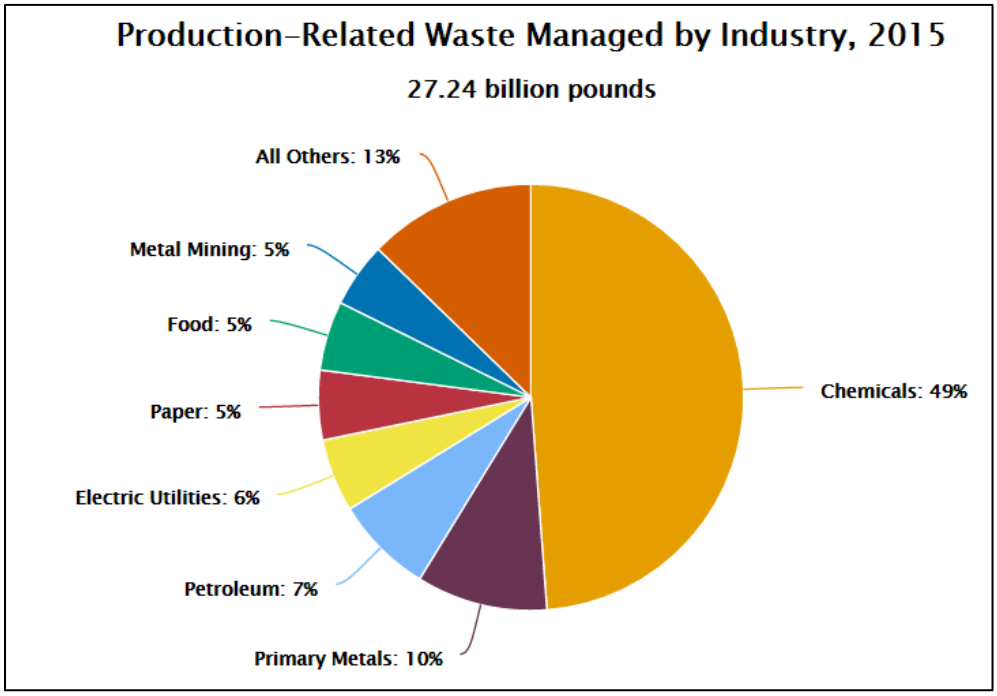
Comparing Industry Sectors in the 2015 TRI National Analysis

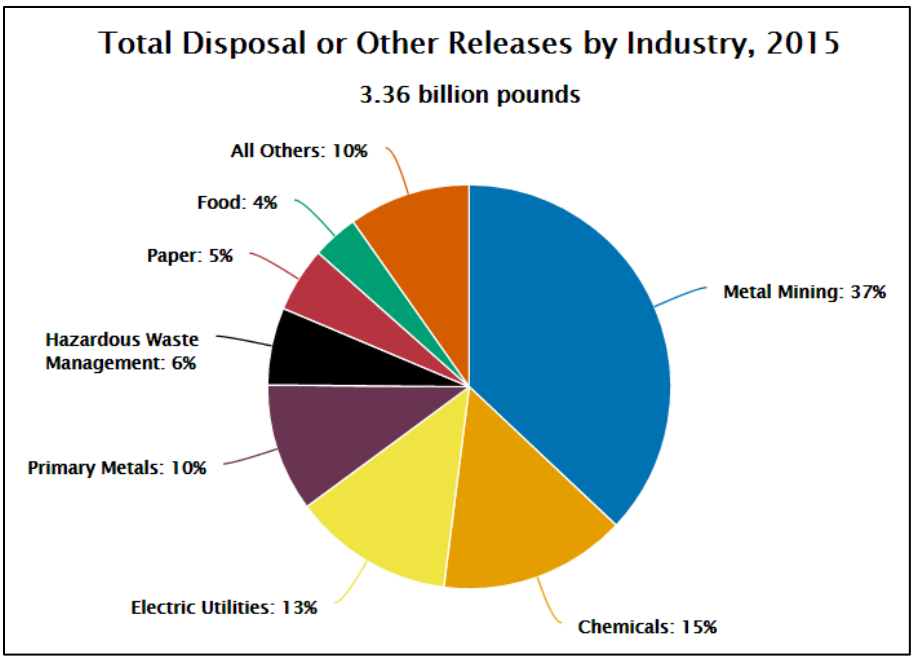
This chapter examines which sectors contributed the most to production-related waste managed and releases in 2015, and highlights several industry sectors to show trends occurring over time. It also discusses the trends among federal facilities, which report to the Toxics Release Inventory (TRI) regardless of industry sector. For analysis purposes, the TRI Program has aggregated the North American Industry Classification System (NAICS) codes at the 3- and 4-digit levels, creating 29 industry sector categories. To learn more about which business activities are subject to TRI reporting requirements, see this list of covered NAICS codes.

The industries that are subject to TRI reporting requirements vary substantially in size, scope, composition, and business type. As a result, the amounts and types of chemicals used, generated, and managed by facilities within a given industry sector often differ greatly from those of facilities in other sectors. For facilities categorized by the same NAICS code, however, the processes, products, and regulatory requirements are often similar, resulting in similar manufacture, processing, or other use of toxic chemicals. Looking at chemical waste management trends within a sector can identify emerging issues, highlight progress made in improving environmental performance, and reveal opportunities for better waste management practices.



Seven industry sectors reported 87% of the quantities of TRI chemicals managed as production-related waste in 2015. A majority (66%) of TRI chemical waste managed originated

from three sectors: chemical manufacturing (49%), primary metals (10%), and petroleum products manufacturing, primarily from petroleum refineries (7%).



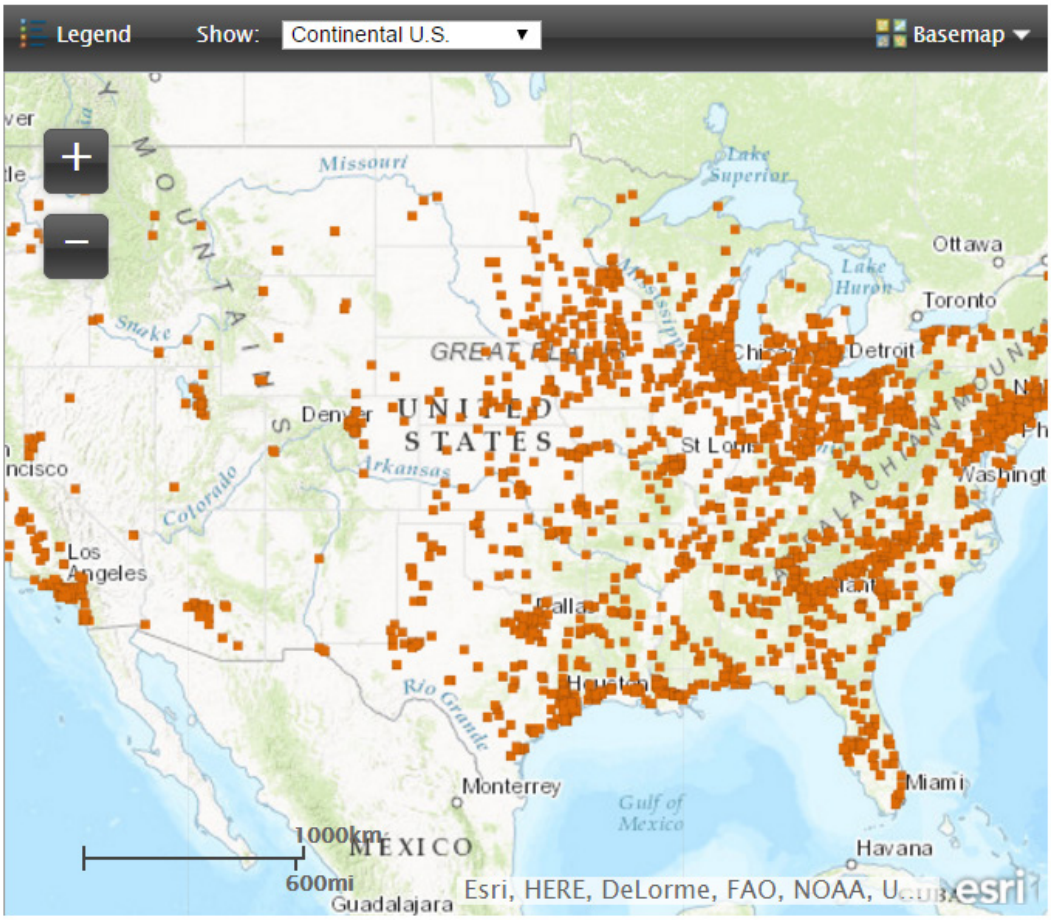
This pie chart shows that 90% of the quantities of TRI chemicals disposed of or otherwise released originated from seven of the 29 TRI industry sectors. Almost two-thirds originated from just three industry sectors: metal mining (37%), chemical manufacturing (15%), and electric utilities (13%). The chemical manufacturing sector is one of the top two sectors for both production-related waste managed and total releases.

- For more details on how the amounts and proportions of TRI chemicals managed as waste have changed over time, see the production-related waste managed by industry trend graph.
- For more information on the breakdown of these releases by medium, see land disposal by industry, air releases by industry, and water releases by industry.

Sections in this chapter

Manufacturing Sectors

This map shows the manufacturing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Manufacturing Facilities Reporting to TRI, 2015

Of the 27.2 billion pounds of production-related waste reported to TRI in 2015, most (86%) was from facilities in a manufacturing sector. Similarly, 88% of the facilities reporting to TRI are in a manufacturing sector. The manufacturing sectors are defined by NAICS sector codes 31 through 33 and include a variety of industries involved in the production of food, textiles, paper, chemicals, plastics, electronics, transportation equipment, and other products. Two of the manufacturing sectors (food and chemicals) are highlighted in more detail later in this chapter.

