers to find ways to reduce chemical waste or avoid the use of toxic chemicals *in the production process*.
- Working with companies to find ways to reduce or avoid the use of toxic chemicals *in the products they make and ensure those products are properly managed at the end of their useful lives*.

**Why is it important?** Toxic chemicals are a growing concern for us and the environment. Air, water, and soil samples show the unintended presence of many toxic chemicals due to human activity. Our knowledge about the hazards posed to people and the environment from chemicals at low levels is changing rapidly, which makes it prudent to take opportunities to reduce exposure to toxic chemicals through pollution prevention.

### Key points

#### Trends in generation of toxic chemical waste by Minnesota industrial sectors

According to 2011 data from Minnesota's 413 reporting facilities, generation of Toxic Release Inventory (TRI) chemical waste has increased in the past two years to exceed 2007 levels. This suggests that progress in pollution prevention among manufacturers has stalled. Report pages 7-11

However, the limits of TRI data should be understood. For some chemicals, the TRI may account for only a fraction of the chemical's total volume in products and unintended releases to the environment during the life of a product or after its disposal. Bisphenol A (BPA) is one example, a chemical produced in the U.S. estimated at 2 billion pounds, with U.S. product demand driving some 3 billion pounds of global use. Report pages 8-10

#### Pollution prevention efforts

- **Paint product stewardship:** The product stewardship program for managing architectural paint in Minnesota requires paint manufacturers to implement and finance such a program. MPCA expects a stewardship plan to be submitted by March 1, 2014 that describes how the program will function. Implementation is set to begin by July 1, 2014. Report page 12

Paint was selected for a product stewardship initiative based on its volume in the waste stream, cost to manage, and high potential for increased recovery and recycling. Minnesota's counties spend approximately \$5 million annually managing leftover paint, so the burden for disposal and recycling falls on the general taxpayer.

- **Electronics recycling:** To address the growing amount of waste electronics in Minnesota and rising costs associated with properly managing these wastes, manufacturers of video display devices (TVs, computer monitors, laptops) are required to collect



and recycle 80% by weight of their products sold in Minnesota. Electronic products contain lead and other heavy metals that are toxic if released into the environment. MPCA is working to identify ways to improve the program. Report pages 13-16

- **Reducing toxic chemicals in products:** MPCA's Pollution Prevention program promotes green chemistry and engineering, most recently through curriculum development grants awarded to several Minnesota post-secondary institutions and through exploration of toxics in products involving chemicals of high concern, such as bisphenol A, lead, and mercury. Report pages 20-27

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## Policy recommendations

### **Proposals for reducing lead and mercury in products, people, and the environment**

Report page 28

1. Prohibit the sale and installation of wheel weights containing lead or mercury.
2. Update law to eliminate obsolete allowances for use of mercury thermometers.
3. Harmonize and strengthen existing statutory requirements for manufacturers of thermostats and displacement relays to be responsible for end-of-life management of their products.
4. Establish a flexible, product stewardship approach for mercury-containing lamps.
5. Work with angling, conservation, and other interested parties to establish a pathway to measurably reduce the use of lead fishing tackle.
6. Create an education campaign with hunting, conservation, food safety, and other interested parties for reducing the use of lead ammunition.

### **Proposals for reducing priority chemicals in products, people, and the environment**

Based on the MPCA and Minnesota Department of Health 2010 report, *Options to Reduce and Phase-out Priority Chemicals in Children's Products and Promote Green Chemistry*, these recommendations offer a framework to guide future policies to close gaps, increase protection of citizens and the environment, and reduce the costs of future cleanup of toxics that could hamper economic development. Report page 29

1. Require manufacturers that produce or sell children's products in Minnesota to report their use of priority chemicals in those products.
2. Add incentives, resources, and revenue sources as needed.
3. Establish formal green chemistry policies to direct the efforts of state agencies, technical assistance programs, and private sector businesses.
4. Direct state agencies to educate Minnesotans about priority chemicals, the risk of priority chemicals, and ways residents can limit their exposure.
5. Direct MPCA and Department of Administration to evaluate adapting Minnesota's existing preferential purchasing initiatives to give preference to products that do not contain priority chemicals.
6. Further enhance coordination among state agencies involved in pollution prevention and reducing toxics in products.

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## Full report

**Toxics and Pollution Prevention Evaluation: 2013 Report to the Legislature** is available at <http://www.pca.state.mn.us/index.php/about-mpca/legislative-resources/legislative-reports/index.html#2014>

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# Introduction

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Minnesota has a lengthy history of working to address the challenges created by products that contain toxic chemicals. Initially, much of the focus was on tackling the challenges posed by “problem materials,” which were defined in Minn. Stat. 115A.03 subd. 24a as: “those materials that when processed or disposed of with mixed municipal solid waste (MSW), contribute to one or more of the following:

- the release of a hazardous substance, pollutant or contaminant;
- pollution of water;
- air pollution, or;
- a significant threat to the safe or efficient operation of a solid waste facility”

In 1989, the Minnesota Legislature directed the then-Office of Waste Management to develop a statewide plan to identify and recommend appropriate management methods for problem materials that are found in mixed MSW. This plan took the form of two parts, the first of which involved identifying problem materials, identifying the available capacity for processing and disposing of problem materials and considering the impact of problem materials on specific processing and disposal technologies. The second part involved certifying that sufficient processing and disposal capacity was available and proposing a statewide plan for separating, collecting and transporting problem materials to processing or disposal facilities to keep them out of MSW.

Problem Materials Plan Part I was published in 1992 and represented one of the first efforts nationwide to systematically identify and address problem materials in MSW. Problem Materials Plan Part II was published in 1995 and provided detailed information on the full range of management needs, barriers and opportunities to allow the various stakeholders involved in problem materials management to:

- Take measures to reduce the manufacture and generation of problem materials
- Improve problem materials management programs
- Incorporate problem materials management into existing solid waste management systems
- Reduce the environmental impacts and direct and indirect costs of improper management
- Conserve the resources (e.g., material, labor and energy) contained in or represented by these materials

Since the publication of Problem Materials Plans I and II, a number of additional disposal restrictions, sales restrictions and other requirements have been passed into Minnesota Statutes over the years, as summarized in Table 1. While these statutes have had success in addressing concerns with the specific wastes and chemicals they were enacted to deal with, they were passed incrementally and for the most part, were focused on waste reduction and pollution prevention in production processes rather than on reducing the use of toxic chemicals or developing better alternatives to toxic components of the product itself.

However, more recent legislation has shifted the focus from management of these types of products as wastes to an emphasis on encouraging product design and manufacturing that moves away from the use of toxic chemicals to begin with. Examples include the recent bans on formaldehyde in children’s personal care products, bisphenol-A in children’s food containers and coal tar sealants for asphalt pavement. This reduces exposure to chemicals of concern during manufacturing and the use of these products along with avoiding the types of management and disposal challenges caused by problem materials that earlier laws sought to address.

**Table 1: Hazardous and Toxic Product Legislative Requirements in Minnesota**

Product / product category	Minn. Statute/ Session Law	First enacted	Disposal ban	Sales ban	Manufacturer reporting	Public Signage Posting/Label	Bounty/deposit	Manufacturer take-back	Recycling requirement	Chemical ban
Toxic Pollution Prevention – reduction of wastes and releases of over 600 toxic chemicals listed by EPA (Toxics Release Inventory)	115D	1990			X					
Electronic waste	115A.1310-115A.1330	2007			X			X	X	
Lead Acid Batteries	115A.915 325E.115 325E.1151	1987 1987 1989	X			X	X		X	
Disposal of Certain Dry Cell Batteries	115A.9155	1990	X			X		X		X
Rechargeable Batteries and Products	115A.9157	1991	X		X			X		
Mercury Product Disposal Prohibition and Recycling Requirement	115A.932	1992	X						X	
Solid Waste Disposal Problem Materials	115A.956	1989								
Toxics in Packaging	115A.965	1991	X	X						X
Listed Metals (ink, dye, pigment, paint, or fungicide containing lead, cadmium, mercury, or hexavalent chromium)	115A.9651	1991		X	X					X
Mercury Product Sales, Use, Labeling, Disposal, Recycling Requirements	115A.932 116.92	1992 1992	X	X		X		X	X	
Notice for Fluorescent Lamps Containing Mercury	325E.127	2007				X				
PCB; Prohibited use	116.37	1976		X		X				X
Chlorofluorocarbon Regulation	116.731	1988	X	X					X	
Priority Chemicals (Toxic Free Kids Act)	116.9403	2009								
Motor Oil and Filters	325E.10-325E.113	1977	X			X			X	
Motor and Vehicle Fluids and Filters: Prohibitions.	115A.916	1987	X							
General and Special Purpose Battery Requirements	325E.125	1990		X		X		X		X
Items Containing Lead Prohibited	325E.389	2007		X						X
Cadmium in Children's Jewelry	325E.3891	2010		X						X
Products containing certain PBDEs	325E.386	2007		X						X
Bisphenol A in Children's Products	325F.173	2009		X						X
Major Appliances	115A.9561	1989	X						X	
Formaldehyde in Children's Products	325F.173	2013		X						X
Bisphenol A in Children's Food Packaging	325F.174	2013		X						X
Coal Tar in Pavement Sealants	116.202	2013		X						X



As Table 1 demonstrates, there are a wide variety of approaches to managing toxics in products, toxics used in manufacturing, and problem materials. Some programs were well-financed; set up a public/private system to manage a material, waste stream, or management process, and now operate smoothly with minimal maintenance effort (e.g., used oil). Others set up requirements, were temporarily funded and are now languishing for lack of funding and follow-up. Responsibility to oversee these regulations is scattered across several agencies or not firmly established in statute.

Lack of consistent funding means that there is inconsistent tracking of compliance or the effectiveness of the various policy approaches and tools.

The table also shows that the pace of specific chemical or product-chemical combination bans has accelerated over the last six years. This is likely due to a variety of reasons:

- scientific advances in environmental monitoring that reveal the presence of chemical contaminants in the environment far from use or production, in the human body, and acting at extremely low levels or in combination with other chemicals to produce negative effects;
- new mechanisms by which citizens get information on chemicals in products and the environment and their effects;
- falling consumer confidence in private commerce to consistently provide safe products, and for government oversight and existing oversight policy to keep pace with commerce and product development;
- globalization and fragmentation of supply chains, making control of product content and oversight of imports difficult.

As was noted three years ago in the legislative report, “*Options to Reduce and Phase-out Priority Chemicals in Children’s Products and Promote Green Chemistry*”<sup>1</sup> that was prepared by the Minnesota Pollution Control Agency (MPCA) and Minnesota Department of Health (MDH) after passage of the Toxic Free Kids Act (Minn. Stat. 116.9403), the federal Toxic Substances Control Act (TSCA) applies primarily to “new chemicals” introduced after the law’s enactment in 1976. There are some 62,000 chemicals in the TSCA inventory and an estimated 7,000 in active commercial use that were “grandfathered” from pre-market review and for which little to no information exists regarding their toxicity or whether they have adverse health or environmental effects. While TSCA does provide U.S. Environmental Protection Agency (U.S. EPA) with some authority to regulate “existing chemicals,” the legal standards U.S. EPA is required to meet in order to regulate such chemicals are so high that they have discouraged U.S. EPA from doing so. Congressional proposals to reform TSCA in the form of the Safe Chemicals Act and the Toxic Chemicals Safety Act were announced in 2010 but failed to pass. A new bi-partisan proposal, the Chemical Safety Improvement Act, was introduced in May 2013; however, strong differences among stakeholders on key provisions in the revised proposal remain.

In the absence of a strong federal statute, Minnesota and other states have taken steps to enact chemicals policy through efforts like the 2009 Toxic Free Kids Act (TFKA), which provided for the establishment of Minnesota’s lists of Priority Chemicals<sup>2</sup> and Chemicals of High Concern<sup>3</sup>, however; there are currently no manufacturer requirements related to the chemicals that appear on these lists.

