

# NATIONAL WILDLIFE FEDERATION



## Putting the Brakes on Quicksilver: Removing Mercury from Vehicles in Ohio

February 2007



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**Written by Michael W. Murray, Ph.D.**

**Research assistance by Knoll Larkin and Liz Szaluta**

**Larry Schweiger, President and Chief Executive Officer NWF**

## **Acknowledgments**

The National Wildlife Federation is grateful to the research support of Knoll Larkin and Liz Szaluta (University of Michigan School of Public Health), for planning, carrying out, conducting data analysis, and reporting on the survey of auto dismantlers described in Section III. We thank Bill Narotski and Frederick Jones of the Ohio Environmental Protection Agency for providing information via phone or email and for taking time to meet on several occasions to discuss the vehicle switch issue, and thank Laurie Stephenson of Ohio EPA for additional information. We are very grateful to Bill Wirthman of Wirthman Brothers, Inc. (Columbus, OH), Eric Stearns of Dicks Auto LLC (Findlay, OH), Mike Swisher of Town and Country Used Parts (Ann Arbor, MI), and Mark Larson and Bob Sandau of LKQ of Michigan (Belleville, MI) for tours and permission to take photos at their facilities. Thanks to Bill Heenan of the Steel Recycling Institute for general information on scrap recycling, and to Jeff Gearhart and Charles Griffith (Ecology Center) and John Gilkeson (Minnesota Pollution Control Agency, Office of Environmental Assistance) for general advice through this project. Thanks to Bob Doyle of The Environmental Quality Company and Dan Adsit of Ford Motor Company for providing photos, and to Luis Figueiredo for use of the camera by the author.

Thanks to Shell Rumohr and Kathleen Eales of NWF for assistance in printing and distribution of this report.

Funding for this project was generously provided by the U.S. Environmental Protection Agency (grant number GL-96595701-0), and in part by the George Gund Foundation. All views, conclusions and recommendations expressed in this report are solely those of the National Wildlife Federation, and do not necessarily reflect the views of the funders.

Report design and layout by Sara E. Jackson (NWF).

Cover photo of mercury containing pellets courtesy of End of Life Vehicle Solutions. Page 1 photo of angler by Brian Preston. Page 12 photo of bucket of mercury pellets by Judie Zaborowski, The Environmental Quality Company. Page 14 photo of Brandywine Falls purchased from iStockphotography.com. All other photos by Michael Murray.



**Keeping the Wild Alive**

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**T**he fishing experience in Ohio and other states continues to be hampered by an ongoing problem: mercury contamination. Ohio has a statewide advisory recommending restricted consumption of all fish from all water bodies in the state because of mercury contamination. While much progress has been made in the past 15 years to reduce mercury releases, further efforts will be needed to meet regional virtual elimination goals and reach the point where mercury fish advisories can be lifted. Fortunately, one of the few "low hanging fruit" opportunities remains to be fully exploited – addressing mercury containing switches in vehicles.

Mercury has been used in several applications in vehicles for several decades, of which convenience light switches and anti-lock braking systems (ABS) were the major uses. While the last of these types of switches were phased out by 2003, the tens of millions of cars on the road or waiting to be recycled represent an ongoing reservoir of 75 tons or more of mercury. If these mercury switches are not removed before vehicles are well into the recycling stream (with the steel recycled and melted in steel mills), most of this mercury will be released to the environment, further contributing to our contamination problems.



**Angler on the Chagrin River in Ohio.**

New voluntary switch collection programs in Ohio and nationally are positioned to begin tackling this problem in an effective way. And a survey of a subset of dismantlers in Ohio suggests general awareness of the issue (71 percent of respondents) and an interest in taking part in a collection program. Maintaining an increasing the effectiveness of the new Ohio mercury switch collection program will require several initiatives, including:

- More active role of auto recycler associations providing information to their member companies on the mercury switch issue and encouraging participation in the voluntary collection programs
- Greater active participation of individual Ohio auto dismantlers in the state's voluntary program
- Increased awareness and activities of scrap recyclers and Ohio's steelmakers (including increasing demand of mercury-reduced scrap)
- Consideration of alternative approaches by the Ohio Environmental Protection Agency and other state agencies (such as the Bureau of Motor Vehicles) to increase dismantler participation in the state program (e.g., through correspondence on other issues)
- Development of a program by the Ohio Department of Administrative Services to ensure removal of all mercury switches from surplus state vehicles prior to auctions
- Recognition by state government officials in relevant agencies of the importance of the voluntary switch removal program, and efforts to work with all stakeholders in considering innovative approaches to continue funding of the program.