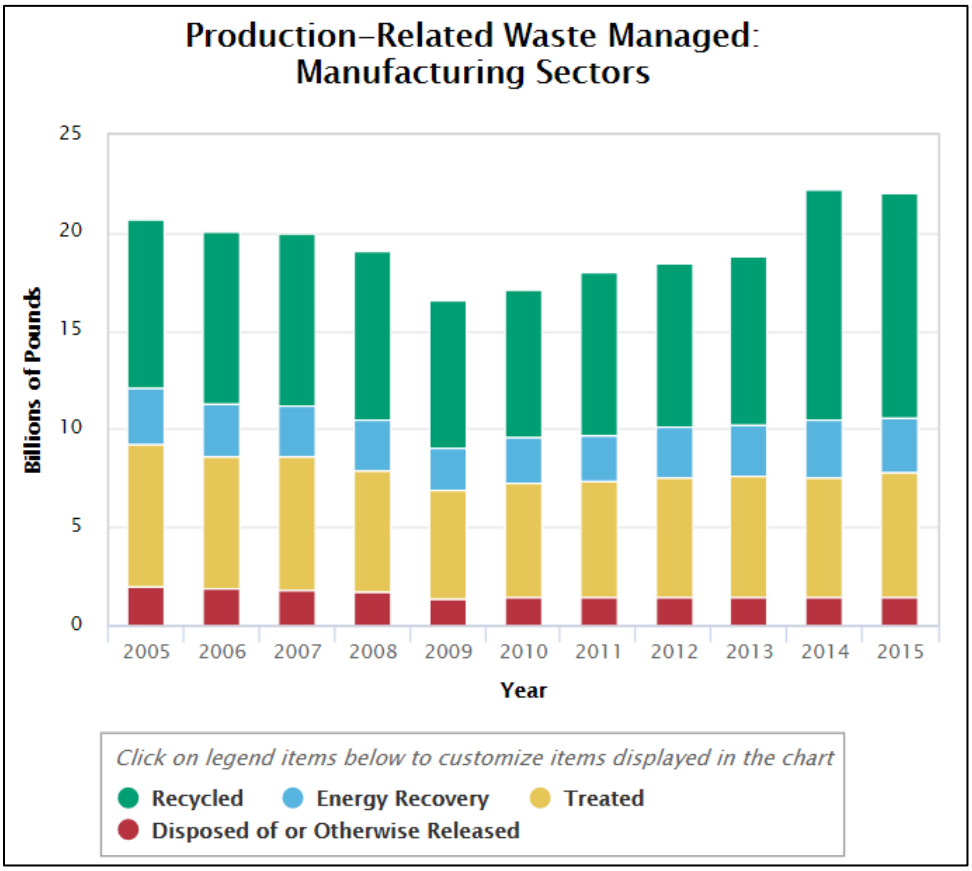
The industries not categorized under manufacturing include metal mining (see profile), coal mining, electric utilities (see profile), chemical wholesalers, petroleum terminals, hazardous waste management, and others.

Quick Facts for 2015: Manufacturing Sectors (NAICS 31-33)	
Number of Facilities that Reported to TRI	**19,279**
Number of Facilities with New Source Reduction Activities	2,301
Production-Related Waste Managed	**23,440.8 million lb**
Recycled	11,598.4 million lb
Energy Recovery	2,945.5 million lb
Treated	7,434.0 million lb
Disposed or Otherwise Released	1,462.9 million lb
Total Disposal or Other Releases	**1,438.3 million lb**
On-site	**1,123.7 million lb**
Air	545.6 million lb
Water	173.1 million lb
Land	405.0 million lb
Off-site	**314.6 million lb**

Note: Numbers may not sum exactly due to rounding.

Manufacturing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the manufacturing sectors.



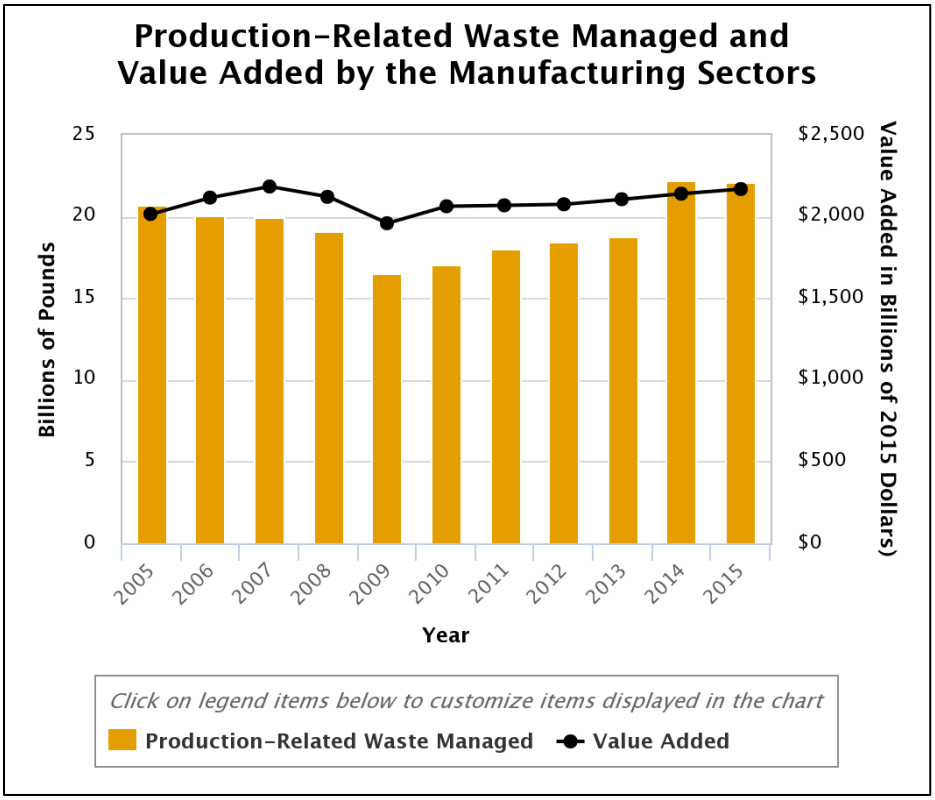
From 2005 to 2015:

- Production-related waste managed by the manufacturing sectors decreased through 2009 following the trend of reduced production resulting from the economic recession. Since 2009, quantities of waste managed have increased.
- Quantities of waste released, treated, or used in energy recovery decreased, while the quantity of waste recycled increased by 34%.

From 2014 to 2015:

- Production-related waste managed decreased by 0.6% (132.8 million pounds).
- In 2015, 7% of the sector's waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

It is important to consider the influence the economy has on production and production-related waste generation. This figure presents the total pounds in production-related waste managed as reported by the manufacturing sectors and the manufacturing sectors' "value added".

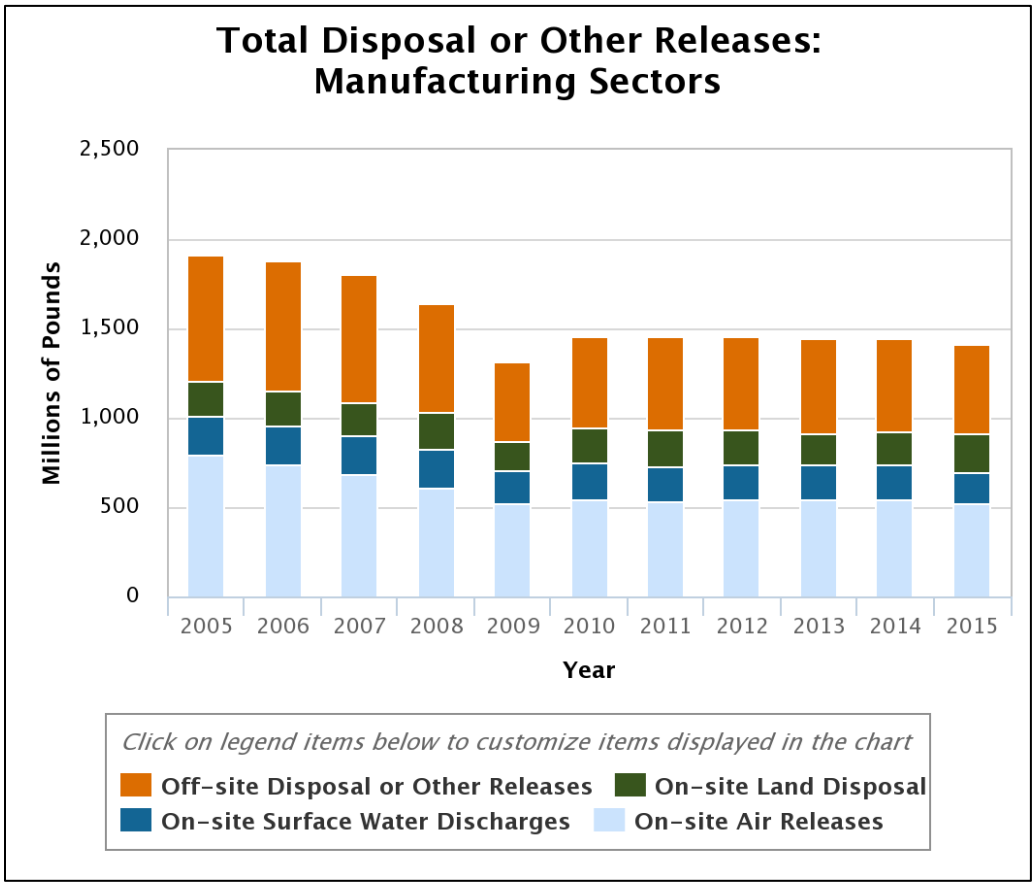


From 2005 to 2015:

- Production-related waste managed by the manufacturing sectors increased by 7%, while value-added by the manufacturing sectors increased by 8% (represented by the black line as reported by the Bureau of Economic Analysis, Value Added by Industry). Value-added is a measure of production that is defined as the contribution of these manufacturing sectors to the national gross domestic product.

Manufacturing Releases Trend

The following graph shows the annual quantities of toxic chemicals released by the manufacturing sectors.



From 2005 to 2015:

- Total releases by the manufacturing sectors decreased by 26%. This is primarily due to a reduction in air emissions and off-site releases.
- Releases to water also declined, while on-site releases to land increased.

