

Waste Management

A Half Century of Progress



Aerial view of “Mount Trashmore” a popular public park in Virginia Beach, Virginia, which is a closed landfill.

EPA Alumni Association

April 2020

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Preface

Former managers and staff of the U.S. Environmental Protection Agency (EPA) have formed an [EPA Alumni Association](#) (EPA AA). The Association has developed this and six other web-based environmental reports in support of our *Half Century of Progress* project. An integrated summary based on all of these reports, [Protecting the Environment: A Half Century of Progress](#), is available on the Association website. The Association has developed these materials to inform high school and college students and other members of the public about the major environmental problems and issues encountered in the United States in the 1960s and 70s and the actions taken and progress made in mitigating these problems over the last half-century. We also want to highlight continuing and emerging environmental challenges we face today. We hope that, besides summarizing the history of U.S. environmental programs, these reports might inspire some students and others to consider careers in the environmental field.

A number of retired EPA program managers and subject matter experts worked together to produce the first editions of these reports in 2016. Additional experts have updated these documents in 2020 in recognition of the 50th anniversary of Earth Day and the creation of the EPA. This updated report has been reviewed by relevant members the EPA AA Board of Directors and other alumni. We welcome comments on this document, which you may provide at this [EPA Alumni Association link](#).

The Association has also produced a *Teacher's Guide* to facilitate the use of these materials by educators interested in including the *Half Century of Progress* in high school and college curricula. The *Guide* contains data interpretation and other questions related to the report topics, with answers. It also includes activities that challenge students to learn more about environmental issues in their communities, web-based resources for additional activities, and three lesson plans related to the HCP materials. These plans were designed and tested by three AP Environmental Science Teachers. Teachers may request a copy [here](#).



Historical Conditions

Modern societies generate large volumes of waste from industrial, commercial, institutional, and residential activities. In the decades before waste management was federally regulated in the United States, discarded materials contaminated land, groundwater, and waterways and posed increasing risks to public health and the environment. Waste was collected and dumped into unlined landfills—even directly into rivers and the ocean. Municipal landfills were usually located near rivers and streams, allowing liquids and refuse to migrate easily into the water supplies. Waste dump sites were unsanitary, attracting rodents, giving off odors, and creating fire hazards. Trash was often burned in the open, contaminating land, water, and air. Liquids containing flammable and toxic chemicals were discharged into unlined “evaporation” ponds, allowing them to migrate into groundwater and waterways.

By the 1960s, pollution from waste was so widespread that citizens and lawmakers began to mobilize around a comprehensive waste management law. Congress passed the *Solid Waste Disposal Act* (SWDA) in 1965, which set minimum safety requirements for local landfills and established a framework for states to better control trash disposal from all sources.¹ In 1965, as synthetic chemical manufacturing was booming and creating toxic byproducts, *hazardous waste* also emerged as a growing threat.² Even with the SWDA in place, little regulation of the proper



Waste was burned in the open at the Kenilworth Park Landfill on the banks of the Anacostia River, 1967. Source: National Park Service

disposal of toxic byproducts—and growing volumes of all types of municipal and industrial wastes—allowed pollution from waste to pose a persistent threat to human health and the environment. As the *New York Times* reported in 1969, “An avalanche of waste and

waste disposal problems is building up around the nation's major cities in an impending emergency that may parallel the existing crises in air and water.”³

With the formation of EPA in 1970, the federal role in waste management grew. EPA reviewed the risks posed by waste, which clearly demonstrated the inadequacy of the SWDA. The House Committee on Interstate and Foreign Commerce described some

of these risks in 1976 as follows: “Current estimates indicate that approximately 30–35 million tons of hazardous waste are literally dumped on the ground each year. Many of these substances can blind, cripple, or kill. They can defoliate the environment, contaminate drinking water supplies, and enter the food chain under present, largely unregulated disposal practices.”⁴ It had become apparent that an overhaul of waste management practices was needed.



Illegal dumping area off the New Jersey Turnpike, facing Manhattan across the Hudson River, early 1970s. Photo: EPA Documerica



Fresno County, California, rancher's pile of chemical drums, May 1972. Photo: Gene Daniels, EPA Documerica

Actions Taken

During the late 1970s and early 1980s, EPA, working with the states, went through a process which transformed the waste industry from an unregulated, thinly capitalized, and often marginal series of unregulated businesses into a well-regulated, updated, and more financially responsible industry. Significant amendments to the SWDA were made with the passage of the *Resource Conservation and Recovery Act (RCRA)* in 1976. Since this amending legislation is so comprehensive, RCRA is generally referred to without reference to the original 1965 act. Through the combined use of the enforcement and permitting tools provided in RCRA, the waste management industry evolved to become both technically and financially capable of providing the long-term care necessary to successfully manage hazardous waste.