**A**s in a number of states, fishing is a popular activity in Ohio. Whether it is ice fishing for walleye, pike, or panfish in Northeastern Ohio or warmer weather fishing for sauger in the Ohio or Scioto Rivers, opportunities abound throughout the state. An estimated 1.37 million anglers fished in Ohio in 2001, including 146,000 from outside the state, and these anglers spent over \$761 million that year, according to the most recent survey from the U.S. Fish and Wildlife Service.<sup>1</sup>

Yet the fishing experience in Ohio (as elsewhere) continues to be bedeviled by a persistent problem – mercury pollution, which is a widespread problem in the state. An advisory recommending restricted consumption of all fish in all the state's water bodies is in place because of this contamination (see Box 1). Health risks from elevated mercury exposures are wide-ranging. Exposures to elevated levels of an organic form of mercury – methylmercury (see below) – *in utero* have been associated with neurodevelopmental problems (such as in memory, attention, and language skills) in children.<sup>2</sup> The number of newborns annually in the U.S. exposed to mercury levels posing these risks is estimated at over 600,000.<sup>3</sup> Some research has also indicated that

## Box 1

### Fish Consumption Advisories for Mercury in Ohio

2007 is the tenth year that some type of statewide fish consumption advisory has been issued by the Ohio Department of Health (ODH) and Ohio Environmental Protection Agency (Ohio EPA) due to mercury contamination. The initial advisory was limited to women of childbearing age and young children. Subsequent research showing that men could be at risk from elevated mercury exposures led to a broadening of the advisory to include all fish consumers. The current advisory recommends that all citizens limit their consumption of all fish to no more than one fish per week. According to the state's fish advisory, fish that are often higher in mercury include walleye, smallmouth bass, and freshwater drum.<sup>6</sup>

In 78 locations, more stringent recommendations are in place (e.g. recommending consumption of certain species no more than once every one or two months), and most of these restrictions are due to mercury and/or PCBs. Common fish species with advisories in these locations include largemouth and smallmouth bass, channel catfish, freshwater drum, and common carp.<sup>7</sup>

mercury can counteract the protective effect of beneficial constituents in fish, with higher methylmercury exposures associated with increased risk of cardiovascular disease in men.<sup>4</sup> In addition, to threats to human health, elevated mercury exposures can affect the reproductive and nervous systems in fish-eating wildlife such as otters and loons, and even some songbirds have recently been found with elevated mercury levels.<sup>5</sup>

While mercury is a natural element, human activities have significantly

increased the amount of mercury cycling in the environment. These activities include mining mercury and using it in products and processes (such as thermometers, other medical devices, lamps, and switches), as well as operations that release mercury due to its incidental presence in a fuel or feedstock (such as burning coal for power generation). The single largest mercury source sector in Ohio and throughout the Great Lakes region has been coal-fired power plants, but other sectors related to purposeful uses of mercury have also contributed significantly to air emissions.<sup>8</sup> Once mercury is released to the air, it can be deposited (with precipitation or in dry forms) locally or regionally or in more distant areas. Once in watersheds, inorganic mercury can be converted into an organic form, methylmercury, which more readily accumulates in organisms and builds up at higher levels of the food web. For example, methylmercury levels in top predator fish can be 10 million times higher than the concentration in the surrounding water.<sup>9</sup>

Under the Great Lakes Water Quality Agreement, the U.S. and Canada committed to the virtual elimination of releases of mercury and other toxic chemicals, including via both incidental releases and purposeful uses. A number of both regulatory and voluntary

programs have been adopted through the years to address mercury releases, including through the Canada-U.S. Binational Toxics Strategy (with a focus on voluntary approaches)<sup>10</sup>, and uses of mercury have decreased over the past 15 years.

However, the combination of ongoing fish consumption advisories and significant mercury releases have kept a focus on the importance of programs to reduce and virtually eliminate mercury releases to the environment. These efforts have been increasing in Ohio as well. Ohio has proposed a rule (consistent with federal requirements) to control mercury emissions from coal-fired power plants, although it is not as stringent as plans developed by a number of other states.<sup>11</sup> On the other hand, in January 2007 a mercury products bill was signed that bans or restricts use of mercury in schools and sales or distribution of mercury containing thermometers, thermostats, and novelty items in Ohio.<sup>12</sup>

This report addresses an additional important source of mercury, for which a small window of opportunity remains for a simple pollution prevention action: mercury containing switches in vehicles.



## II. Mercury Switches in Vehicles: The Problem

### A. Metal Recycling

The problem of mercury containing switches is embedded within a larger materials use and recycling success story. Steel is by some measures the most recycled material in the U.S.: in 2005, the domestic steel industry recycled (or exported for recycling) approximately 76 million metric tons (Mt) of steel products, including vehicles, appliances, construction materials, cans and other products. This amounted to an overall steel recycling rate of about 76 percent.<sup>13</sup> In addition to conserving raw materials, steel recycling saves energy and decreases need for landfill space.