From 2014 to 2015:

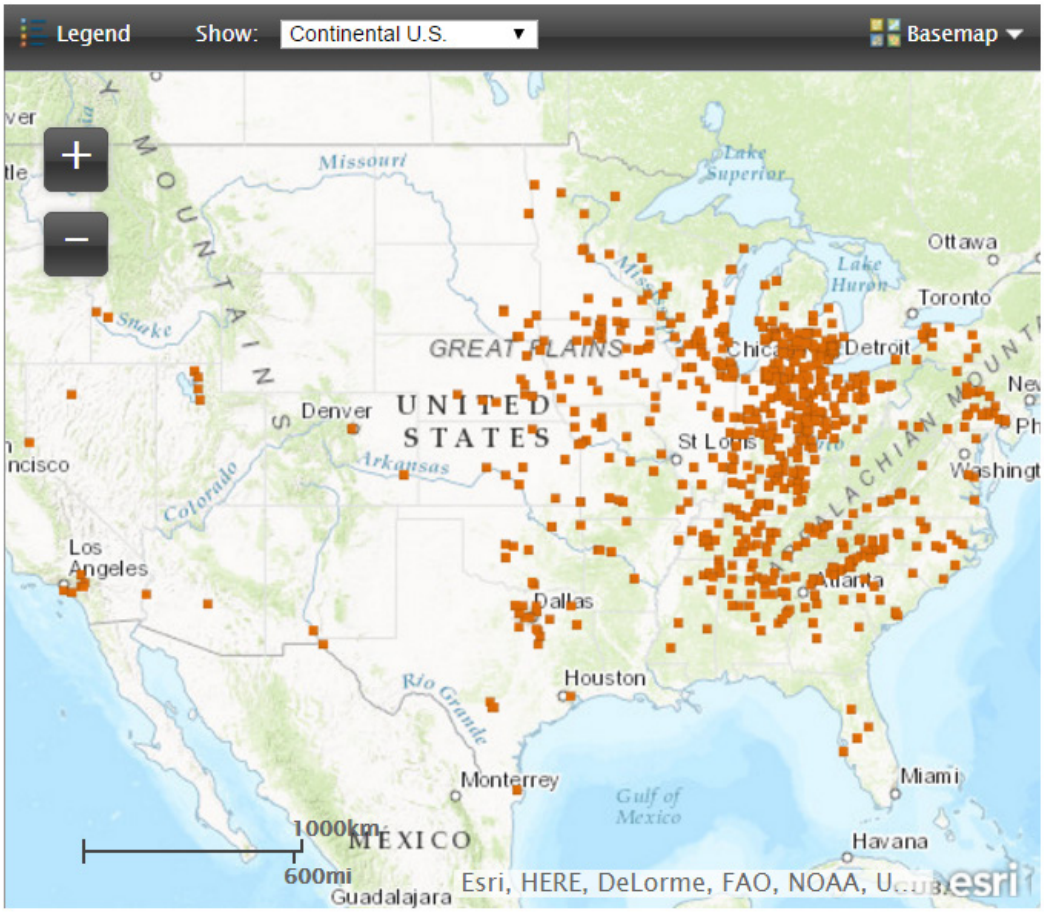
- Total releases decreased by 2.3% (33.9 million pounds).
- On-site land disposal increased while on-site releases to air and water decreased.

Source Reduction in the Manufacturing Sectors:

Twelve percent of manufacturing facilities initiated source reduction activities to reduce toxic chemical use and waste generation in 2015. The most commonly reported source reduction activitites were good operating practices and process modifications. For example, one facility improved air flow through coating application equipment to reduce spray volume and overspray of solvent-based paints. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Food Processing

This map shows the food processing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Food Processing Facilities Reporting to TRI, 2015

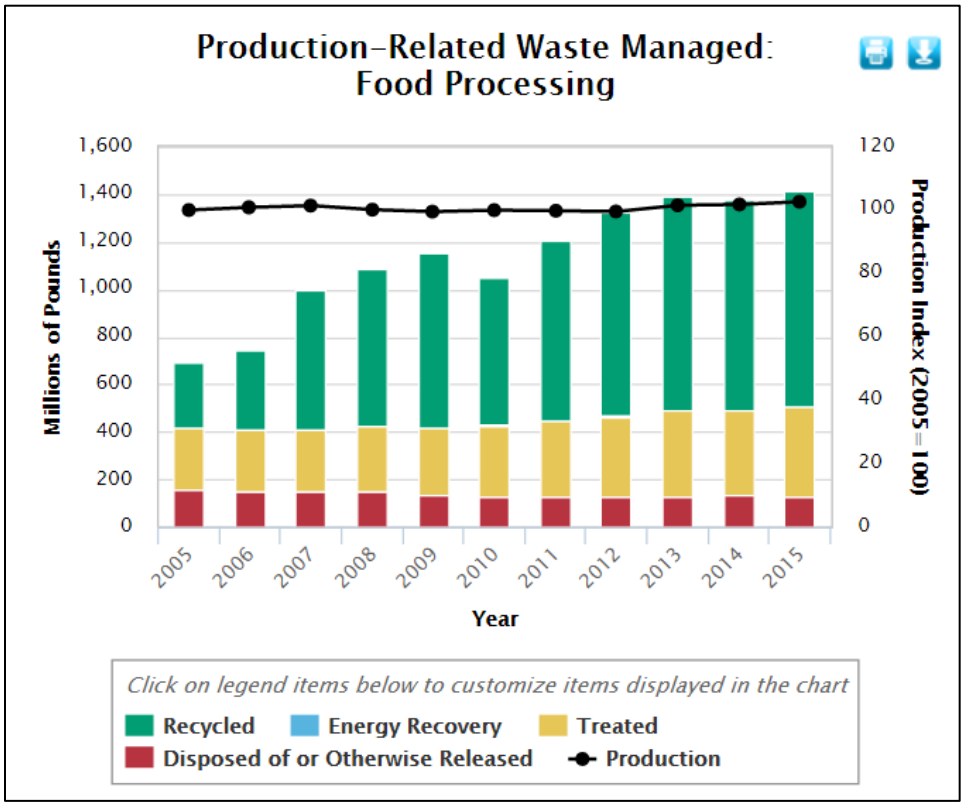
The food processing sector includes facilities that process livestock and agricultural products into food products for consumption. It includes sectors under NAICS 311 such as those processing meat, dairy, vegetable, and fruit products, but does not include agricultural activities. This sector is highlighted here because it is one of the "national emphasis areas" of EPA's Pollution Prevention (P2) Program. As a national emphasis area, EPA's goal for the sector is to implement P2 projects that support more sustainable food manufacturing resulting in reduced hazardous materials generation and use, water usage, greenhouse gas emissions, and/or business costs.

Quick Facts for 2015: Food Processing (NAICS 311)	
Number of Facilities that Reported to TRI	**1,571**
Number of Facilities with New Source Reduction Activities	135
Production-Related Waste Managed	**1,437.4 million lb**
Recycled	910.7 million lb
Energy Recovery	0.7 million lb
Treated	395.2 million lb
Disposed or Otherwise Released	130.8 million lb
Total Disposal or Other Releases	**123.9 million lb**
On-site	**117.0 million lb**
Air	45.3 million lb
Water	62.8 million lb
Land	8.9 million lb
Off-site	**6.9 million lb**

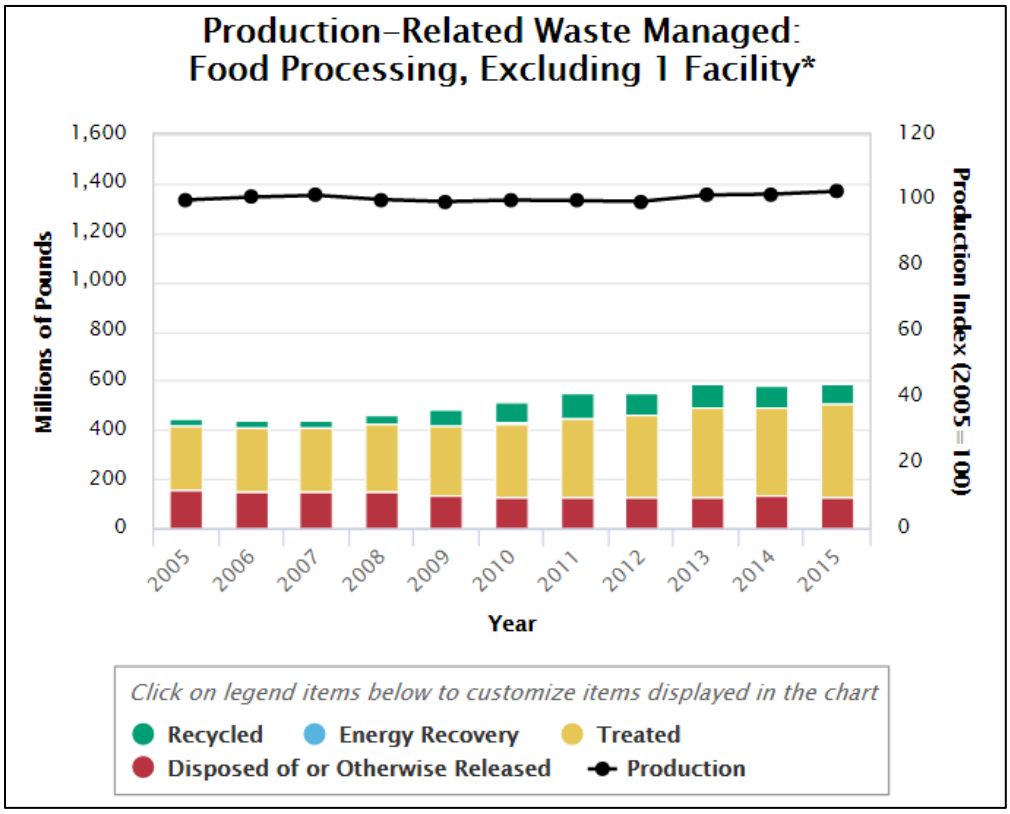
Note: Numbers may not sum exactly due to rounding.

Food Processing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the food processing industry.



The following graph shows the annual quantities of toxic chemicals managed by the food processing industry, excluding one soybean processing facility.