RCRA set national goals for 1) protecting human health and the environment from the potential hazards of waste disposal; 2) conserving energy and natural resources; 3) reducing the amount of waste generated; and 4) ensuring the wastes are managed in an environmentally sound manner.⁵ The RCRA statute is largely a pollution prevention measure, distinguishing it from EPA's statutes that depend primarily on end-of-pipe pollution controls, such as the Clean Air and Clean Water acts. EPA's RCRA program, established to address the goals of the statute, is a joint federal and state enterprise whereby the federal program

provides basic requirements that states adapt to their needs, resources, and economies. The regulations define solid and hazardous waste and mandate strict requirements for generation, recycling, transportation, treatment, storage, and disposal of hazardous waste.⁶ In addition, RCRA bans open dumping and promotes source reduction (minimizing the amount of waste that is generated), recycling, and safe disposal of municipal wastes.

Major Provisions of the Resource Conservation and Recovery Act

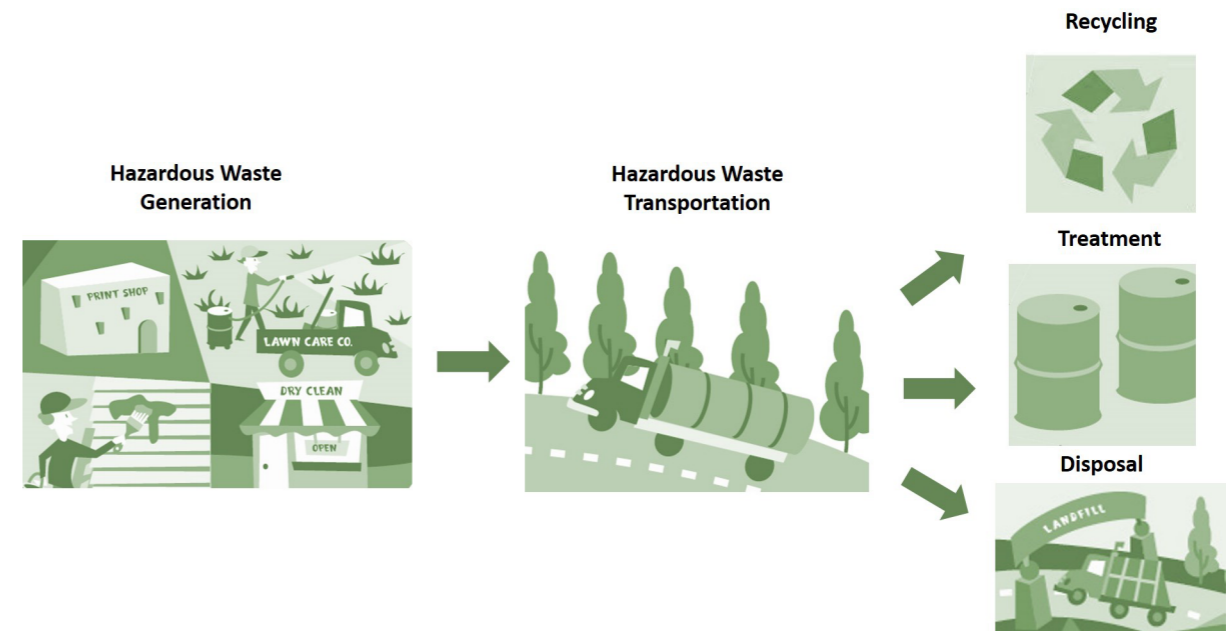
Subtitle	Provisions
A	General Provisions
B	Office of Solid Waste; Authorities of the Administrator and Interagency Coordinating Committee
C	Regulation of Hazardous Waste
D	Regulation of Solid Waste
E	Duties of the Secretary of Commerce in Resource and Recovery
F	Federal Responsibilities
G	Miscellaneous Provisions
H	Research, Development, Demonstration and Information
I	Regulation of Underground Storage Tanks
J	Standards for the Tracking and Management of Medical Waste

The major subdivisions of RCRA are the hazardous waste and solid waste programs. Subtitle C, the *hazardous waste* program, establishes a system for managing hazardous waste from generation until disposal, or from “cradle to grave.” EPA authorizes states to operate their own hazardous waste programs that must be at least as protective as federal standards. These programs apply to generators, to transporters, and to treatment, storage, and disposal facilities. Subtitle D, the *solid waste* program:

- Prohibits open dumping of solid waste;
- Sets criteria for municipal solid waste landfills and other waste disposal facilities, such as incinerators; and
- Provides a framework for states to develop plans for managing nonhazardous industrial and municipal solid waste.

Additional standards were established in 1991 for municipal solid waste landfills, explicitly defining design, operation, and closure standards, restricting landfill locations, and requiring liners and groundwater monitoring. The legislation has brought about robust state permitting and oversight. This is especially critical for hazardous waste, but also applies to municipal and industrial wastes falling under Subtitle D.

The first RCRA hazardous waste permit was issued in October 1981. RCRA permits specify the waste management activities facilities can conduct and the conditions under which they



RCRA's Cradle-to-Grave Hazardous Waste Management System.