Steel is produced in one of two ways in the U.S.: in integrated mills, pig iron is produced from iron ore and coke, and then processed in a basic oxygen furnace with some scrap to produce steel, while in electric arc furnaces (EAFs, also sometimes termed mini-

mills), an electric current is passed through mostly scrap metal, creating extremely high heat which melts the metal and, with refining, produces steel. Of the 93.3 million metric tons of raw steel production in the U.S. in 2005, 56% was produced by EAFs, and 44 percent was produced using basic oxygen furnaces.<sup>14</sup> While basic oxygen furnaces can utilize some scrap metal, the majority of steel scrap used in steelmaking in the U.S. is consumed by EAFs. The single largest source of scrap steel is vehicles, of which nearly two-thirds the weight can be iron and steel (although this percentage is decreasing as more plastics are used in vehicle manufacturing).<sup>15</sup> In 2005, the estimated recycling rate for scrap steel from vehicles was 102% (i.e., more steel was recycled from vehicles than was used in the production of new vehicles).<sup>16</sup>

The general vehicle recycling infrastructure is shown schematically in

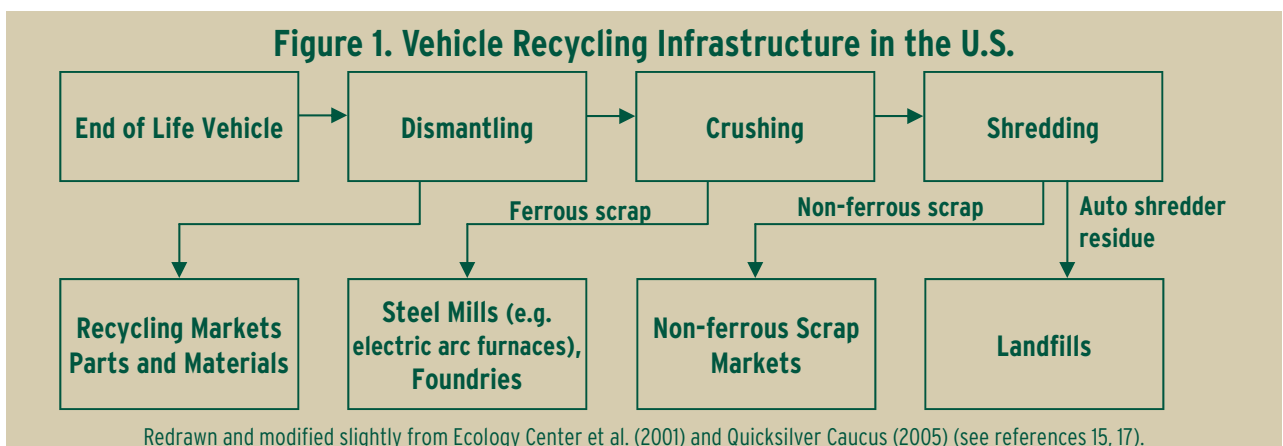




Image courtesy of Wirthman Brothers, Inc., Columbus, OH.

**Figure 2.**  
**On-site auto  
crusher**

Figure 1.<sup>17</sup> End of life vehicles (e.g., following an accident or a decision by an owner to sell, donate or abandon) are typically first taken to and maintained at a dismantler, where parts and materials with significant resale value are removed and sold. (Scrap recyclers earn money solely on the value of the steel, and may in some cases take vehicles that have gone through dismantlers or salvage yards.) Once all parts and materials with significant resale value have been removed from a vehicle, the hulk is available for crushing and/or shredding. Crushing – where done – can be carried out on-site (see Figure 2), but in many cases (in particular for smaller operations), crushing occurs either off-site or is done via a mobile crusher brought to the dismantler. Shredding is typically done at freestanding shredders, where the

process breaks the material into fist-sized chunks, and then separates material into ferrous metal, nonferrous metal, and auto shredder residue (ASR) (also termed "fluff") fractions. Ferrous (or iron and steel) metals are recovered by magnetic separation, and can then be transferred to a mill for new steel production. Other technologies are used to recover nonferrous metals, which can be sold on the non-ferrous scrap market. The ASR contains foam, textiles, glass and other material, and is typically sent to a landfill.<sup>18</sup>

## **B. Mercury Use in Vehicles**

Mercury has been used for a number of years in various applications in automobiles. The most significant uses have been convenience light switches for hoods and trunks, switches in antilock braking systems (ABS), and to a lesser extent in active ride control systems, with a mid-1990s breakdown of mercury use in each of 87, 12, and one percent, respectively.<sup>19</sup> The convenience lights were designed so that when the hood or trunk reached a certain opening angle, a mercury bead inside a pellet would activate an electrical circuit, turning on the lamp. Figure 3 shows examples of locations of mercury hood light switches in three domestic models. Each mercury switch contained on average approximately 0.8



**Figure 3. Mercury containing light switches in three vehicles.**



**Hood light in 1994  
Oldsmobile  
Silhouette**



**Hood light in 1992  
Ford Explorer**



**Hood light in  
circa 1991  
Dodge Dynasty**



Top left photo courtesy of LKQ of Michigan (Belleville, MI), other three photos courtesy of Town and Country Used Parts (Ann Arbor, MI).

grams mercury. There were a variety of light switch assemblies manufactured, and it is sometimes not obvious whether or not an assembly contains mercury. Figure 4 shows examples of mercury containing switch assemblies and pellets removed from vehicles.