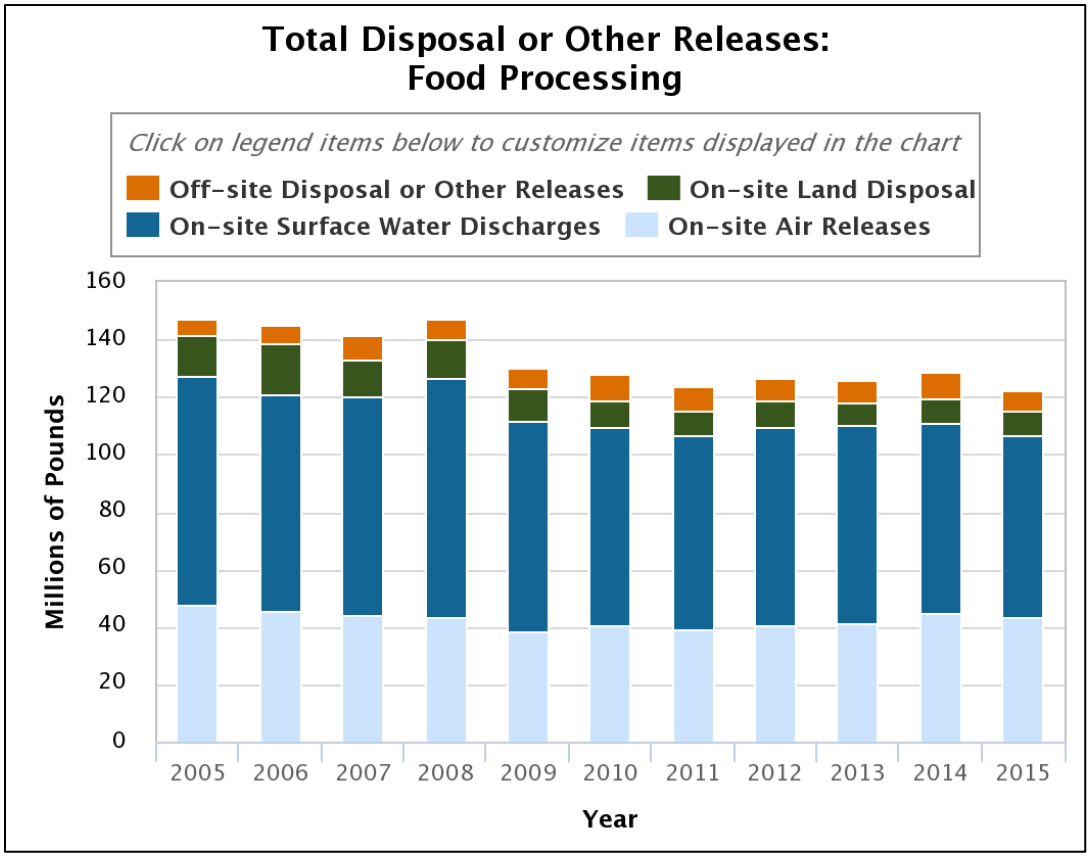
Note: *Excludes 1 soybean processing facility whose quantities of n-hexane recycled drive the sector's trend

From 2005 to 2015:

- Food production increased by 3% (as reported by the Federal Reserve Board, Industrial Production Index for Nondurable Goods).
- While the sector's production levels have remained relatively steady since 2005, production-related waste increased by 105%.
- Trends in quantities of production-related waste are driven by one soybean processing facility's reported recycled quantity of n-hexane. Excluding this quantity, production-related waste increased by 31%.
- The proportion of managed waste that is recycled increased from 2005, when 40% of total production-related waste was recycled, to 2015, when 64% was recycled.
- Quantities disposed of or otherwise released declined from 22% of total production-related waste in 2005, to 9% in 2015.

Food Processing Releases Trend

The following graph shows the annual quantities of toxic chemical released by the food processing industry.



From 2005 to 2015:

- The food processing sector accounts for more water releases than any other sector.
- The sector's total disposal or other releases decreased by 17%, driven by a 17-million-pound reduction in on-site surface water discharges. This occurred despite a 3% increase in production since 2005.

In 2015:

- Releases of nitrate compounds to surface water accounted for 49% (61.3 million lb) of the sector's total disposal or other release quantities. Under the TRI reporting requirements, nitrate compounds are reportable only when in solution with water. Nitrate compounds are relatively less toxic to human health than other TRI chemicals discharged to surface waters, but are formed in large quantities by this sector during treatment processes due to the high biological content of wastewater.

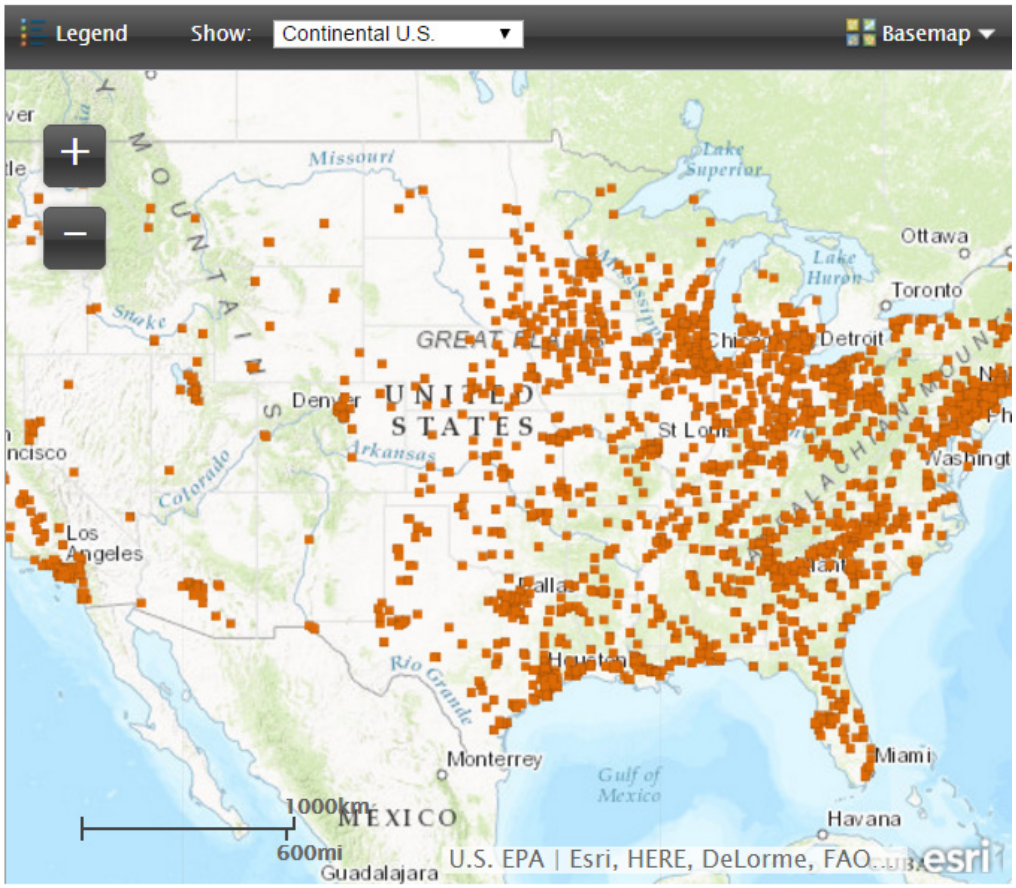
- Note that surface water discharges are often regulated by other EPA programs such as the program established under the Clean Water Act that issues National Pollutant Discharge Elimination System (NPDES) permits.
- The food processing sector contributed 36% of total nitrate compound releases to water, due to the large quantities of biological materials in wastewaters from meat processing facilities.
- Other chemicals commonly released by food processing facilities include ammonia, n-hexane and nitric acid.

Source Reduction in the Food Processing Sector:

Nine percent of facilities (135) reported initiating source reduction activities to reduce toxic chemical use and waste generation in 2015. The most commonly reported source reduction activitites were good operating practices and process modifications. For example, one facility installed a UV light channel to disinfect waste water rather than using chlorine. TRI's Pollution Prevention Search Tool or the EPA data visualization tool for food processing to learn more about pollution prevention opportunities in this sector.

Chemical Manufacturing

This map shows the chemical manufacturing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Chemical Manufacturing Facilities Reporting to TRI, 2015

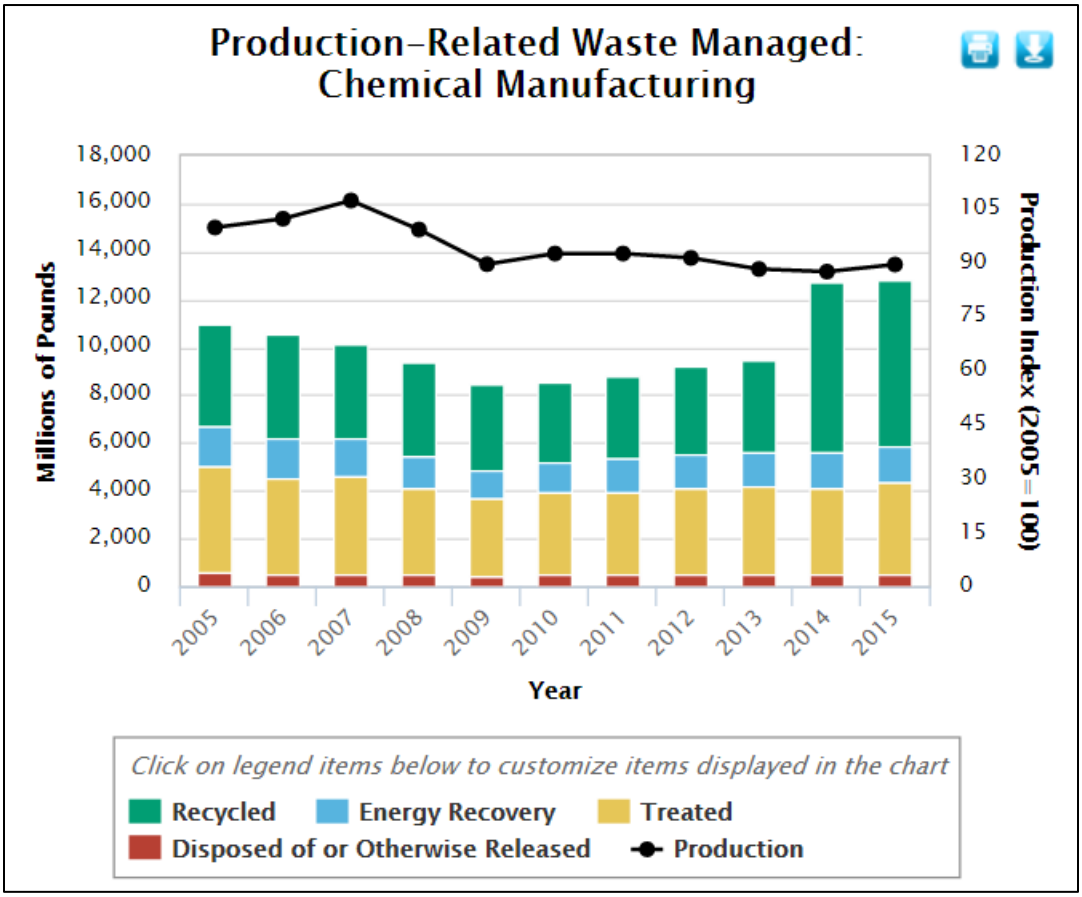
Chemical manufacturers produce a variety of products, including basic chemicals, products used by other manufacturers (such as synthetic fibers, plastics, and pigments), pesticides, pharmaceuticals, paints, and cosmetics, to name a few. In 2015, the chemical manufacturing sector had the most facilities (3,452, 16% of facilities that reported in 2015) report to TRI and also reported 49% of all production-related waste managed; more than any other sector.