The toxics and pollution prevention activities documented in this report have in past years been conducted more or less separately from the typical environmental protection activities engaged in by the MPCA, such as permitting of waste-water discharges and environmental monitoring. Since enactment of the TFKA and development of the Minnesota lists of Priority Chemicals and Chemicals of High Concern, a growing level of coordination is taking place between staff in various parts of the MPCA to discuss, and where reasonable, align the work being planned.

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<sup>1</sup> <http://www.pca.state.mn.us/index.php/view-document.html?gid=15319>

<sup>2</sup> <http://www.health.state.mn.us/divs/eh/hazardous/topics/toxfreekids/priority.html>

<sup>3</sup> <http://www.health.state.mn.us/divs/eh/hazardous/topics/toxfreekids/highconcern.html>

One example is the monitoring conducted by the MPCA to evaluate the presence of unregulated chemicals such as pharmaceuticals and other pollutants in Minnesota's lakes, streams and drinking water. These chemicals are derived from the use of personal care products and other everyday consumer products. Some of these unregulated chemicals have been named Priority Chemicals by the MDH pursuant to the TFKA. The MPCA has undertaken ongoing monitoring to better understand the presence, extent, and sources of these unregulated chemicals of emerging concern in the environment; in addition, the MPCA recently requested and received funding under the Clean Water, Land and Legacy Amendment for developing criteria that may be used to evaluate unregulated chemicals being detected in Minnesota's lakes, streams and/or groundwater and help identify those of highest priority for reduction from an ecological impact standpoint.

The work done by the MDH in developing human health-based guidance through its Drinking Water Contaminants of Emerging Concern program also provides important information that is used by MPCA in developing priorities. Using the results from its monitoring activities, the MPCA nominates five to ten chemicals of emerging concern to MDH's program each year for development of human health-based guidance. The health-based guidance developed by MDH is important to understanding the level of concern posed to human health from exposure to these chemicals.

This collaboration, both within the MPCA and between state agencies is an important development and will help each agency focus its resources in a coordinated and efficient manner on chemicals that appear to pose the most risk to human health and the environment.

## Report organization

As directed by Minn. Stat. 115A.121, this report discusses pollution prevention activities required in chapters 115A, 115D and 325E. It describes:

- trends in toxic chemicals waste generation by Minnesota industrial sectors as directed by Minn. Stat. 115D.10,
- architectural paint product stewardship program activities as directed by Minn. Stat. 115A.1415,
- electronics recycling program activities as directed by Minn. Stat. 115A.1310-1330,
- toxics in packaging program activities as directed by Minn. Stat. 115A.965, and
- activities related to Priority Chemicals as relates to Minn. Stat. 116.9403.

This report also offers recommendations to further reduce toxic chemical content in products sold and used in Minnesota.

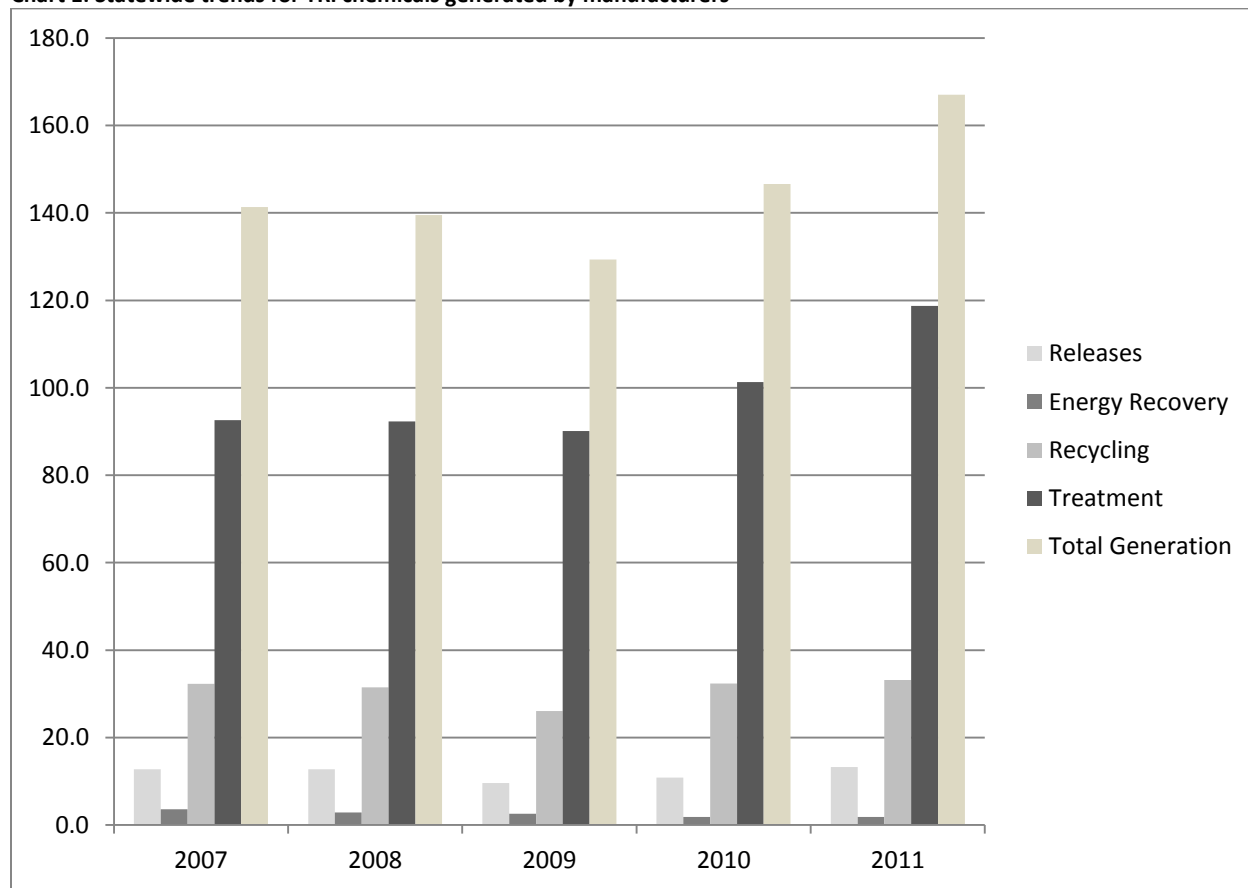
# Statewide trends for TRI reporting industries

The MPCA evaluates data supplied by facilities reporting to the Minnesota Emergency Planning and Community Right-to-Know Act (EPCRA) program and the U.S. EPA to determine trends in quantities of chemicals generated and released. The 2011 data from Minnesota's 413 reporting facilities suggest that progress in pollution prevention among manufacturers has stalled as Toxic Release Inventory (TRI) chemical waste generation has increased in the past two years to exceed 2007 levels.

## Generation of TRI chemicals in Minnesota – manufacturing sector

For the purposes of TRI reporting, toxic chemical generation is defined as the sum or aggregate of the quantities for each waste management method employed, which includes releases (direct release to air, water, or land); on-and-offsite recycling; treatment; and burning for energy recovery. In general, Minnesota's pollution prevention efforts focus on working with manufacturers to reduce waste through improving the efficiency of production processes or finding ways to use less or non-toxic chemicals in those processes.

**Chart 1: Statewide trends for TRI chemicals generated by manufacturers**



**Table 2: Management method of TRI chemicals generated (in millions of pounds)**

Year	2007	2008	2009	2010	2011
Releases	12.8	12.8	9.6	10.9	13.3
Energy Recovery	3.6	2.9	2.6	1.9	1.9
Recycling	32.3	31.5	26.1	32.4	33.2
Treatment	92.6	92.3	90.1	101.3	118.7
Total Generation	141.3	139.5	129.3	146.6	167.0
(note: by manufacturers)					

As Chart 1 shows, 2010 saw a return in waste generated by manufacturers to the pre-recession levels seen in 2007. However, 2011 now shows an additional increase of 14 percent over 2010. This corresponds with the trends seen in the Purchasing Manager's Index (PMI). The PMI is a composite index based on new orders, production, delivery lead time, inventories and employment and is used by economists and government officials to forecast the future state of the economy. It provides an early indication of where the economy is headed in the next three to six months. An index above 50.0% indicates expansion while an index below 50.0% indicates contraction. The PMI dropped below 50% in August 2008 and remained there until July 2009, reaching a low of 28.4% in February 2009. TRI chemical waste generation by manufacturers rebounded in 2010 and essentially returned to 2007 levels, similarly following the PMI trend, which rose above 50% in August 2009 and remained there for all of 2010 and 2011, including periods where it rose above 60% between February and June 2010 and again between March and May 2011.

Another concern about recent TRI data is the relatively rapid rise in waste being managed through treatment compared to other forms of management. While releases and recycling reported in 2011 rose four percent and three percent from 2007, respectively, and energy recovery has declined 47 percent during that period, waste being managed through treatment rose 28 percent. While it is generally considered good for wastes to be captured and treated compared to being released directly into the environment, treatment is a non-value added cost for manufacturers. Processes that generate large amounts of chemical wastes that are managed through treatment should be viewed as a high priority for pollution prevention.

Additional research has shown that eleven facilities are responsible for 80 percent of the 133 million pounds of toxic chemical wastes being reported as managed through treatment. They represent industry sectors such as: petroleum refining, pulp and paper mills, water purification equipment manufacturing, coated and laminated paper manufacturing, beet sugar manufacturing, ethanol manufacturing and miscellaneous chemical preparations. The chemicals being reported by these facilities include: ammonia, methanol, N,N-dimethylformamide, toluene, propylene, xylene, glycol ethers, methyl isobutyl ketone, nitrate compounds, phenol, chlorine dioxide, formic acid and carbon disulfide. Further research by MPCA pollution prevention staff will focus on the processes in which these chemicals are used or generated as waste byproducts and whether there are chemical substitutes or process changes available that would reduce or prevent these wastes from being generated.

When examining TRI data for the prevalence of MDH Priority Chemicals, five of the nine Priority Chemicals are found to be reported in Minnesota. These include: Bisphenol A (BPA), decabromodiphenyl ether (decaBDE), formaldehyde, lead, and di (2-ethylhexyl) phthalate. Cadmium, hexabromocyclododecane (HBCD), butyl benzyl phthalate (BBP) and dibutyl phthalate (DBP) are not reported by any Minnesota industrial facilities. However, this could mean that they are used, but not in amounts that trigger TRI reporting requirements. The vast majority of TRI reports of Priority Chemicals involve lead, in part because of stricter reporting requirements due to its classification by U.S. EPA as a persistent, bioaccumulative, toxic (PBT) chemical.

## **Deficiencies in TRI and Other Data Sources in Estimating Total Environmental Release: BPA as an Example**

The limits of TRI data should be understood. For some chemicals, the TRI may account for only a fraction of the chemical's total volume in products and unintended releases to the environment during the life of a product or after its disposal. Consider the example of BPA, a high production volume chemical with global use estimated in 2012 at 13 billion pounds and growing. While U.S. production of BPA and intermediates like plastic and epoxy resins has declined to about 2 billion pounds in 2012, it has grown substantially elsewhere, primarily in the Asia-Pacific region<sup>4</sup>.

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<sup>4</sup> Transparency Market Research, 2013 <http://www.transparencymarketresearch.com/bisphenol-a-market.html>

Given that a large amount of intermediates, components, and finished goods made with BPA in the Asia-Pacific are consumed in the U.S., one can conclude that the amounts of BPA in U.S. commerce will exceed the 2 billion pounds used in domestic manufacturing. Using World Bank data for 2012<sup>5</sup>, MPCA staff estimate that U.S. household consumption alone drives over 3 billion pounds of global BPA use. These uses include:

- 72% of BPA goes into making polycarbonate resins - eyeglass lenses, medical equipment, water bottles, CDs and DVDs, cell phone components, consumer electronics, computers and other business equipment, electrical equipment, household appliances, security shields, construction glazing, automobile headlight lenses, sports safety equipment, and some reusable food and drink containers. Residual, unreacted BPA remaining in polycarbonate products can leach out into food or the environment while reacted BPA can be released from polycarbonate when it is exposed to strongly basic conditions, UV light, or high heat.
- 21% of BPA goes into epoxy resins for uses such as: industrial floorings, adhesives, sealants, industrial protective coatings, powder coatings, automotive primers, food can linings and printed circuit boards.  
Epoxy resins made with BPA are stable. Only residual, unreacted BPA remaining in epoxy resins can leach out into food or the environment.
- 7% of BPA is used in specialized, lower volume applications, including flame retardants, and high-performance resins (e.g., unsaturated polyester resins, polysulfone resins, polyetherimide, and polyacrylate), food, food additives, drugs, and cosmetics.