Use of the mercury light switches by automakers increased dramatically in the 1980s, and by 1996, an estimated 9.7 metric tons of mercury was being used annually in auto switches in the U.S. In addition, by 2000, an estimated 3.2 – 3.8 tons of mercury was being used in ABS

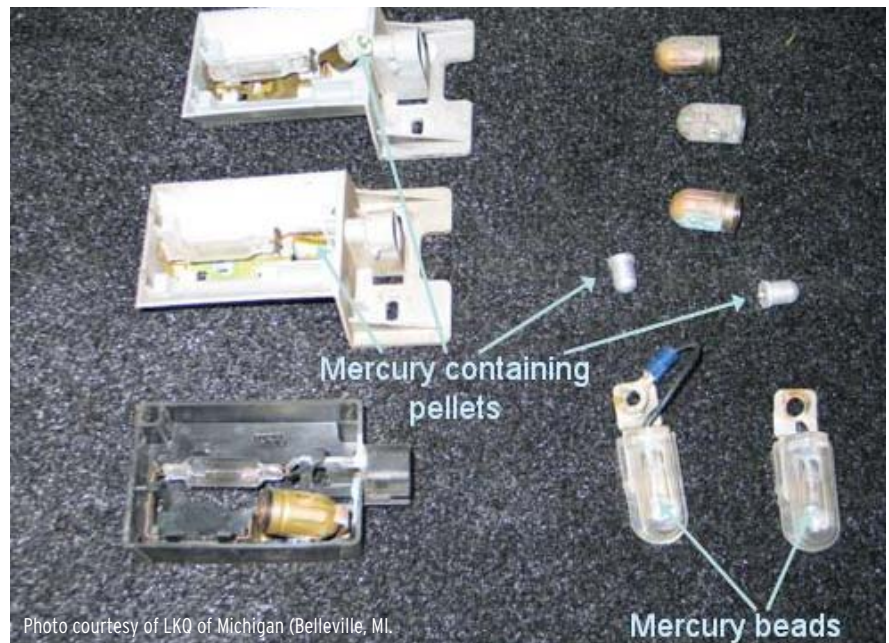


Photo courtesy of LKQ of Michigan (Belleville, MI).

**Figure 4. Examples of mercury containing switch assemblies and mercury containing pellets. Larger pellets in upper right and in lower left assembly are not mercury containing.**

switches, with unknown amounts used in other applications, such as active ride control switches, high intensity discharge lamps, and other fluorescent lamps in vehicles.<sup>20</sup>

**Table 1. Makes of Cars and Trucks Potentially Having Mercury Containing Hood and/or Trunk Convenience Light Switches**

Make/Model	Years
GM	2002 and older
Ford	2001 and older
DaimlerChrysler	1998 and older
Volvo	1991 and older
Audi 100	1977 - 1988
Audi 200	1980 - 1988
Mazda Navajo	1993 - 1997
Mazda B-Series Pickup	1995 - 1999

Source: End of Life Vehicle Solutions Corporation. (Note that not all models of all makes utilized mercury convenience light switches.)

U.S. automakers had voluntarily removed the last mercury containing convenience light switches from vehicles by the 2003 model year.<sup>21</sup> International automakers had either never used mercury in similar applications or had phased out these uses in the 1990s. Table 1 indicates makes and years of autos that potentially had mercury containing convenience light switches.

If not removed from a vehicle before it goes through the full recycling process, mercury switches are most likely to wind up in the ferrous fraction, be melted with the scrap steel, and the mercury largely lost (due to its high volatility) with furnace emissions during the steelmaking process. Because mercury has been used in a number of other switch applications as well, including in tilt switches in appliances, scrap steel from these applications can contribute additional mercury to EAF feedstocks. U.S. mercury emissions from EAFs in one estimate amounted to 10.7 metric tons in 1999,<sup>23</sup> making EAFs one of the largest source sectors of mercury air emissions in the country.

As noted above, automakers stated that no mercury containing convenience light switches were used beyond model year 2002. In addition, automakers using mercury containing ABS switches in 2000 (Ford, DaimlerChrysler and Mazda North America) were earlier planning on having phased out all such uses by model year 2006<sup>24</sup>; the industry states that all mercury switch applications had ceased by January 1, 2003.<sup>25</sup> (Smaller amounts of mercury continue to be used in applications such as HID headlamps and navigation displays, although the automakers are developing mercury-free alternatives

for these applications.<sup>26)</sup> While major uses of mercury in autos has been phased out, mercury switches in the tens of millions of pre-2003 model year vehicles either still on the road or in the early phases of recycling operations will serve as an ongoing – and easily preventable – source of mercury releases for the next decade, unless widespread and effective action is taken.