Quick Facts for 2015: Chemical Manufacturing (NAICS 325)	
Number of Facilities that Reported to TRI	**3,452**
Number of Facilities with New Source Reduction Activities	519
Production-Related Waste Managed	**13,295.6 million lb**
Recycled	6,978.3 million lb
Energy Recovery	1,711.0 million lb
Treated	4,088.8 million lb
Disposed or Otherwise Released	517.5 million lb
Total Disposal or Other Releases	**512.0 million lb**
On-site	**439.5 million lb**
Air	164.2 million lb
Water	27.9 million lb
Land	247.4 million lb
Off-site	**72.5 million lb**

Note: Numbers may not sum exactly due to rounding.

Chemical Manufacturing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the chemical manufacturing industry.



From 2005 to 2015:

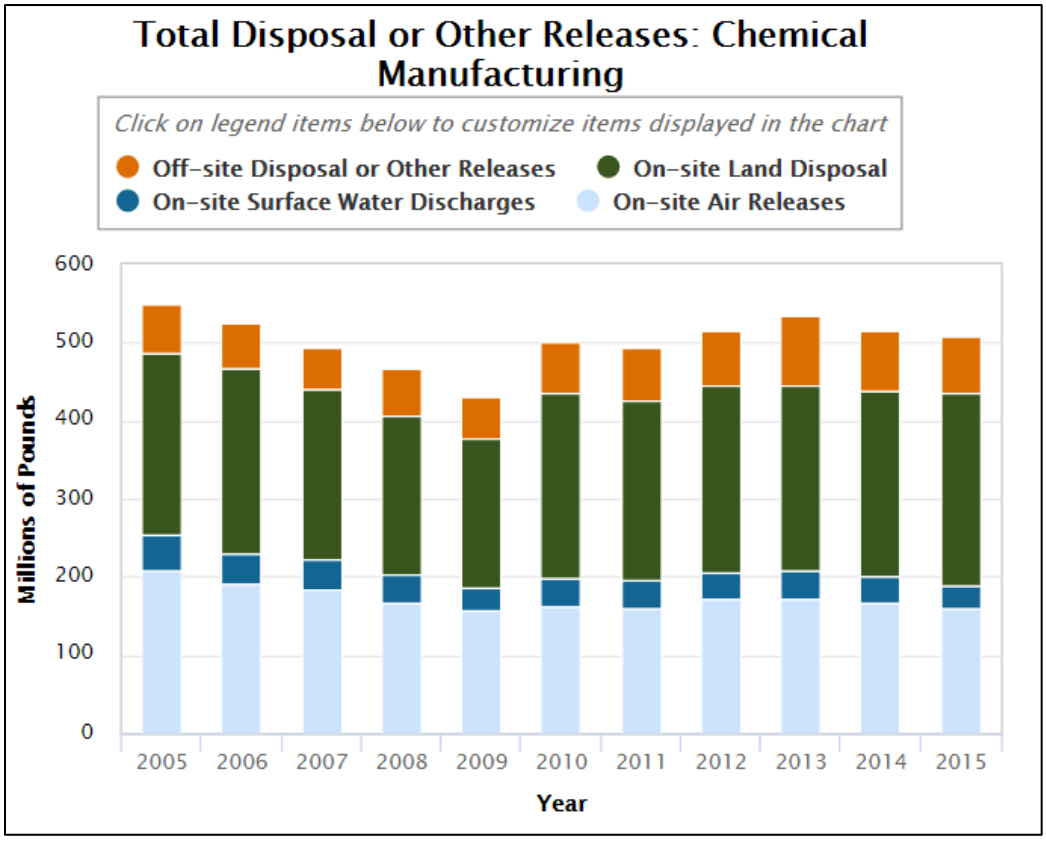
- Production-related waste managed by the chemical manufacturing sector increased by 16%, while production (represented by the black line as reported by the Federal Reserve Board, Industrial Production Index for Major Industry Groups) decreased by 10%.
- Quantities of waste released, treated, or used in energy recovery decreased, while the quantity of waste recycled increased by 62%.
- The large increases in recycled waste in 2014 and 2015 are due to the quantity of recycled cumene reported by one facility. Excluding this amount, the total quantities of waste recycled decreased by 16% and production-related waste managed decreased by 14%.

From 2014 to 2015:

- Production-related waste managed increased by 35.4 million pounds (0.3%).
- In 2015, 4% of the sector's waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

Chemical Manufacturing Releases Trend

The following graph shows the annual quantities of toxic chemical released by the chemical manufacturing industry.



From 2005 to 2015:

- Total releases by the chemical manufacturing sector decreased by 8%. This was primarily due to a reduction in air emissions.
- Water releases also declined, while on-site releases to land and off-site disposal increased.

From 2014 to 2015:

- Total releases decreased by 6.7 million pounds (1.3%).
- In 2015, the sector reported more air releases than any other sector, accounting for 24% of all TRI air emissions.

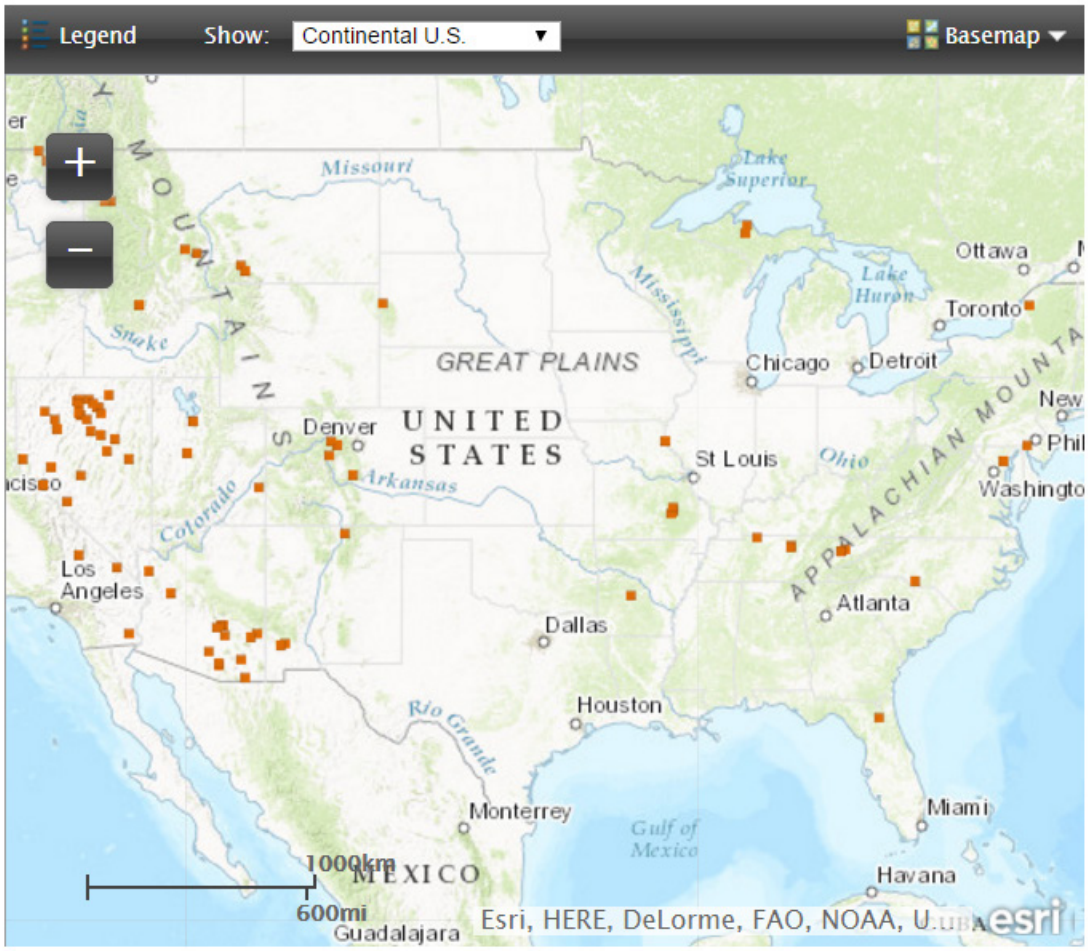
Source Reduction in the Chemical Manufacturing Sector:

Although chemical manufacturing has consistently been the sector with the most production-related waste managed, more than 500 facilities in the sector initiated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. The most commonly reported categories of source reduction activities were good operating practices and spill and leak prevention. For example, one facility refrigerates acetaldehyde before use in order to reduce its potential to evaporate into the air. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

For more information on how this sector and others can choose safer chemicals, visit EPA's Safer Choice Program pages for Alternatives Assessments and the Safer Choice Ingredients List.

Metal Mining

This map shows the metal mining facilities that reported to Toxics Release Inventory (TRI) in 2015.



Metal Mines Reporting to TRI, 2015

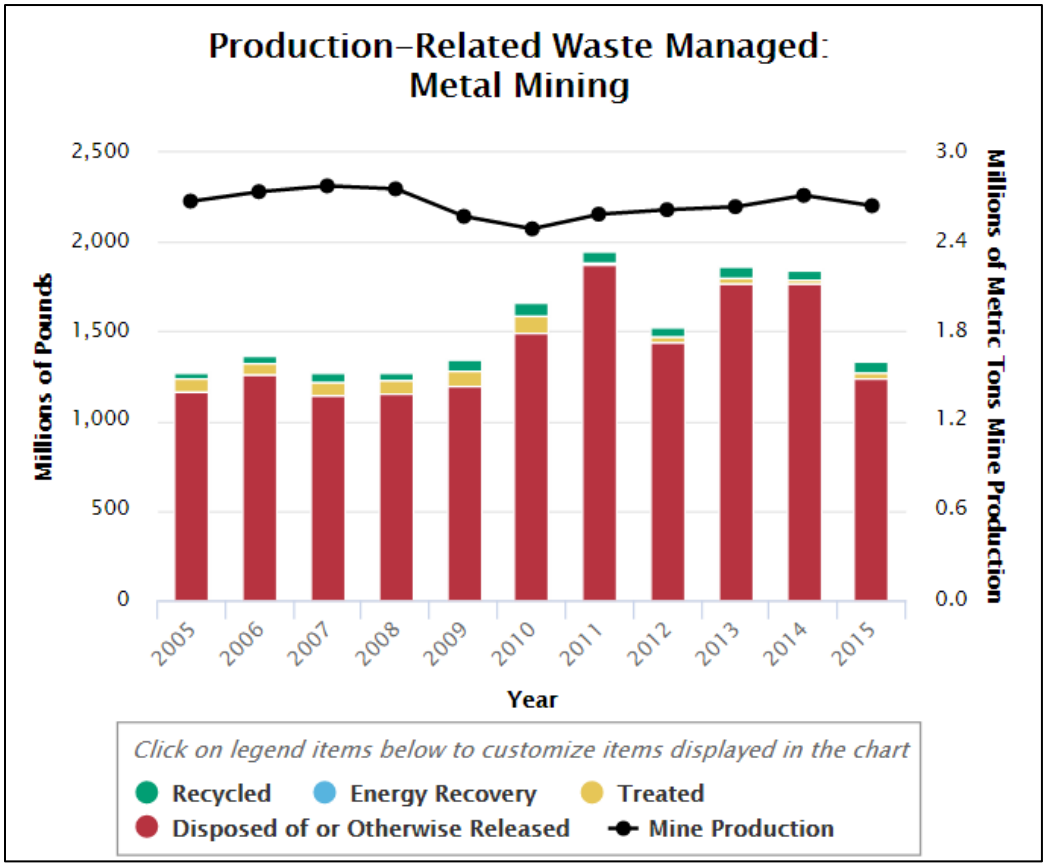
The portion of the metal mining sector covered by TRI reporting requirements includes facilities mining copper, lead, zinc, silver, gold, and several other metals. In 2015, 86 metal mining facilities reported to TRI. They tend to be in Western states where most of the copper, silver, and gold mining occurs; however, zinc and lead mining tend to occur in Missouri, Tennessee, and Alaska. Metals generated from U.S. mining operations are used in a wide range of products, including automobiles and electric and industrial equipment. The extraction and beneficiation of these minerals generate large amounts of waste.