Using 2007 for comparison since that is a year for which data on both TRI and U.S. BPA manufacturing are available, contrast the 2.4 billion pounds of BPA in U.S. production with national TRI reports totaling uncontrolled releases of BPA of about 175,000 pounds. Another 685,000 pounds was transferred to land containment and about 2.76 million pounds were incinerated. This TRI total of about 3.61 million pounds amounts to 0.15% of U.S. production<sup>6</sup>.

A summary of a Canadian study suggests between 44% and 68% of the BPA consumed in Canada in 2010 was “destroyed in the use of products, such as the epoxy coatings often used to line the inside of food cans.” Another 24% to 43% went into landfills, while less than 14% was released, recycled, incinerated or found its way into sludge. Applying 14% to U.S. BPA production in 2007 suggests on the order of 330 million pounds per year were “released, recycled, incinerated or found its way into sludge.”

MPCA has calculated that 675,000 pounds of BPA per year are recycled as part of thermal paper recycling in the U.S. with minute concentrations showing up in recycled paper products (a potential concern in food contact packaging) and an unknown fraction of this amount then re-released after treatment of recycling wastewater.

Analysis of all these numbers leads to some general conclusions:

- The numbers available suggest that only about 3.5 million pounds of U.S. BPA are accounted for, or only about 1% of the Canadian estimate for released, recycled, incinerated or in sludge;
- Using the available numbers and applying the apparent percentage of BPA that is not destroyed in incineration (30%) to the 330 million pounds of BPA per year in this category suggests that on the order of an additional 99 million pounds per year cannot be accounted for in the U.S.
- Research is needed on the fate of product BPA in both municipal solid waste and wastewater treatment plant sludge incineration; how much is released to air as BPA or byproducts; how much is present in fly (stack) ash and bottom ash; and how much is then released through land application or other management techniques;
- More information is also needed on the environmental fate of BPA in solid wastes that are landfilled under anaerobic conditions, and that leaves the permitted boundary of the landfill as a constituent of

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<sup>5</sup> <http://wdi.worldbank.org/table/4.8>

<sup>6</sup> The preceding is mostly from the *Bisphenol A Action Plan* (U.S. Environmental Protection Agency 3/29/2010) [http://www.epa.gov/opptintr/existingchemicals/pubs/actionplans/bpa\\_action\\_plan.pdf](http://www.epa.gov/opptintr/existingchemicals/pubs/actionplans/bpa_action_plan.pdf)

land-applied leachate; in leachate delivered to wastewater treatment plants; or as leachate sprayed into the air by evaporators to reduce the volume and expense of delivery to wastewater treatment plants;

- While some studies have been done, it is necessary to better understand the rate of release of unreacted or depolymerized BPA from products during their useful life, prior to disposal.

BPA toxicity has proven to be complex. BPA has been characterized as a “weak estrogenic” compound and recent studies have found more routes of estrogenic effect on systems of the human body, which increase its estrogenic effect beyond historical understanding.<sup>7</sup> Other scientists have reported on pre-natal BPA exposures being correlated not only with later obesity in that generation, but causing permanent genetic tendency towards obesity in subsequent generations.<sup>8</sup> With many chemicals such as BPA, “the [higher] dose makes the poison” adage is giving way to “the timing makes the poison” and “very small doses at the wrong time make the poison.” A thorough understanding of BPA toxicology is important in understanding populations at particular risk from exposures.

University of Minnesota researchers have described BPA as “pseudo-persistent in the environment because of continual inputs”, and organisms may be subject to chronic exposure to BPA during sensitive life stages.<sup>9</sup> Data analysis by the National Health and Nutrition Examination Survey found that BPA levels in humans did not drop as expected during fasting, suggesting that other exposure routes besides food ingestion lead to BPA being “pseudo-persistent” in the human body in some circumstances. While the state has developed an understanding of exposures that are protective through the oral route of exposure, the state has not evaluated dermal and inhalation exposures<sup>10</sup>.

A better understanding of total exposures from all sources may be critical in developing successful strategies for protection of human health and the environment. Since the TRI and waste management data provide an incomplete representation of total environmental release and pathways of exposure, it is clear that additional efforts are needed to characterize the full extent of potential exposure.

## Overall trends in TRI chemical generation – all industrial sectors

The manufacturing sectors that report generating the most TRI wastes in Minnesota include: petroleum refineries, pulp mills, small arms ammunition manufacturing, paper mills and laminated plastics manufacturing. The chemicals for which the most waste was reported to be generated are ammonia, lead compounds, methanol, n,n-dimethylformamide and copper compounds.

**Table 3: Total amount of TRI chemicals generated (in millions of pounds)**

Year	2007	2008	2009	2010	2011
non-manufacturers (electric utilities, chemical distributors)	16.6	15.7	15.0	14.3	13.7
recyclers (metals and solvents)	0.8	1.1	0.9	1.3	32.6*
waste treatment (incineration)	15.9	15.8	9.2	11.9	13.2
manufacturers	141.3	139.5	129.3	146.6	167.0
total TRI chemical generation	174.6	172.1	154.5	174.1	226.6

\*increase due to change in reporting by Gopher Resources

<sup>7</sup> *Bisphenol A: contested science, divergent safety evaluations*, European Environment Agency, 2013 Andreas Gies and Ana M. Soto

<sup>8</sup> *Transgenerational Inheritance of Prenatal Obesogen Exposure*, Bruce Blumberg, PhD, Department of Developmental and Cell Biology & Department of Pharmaceutical Sciences, University of California-Irvine, October 31, 2013 <http://www.youtube.com/watch?v=unTOLE9yn-k&feature=youtu.be>

<sup>9</sup> *Bisphenol A exposure, effects, and policy: A wildlife perspective*, Journal of Environmental Management, March 2012) Shelby Flint et. al. [http://www.consbio.umn.edu/download/Flint\\_et\\_al\\_2012\\_BPA.pdf](http://www.consbio.umn.edu/download/Flint_et_al_2012_BPA.pdf)

<sup>10</sup> MDH 2012. Minnesota Department of Health information on Bisphenol A in Drinking Water, <http://www.health.state.mn.us/divs/eh/risk/guidance/gw/bpainfosheet.pdf>



As Table 3 shows, waste generation from non-manufacturers (primarily electric utilities) continues to decline from 2007, while waste treatment facilities show a gradual increase since 2009, similar to the trend seen in manufacturing waste generation. The very large increase from 2010 to 2011 among recyclers is due to one facility, Gopher Resources, changing their reporting approach due to new information that became available to them after a change in how they processed pollution control dust that is captured and run back through their furnaces for further lead recovery (on-site recycling). The new processing system allows them to monitor dust levels rather than estimate them based on grab samples as was done beforehand and the data collected once the new system became operational showed that Gopher Resources had been previously underreporting dust levels prior to 2011.

The MPCA has been working with the Minnesota Technical Assistance Program<sup>11</sup> (MnTAP) to develop a more comprehensive data analysis protocol for identifying small and medium businesses that can benefit from pollution prevention technical assistance. Using a grant from the Environmental Council of States (ECOS), MnTAP has built a database to examine data for wastewater permitting, hazardous waste shipments and air toxics emissions along with the TRI data that has traditionally been used for directing pollution prevention assistance. This will allow them to generate more broad based quantitative information about wastes produced from a large number of industries and find more facilities that may not be required to report to TRI.

## Trends in TRI chemical releases – all industrial sectors

As seen in Table 4, after several years of declines through 2009, total TRI chemical releases from all industrial sectors began to rise again in 2010 and the upturn is largely due to increased releases from manufacturers. Fortunately, overall releases are still down 12 percent from 2007 levels. Electric utilities continue to reduce releases, now down 20 percent from 2007, whereas releases from manufacturers have risen 4 percent since 2007, despite total chemical generation increasing by 18 percent during that period.

**Table 4: Total amount of TRI chemicals released (in millions of pounds)**

Year	2007	2008	2009	2010	2011
non-manufacturers (electric utilities, chemical distributors)	13.8	12.6	12.0	11.7	11.0
recyclers (metals and solvents)	0.5	0.4	0.3	0.3	0.3
waste treatment (incineration)	1.5	0.6	0.4	0.4	0.6
manufacturers	12.8	12.8	9.6	10.9	13.3
total TRI chemical releases	28.6	26.4	22.3	23.3	25.2

<sup>11</sup> <http://mntap.umn.edu/>

# Architectural paint product stewardship

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During the 2013 legislative session, the Legislature enacted a product stewardship program for managing architectural paint in Minnesota. The law requires paint manufacturers, individually or through a stewardship organization, to implement and finance a statewide product stewardship program that manages architectural paint by reducing the paint's waste generation, promoting its reuse and recycling, and providing for negotiation and execution of agreements to collect, transport, and process the architectural paint for end-of-life recycling and reuse. The program is funded by a stewardship assessment paid by paint manufacturers and managed through the sales chain.

The program in Minnesota is expected to be consistent with the paint stewardship programs operating or under design in six states. PaintCare, the industry-created stewardship organization, will be submitting a stewardship plan to the MPCA by March 1, 2014 that describes how the program will function in the state. The program is to be implemented by July 1, 2014.

Based on the experience of other state programs, the MPCA anticipates a number of benefits from a product stewardship approach for managing architectural paint in Minnesota:

- Expand the number of recycling locations for paint with an expected overall increase in the amount of paint recycled.
- Create an incentive for retailers to collect paint, particularly smaller entities.
- Transition from government-funded collection and recycling programs to one funded by consumers and manufacturers.
- The paint industry, through the stewardship organization PaintCare, will design and manage the program.
- Support economic development opportunities for paint recyclers.

# Electronics recycling

## Overview

The Minnesota Electronics Recycling Act (Act) was enacted in May 2007 to address the increase in the amount of waste electronics generated in Minnesota and the rising costs associated with properly managing waste electronics. The law is premised on a producer responsibility approach that engages the manufacturers of certain electronic products in the collection and recycling of waste electronics. By internalizing the costs of end-of-life management, this more economically efficient approach to providing collection and recycling offers incentives for manufacturers to implement green design practices such as design for recyclability and other techniques to reduce cost.

The act establishes an obligation for manufacturers of video display devices (VDDs) such as household televisions, computer monitors and laptops to collect and recycle 80 percent by weight of their products sold in Minnesota. To meet this obligation, manufacturers are able to apply a broader range of products called covered electronic devices (CEDs) including desktop computers, printers, DVD players and video cassette recorders in addition to VDDs to meet their obligations. Table 5 summarizes the first six years of program activity.

**Table 5: Program Year Comparison**

	PY1/FY08	PY2/FY09	PY3/FY10	PY4/FY11	PY5/FY12	PY6/FY13	
Recycled per capita, statewide (pounds)	6.5	5.7	6.5	6.2	6.6	6.0	Supply
CEDs recycled (pounds)	33.6 million	30.3 million	34.7 million	33.0 million	35.2 million	32.4 million	
Conversion: program pounds*	41.8 million	36.5 million	41.4 million	38.4 million	41.0 million	37.6 million	
VDD sales (pounds)	25.6 million	31.2 million	29.2 million	27.1 million	26.1 million	22.8 million	Demand
Manufacturer recycling obligation (program pounds)	15.3 million (60 percent)	25.0 million (80 percent)	23.4 million (80 percent)	21.7 million (80 percent)	20.9 million (80 percent)	18.2 million (80 percent)	
Purchased: program pounds (and actual pounds)	32.7 million (28.0 million)	29.8 million (24.3 million)	33.3 million (28.7 million)	31.5 million (27.7 million)	24.2 million (21.6 million)	25.4 million (22.9 million)	
New recycling credits**	17.6 million	5.1 million	10.5 million	10.0 million	3.2 million	7.7 million	Credits
Recycling credits available at program year end	17.6 million	22.7 million	33.2 million	43.4 million	46.6 million	54.3 million	

\*Program pounds reflect 1.5x multiplier applied to pounds collected outside of the 11-county metropolitan area

\*\*Recycling credits have the same value as program pounds, but their use was restricted starting in PY3

## Collection

Registered collectors are public or private entities that receive CEDs from households and arrange for delivery to a registered recycler. Collectors report annually on the total pounds of CEDs collected during the program year and where they were sent. While permanent collection sites account for 75 percent of the actual pounds collected, residents may also drop off devices at events, or use pick-up or mail-back services. To encourage collection throughout Minnesota, a credit of an additional 0.5 pound is offered for every pound of CEDs collected outside the 11-county metropolitan area (Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott, Sherburne, Washington and Wright). About 55 percent of the collection opportunities available in Greater Minnesota are offered by local governments.