### **C. Vehicle Recycling in Ohio**

Auto dismantlers and scrap yards in Ohio have a substantial market within the state in the form of an active steelmaking industry; in 2000, nearly 10 percent of the active EAFs in operation in the country (19 of 198) and over 10 percent of nominal production capacity was located in the state.<sup>27</sup> In 2005, the iron and steelmaking industry in Ohio reported receiving the largest amount of iron and steel scrap available through brokers, dealers and other sources of any state, at nearly 13 percent of the national total.<sup>28</sup> (Note that scrap purchased at Ohio plants would not necessarily have come exclusively from Ohio scrap suppliers). While there has been limited testing of EAFs in Ohio and elsewhere, one study estimated annual mercury emissions from a single facility at 660 lbs.<sup>29</sup>

The vehicle recycling infrastructure itself in Ohio is very extensive. While some recyclers are high-value parts dismantlers which tend to be high volume operations, the large majority of the estimated 750 dismantlers in the state<sup>30</sup> are lower volume, more traditional auto salvage operations. Recyclers have the opportunity to join several trade associations, but it appears most are not members. For example, the Automotive Recyclers Association (ARA) lists only 49 member companies in the state,<sup>31</sup> while the Ohio Auto and Truck Recyclers Association lists 154 members.<sup>32</sup>

In an effort to gauge awareness of the mercury switch issue and interest in addressing the problem among dismantlers, NWF worked with students from the University of Michigan's School of Public Health on a survey of a subset of Ohio dismantlers in the fall of 2005. The students, Knoll Larkin and Liz Szaluta, conducted a phone survey of dismantlers in the state, with the targets derived from the list of ARA members and an online (Yellow Book) directory search. The total number of companies targeted was 104. Representatives from 30 companies completed the survey, 10 refused, and 64 were not able to be reached. Key findings of the survey are indicated in Box 2.

## Box 2. Key Findings of NWF Fall 2005 Survey of Ohio Vehicle Dismantlers

The following key findings were obtained based on responses from representatives from 30 companies to the phone survey:

- 95 percent worked with both domestic vehicles and international makes
- 71 percent were aware of the mercury switch issue
- 23 percent said they removed mercury switches "all the time", while an additional 14 percent said they removed mercury switches "most of the time"
- Of those companies removing mercury switches, the majority (88 percent) did not know what to do with the switches, and were generally storing them in buckets.

Questioned on barriers to removing mercury switches from vehicles, responses included:

- 47 percent reported time as a barrier
- 37 percent reported cost as a barrier
- Other barriers included lack of information on the issue, extra effort and work, lack of awareness about how to remove switches, uncertainty about what to do with collected switches, and lack of mandate

Finally, 88 percent indicated an interest in participating in a voluntary switch collection program.

as strong interest in participating in a voluntary switch collection program. The survey findings indicated that a combination of a formal collection infrastructure and additional resources (including information and possibly financial) could potentially lead to a successful mercury switch collection system.

While the survey consisted of a small sample of the total number of auto dismantlers in Ohio, and most of those targeted could not be reached, the responses of those completing the survey was encouraging. This included involvement of a higher percentage of respondents in removing mercury switches than was anticipated, as well

### III. Mercury Switches in Vehicles: Taking Action

**T**here is a relatively small window of opportunity to address the mercury switches in tens of millions of vehicles on the road and in the early phase of the recycling process. The U.S. Environmental Protection Agency estimates that 67 million switches are available for recovery, and an effective program could prevent up to 75 tons of mercury emissions to the air that would otherwise occur over the next 15 years,<sup>33</sup> while other recent estimates have suggested higher amounts of mercury remaining in vehicles.<sup>34</sup> Regardless of the exact amount of aggregate mercury in these vehicles, concerted efforts will be needed to prevent much of this mercury from entering the environment over the next 10-15 years.

In response to this need, a number of policies have been adopted around the country and in Canada. This has included laws in a number of states mandating mercury collection programs. For example, in Maine, a state law requires (as of January 1, 2003) removal of mercury containing convenience light and ABS switches from vehicles before crushing and shredding. The law also requires automakers to develop a collection system and pay a bounty (increased to \$4.00/switch collected if a vehicle identification number is provided) to

auto recyclers.<sup>35</sup> Other states have passed legislation in recent years mandating mercury switch removal (e.g. Arkansas, Indiana, New Jersey, and Rhode Island), while at least a dozen states have developed voluntary collection programs.<sup>36</sup>