Quick Facts for 2015: Metal Mining (NAICS 2122)	
Number of Facilities that Reported to TRI	**86**
Number of Facilities with New Source Reduction Activities	6
Production-Related Waste Managed	**1,339.7 million lb**
Recycled	71.7 million lb
Energy Recovery	0.002 million lb
Treated	25.3 million lb
Disposed or Otherwise Released	1,242.6 million lb
Total Disposal or Other Releases	**1,243.1 million lb**
On-site	**1,236.5 million lb**
Air	2.1 million lb
Water	1.4 million lb
Land	1,233.1 million lb
Off-site	**6.5 million lb**

Note: Numbers may not sum exactly due to rounding.

Metal Mining Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the metal mining industry.



From 2005 to 2015:

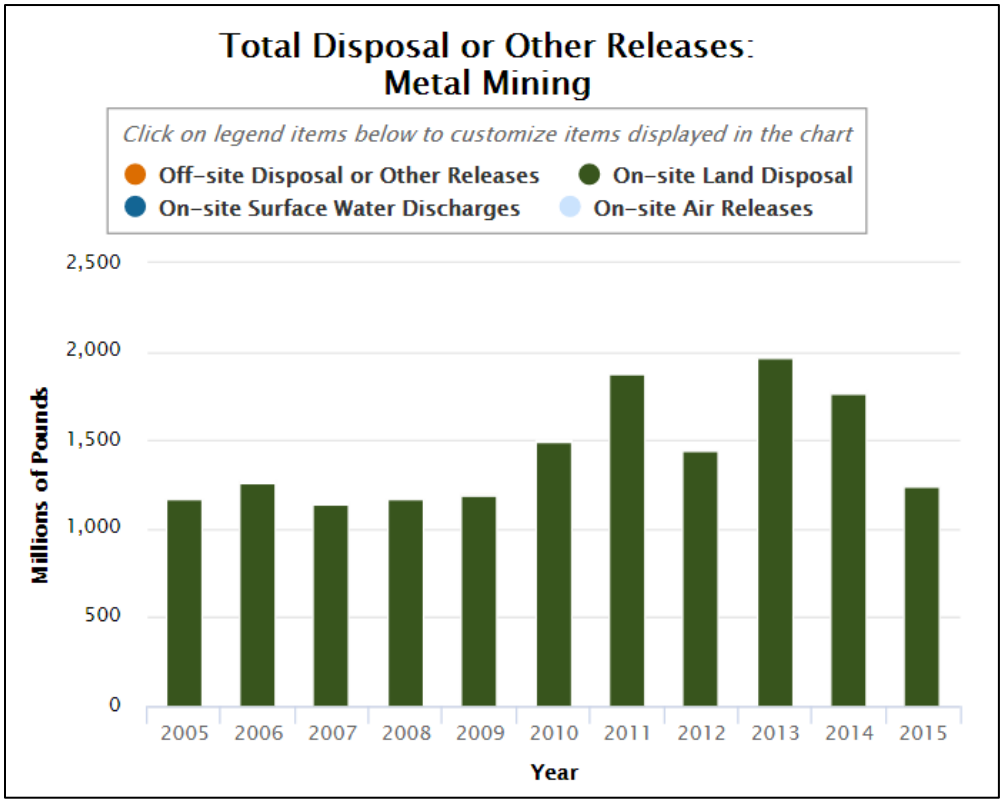
- While metal mining production (as reported in the United States Geological Survey) remained relatively steady, the quantity of waste managed fluctuated.
    - One factor other than production frequently cited by facilities as a contributor to the changes in quantities of waste managed is the composition of the extracted ore and waste rock, which can vary substantially from year to year. In some cases, small changes in the waste's composition can impact whether chemicals in waste rock qualify for a concentration-based exemption from TRI reporting in one year, but not qualify for the exemption the next year or vice versa.

In 2015:

- 93% of the metal mining sector's production-related waste managed was disposed of or otherwise released.

Metal Mining Releases Trend

The following graph shows the annual quantities of toxic chemical released by the metal mining industry.



From 2005 to 2015:

- More than 99% of the metal mining sector's releases were on-site land disposal. On-site land disposal by metal mines has fluctuated in recent years, increasing significantly in 2013 and then decreasing in 2014 and 2015.
- Several mines have reported that changes in production and changes in the chemical composition of the deposit being mined are the primary causes of fluctuations in the amount of chemicals reported.
- Metal mining facilities typically handle large volumes of material, and even a small change in the chemical composition of the deposit being mined can lead to big changes in the amount of toxic chemicals reported nationally.

In 2015:

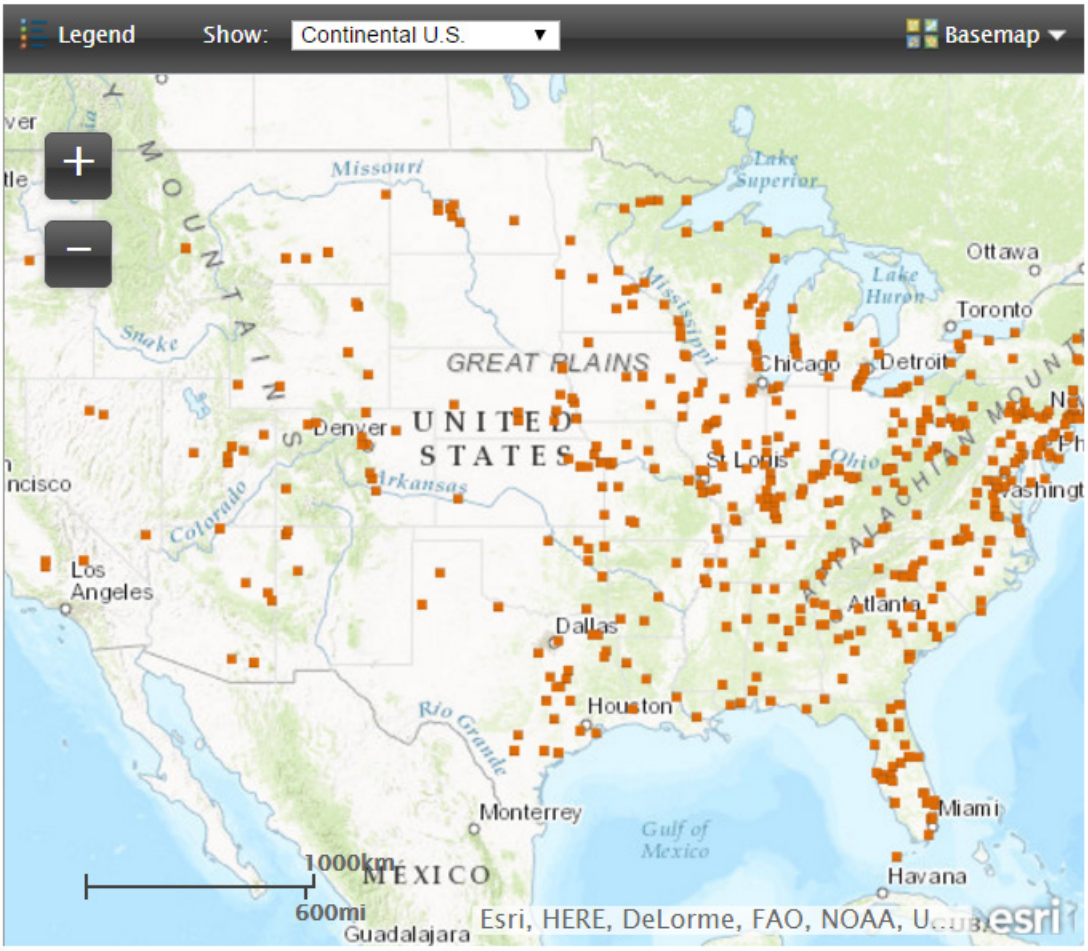
- The metal mining sector reported the largest quantity of total disposal or other releases, accounting for 37% of total releases and 61% of on-site land disposal for all industries.

Source Reduction in the Metal Mining Sector:

Six of the 86 facilities inititated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. Toxic chemical quantities reported by this sector are not especially amenable to source reduction, because they primarily reflect the natural composition of the ore and waste rock. The most commonly reported source reduction activity was good operating practices, which includes activities such as improving maintenance scheduling, recordkeeping, or procedures. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Electric Utilities

This map shows the electric utilities that reported to Toxics Release Inventory (TRI) in 2015.