Minnesota's per-capita collection rate of 6.2 pounds compares favorably with other leading states such as Oregon (6.89 pounds) and Wisconsin (6.85 pounds). Statewide, local governments collected 49 percent of CEDs in program year 6 (FY13), offering a mix of permanent collection sites, special events for residents and curbside recycling.

Among the metropolitan counties registered to collect CEDs, most recover some of their costs from recyclers who work with manufacturers. Some counties also charge various fees such as solid waste tip fees or disposal fees to residents using the service to help recover costs. In neither the metropolitan area nor in Greater Minnesota are costs fully recovered through recyclers or consumer recycling fees alone.

## Recycling

Registered recyclers are public or private entities who accept CEDs from registered collectors for the purpose of recycling. The recyclers report annually on the total pounds received and recycled during the program year. The number of registered recyclers has remained steady for each of the program years, and reporting continues to indicate that the majority of the recycling is done by a few processors, with the top five processing 77 percent of the total weight recycled.

## Manufacturer registration and reporting

Manufacturers report annually to the Minnesota Department of Revenue on their program year sales of VDDs to households in Minnesota and how they met their recycling obligation. An analysis of these reports has identified several prominent trends:

- By weight, the manufacturer's recycling obligation is lower than the available pounds that are recycled; total recycling obligation is 48 percent of the total program pounds recycled.
- Manufacturer purchases of recycled pounds have far exceeded their recycling obligation for each program year, with an average of 50 percent above obligation in the first six program years. This has generated a large amount of recycling credits.

As discussed in the section on Collection, "program pounds" includes the weight of covered electronic devices collected from households located outside the 11-county metropolitan area that is calculated at 1.5 times the actual weight and is used for this data because it shows how many pounds were truly available to purchase. Addressing the imbalance of supply of recycled pounds and manufacturer demand for them is a significant challenge expressed by many program stakeholders.

Manufacturers remit a registration fee each program year based on their sales of VDDs in the previous program year. These base registration fees are dedicated to funding the state agency responsibilities under the Act. The data show that base registration fees have remained consistent. In program year 6, the overall weight of VDD sales dropped for the fourth consecutive year, with recycling obligation of 18.2 million pounds. At the same time, manufacturer reports show the number of devices sold increased, reflecting the change toward devices that are generally lighter, including mobile devices.

Manufacturer purchases of recycled pounds represented 83 percent of the obligation in program year 6. Combined with the use of recycling fees and credits, manufacturer purchases of new pounds far exceed the obligation each program year, which in turn, generates new recycling credits. Manufacturers that do not meet

their full obligation through purchases of recycled pounds are permitted to fulfill the remainder of their obligation through recycling fees. Approximately one to three percent of the recycling obligation is met through fees each program year. MPCA prefers manufacturers purchase recycled pounds rather than pay fees. To this end, the program has served to foster greater communication between stakeholders with material to sell and manufacturers that need to meet their recycling obligation.

Recycling credits are generated when manufacturers exceed their program year recycling obligation; for each extra program pound purchased, manufacturers receive a credit that they can apply to meet a future obligation. Manufacturer purchases of recycled program pounds in the first program year were more than double the recycling obligation, creating 17.6 million credits and leading to the establishment of a limit of 25 percent of a manufacturer's program year obligation that can be met through the use of recycling credits. Since this amendment went into effect, credits have been used to meet 8 percent of the obligation in program years three and four and 14 percent in program years 5 and 6. As new purchases continue to exceed obligations, more credits continue to be generated each program year. While manufacturer purchases have consistently exceeded recycling obligations, they still don't fully cover the program pounds available for purchase each year.

## Discarded electronic products in municipal solid waste

The Minnesota Electronics Recycling Act requires the MPCA to provide information about covered electronic devices that may be disposed of in the state. The MPCA contracted for a Statewide Waste Characterization Study to be conducted in 2013. Electronic devices broadly and video display devices in particular were of specific interest to the Agency. Table 6 summarizes the results of the study for electronic products.

**Table 6: Discarded electronic products in municipal solid waste**

<b>Electronics</b>	<b>Mean</b>
Laptops	<0.1%
Computer Monitors	Not found
Televisions	<0.1%
Printers	0.1%
All Other Electronic Items	1.1%
<b>Subtotal Electronics</b>	<b>1.2%</b>

Source: 2013 Statewide Waste Characterization (<http://www.pca.state.mn.us/zihy86c>)

The results of the Waste Characterization Study indicate that approximately 1.2 percent of all material disposed, or 35,000 tons of electronic products were discarded at MSW facilities in 2012. However, the presence of video display devices, (laptops, computer monitors and televisions) was quite low, with a mean percentage of less than 0.1% in the study. The study estimates that 70 tons of laptops and 1400 tons of televisions were disposed during 2012 in Minnesota.

Based on the results of the 2013 Waste Characterization Study, the MPCA is able to conclude that the vast majority of video display devices addressed by the Act are recycled rather than placed in municipal solid waste. The disposal ban on cathode ray tube (CRT)-containing products appears to be effective at deterring disposal of these products despite the ongoing challenges to recycling CRTs globally. However, the Waste Characterization Study does indicate that a significant amount of electronic products are still being disposed in MSW, offering an opportunity to expand collection opportunities. As part of the evaluation of the Act as discussed in this section of the report, the MPCA will examine broadening the scope of products addressed by the Act as well as whether other complementary measures such as disposal bans may be necessary to increase recycling of electronics.

## E-waste program compliance and enforcement

The MPCA has continued to monitor the collectors, recyclers and manufacturers. Of the 217 collectors and 72 recyclers registered in FY13, 88 % of the collectors and 89% of the recyclers have submitted their required annual reports and registrations for the upcoming program year as of November 2013. Over the past two years, the MPCA has conducted over 35 facility inspections that resulted in approximately ten enforcement actions,

which included compliance schedules and corrective actions. In addition, MPCA staff visited three registered recyclers in Wisconsin who receive a substantial amount of CEDs from Minnesota.

To enhance compliance with electronic waste management the MPCA hosted a workshop for approximately 80 recyclers from Minnesota and three from Wisconsin. The purpose of the workshop was to educate the recyclers on proper waste management of CEDs, what to expect during an inspection, and to have discussions regarding the future of the program and overall trends in the industry.

## **Emerging issues in e-waste**

The MPCA is seeing an increasing number of situations where individuals are collecting and scrapping electronics, processing components with value, and due to the cost for disposal of CRTs, are abandoning the remaining waste. In several cases the responsible party has no resources to clean up the waste. Generally, these individuals were never registered through the e-waste program. The MPCA is working with local units of government in an effort to get these sites cleaned up. Currently, the MPCA is attempting to facilitate cleanups at six locations that have more than 32 semi-trailers of electronic devices, which are mostly comprised of CRTs.

## **Challenges for changes to the Minnesota Electronics Recycling Act**

The Minnesota Electronics Recycling Act was enacted in 2007 to implement a producer responsibility approach to managing and financing the collection and recycling of waste electronics from Minnesota households. The program has resulted in a significant increase in the weight recycled, an expansion of collection opportunities and significant economic activity for processors of electronic waste. However, given the maturation of the program and the changes in technology and consumer's purchasing habits, the MPCA recognizes that several changes are necessary to ensure the continuing effectiveness and integrity of the program.

The MPCA and other stakeholders have identified several challenges to the functioning of the Act. These challenges include: the total weight of products sold in the state is declining while the weight of material collected remains constant, the relatively narrow scope of product addressed under the Act and finally several counties in Greater Minnesota do not have adequate access to collection service for residents.

The MPCA has initiated a process in the fall of 2013 to identify areas for program improvement and policy options to address those challenges. The MPCA will conduct outreach to local government, electronics recyclers, manufacturers, retailers and other stakeholders to solicit input and identify support and concerns with the range of policy approaches for consideration during the 2015 legislative session.



# Toxics in packaging

## Legislative Background

In 1991, the Minnesota Legislature passed the “Prohibitions on Selected Toxics in Packaging” law (Minn. Stat. § 115A.965, 1992 Session Laws Ch. 337, Sec. 50). The bill was based on model legislation drafted two years earlier by a working group in the Coalition of Northeastern Governors (CONEG), with active cooperation of a wide range of stakeholders from environmental groups, industry, and governmental agencies.

The law prohibits the intentional introduction of lead, cadmium, mercury, or hexavalent chromium into packaging or the components of packaging that is offered for sale or is being distributed for promotional purposes. It also prohibits the incidental presence of these metals at concentrations exceeding 100 parts per million (ppm) total by weight for the four metals. For the purposes of this law, “packaging” is defined as: “a container providing a means of marketing, protection or handling of a product and shall include a unit package, an intermediate package and a shipping container as defined in American Society for Testing and Materials (ASTM) D 996. “Package” shall also mean and include such unsealed receptacles as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags and tubs.”

Minnesota is one of 19 states that have adopted the model “toxics in packaging” legislation. Because most packagers and package manufacturers selling into the U.S. market distribute to at least one of the 19 states, the packaging laws are seen (by some) as a national standard in the absence of federal legislation, at least for major domestic packaging manufacturers and distributors. The law was one of the first to pursue a “source reduction” strategy, which strives to keep unwanted material out of the recycled and discarded waste stream entirely by eliminating the use of that unwanted material. The law applies to manufacturers, distributors, and suppliers of packaging as well as to manufacturers of packaged products. The law requires these parties to maintain on file current certificates of compliance that show they are following the packaging law.

## Joint Action

In 1992, a number of states with enacted laws formed the Toxics in Packaging Clearinghouse (TPCH) under the auspices of CONEG to encourage consistent and streamlined implementation of each state’s Toxics in Packaging law. Administration of TPCH was transferred to the Council of State Governments, and then to the Northeast Recycling Coalition in 2005. Currently there are nine state members of the Clearinghouse and ten states that have toxics in packaging laws but who are not members of the Clearinghouse. Since the 2011 Biennial Report was released, Illinois did not renew its membership in TPCH, reportedly for budgetary reasons.

**Table 7: States with Toxics in Packaging legislation**

TPCH Member States	States with Legislation/Not TPCH Members
1. California	1. Florida
2. Connecticut	2. Georgia
3. Iowa	3. Illinois
4. Minnesota	4. Maine
5. New Hampshire	5. Maryland
6. New Jersey	6. Missouri
7. New York	7. Pennsylvania
8. Rhode Island	8. Vermont
9. Washington	9. Virginia
	10. Wisconsin

The legislation in some non-member states does not include enforcement authority. This is cited by those states as a barrier to implementation of the law and TPCCH membership. Responsibility for enforcement also varies among the states; in some states the authority clearly rests with the environmental agency, in other states it clearly rests with the agency responsible for trade/consumer protection, and in some states it is not clear which agency has primary authority.

TPCH member states consider exemption requests jointly to ensure that all parties receive the same information and to minimize the administrative costs borne by individual states. The TPCCH receives and answers requests for information and clarification from businesses, governments, and stakeholder groups. Current information may be found at the clearinghouse website, <http://www.toxicsinpackaging.org>.

In the interest of obtaining information needed for good decision-making, the TPCCH offers ex officio membership to industrial representatives. The Steel Recycling Institute, the American Plastics Council, and the Paper Recycling Coalition have participated for many years. Since the 2011 Biennial Report was issued, the Glass Packaging Institute has joined TPCCH as an ex officio member. The TPCCH also draws on a network of technical experts.