#### Ohio's New Mercury Switch Program

In September 2006, a new statewide voluntary mercury switch collection program began in Ohio, involving a partnership of Ohio EPA and End of Life Vehicle Solutions (ELVS) Corporation, also as part of the National Vehicle Mercury Switch Recovery Program (see below). ELVS was formed by the auto industry to deal with chemicals of concern in the industry, and has a current emphasis on managing programs to collect,

**Figure 5:** Switches removed from vehicles.



Image courtesy of Dicks Auto LLC, Findlay, OH





**Figure 6:**  
**Mercury**  
**containing**  
**pellets in drum.**

transport, retort, recycle or dispose of elemental mercury from automotive switches.<sup>37</sup> The company has contracted with The Environmental Quality Company to provide the actual collection infrastructure, including buckets and switch removal instructions; the company then facilitates recycling of the collected mercury.<sup>38</sup> Figure 5 shows a collection bucket with switches at a dismantler, and Figure 6 shows mercury pellets from disassembled switches.

The Ohio program involves both convenience light and ABS switches, and pays \$3.00 per switch to auto recyclers for each switch collected, and has \$60,000 of funding available for the first year, with a goal of collecting 20,000 switches the first year. The process for getting involved in the program is straightforward, as described in Box 3.

### **Box 3. Process for Taking Part in Ohio's Voluntary Mercury Switch Removal Program for Auto Recyclers**

1. Contact Bill Narotski of the Ohio EPA Office of Compliance Assistance and Pollution Prevention (OCAPP), by phone (614-644-3469 or 800-329-7518), email ([bill.narotski@epa.state.oh.us](mailto:bill.narotski@epa.state.oh.us)), or mail (Attn: Bill Narotski Ohio EPA - OCAPP, P.O. Box 1049, Columbus, OH 43216-1049). Your contact information is forwarded to ELVS, and you will receive your first collection bucket and additional information
2. Complete and submit to OCAPP a W-9 and Division of Homeland Security Form (also available online at the OCAPP Web site).
3. Following instructions provided by ELVS, remove and collect mercury switches. The Ohio EPA recommends that entire switch assemblies be removed and placed in the bucket, rather than attempting to remove just the mercury pellets.
4. Once a bucket is full, make sure the lid is secure and mail it to the Environmental Quality Company (which covers the shipping costs), which will then mail back another bucket. Ohio EPA issues quarterly checks to auto recyclers based on switch collection numbers obtained from the recycling contractor.<sup>39</sup>



As of February 2007, 114 auto recyclers in the state had announced intentions to participate in the program, and over 14,000 switches have been collected. However, only 7 companies had actually submitted switches,<sup>40</sup> so there is clearly room for improvement in active involvement in the program. Continuation of the program (as currently structured) beyond the first year is contingent on additional funding becoming available. If funds run out, the program could potentially be transferred to formally fall under the national program, drawing on funds for financial incentives to participating dismantlers.<sup>41</sup>

### **National Vehicle Mercury Switch Recovery Program**

In August 2006, the National Vehicle Mercury Switch Recovery Program (NVMSRP) was established, through a Memorandum of Understanding involving U.S. EPA and representatives of auto manufacturers, steelmakers, dismantlers, shredders, states, environmental groups, and trade associations of certain stakeholders. The program is intended to complement (not replace) existing state switch recycling efforts, with an overall goal of reducing up to 75 tons of mercury over the next 15 years. Key partners and their roles include:

- **Automakers**, which created the End of Life Vehicles Solutions (ELVS) Corporation, which provides support and infrastructure (as noted above)
- **Dismantlers**, which if participating, will be able to market reduced mercury scrap and earn financial incentives
- **Scrap Recyclers**, which if participating, will build awareness of the program in their industry and among dismantlers
- **Steelmakers**, which if participating, will encourage their supply chain to participate, and will take steps to purchase scrap metal generated by other program participants<sup>42</sup>

Startup funding for the program consists of a \$4 million Implementation Fund, provided by participating vehicle manufacturers and steelmakers, to cover a three-year period. Uses and disbursement of the monies are coordinated through an Implementation Fund Coordination Committee (IFCC). The program will be reviewed after three years, including the possibility of extending the life of the fund.<sup>43</sup> In addition, EPA is planning on proposing a national emission standard for electric arc furnaces in 2007; compliance could likely be demonstrated by use of mercury-reduced scrap resulting from the national switch removal program.<sup>44</sup>



**Brandywine  
Falls in  
Cuyahoga  
Valley  
National Park  
(near  
Sagamore  
Hills, OH).**

istockphotography.com

## IV. Recommendations

**T**here appears to be increasing awareness among dismantlers, scrap yards, and other parties on the importance of mercury pollution prevention, and the value of removing mercury switches from vehicles at the start of the recycling process. George Eliades, executive vice president of the Automotive Recyclers Association noted recently that the mercury switch issue is one of the five biggest challenges facing auto recyclers.