Electric Utilities Reporting to TRI, 2015

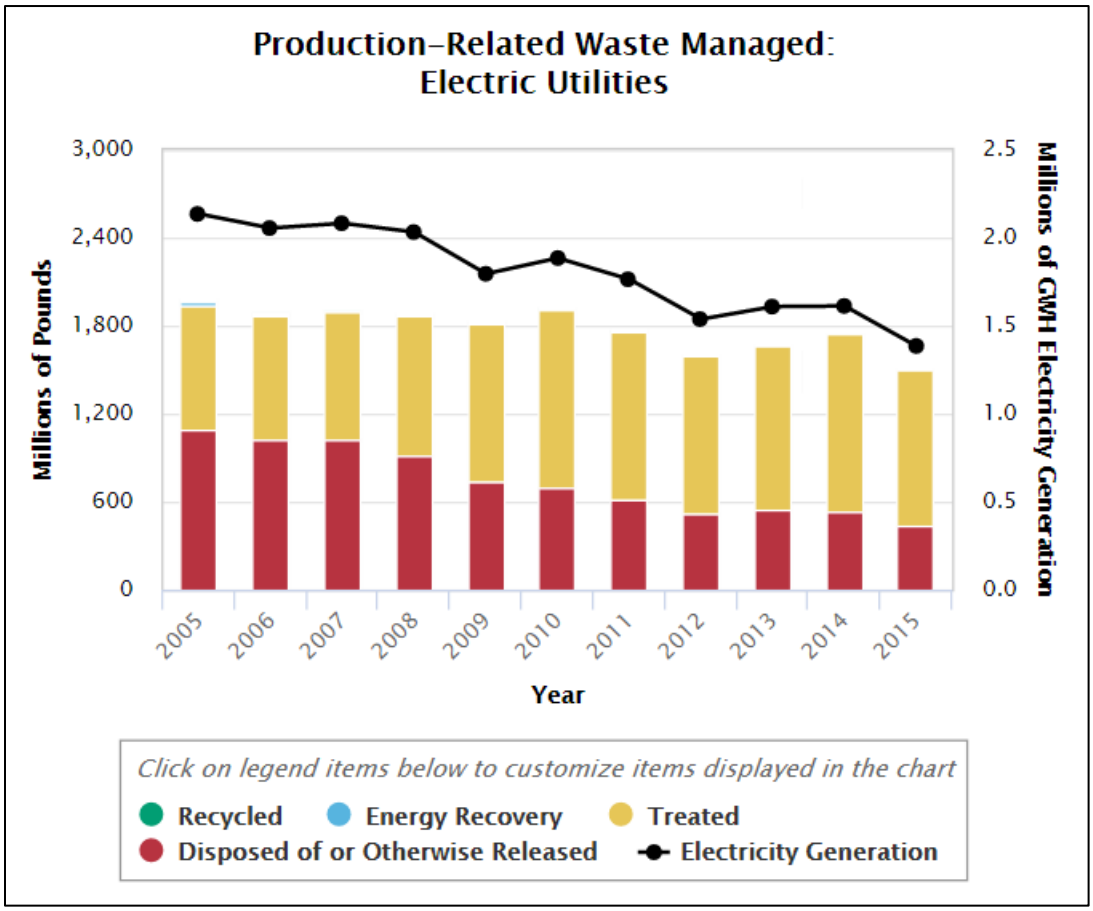
The electric utilities sector consists of establishments primarily engaged in generating, transmitting, and distributing electric power. Electric-generating facilities use a variety of fuels to generate electricity; however, only the combustion of coal or oil to generate power for distribution in commerce is covered under TRI reporting requirements. In 2015, 554 electricity generating facilities reported to the TRI Program.

Quick Facts for 2015: Electric Utilities (NAICS 2211)	
Number of Facilities that Reported to TRI:	**554**
Number of Facilities with New Source Reduction Activities	20
Production-Related Waste Managed	**1,506.5 million lb**
Recycled	5.4 million lb
Energy Recovery	0.3 million lb
Treated	1,061.9 million lb
Disposed or Otherwise Released	438.9 million lb
Total Disposal or Other Releases	**438.2 million lb**
On-site	**370.6 million lb**
Air	133.5 million lb
Water	3.5 million lb
Land	233.6 million lb
Off-site	**67.5 million lb**

Note: Numbers may not sum exactly due to rounding.

Electric Utilities Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by electric utilities.



From 2005 to 2015:

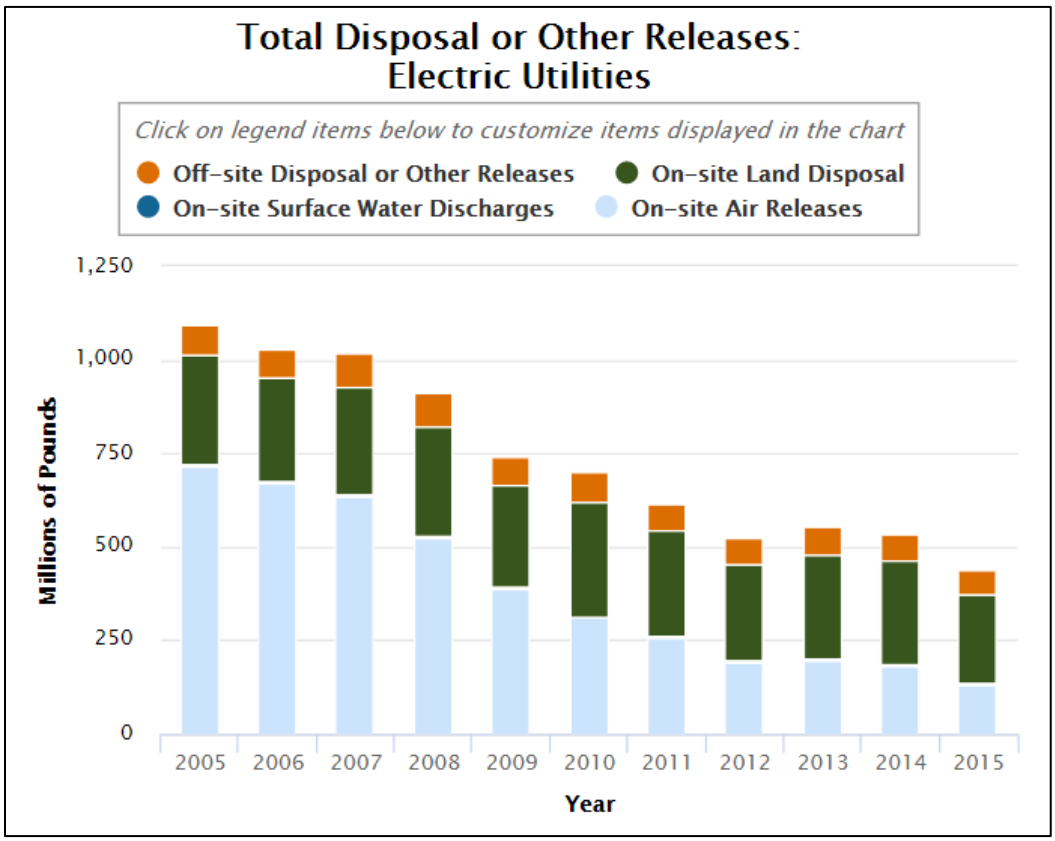
- Production-related waste managed decreased by 467 million lb (24%) since 2005.
- Net electricity generation decreased by 35% (in terms of electricity generated using coal and oil fuels as report by the U.S. Department of Energy's Energy Information Administration). The recent production decrease was driven by the industry's transition to natural gas, as only facilities that combust coal or oil to produce power are covered under TRI reporting requirements.
- Per gigawatt-hour (GWH) produced, releases decreased dramatically (38%), while quantities treated increased considerably.

In 2015:

- Approximately two-thirds of production-related waste managed was treated, while approximately one-third was released.
    - This is in contrast to 2005, when over half of the waste was released, and about one-third was treated. This trend is in large part due to an increase in scrubbers at electric utilities that treat (or destroy) acid gases that would otherwise be released on-site to the air.

Electric Utilities Releases Trend

The following graph shows the annual quantities of toxic chemical released by electric utilities.



From 2005 to 2015:

- Releases from the electric utilities sector decreased by 60%. This decrease was driven by a 81% decrease in on-site air releases, while on-site land disposal and off-site disposal or other releases remained relatively constant.

From 2014 to 2015:

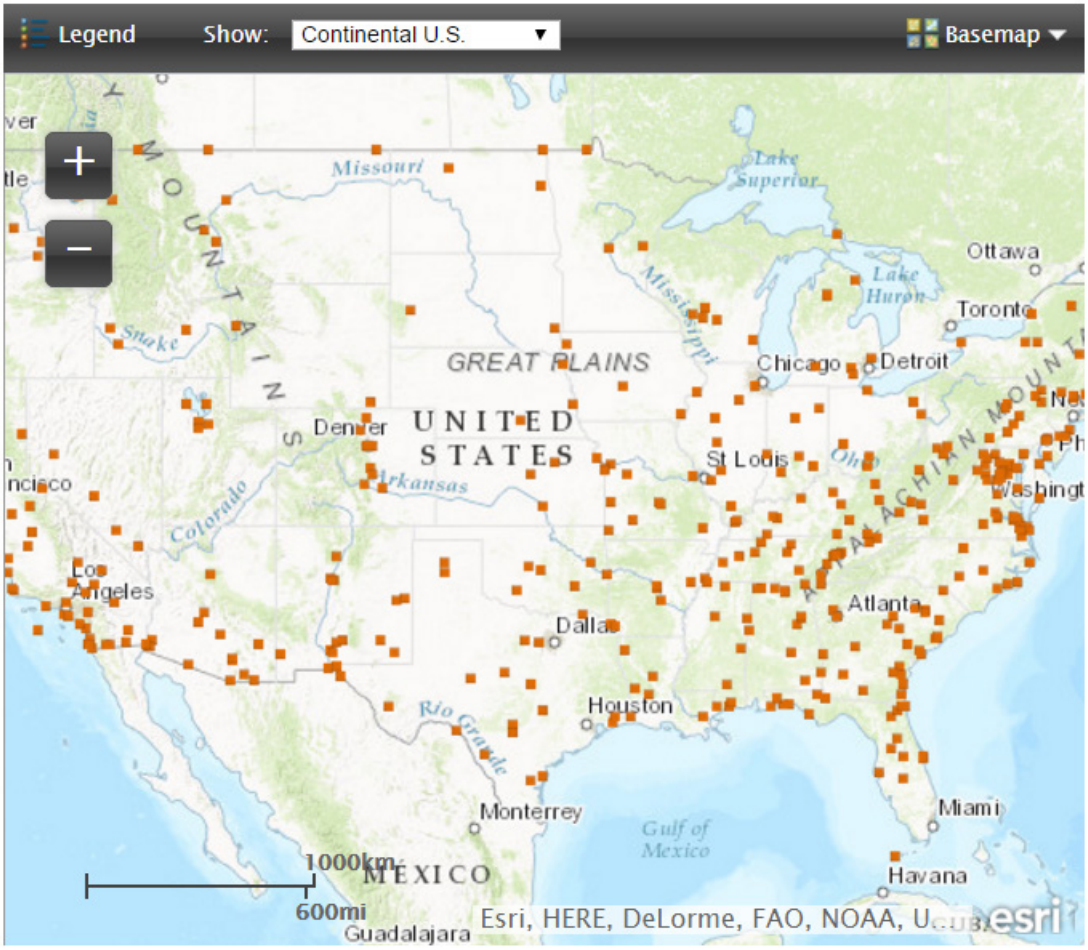
- Releases by electric utilities decreased by 18% (98 million pounds). This decrease was driven by decreases in on-site air releases and land disposal.