## Enforcement Actions

The MPCA has enforcement authority for Minn. Stat. § 115A.965. As a member of TPCCH, Minnesota participated in discussions of and supported enforcement actions by other state members for packaging that was used and sold by national retailers. In 2012, member states used results of the x-ray fluorescent (XRF) screening project for coordinated state enforcement of state toxics in packaging laws. Six TPCCH member states contacted seventeen manufacturers, distributors and retailers, who had non-compliant packaging. They were brought into compliance with state laws through voluntary actions, which included stopping the distribution and sale of the non-compliant packaging in member states.

No enforcement actions were undertaken individually by the MPCA during this reporting period.

## Exemptions Requested and Granted

No exemption requests were received or granted by TPCCH or Minnesota during the 2012-2013 Reporting Period.

## Current Activities

Minnesota joined the TPCCH in 1993 and has remained an active member continuously since that time.

During the 2012-2013 reporting period, the TPCCH:

- Continued to communicate with states that have legislation but are not TPCCH members regarding toxics in packaging issues and possible membership in TPCCH.
- Coordinated and communicated on toxics in packaging issues with the U.S. EPA and trade groups that are not represented as ex officio members of TPCCH, such as the Institute of Packaging Professionals, as well as testing laboratories and packaging manufacturers and distributors.

## TPCH Publications and Other Activities

TPCH released the following publications during the 2012-2013 Reporting Period, summarizing research and testing activities carried out by TPCCH and member states:

- *Laboratory Round Robin Test Project: Assessing Performance in Measuring Toxics in Packaging*
- *Guidance on Laboratory Analysis for Toxics in Packaging*

- *An Assessment of Heavy Metals in Packaging: A Focus on Flexible PVC from Discount Retail Chain Stores*, summarizing the third packaging screening project using x-ray fluorescent (XRF) technology to detect the presence of regulated metals in packaging.
- *XRF Screening of Packaging Components: Inks & Colorants*. This was the fourth TPOCH project utilizing XRF technology to identify non-compliant packaging and assess compliance rates with state toxics in packaging laws.

During the reporting period, TPOCH and member states worked on several projects, including:

- Under a contract from the California Department of Toxic Substances Control, initiated and completed the second laboratory test methods project to evaluate the performance of independent laboratories in analytical testing of glass packaging for toxics in packaging.
- Member states (Iowa and Washington) used the results of the XRF screening project to initiate outreach to retailers and suppliers of non-compliant bags (flexible polyvinyl chloride (PVC) and ink/colorant issues) and to bring the packaging into compliance with state laws.
- Identified the potential for imported glass wine bottles to exceed the threshold for metals regulated by state laws, and began work with the Glass Packaging Institute to address this issue.
- Initiated a research project on metal packaging components (for example, zippers, grommets) to assess compliance with state toxics in packaging laws, and initiate coordinated state enforcement, if appropriate.

# Reducing toxic chemicals in products

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## Green Chemistry Initiative

“Green chemistry” and “green engineering” are sets of principles for product designers to consider when making choices of materials, constituents, configurations within larger systems, or other product design and manufacturing process decisions. These principles were established recognizing that such design choices dictate the product’s environmental, human health and energy impacts during and after its intended use.

MPCA’s Pollution Prevention program has been promoting green chemistry and engineering since 2009 and has used temporary federal funds to fund green chemistry product improvement via state grants. In the process, MPCA has gathered information from Minnesota companies, academics, non-governmental organizations (NGOs), policymakers and other stakeholders about useful roles for a long-term green chemistry and engineering emphasis as part of the MPCA’s pollution prevention effort. The policy recommendations presented in this report reflect that learning.

In the time since MPCA’s 2010 report to the Legislature on green chemistry, market forces for safer and greener products identified in that report have accelerated. A 2012 Ernst & Young/GreenBiz study of companies with over \$1 billion in annual revenue show some of their top drivers, measured by percent of survey respondents identifying them, can be addressed at least in part by the use of green chemistry and engineering techniques:

- changes in customer demand (87%);
- brand risks (87%);
- increased stakeholder expectations (86%);
- competitive threats (81%); and
- new revenue opportunities (80%).

The study also found companies are facing increasing inquiries from investors and stakeholders in many related areas, including:

- producer responsibility for recycling of products and packaging (42%);
- toxic chemicals in products (39%);
- sustainable sourcing and procurement (34%).

A fast-growing number of influential companies - Walmart, Target, Staples, Procter & Gamble, Hewlett Packard, Ford, S.C. Johnson, 3M, Herman Miller, Nike, Patagonia, Johnson & Johnson, Steelcase, Timberland and many, many more - are now pushing or pulling product safety improvement up supply chains. On the government side, “environmentally preferable purchasing” is being picked up and adopted by local, state and federal governments across the U.S. and, in various forms, around the world.

As noted above, changes in consumer demand are driving private commerce and greener practices are being applied in government actions. Consumer surveys show up to 80% will seek out greener or safer products, while 25% or more are now willing to pay a price premium for products demonstrated to be safer or greener. In part, MPCA’s recommendations are designed to channel new resources to Minnesota companies, researchers and educators who will bring growth to the state’s economy by developing new jobs and revenue from the growing demand for chemically safer products.

## Green chemistry curriculum development

Since the previous program update provided in the 2012 Pollution Prevention Evaluation Report<sup>12</sup>, MPCA has completed green chemistry curriculum development projects with four Minnesota post-secondary institutions to develop and incorporate aspects of green chemistry and engineering into chemistry and engineering

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<sup>12</sup> <http://www.pca.state.mn.us/index.php/view-document.html?gid=17336>

curricula (courses, labs, experiments). These institutions include: the University of Minnesota-Duluth, St. Catherine University, Winona State University and the University of Minnesota-Twin Cities. These projects were funded through the agency's 2011-2012 pollution prevention grant from U.S. EPA Region 5. Additionally, two more curriculum development grants were awarded in fall 2012 to Northwestern Health Sciences University and the University of Minnesota-Twin Cities through MPCA's Environmental Assistance Grant program. Case studies<sup>13</sup> for each of these grant projects are posted on the MPCA web site.

### Exploring chemical use in Minnesota products

The MPCA's 2012-2013 pollution prevention grant from U.S. EPA Region 5 funded three major projects on toxics in products. The first was a project to help reduce the use of thermal receipt papers<sup>14</sup>, many of which contain the Minnesota Priority Chemical Bisphenol A (BPA) or Bisphenol S (BPS), a common chemical alternative that is now showing human health effects similar to BPA. In addition, it also provided for a project to survey conditions of use in Minnesota of formaldehyde and hexabromocyclododecane (HBCD) in building products<sup>15</sup> and a project to survey the use of nonylphenol (NP) and nonylphenol ethoxylate (NPE) in industrial/institutional detergents<sup>16</sup>. BPA, formaldehyde and HBCD are all listed as Priority Chemicals by the Minnesota Department of Health while NPE is listed as a Chemical of High Concern.

#### Bisphenol A

BPA is a reproductive, developmental, and systemic toxicant in animal studies and is weakly estrogenic. This project targets the hospitality sector, paper recyclers, and other interested partners to:

- 1) determine how much BPA is contained in the thermal papers used by participating partners,
- 2) estimate how much BPA is contained in Minnesota's recycled paper,
- 3) provide education and financial incentives to grant partners to assist them in switching to paperless point-of-sale systems, or as a second-choice option, to switch to BPA-free thermal papers, and
- 4) promote the use of paperless systems or BPA-free papers to other Minnesota businesses.

At the end of the first year, the project has 16 hospitality partners that have completed questionnaires to set baselines for metrics and that are committed to completing the project. Two outreach/assistance videos are posted on MPCA's web site. The first provides information about chemical developers in thermal papers (specifically BPA) and introduces the assistance program and role of businesses that would like to participate in it. The second video provides detail about types of paperless point-of-sale systems and gives more details about how businesses can participate in the project.

#### Formaldehyde

Formaldehyde is a colorless flammable gas and is naturally produced in small amounts by trees, humans, and other organisms. It is pervasive, causes eye and respiratory effects including asthma, and is carcinogenic. Formaldehyde is currently used in thousands of products manufactured and sold in Minnesota in the form of adhesives, bonding agents and solvents. Key findings from the building products survey indicate:

- Indoor air quality health concerns have increased the knowledge base among architects and engineers to research the amount of formaldehyde used in various building industry products. Increasingly, product specifications recognize formaldehyde as a concern by calling for safer functional alternatives.

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<sup>13</sup> <http://www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/reducing-toxicity/green-chemistry-and-design/green-chemistry-and-design-college-curriculum-grant-projects.html>

<sup>14</sup> <http://www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/reducing-toxicity/green-chemistry-and-design/green-chemistry-and-design-bpa-in-thermal-paper-project.html>

<sup>15</sup> <http://www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/reducing-toxicity/green-chemistry-and-design/green-chemistry-and-design-formaldehyde-and-hbcd-in-building-products-project.html>

<sup>16</sup> <http://www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/reducing-toxicity/green-chemistry-and-design/green-chemistry-and-design-npe-in-detergents-project.html>

- Building product resellers in Minnesota are moving towards GreenGuard-certified products<sup>17</sup> that limit off-gassing levels and provide third party validation.
- Commercial furniture manufacturers are reducing the use of urea formaldehyde as a component chemical across product lines to ensure compliance with California Air Resource Board (CARB) standards. Commercial furniture companies are beginning to offer optional “No Added Urea Formaldehyde<sup>18</sup>” wood in their products.
- Unregulated, imported engineered wood products may be the single largest contributor of formaldehyde emissions.

### **Hexabromocyclododecane**

Hexabromocyclododecane (HBCD) is a brominated fire retardant. HBCD is typically added to extruded polystyrene foam (XPS) and expanded polystyrene foam (EPS) which is used as insulation in buildings. HBCD may also be used in upholstered furniture, automobile interior textiles, car and truck cushions and insulation blocks, packaging material and in limited use in electronic equipment and wiring. HBCD is also used in the textile backer for nylon carpet tiles and in military fabrics.

Survey efforts have confirmed that the use of HBCD in the Minnesota building industry is overwhelmingly in the manufacturing of EPS and XPS products. HBCD is added to these products as a component of a premixed solution. The building industry is largely unaware of the presence of HBCD in their products or the potential harms of this persistent, bioaccumulative and toxic chemical, which has been identified as an endocrine disruptor as well as a developmental toxicant.

HBCD is being phased out by regulation in both Canada and the European Union. In October of 2012, the Stockholm Convention<sup>19</sup> on Persistent Organic Pollutants proposed a global ban on HBCD. The proposed ban was approved in May 2013, but will require ratification by the U.S. Senate and changes to the Toxic Substances Control Act<sup>20</sup> to be implemented in the U.S.

In late 2013, the first domestically produced EPS and XPS products with HBCD-free flame retardants are expected to come onto market. If these products prove to be safe and effective, they may replace HBCD in EPS and XPS products from major manufacturers. However, imported products may still use HBCD in unknown quantities.

### **Nonylphenol and nonylphenol ethoxylate**

In the environment, NPEs degrade into NP, which is persistent in the aquatic environment, moderately bioaccumulative, and extremely toxic to aquatic organisms. MPCA staff interviewed representatives of 28 commercial laundry facilities in Minnesota, and found only two that reported using detergents containing NPE. Estimates from twelve of the larger facilities show they have eliminated about 545,000 pounds (272 tons) of NPE use and discharge per year. MPCA staff have concluded that voluntary phase-out has been successful among commercial laundries in Minnesota. MPCA staff will look at future water and sediment monitoring results (where available) to see if the industrial laundry reductions have a noticeable impact on NP and NPE levels in waste water and the environment.