The new voluntary Ohio and national programs are steps in the right direction to addressing the problem, but given the relatively limited time to capture a large fraction of the switches still in vehicles, concerted efforts are needed. NWF recommends the following steps be taken to improve collection and recycling of mercury switches in Ohio:

- All parties involved in steel scrap recycling in Ohio should make good faith efforts to meet obligations identified in the August 2006 Memorandum of Understanding to Establish the National Vehicle Mercury Switch Recovery Program
- Auto recycler associations should include information on mercury switches prominently on their Web

*"The five biggest challenges [to auto recyclers] are salvage, insurance, education and training, air bags, and mercury switches."*

**George Eliades, Executive Vice President of the Automotive Recyclers Association<sup>45</sup>**

sites (including on the new voluntary state program), and promote the program in any direct correspondence with member companies

- As part of expanding outreach efforts, Ohio auto recycler associations should increase promotion of programs such as the ARA's Certified Automotive Recycler to improve environmental performance, including removing and collecting mercury switches
- Ohio auto dismantlers who are not yet participants in the state's voluntary program should contact Ohio EPA about joining, and complete the sign-up process
- End of Life Vehicle Solutions and/or the automakers should consider developing additional guidance to dismantlers on identifying mercury containing switches.

- Scrap recyclers should increase their attention to the mercury switch issue, and encourage dismantlers supplying them to participate in the voluntary program
- Ohio's steelmakers should promote the program in their supply chains, including through Web-based and direct correspondence with affiliated businesses
- Ohio EPA should work with other state agencies (such as the Bureau of Motor Vehicles) to consider alternative approaches to increasing dismantler participation in the state program, including through reminders in correspondence on other issues
- Ohio Bureau of Motor Vehicles should take action to increase participation by dismantlers; for example, the Dealer Board could authorize revision of the Dealer Handbook, to include a brief description of the mercury switch issue and existing programs
- Ohio Department of Administrative Services should develop a program to ensure removal of all mercury switches from surplus state vehicles prior to auctions
- State government officials should recognize the importance of the

voluntary switch removal program, and work with all stakeholders in considering innovative approaches to continue funding of the program

The Ohio vehicle recycling industry is well positioned to have an effective mercury switch removal program for a number of years, and a number of resources are available to assist in this effort (see Appendix). But effective implementation will require a solid commitment by all relevant parties (including automakers, dismantlers, scrap recyclers, steel mills, and state government) to ensure that the informational and financial resources are available to get the job done.

## Resources on Mercury Switches in Vehicles

### Mercury Switch Removal Program Resources

Ohio Voluntary Mercury Switch Removal Program for Auto Recyclers  
[http://www.epa.state.oh.us/ocapp/sb/switch\\_removal\\_program.html](http://www.epa.state.oh.us/ocapp/sb/switch_removal_program.html)

End of Life Vehicles Solutions (ELVS) Corporation  
<http://www.elvsolutions.org/>

Environmental Quality Company - ELVS Mercury Switch Recovery Program  
<http://www.eqonline.com/services/ELVS-Mercury-Switch-Recovery-Program.asp>

National Vehicle Mercury Switch Recovery Program  
<http://www.epa.gov/mercury/switch.htm>

### Other Ohio EPA/Associated Resources

Bowling Green State University, Elemental Mercury Collection and Reclamation Program  
<http://www.bgsu.edu/offices/envhs/page18364.html>

Ohio Mercury Reduction Group  
[http://www.epa.state.oh.us/ocapp/p2/mercury\\_pbt/omrg.html](http://www.epa.state.oh.us/ocapp/p2/mercury_pbt/omrg.html)

Ohio Small Business Assistance Office, Environmental Compliance Guide for Motor Vehicle Salvage Yards, March 2003 (Update),  
<http://www.epa.state.oh.us/ocapp/sb/publications/salvageguide.pdf>

### Mercury Switch Guides/Fact Sheets

Environmental Compliance for Auto Recyclers, Ohio Fact Sheets (can access separate page for mercury)  
<http://www.ecarcenter.org/OH/virtualtour.html>

Maine Department of Environmental Protection, Auto Dismantlers Guide To Recycling Mercury Switches and Mercury Lamps, Revised September 2005,  
<http://www.state.me.us/dep/rwm/mercury/pdf/guidancemanual0905.pdf>

U.S. EPA, Region 5 - Mercury - Binational Toxics Strategy (includes switch removal fact sheets)  
<http://www.epa.gov/region5/air/mercury/autoswitch.htm>

### Mercury Switch Removal - Videos

End of Life Vehicle Solutions Corporation, Educational Materials (includes online video, also included on DVD shipped with collection bucket)  
<http://www.elvsolutions.org/educational.html>

Clean Air Foundation, Switch Out Video  
<http://www.cleanairfoundation.org/switchout/index.asp>