Source Reduction in the Electric Utilities Sector:

Only 20 electric utility facilities initiated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. Note that adding a scrubber is considered a control technology for waste that is generated, and is not a source reduction activity that prevents waste from being generated. The most commonly reported category of source reduction activities for this sector was process modifications, which include activities such as modifying equipment, layout, or piping. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Federal Facilities

This map shows the federal facilities that reported to Toxics Release Inventory (TRI) in 2015.



Federal Facilities Reporting to TRI, 2015

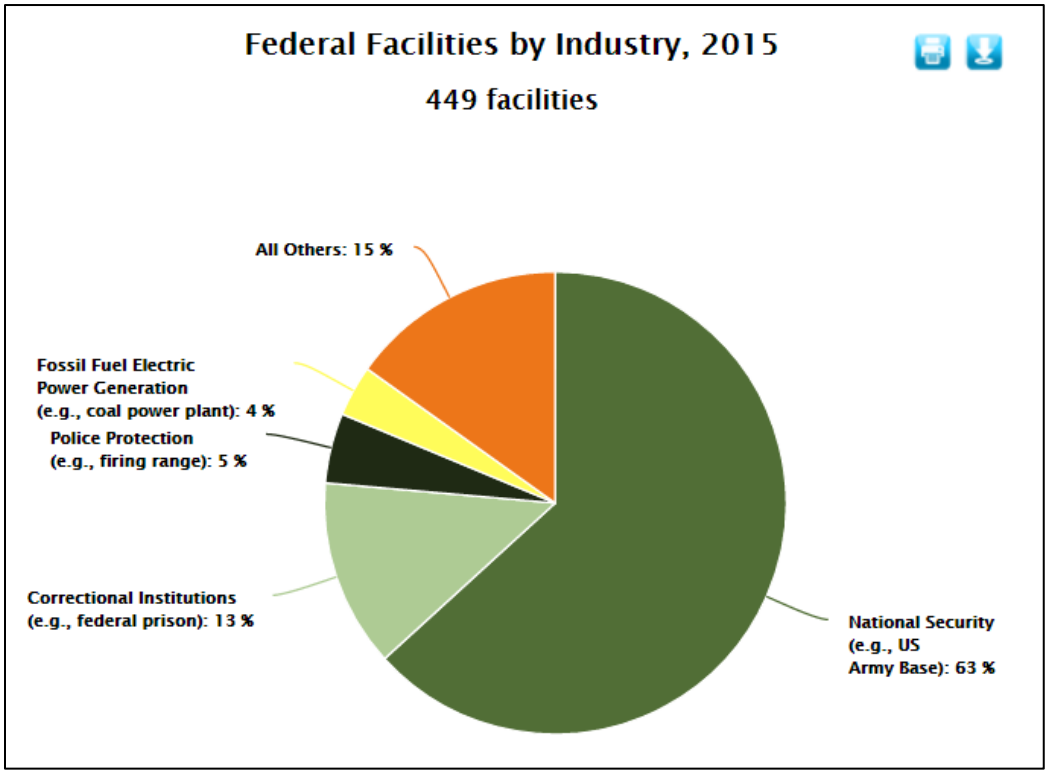
In 1993, President Clinton signed Executive Order 12856, "Federal Compliance with Right-to-Know Law and Pollution Prevention Requirements." This order established that TRI reporting requirements be extended to all federal facilities that meet TRI threshold reporting criteria regardless of the type of operations at the facility, as described by their NAICS code. These actions were recently affirmed in March 2015 by President Obama through Executive Order 13693, "Planning for Federal Sustainability in the Next Decade." Due to these requirements, federal facilities are subject to the TRI reporting requirements.

Quick Facts for 2015: Federal Facilities (All Sectors)	
Number of Facilities that Reported to TRI:	**449**
Number of Facilities with New Source Reduction Activities	21
Production-Related Waste Managed	**181.2 million lb**
Recycled	43.1 million lb
Energy Recovery	0.2 million lb
Treated	86.1 million lb
Disposed or Otherwise Released	51.8 million lb
Total Disposal or Other Releases	**61.1 million lb**
On-site	**58.8 million lb**
Air	15.4 million lb
Water	13.3 million lb
Land	30.1 million lb
Off-site	**2.3 million lb**

Note: Numbers may not sum exactly due to rounding.

Federal Facilities by Industry

The following pie chart shows the number of federal facilities reporting to the Toxics Release Inventory (TRI) program by industry in 2015.

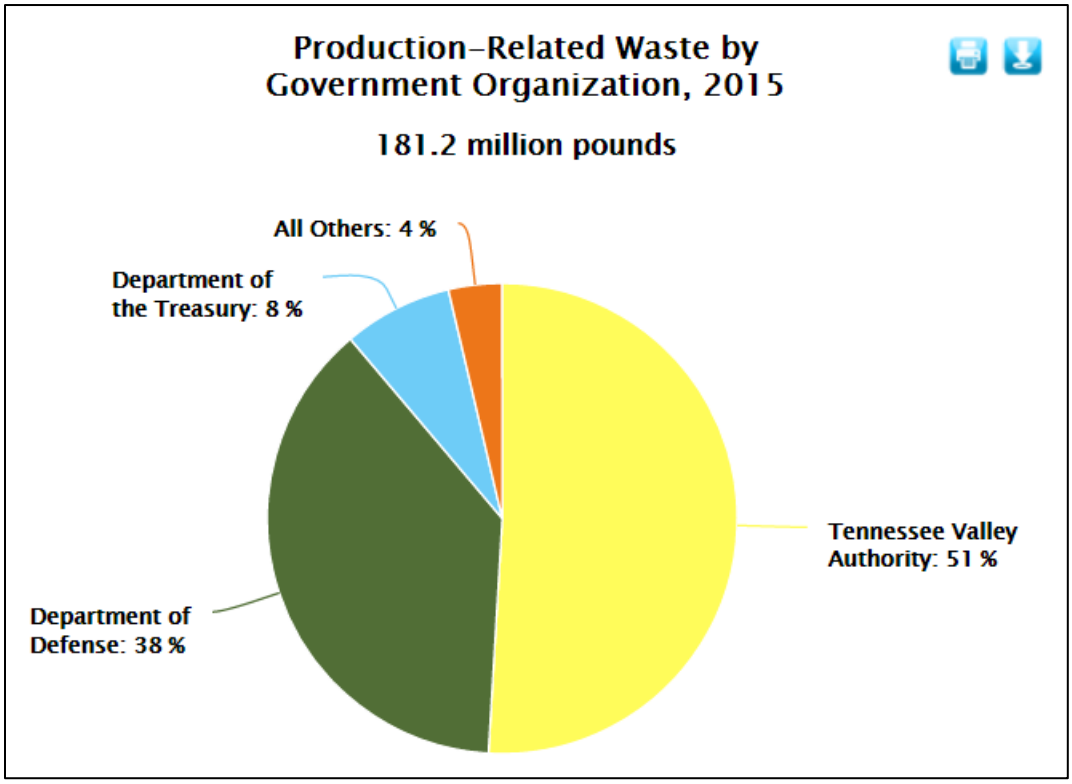


For the year 2015, 449 federal facilities in 39 different types of operations (based on their 6-digit NAICS codes) reported to the TRI Program. Almost two-thirds of these facilities were in the National Security sector, which includes Department of Defense facilities such as Army and Air Force bases. All federal facilities are subject to TRI reporting requirements regardless of their sector. Therefore, for some industry sectors, the TRI database only includes data from federal facilities. More than three-quarters of federal facilities are in National Security, such as military bases (63%); Correctional Institutions (13%); and Police Protection, such as training sites for Border Patrol stations (5%).

As with non-federal facilities, activities at federal facilities drive the types and quantities of waste managed that is reported. Some of the activities at federal facilities that are captured by TRI reporting are similar to those at non-federal facilities, such as hazardous waste treatment. In other cases, federal facilities may report due to a more specialized activity not usually performed by non-federal facilities. For example, all of the federal facilities included under Police Protection and Correctional Institutions only reported for lead and lead compounds, likely due to the use of lead ammunition on firing ranges at these facilities.

Waste Management by Federal Facilities

The following pie chart shows the percentages of toxic chemicals managed by federal facilities by government organization in 2015.



- 96% of the TRI chemicals managed as production-related waste at federal facilities was reported by: the Tennessee Valley Authority (51%), the Department of Defense (38%), and the Department of the Treasury (8%).
- All other government organizations comprised 4% of the production-related waste managed.

The types of waste reported by federal facilities vary by the type of operation. For example, the Tennessee Valley Authority (TVA) is a government-owned electric utility that provides power to southeastern states. Out of the 18 TVA facilities that reported to TRI for 2015, virtually all of the production-related waste comes from the fossil fuel plants that report in the Fossil Fuel Electric Power Generation sector. Similarly, out of 7 Department of the Treasury facilities reporting to TRI, most are mints for manufacturing currency and, accordingly, report in the Metal Stamping and Commerical Printing NAICS sector classification.

Source Reduction at Federal Facilities:

Since federal facilities are subject to TRI reporting regardless of their industry sector classification, their operations are diverse and few focus on manufacturing processes. Due to their unique functions, some federal facilities may face challenges in implementing source reduction strategies to reduce chemical waste. For the 2015 reporting year, 21 federal facilities (5%) reported implementing source reduction activities.

Facilities that do not implement source reduction activities may elect to indicate the types of barriers to source reduction they encountered. For federal facilities, most of the facilities that indicate barriers to implementing source reduction are national security or correctional institutions that report on lead or copper. For example, several facilities in the National Security sector indicated that they reported on lead because it is contained in the ammunition used on site and they have not been able to identify ammunition that does not contain lead. However, other federal facilities have been able to implement some source reduction activities. To find examples of federal facilities' source reduction activities, visit TRI's Pollution Prevention Search Tool and select industry sectors, such as National Security, Correctional Institutions, or Police Protection.