## **Lead and Mercury in Products**

Lead and mercury continue to be used to manufacture many products where production, use, misuse, and disposal of that product and its lead and mercury constituents can create human and environmental health problems. Several categories of mercury products are no longer manufactured and sold, but there are significant quantities remaining in use that must be properly managed at end of life to prevent human and environmental health problems. This section discusses five categories of lead and mercury containing products to provide background for the report’s policy recommendations to address these product categories. For

<sup>17</sup> [http://greenguard.org/en/CertificationPrograms/CertificationPrograms\\_indoorAirQuality.aspx](http://greenguard.org/en/CertificationPrograms/CertificationPrograms_indoorAirQuality.aspx)

<sup>18</sup> <http://www.scsglobalservices.com/files/standards/SCS-EC10.2-2007.pdf>

<sup>19</sup> <http://chm.pops.int/Convention/POPsReviewCommittee/Chemicals/tabid/243/Default.aspx>

<sup>20</sup> [http://www.ciel.org/Publications/TSCAPOPs\\_May10.pdf](http://www.ciel.org/Publications/TSCAPOPs_May10.pdf)



mercury thermometers, thermostats, and displacement relays, there are already statutes in place that need to be updated.

## Lead Wheel Weights

Lead has been used in weights for wheel balancing for many years. In July 2003, Environmental Defense, Ecology Center of Ann Arbor, and the Clean Car Campaign issued the report “*Getting the Lead Out: Impacts of and Alternatives for Automotive Lead Uses*”<sup>21</sup> documenting the use and release of lead in automobile applications, including lead acid batteries and wheel weights. At that time, the annual use of lead for wheel weights in the US was estimated to be 17,600 to 22,000 metric tons, with 20% used on new vehicles and 80% used on replacement tires. The amount of lead installed as wheel weights in the North American vehicle fleet was estimated to be 49,000 to 62,000 metric tons. Annual loss to the environment of wheel weights in use was estimated at 10% of the lead weights installed in the fleet, or 5000-6000 metric tons per year.

Extended producer responsibility (EPR) legislation for vehicles enacted in Japan and the EU established requirements and a timeline for phasing out lead wheel weights. The EU End of Life Vehicle Directive required the phase-out of lead wheel weights between 2003 and 2005. As a result, manufacturers developed zinc, iron, and other non-lead balancing products. Vehicles assembled in Europe and sold in the US generally followed the EU requirements. Vehicle manufacturers assembling in the US first started using non-lead weights around 2006. By 2010, all vehicle manufacturers were using non-lead balancing on new vehicles, in the US and worldwide.

In 2003, Ecology Center of Ann Arbor received a grant from U.S. EPA to evaluate the use of non-lead weights in public and private fleets in the Great Lakes States. The State of Minnesota Travel Management Division (TMD) volunteered to be part of this project and piloted the use of several different clip-on weights. Around the same time a company developing a lead-free high density tungsten polymer composite for the fishing tackle industry began evaluating its use for an adhesive ‘cut to weight’ wheel balancing product. TMD worked with this company to pilot several variations of this new product. Based on that pilot testing, the product was introduced to the market as the “3M Wheel Weight System”<sup>22</sup> around 2008.

In December 2007, U.S. EPA convened a meeting of wheel weight manufacturers, tire manufacturers and retailers, vehicle manufacturers, representatives of federal, state, and local government, and nonprofits to develop a strategy for moving away from lead balancing to non-lead balancing. At this meeting, wheel weight manufacturers asked U.S. EPA to use TSCA to phase out the sale of lead wheel weights. Vehicle manufacturers stated their commitment to phase out the use of lead wheel weights in assembly of new vehicles sold in the US and worldwide. The U.S. Postal Service, the Air Force, and General Services Administration described their initiatives to phase out the purchase and use of lead wheel weights in favor of lead-free products. State representatives described their pilot projects. Environmental groups described their initiatives, including national and regional outreach and education, and legal action under California Proposition 65.

The result of this stakeholder meeting was U.S. EPA’s Lead Free Wheel Weight Initiative (LFWWI), announced in August 2008. Information on the Initiative, such as goals and members, can be found at <http://www.epa.gov/wastes/hazard/wastemin/nlffwwi.htm>. In support of LFWWI and state policy initiatives, in April 2008, the Environmental Council of the States (ECOS) passed Resolution 08-9 “*Phasing out the Sale and Installation of Lead Wheel Weights*” and renewed the resolution in March 2011<sup>23</sup>.

In May 2009, the Ecology Center of Ann Arbor and Sierra Club et. al. submitted a petition under Section 21 of TSCA requesting that U.S. EPA initiate rulemaking under Section 6 of TSCA to phase out the sale of lead wheel weights by January 1, 2011. U.S. EPA accepted the petition on August 26, 2009 but has not issued a proposed rule.

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<sup>21</sup> [http://www.edf.org/sites/default/files/4111\\_drivingforward\\_0104.pdf](http://www.edf.org/sites/default/files/4111_drivingforward_0104.pdf)

<sup>22</sup> [http://solutions.3m.com/wps/portal/3M/en\\_US/3M\\_Automotive/OEMs/3M\\_Solutions/Wheel\\_Weights/](http://solutions.3m.com/wps/portal/3M/en_US/3M_Automotive/OEMs/3M_Solutions/Wheel_Weights/)

<sup>23</sup> [http://www.ecos.org/files/4392\\_file\\_08\\_9\\_Lead\\_Wheel\\_Weights\\_2011\\_version.doc](http://www.ecos.org/files/4392_file_08_9_Lead_Wheel_Weights_2011_version.doc)

Since 2009, six states have enacted sales and installation bans for balancing products containing lead. Those states are California, Illinois, Maine, New York, Vermont, and Washington.

At least two companies in North America manufacture wheel, axle and drive shaft balancing products containing liquid mercury. These products contain large quantities of mercury and there are many suitable products for these applications that do not contain mercury. The wheel weight and balancing product laws in Illinois and Maine prohibit the sale and installation of these products.

The State of Minnesota contracts for tires and wheel balancing, and the State of Minnesota contract for purchase of school buses by public school districts, require the use of non-lead balancing products. These requirements became effective in mid-2009.

### **Mercury Thermometer Sales Prohibition**

In 2002, the Minnesota Legislature enacted the nation's first comprehensive sales prohibition for mercury thermometers. At the time the legislation was enacted, accurate non-mercury temperature measurement methods and devices were available for nearly every 'new' product or application, but in some cases there were no non-mercury replacement parts available to retrofit existing equipment that relied on certain types of mercury thermometers. In addition, some federal and state regulations and laboratory test methods required the use of mercury thermometers. Non-governmental standards, such as ASTM test methods, also required the use of mercury thermometers. The availability of certified and traceable standard reference thermometers was largely limited to mercury thermometers.

The legislation enacted by the Minnesota Legislature in 2002 contained several exemptions and exceptions that took these factors into account and were written to move some of these situations to non-mercury devices as standards and technology changed.

Since Minnesota passed the first state legislation in 2002, the entire landscape of mercury thermometer technology and use has changed. As of 2013, there are no federal or state regulations that require the use of mercury thermometers. Moreover, the standards that did require mercury thermometers now require temperature recording devices and this cannot be achieved with mercury thermometers. ASTM and similar standards organizations are in the process of eliminating mercury thermometer requirements across the board in their standards and this process is nearly complete. Thermometer manufacturers have perfected a wide range of accurate non-mercury devices for every imaginable application and nearly all of these can also be retrofitted into nearly any piece of industrial or laboratory equipment that was originally designed to use a mercury device. The National Institute of Standards and Technology (NIST), which calibrates and certifies standard reference thermometers, no longer performs this service for mercury thermometers. Only non-mercury temperature measurement devices are now calibrated and certified by NIST.

### **Mercury-containing thermostats and displacement relays**

In 1992, the Minnesota Legislature enacted the first state law requiring mercury thermostat manufacturers to assume responsibility for management of end-of-life thermostats. The law requires manufacturers of mercury thermostats and non-mercury thermostats that may replace thermostats to provide education and incentives for proper management of end-of-life thermostats. The law does not require manufacturers to report on their educational and incentive programs, identify program participants, or report on the recovery rates being achieved. However, until a few years ago, manufacturers did provide annual national recovery information, by participants in each state. Currently the manufacturers and their association ended that practice and will not identify participants or recovery rates unless specifically required to by law.

Since 2007, several additional states have passed manufacturer responsibility laws for thermostats with more rigorous requirements for participation, provision of incentives, reporting, and recovery rates, since the 'voluntary' programs in operation in states other than Minnesota had very little outreach and education, no incentives, and single digit recovery rates.

In 1997, the Minnesota Legislature enacted the only state law requiring mercury displacement relay manufacturers to assume responsibility for end-of-life thermostats. The provisions of the law are similar to the state's thermostat manufacturer law. The relay law explicitly states that manufacturers are responsible for the cost of collecting and managing end-of-life relays, which the thermostat law does not include. The relay law provides antitrust protection for a group of manufacturers to work together to collect and manage end of life mercury displacement relays. The thermostat law does not currently include such a provision. Like the thermostat law, the relay law does not require manufacturers to report on program components, program participants, or recovery rates.

### **Mercury-containing lamps**

All fluorescent bulbs contain mercury, which makes their safe disposal an important issue for both public health and the environment. Because of concerns about mercury, Minnesota law bans the disposal of household and business fluorescent lamps in the trash, and directs that they must be recycled. This applies to fluorescent lights of all shapes and sizes, including compact fluorescent lamps (CFLs).

Product stewardship for mercury-containing lamps meshes with the Implementation Plan for Minnesota's Statewide Mercury total maximum daily load (TMDL) adopted by the MPCA in October 2009 since it provides a framework for establishing end-of-life management programs for mercury containing products.

Mercury-containing lamps were identified as one of the priority products for a product stewardship approach due to presence in the waste stream, low recycling rates, high costs for management, potential for enhanced recycling and economic development opportunities, and a toxic constituent.

The MPCA will work with manufacturers, retailers, recyclers, local governments and others along the product chain to examine potential product stewardship policy approaches and identify areas of common ground.

As sales of CFLs increase, concerns about their end-of-life management are growing as well. CFLs (and tubular lamps) are collected at most of the regional household hazardous waste programs in Minnesota, but as of January 2013, there were about 150 small retail hardware stores in 52 counties that collected both CFL and tube lamps year-round; 38 HHW facilities in 37 counties that collected both CFL and tube lamps year-round; 25 counties that have access to seasonal/mobile HHW collections for CFLs and tubes; and 22 counties that have no lamp collection at all. In 2008, the national lighting industry estimated that residential CFL discards in Minnesota would increase from 346,000 in 2008 to 2.42 million in 2011, a seven-fold increase. Based on national sales figures and average lamp life, estimated residential CFL discards in Minnesota would be 40 to 50 percent higher in 2013 than 2011, or 3.4 to 3.6 million. Maine, Vermont, and Washington are states that have enacted a product stewardship approach for mercury-containing lamps.

### **Lead Fishing Tackle**

The Priority Facilities Project (1999-2000) of the former Office of Environmental Assistance (OEA)<sup>24</sup> sought to accelerate reductions in the release of toxic chemicals by Minnesota manufacturers whose emissions and releases, as reported in their Toxic Release Inventory (TRI) Reports, posed significant threats to human health and the environment. One of the facilities identified as a "Priority Facility" in this project was a manufacturer of lead fishing tackle and other lead products. One goal of the project was to jointly pursue pollution prevention approaches such as substituting less-toxic feedstock materials for toxic materials. This particular manufacturer had invested in lead-free alternatives but retailer and consumer interest was low. It soon became apparent that environmental and human health risks associated with the use of and environmental loss of lead tackle were more extensive than manufacturer releases and transfers of lead. It also became apparent that a multi-faceted approach was necessary to drive changes in the market for lead-free tackle.

In 2004 Session Laws, Ch. 215, Sec. 33-34, the Minnesota Legislature directed the commissioner of natural resources and the director of the OEA to provide public education regarding concerns about lead tackle and promoting the availability of lead-free tackle. The Legislature also authorized the OEA to award grants for the purpose of reducing the use of lead fishing tackle. This legislative initiative allowed the MPCA and the

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<sup>24</sup> The OEA was merged with the MPCA in 2005.

Department of Natural Resources (DNR) to operate an expanded Get the Lead Out! program for several years beyond the original Priority Facilities Project activities.

A collaborative partnership ensued between MPCA and the DNR to encourage increased manufacture, sale and consumer use of environmentally friendly non-lead fishing tackle. MPCA sought to directly involve Minnesota tackle manufacturers, sporting goods retailers, non-profit organizations and fishing clubs, and especially anglers themselves, in the development and implementation of the campaign.