Michigan Department of Environmental Quality, Michigan Mercury Switch/Sweep Video ("The 48 Second Solution")  
[http://www.michigan.gov/deq/0,1607,7-135-3307\\_29693\\_4175---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3307_29693_4175---,00.html)

Washington State Department of Ecology, Hazardous Waste and Toxics Reduction Program, Auto Mercury Switch Removal from Hoods, Trunks and ABS sensors (7-minute video). Available by calling (509) 575-2490

### **Mercury Switches - Overview Reports**

Ecology Center, Great Lakes United, and University of Tennessee Center for Clean Products and Clean Technologies, Toxics in Vehicles: Mercury, January 2001, <http://www.cleancarcampaign.org/reports.shtml>

King County (WA), Automotive Mercury Switch Removal Programs, Final Report (prepared by Gaither, M.), Publication Number SQG-MERCURY-2 (8/04) <http://www.govlink.org/hazwaste/publications/HgSwitchReportFinal.pdf>

Quicksilver Caucus, Removing Mercury Switches from Vehicles - A Pollution Prevention Opportunity for States [http://www.ecos.org/files/1666\\_file\\_ECOS\\_QC\\_Mercury\\_921Final.pdf](http://www.ecos.org/files/1666_file_ECOS_QC_Mercury_921Final.pdf)

Wisconsin Mercury Sourcebook: Automotive (Draft) <http://www.epa.gov/glnpo/bnsdocs/hgsbook/auto.pdf>

### **Automobile Recycling Associations**

Automotive Recyclers Association <http://www.a-r-a.org/>

Ohio Auto & Truck Recyclers Association (OATRA) <http://www.oatra.com>

### **Other Industry Associations**

Alliance of Automobile Manufacturers <http://www.autoalliance.org/>

American Iron and Steel Institute <http://www.steel.org/>

Association for Iron & Steel Technology <http://www.aistech.org/>

Institute of Scrap Recycling Industries, Inc. <http://www.isri.org/>

Ohio Steel Council <http://www.ohiosteel.org/>

Steel Manufacturers Association <http://www.steelnet.org/>

Steel Recycling Institute <http://www.recycle-steel.org/>

### **Other State (selected)/Association Web Pages**

Environmental Council of the States (also has link to Quicksilver Caucus) <http://www.ecos.org/>

Indiana Department of Environmental Management, Auto Salvage Program <http://www.in.gov/idem/programs/land/autosalvage/index.html>

Maine Department of Environmental Protection, Motor Vehicle Recycling <http://www.state.me.us/dep/rwm/motorvehiclerecycling/>

Michigan DEQ, Mercury Pollution Prevention [http://www.michigan.gov/deq/0,1607,7-135-3307\\_29693\\_4175--,00.html](http://www.michigan.gov/deq/0,1607,7-135-3307_29693_4175--,00.html)



Minnesota Pollution Control Agency, Mercury  
[http://www.pca.state.mn.us/oea/p2/  
mercury.cfm](http://www.pca.state.mn.us/oea/p2/mercury.cfm)

Northeast Waste Management Officials'  
Association (link to auto switch page via  
Mercury Topic Hub)  
[http://www.newmoa.org/prevention/  
mercury/](http://www.newmoa.org/prevention/mercury/)

Vermont Department of Environmental  
Conservation, Auto Salvage Yard  
Environmental Resource Center  
[http://www.anr.state.vt.us/dec/ead/sbcap/  
salvage/index.htm](http://www.anr.state.vt.us/dec/ead/sbcap/salvage/index.htm)

### **Nonprofit Organizations Working on Mercury Switches**

Clean Air Foundation (Canada)  
<http://www.cleanairfoundation.org/>

Clean Car Campaign, Mercury in Vehicles  
[http://www.cleancarcampaign.org/  
mercury.shtml](http://www.cleancarcampaign.org/mercury.shtml)

Ecology Center  
<http://www.ecocenter.org/>

Environmental Defense  
<http://www.environmentaldefense.org/>

National Wildlife Federation  
<http://www.nwf.org/mercury>

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- <sup>3</sup> Mahaffey, K.R. 2005. Mercury exposure: Medical and public health issues, *Transactions of the American Clinical and Climatological Association*, 116:127-154.
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- <sup>7</sup> *Ibid.*
- <sup>8</sup> Murray, M. and Holmes, S.A. 2004. Assessment of mercury emissions inventories for the Great Lakes states, *Environmental Research*, 95:282-297; also see Great Lakes Binational Toxics Strategy, 2005 Progress Report, <http://binational.net/bns/2005/2005-GLBTS-English-web.pdf>
- <sup>9</sup> Wiener et al. 2003, *Op. Cit.*
- <sup>10</sup> Canada-U.S. Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin (or "Binational Toxics Strategy"), April 1997, See <http://www.binational.net>
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Great Lakes Natural Resource Center, National Wildlife Federation  
213 West Liberty St., Suite 200, Ann Arbor, MI 48104-1398