The resulting ten-year campaign yielded many partnerships, and numerous innovations and accomplishments. The Get the Lead Out! program resulted in several existing and new Minnesota businesses introducing lead-free fishing tackle product lines, significantly increasing the availability of environmentally-friendly weights at retail sporting goods and bait and tackle stores, and raising consumer awareness and purchase of lead-free tackle. Featured campaign activities included lead tackle exchanges, point-of-purchase displays for retailers, enlisting involvement of hundreds of lake associations, fishing clubs and other non-profit and civic organizations, and the delivery of technical and financial assistance to Minnesota's fishing tackle industry.

In 2004, the Minnesota DNR conducted a survey of tackle loss in five large lake walleye fisheries using creel surveys. The creel survey results were used to estimate annual and cumulative losses. The study results indicated that over 100,000 lead tackle items were lost in the five water bodies that season, totaling about one metric ton of lead. The study estimated that cumulative tackle losses from 1983-2004 for Lake of the Woods, Mille Lacs, and Rainy lakes totaled about 1.5 million lead tackle items representing over 16 metric tons of lead.<sup>25</sup>

The sale and use of lead fishing tackle is currently banned in a number of local, state, and national jurisdictions. The longest-standing prohibition is Great Britain's ban on the use of lead tackle and certain lead shot, which was enacted in 1987 to protect the Mute Swan.

Local:

- Quarry Lakes, East Bay Regional Park District/Alameda County Water District, California

State:

- Maine: Prohibits sale and use of tackle weighing one half ounce or less.
- Massachusetts: Prohibits use of lead tackle weighing less than one ounce or less than one inch in length in all inland waters of the state.
- New Hampshire: Prohibits the sale and use of lead sinkers weighing less than one ounce and lead jigs less than one inch in all freshwater bodies of the state.
- New York: Prohibits sale of tackle weighing one half ounce or less.
- Vermont: Prohibits the sale or use of lead fishing tackle weighing one half ounce or less.
- Washington: Prohibits the use of certain lead fishing tackle and flies in thirteen water bodies.

United States: Use of lead fishing tackle is prohibited at twelve national wildlife refuges and one national park.

- J.N. "Ding" Darling Wildlife Refuge in Florida
- Horicon National Wildlife Refuge in Wisconsin
- Muscatatuck National Wildlife Refuge in Indiana
- National Bison Range in Montana
- Ninepipe National Wildlife Refuge in Montana
- Pablo National Wildlife Refuge in Montana
- Patuxent National Wildlife Refuge in Maryland
- Rachel Carson National Wildlife Refuge in Maine
- Rappahanock National Wildlife Refuge in Virginia
- Red Rock Lakes National Wildlife Refuge in Montana
- Seney National Wildlife Refuge in Michigan
- Union Slough National Wildlife Refuge in Iowa

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<sup>25</sup> Radomski, Paul, et. al. Estimates of Tackle Loss for Five Minnesota Walleye Fisheries. *North American Journal of Fisheries Management* 26:206–212, 2006.

- Yellowstone National Park

Canada:

- Use of lead fishing tackle weighing less than 50 grams is prohibited in all national parks and national wildlife areas.

Denmark:

- Prohibits the sale and use of lead fishing tackle.

Great Britain:

- Prohibits the use of lead sinkers weighing less than one ounce and lead shot weighing more than 0.06 grams in freshwater bodies.

## Lead Ammunition

Lead ammunition is known to cause environmental and wildlife problems. One issue that arises on land is when lead ammunition material is left in discarded animal remains or wounded animals that are then eaten by raptors and other wildlife that are highly sensitive to lead. Bald eagles, for example, can die from ingesting as little as 25 mg (0.00088 ounces) of lead. California banned the use of lead ammunition in the condor range in 2007 and there is strong scientific evidence that this lead ammunition use ban has had a positive effect on the California condor.

In October 2013 the California Legislature passed and Governor Jerry Brown signed AB 711<sup>26</sup>, which will phase in requirements for the use of non-lead ammunition between 2015 and 2019, to protect wildlife and the environment. As noted in Governor Brown's signing statement<sup>27</sup>, California has prohibited the use of lead ammunition in eight counties in the California condor range since 2007. The U.S. Fish and Wildlife Service has banned lead ammunition for hunting waterfowl nationwide since 1991 and 31 states currently regulate lead ammunition in some manner. Though alternatives to lead ammunition are available today, the California law allows sufficient time for the state agencies to promulgate the implementing rule and for hunters and ammunition manufacturers to adapt to the new requirements.

The use of lead shot for waterfowl hunting has been prohibited since 1991 in the US under US Fish and Wildlife Service rules, and since 1999 in Canada under the Migratory Birds Convention Act. On US federal lands, the use of lead shot is prohibited for upland game hunting at 54 of the 81 national wildlife refuges that allow upland game hunting, while the remaining 13 refuges do not allow upland game hunting.<sup>28</sup>

In March 2008, the North Dakota Department of Health announced that it found lead fragments in packages of donated venison. The Minnesota Departments of Agriculture, Health, and Natural Resources tested donated venison in Minnesota and found that 22 percent contained lead fragments in both ground meat and whole muscle. Despite program changes to address the problem, follow-up testing in the fall of 2008 indicated that there was still a significant problem and all donated meat was screened by x-ray testing. Only meat that was free of lead was released for consumption. A fact sheet<sup>29</sup> released in 2009 concluded that contaminated meat posed a significant health risk to children and pregnant women who consume venison that contains lead fragments. The state would not allow such meat to be sold in commerce so it could not allow it to be donated to food shelves for consumption. It also concluded that the problem was not due to inadequate or improper processing since lead fragments could be found up to 18 inches away from the wound channel and were often not visible. Given the conclusions of the 2008-2009 studies by the three agencies, the only way to avoid lead-contaminated venison for home consumption or food shelf donations is to use ammunition that does not contain lead.

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<sup>26</sup> [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201320140AB711&search\\_keywords=](http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB711&search_keywords=)

<sup>27</sup> [http://gov.ca.gov/docs/AB\\_711\\_2013\\_Signing\\_Message.pdf](http://gov.ca.gov/docs/AB_711_2013_Signing_Message.pdf)

<sup>28</sup> United States Department of the Interior, Fish and Wildlife Service. 2012–2013 Refuge-Specific Hunting and Sport Fishing Regulations; Final Rule. 77 FR 56028.

<sup>29</sup> <http://www.mda.state.mn.us/news/publications/news/govrelations/leadcontamvenison.pdf>

# Policy recommendations

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In addition to reporting on activities and advancements since the last reporting period, the *Toxics and Pollution Prevention Evaluation Report* presents an opportunity to identify policy recommendations that could further enhance Minnesota's goals of reducing toxic chemicals in products, preventing pollution, informing Minnesotans about toxics in products and promoting green chemistry. The following sections present recommendations that would enhance Minnesota's efforts in these arenas, beginning with more specific prohibitions or phase-outs and ending with a broader set of strategies for further coordinating and advancing toxics reduction efforts in Minnesota.

## Proposals for reducing lead and mercury in products, people and the environment

1. **Lead wheel weights.** Prohibit the sale and installation of wheel weights and other balancing products containing lead or mercury; new motor vehicles may not be sold with wheel weights or other balancing products containing lead or mercury.
2. **Mercury thermometers.** Update the law to eliminate the obsolete allowances for use and the references to primary standard thermometers. The legislation should allow mercury thermometer sales only where an Interstate Mercury Education and Reduction Clearinghouse (IMERC) member state has approved a limited use exemption and that exemption is provided to the MPCA. This is parallel to current statutory language [Minn. Stat. § 116.92, subd. 8e(c)] prohibiting sales of mercury switches and relays except where an IMERC state has approved a limited use exemption and that exemption is provided to the MPCA.
3. **Mercury thermostats and displacement relays.** Harmonize and strengthen the existing statutory requirements for manufacturers of thermostats and displacement relays to be responsible for end of life management of their products by broadening the education and incentive requirements and requiring at minimum: annual reporting on program components, identification of participants, recovery rates, and proposals to expand participation and increase recovery rates from all sectors that use the products.
4. **Mercury-containing lamps.** Establish a flexible, product stewardship approach for mercury-containing lamps. Based on the experience with product stewardship for waste electronics and rechargeable batteries in Minnesota and with other products in other states, product stewardship offers significant opportunities to improve the collection rate of mercury-containing lamps. Product stewardship for mercury-containing lamps would result in an increased number of private sector entities providing collection opportunities and reducing the taxpayer obligation to manage these products through the local governments that offer collection.
5. **Lead fishing tackle.** Work with angling, conservation and other interested parties to establish a pathway to measurably reduce the use of lead fishing tackle. In the process review and learn from the experience of other jurisdictions that have done so successfully.
6. **Lead ammunition.** Create an education campaign with hunting, conservation, food safety and other interested parties for reducing the use of lead ammunition similar to the Get the Lead Out! program that was developed for lead fishing tackle. Also, monitor California's approach and experience with phasing out the sale and use of lead-containing ammunition for hunting.



## Reducing priority chemicals in products, people, and the environment

MPCA and partners in other State agencies have been increasing coordination of current toxics-in-products regulations in Minnesota statute, and are discussing a framework for future policy change to close gaps and increase protection of citizens, the environment, and reduce the future costs of toxics remediation which could hamper economic development.

This framework builds on the recommendations for legislative action presented in the MPCA and MDH 2010 Report to the Legislature, “*Options to Reduce and Phase-out Priority Chemicals in Children’s Products and Promote Green Chemistry*.” Those five recommendations were:

1. Require manufacturers that produce or sell children’s products in Minnesota that contain one or more Priority Chemicals be subject to reporting requirements;
2. Policy makers should consider adding additional program components, incentives, resources, and revenue sources to the effort as needed;
3. Establish formal green chemistry policies to help direct the efforts of state agencies, technical assistance programs and private sector businesses;
4. Direct state agencies to develop materials to educate Minnesotans about Priority Chemicals, the concepts of risk and exposure, and ways Minnesotans can limit their exposure to Priority Chemicals;
5. Direct the MPCA and the Department of Administration to evaluate adaptation of Minnesota’s existing preferential purchasing initiatives to give preference to products that do not contain Priority Chemicals.

As noted below, various degrees of progress have been made on implementing each of these five recommendations. That progress has resulted in new learning that the MPCA has drawn upon to suggest further updates and refinements to each recommendation. Additionally, MPCA offers a new recommendation since the 2010 report:

6. Further enhance coordination among state agencies involved in pollution prevention and reducing toxics in products.

### Update on Recommendations and Additional Policy Suggestions

Following are updates to the five 2010 recommendations listed above and the new recommendation 6, with possibilities for refined implementation along with the associated reasoning.

- 1. Require manufacturers that produce or sell children’s products in Minnesota that contain one or more Priority Chemicals be subject to reporting requirements;**
  - Because of the number of chemicals consistently present in Minnesotans’ bodies and environment (see the BPA discussion), MPCA proposes broadening this statement somewhat: Improve chemical use and release reporting so Minnesotans know what chemicals are being released into our environment over a product’s life cycle.

States have legitimate interests in seeking toxicity information on specific products since federal TSCA focuses on domestic use of input chemicals, and misses all the possible uses of those input chemicals in finished products (“articles”), especially those imported: clearly, a huge slice of the consumer products supply chain. State reporting requirements on products will capture imports of toxic chemicals embedded in products or articles in ways that federal TSCA (as possibly amended) will not.

#### **Require reporting on Priority Chemical use under the TFKA**

- The Legislature should amend the TFKA to require reporting on Priority Chemicals used in children’s products. Fees that are at a minimum sufficient to fund the reporting program should be authorized as well.

Various Minnesota stakeholders have been discussing possible amendments to the 2009 TFKA, including requirements similar to the State of Washington’s for reporting Priority Chemicals present in children’s products, State agency exposure and safer alternatives assessments, fee structures, and eventual pathways to bans for children’s products that continue to contain Priority Chemicals over time. These discussions have

been taking place with consideration of toxics in products policy being implemented in other states, and the discussion in Congress of amendments to the federal TSCA, discussed earlier.

Reasoning: MPCA, MDH and other state agencies continue to have difficulty tracking the incidence in Minnesota commerce of Priority Chemicals designated under the TFKA. In addition, concerned consumers continue to have difficulty getting information about the presence (or absence) of toxic chemicals in the products they use. Similarly, policymakers do not have the information they need to create policy incentives and penalties to prevent Minnesota citizens from being exposed to harmful chemical content.

Other states such as Washington, Maine and California are developing a level of information for product types (e.g., children's pajamas) but not specific products (e.g., the Widget Company's children's pajamas with the stars on them), and no other U.S. jurisdiction has yet developed a broad landscape of incentives that move manufacturers, major retailers or distributors, or brand name owners to reduce or eliminate Priority Chemicals in children's products. Reporting requirements and fees that escalate over time, but with an upfront grace period for early action, should together work to get Priority Chemicals out of products sold to Minnesotans.

Instituting reporting requirements may also assist businesses in identifying Priority Chemicals present in their product supply chains, which they may not have been previously aware of (some Priority Chemicals may be present as a contaminant). Thus, reporting information could be beneficial to multiple stakeholders and may in itself prove to be an incentive for manufacturers to reformulate products with safer alternatives, leading to a more marketable product, as consumers begin to take more interest in the ingredients used within the products they purchase.

#### **Require pollution prevention planning and reporting for Priority Chemicals and Emerging Contaminants**

- Broaden beyond the TFKA to improve chemical use and release reporting so Minnesotans know what chemicals are being released into our environment over a product's life cycle.

Priority Chemicals designated pursuant to the TFKA and other highest-priority emerging environmental contaminants designated by the MPCA and MDH should be added to the list of chemicals that companies are required to plan to reduce and report on under the 1990 Toxic Pollution Prevention Act (TPPA).

The threshold triggering the reporting should include both use in feedstocks and supplied components and in the production process, and be set at the same threshold currently in place for persistent, bioaccumulative or toxic (PBT) chemicals: 100 pounds used per year. As chemicals come on or off these priority lists, companies would be automatically subject to or exempt from the reporting requirement.

Reasoning: The TFKA is primarily focused on reducing children's exposures to toxic chemicals. However, the Priority Chemicals are also contaminants of concern which, as the case study of BPA illustrates, are often ubiquitous in the environment and affect organisms and ecological systems in negative ways.

Emerging contaminants such as nonylphenol ethoxylates (see discussion page 23) identified by MDH and MPCA in ground or surface water are in the same category of concern. TPPA planning and reporting will provide incentive to companies to understand if and where Priority Chemicals and emerging environmental contaminants are found in their products and processes, and will generate new public information on where these chemicals are and in what approximate amounts. This change would not reveal all sources of these chemicals, but it would provide new information on active sources and cost-effectively leverage existing Minnesota programs.

Threshold triggers should be sufficiently- low (e.g., PBT levels) to cause companies to investigate whether and where Priority Chemicals and emerging contaminants are coming to them from upstream suppliers.

#### **2. Policy makers should consider adding additional program components, incentives, resources, and revenue sources to the toxics pollution prevention effort as needed;**

- Develop further incentives or mandates for discontinuing use of the most problematic chemicals. This could take multiple forms and could include future bans and the use of additional policy tools that demonstrate effectiveness over time. At this time, MPCA is only recommending consideration of fees as an incentive tool.

### **Incentives: Fees assessed on children's products containing Priority Chemicals**

If the Legislature amends the TFKA to require reporting on Priority Chemicals in children's products, fee structures should be applied to fund the ongoing costs of the reporting, assessment, and compliance assurance program. In addition, the fee structure should include an additional layer assessed on children's products that continue past reasonable replacement timelines to contain Priority Chemicals. These fees could escalate as more reporting periods pass.

Reasoning: An additional fee layer that escalates over time should provide real and increasing incentive to work with researchers and suppliers to find safer alternatives, getting Priority Chemicals out of products sold to Minnesotans.

### **Incentives: Fees on releases of Priority Chemicals or Emerging Contaminants reported by manufacturers under the Toxic Pollution Prevention Act**

Consider refining the TPPA so that as Priority Chemicals or other highest-priority emerging environmental contaminants are added to the list of chemicals that companies are required to plan to reduce and report on under the TPPA, the fees included in the TPPA are also applied. These would include a base fee on the each chemical reported by a company, and an additional fee on the amount of the chemical used or released by the company.

Only manufacturers and downstream processors would be subject to the TPPA requirements. They do not apply to retailers or distributors.

Reasoning: The application of a fee provides an additional incentive beyond the reporting and planning requirements to reduce the use or release of these chemicals.

### **3. Establish formal green chemistry policies to help direct the efforts of state agencies, technical assistance programs and private sector businesses;**

- Continue green chemistry and pollution prevention innovation and reform (this would include funding for development grants, incentives for new research and development, and so on).

### **Funding for safer alternatives**

If the preceding recommendations involving new fee structures are not implemented or do not include support for green chemistry and engineering, biennial appropriations under the TFKA should be increased to allow for ongoing grants to eligible researchers, educators, and companies to undertake green chemistry or safer alternatives evaluation projects.

Reasoning: Current funding to MDH and MPCA covers chemical review and listing, and tracking of chemicals policy. In past years MPCA has received temporary federal funds to provide grants to companies and faculty for green chemistry and chemicals evaluation projects; those funds are no longer available. MPCA has found that grants of around \$50,000 can incentivize and support company projects such as the green chemistry demonstration projects<sup>30</sup> funded in 2011-2012, and grants of \$5,000 to \$15,000 allow chemistry educators to develop new curricula and materials to integrate green chemistry and engineering concepts, affecting hundreds of students a year and their subsequent professional life. Additional state appropriations can make these offerings a more regular part of Minnesota's product improvement program.

In general, all innovation or research and development grants or tax incentives should be reviewed to identify and implement all opportunities to include green chemistry and engineering research and implementation, for both private and university development of safer alternatives.

In the TFKA and in other statutes as appropriate, establish a state policy for what constitutes a "safer alternative," including what human health and environmental impacts for a new alternative should be researched and documented, and in general how improvement over an incumbent chemical or product should be initiated after a balanced decision making process.

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<sup>30</sup> <http://www.pca.state.mn.us/index.php/topics/preventing-waste-and-pollution/p2-pollution-prevention/reducing-toxicity/green-chemistry-and-design/green-chemistry-and-design-demonstration-project.html>

**4. Enable state agencies to develop materials to educate Minnesotans about Priority Chemicals, the concepts of risk and exposure, and ways Minnesotans can limit their exposure to Priority Chemicals;**

No specific recommendations at this time, however, if reporting policies recommended above are implemented, state agencies would communicate to citizens any actionable or informative data not designated as confidential business information. In addition to MPCA, the Departments of Health and Commerce also have established outreach mechanisms for audiences that could benefit from this information.

**5. Direct the MPCA and the Department of Administration to evaluate adaptation of Minnesota's existing preferential purchasing initiatives to give preference to products that do not contain Priority Chemicals.**

MPCA pursues this on an ad hoc basis and with a small fraction of a full time employee, searching state contracts for upcoming expirations or renewals that may involve Priority Chemicals, contaminants of emerging concern, and more broadly, energy-saving or life cycle impact reduction opportunities. An example of a recent success is the inclusion of Green Seal and Globally Harmonized System of product safety disclosure standards precluding use of nonylphenol ethoxylates or triclosan in the new dishwashing detergents and service contract.

Both MPCA and Department of Administration do not have enough resources to pursue all opportunities in a timely and fully-informed manner. Funding to support these efforts could be included in #3 above.

**6. Further enhance coordination among state agencies involved in pollution prevention and reducing toxics in products.**

As noted previously in this report, Minnesota's pollution prevention and toxics reduction efforts have developed incrementally over time. The current mix of pollution prevention authorities, specific chemical or product bans, green chemistry initiatives and consumer education efforts have all led to advances in toxics reduction and pollution prevention. However, they also represent a somewhat piecemeal approach to this arena.

As a result of recent legislation such as the TFKA and the recognized importance of a multi-agency approach to addressing toxics in products, state agencies are collaborating more than ever before on strategies and approaches to understand the prevalence and release of chemicals of concern; evaluate human health and environmental impacts; and implement strategies to reduce the use of these chemicals and promote safer alternatives. With that said, additional work is needed to clarify roles and responsibilities, identify opportunities for consolidation/efficiency gains, and to optimize the effectiveness of all the tools available to address this area of concern.

**Optimize existing authorities**

- Develop clearer, more consistent, and meaningful enforcement and evaluation practices for toxics-in-products regulation in Minnesota statute, including clarifying roles among agencies and adequately funding the associated activities, so that policymakers and citizens may evaluate whether these statutes are achieving their intended purpose.

The Legislature should direct state agencies to further develop coordinated, statewide strategies to address toxics pollution reduction, and should fund this effort on a sufficient and ongoing basis. This would include a review of existing statutes to identify opportunities for consolidation, clarification, and addressing gaps.

Reasoning: Oversight functions for the growing number of product or product constituent sales or use bans are fragmented among agencies or the attorney general's office and not adequately funded. As a result, the Legislature and the people of Minnesota cannot tell if products are in compliance and safe, and State agencies have only ad hoc mechanisms for communicating (sometimes multiple) requirements to responsible producers and sellers, and for conducting product testing and enforcement.

Example: Early data from the State of Washington's children's product reporting suggests that several products that are likely to be sold in Minnesota by the same national retailers may be in violation of existing State statute or federal rule. Several products contain metals either as incidental contaminants (possibly in violation of the Minnesota Listed Metals statute at 115A.9651, or for an anti-microbial function that would require prior approval by the U.S. Food and Drug Administration and U.S. Environmental Protection Agency.

MPCA has insufficient resources to confirm the reported data through testing and confirm (non)compliance with 115A.9651 or to pursue inquiry with the FDA and EPA on whether these products have been approved or are noncompliant.

#### **Enhance coordination and address gaps**

- Build on enhanced monitoring and analysis with multi-agency strategies and priorities to first identify chemicals with the greatest potential for impacts and then reduce the use of those chemicals through green chemistry, consumer education, pollution prevention and policy-based tools.

Continue to tie existing state-level authorities and expertise into a cohesive system for addressing toxics in products and preventing pollution. This includes ongoing efforts to coordinate monitoring and evaluation, to develop consumer education efforts, and to identify gaps in existing information and options for filling those gaps (such as the proposed enhancements to the TFKA and TPPA identified above).

Reasoning: Enhanced coordination and collaboration – both among state agencies and with other partners – is essential for future advancement in the areas of toxics reduction and pollution prevention. While more progress is needed, state agencies have begun to address the need for greater collaboration and the development of multi-agency strategies to address pollution prevention and toxics in products. For example, the increased efforts by both MPCA and MDH to monitor and evaluate unregulated chemicals (with funding provided from the Clean Water Fund) have resulted in greater information-sharing and establishment of shared priorities between the two agencies. As a result, we now better understand the presence and potential effects of more chemicals found in Minnesota’s environment, and we are able to share that information with Minnesotans to help inform policy discussions. This is just one example of how enhanced collaboration among agencies presents an opportunity to improve understanding of the effects of toxics in products and use that new information to promote green chemistry, pollution prevention and policy-based tools for their replacement by safer alternatives.

MPCA and other agencies have implemented to the extent allowed by current funding the following additional activity-based recommendations from the 2010 Report:

- The MPCA and MDH should continue their participation in the Interstate Chemicals Clearinghouse;
- The MPCA and MDH should participate in states’ initiatives that support TSCA reform;
- The MPCA should establish a policy to promote green chemistry and product design as part of its pollution prevention programs to enhance Minnesota businesses’ competitiveness in all markets.
- The MPCA should direct existing staff resources to explore and promote green chemistry and design across sectors, supply chains and state government.

The framework currently being discussed by MPCA and partner agencies incorporates most of these recommendations in one form or other, but Priority Chemicals and green chemistry policies should be developed wherever feasible in state law and programs; not confined to the context of the TFKA.