Source: <https://www.epa.gov/hw/learn-basics-hazardous-waste>

can conduct them. For example, permits for landfills receiving hazardous waste specify landfill liner and other requirements (e.g., for installing systems that collect the liquid that drains from a landfill, known as leachate). Entities permitted to treat, store, or dispose of hazardous wastes also are required to certify annually that they have a program in place to reduce the volume and toxicity of hazardous wastes generated. The definition of hazardous waste is a critical and influential piece of the legislation. It is essential to determining requirements for waste treatment and landfilling and is key in the cleanup and corrective action contexts, further described below.

Hazardous and Solid Waste Amendments

The *Hazardous and Solid Waste Amendments*, passed by Congress in 1984, established programs under RCRA for land disposal, underground storage tanks, and made other changes that reinforced RCRA's protective framework. The RCRA *Corrective Action* program is one of the most expansive of the nation's federal and state cleanup programs.⁷ The Corrective Action facilities that manage hazardous wastes are required to clean up any hazardous waste releases at the facility owner's expense. This ensures that facilities permitted to manage newly generated hazardous waste address all existing cleanup obligations. The program thus mitigates public health and environmental threats and prevents industrial or commercial sites from becoming *Superfund* sites, or sites where levels of contamination may pose an unacceptable risk to human health and the environment. This in turn prevents unnecessary expenditure of taxpayer dollars. Corrective Action cleanups are essential for revitalizing communities and spurring economic development by enabling reuse of land for housing, industrial, or commercial projects.

To protect groundwater and soil from hazardous waste contamination, the *Land Disposal Restrictions* program establishes treatment requirements—based on best demonstrated treatment

technology—that must be met before a waste may be disposed of in land units (e.g., landfills, surface impoundments, or waste piles). The program issued the original treatment methods and level of treatment requirements between 1986 and 1998, and has continued to adapt these to new hazardous wastes and treatment technologies. These stringent requirements and an emphasis on sound waste minimization practices encourage businesses to put plans in place to minimize the wastes they generate.

The *Underground Storage Tanks* program, established under Subtitle I, was also introduced through the 1984 amendments. These provisions were upgraded even further by more comprehensive requirements in the *Energy Policy Act* of 2005. While a part of Subtitle C of the hazardous and solid waste amendments regulates the storage of hazardous waste, this program regulates the underground storage of a much broader universe of facilities: 3,500 active hazardous substances storage tanks and 548,00 active underground petroleum products storage tanks at 200,000 sites. The program, which targets spill prevention and cleanup of product releases at the regulated sites, is primarily implemented by states and territories and has resulted in the proper closure of 1.9 million underground storage tanks.⁸

Progress Made

RCRA's impact on waste management across the country since its inception has been extensive. The regulations have created a comprehensive system and federal/state infrastructure to manage hazardous waste from “cradle to grave,” as well as a framework for states to implement municipal solid waste and nonhazardous secondary materials management programs. RCRA's comprehensive hazardous waste regulations and its Corrective Action program are also critical to preventing future Superfund sites. The following metrics broadly describe some of the accomplishments of the RCRA program as of 2014:⁹

- Manages 2.5 billion tons of solid, industrial, and hazardous waste from the manufacturing and use of goods throughout the economy each year.
- Oversees 6,600 permitted facilities, with over 20,000 process units.
- Oversees between 350,000 and 550,000 facilities that generate hazardous waste.
- Addresses cleanups at 3,700 contaminated facilities and is reviewing as many as 2,000 possible additional facilities.
- Provides grant funding to states for hazardous waste program implementation, with \$69.7million provided in fiscal 2018.¹⁰

Industrial and Commercial Wastes

RCRA's requirements have led to the proper management and disposal of hazardous wastes in lined or covered landfills, surface impoundments, land application units, and deep well injection sites. During the late 1970s and early 1980s, EPA—working with the states—dramatically improved how wastes were handled. Through the combined use of the enforcement and permitting tools provide in RCRA, the waste management industry evolved to become both technically and financially capable of providing the long-term care necessary to successfully manage hazardous waste.



Safe management of hazardous waste under RCRA. Source: EPA

RCRA has also encouraged beneficial recovery of materials and energy and safe reuse of hazardous wastes. Human exposures to hazardous wastes and contaminated groundwater have declined since RCRA's implementation. EPA has implemented a number of RCRA-focused partnership and award programs to encourage companies to modify practices to generate less hazardous and nonhazardous waste and to reuse materials safely. For example:

- Since the RCRA permitting process was implemented, permits have been put in place to prevent dangerous hazardous waste releases at over 20,000 units. At the end of FY 2018, 963 (72%) of 1330 permitted facilities were properly permitted.¹¹
- RCRA has developed new regulations, guidelines, and policies for the following unique waste streams: coal ash, pharmaceutical hazardous wastes (e.g., nicotine), scrap metal, used oil, lead-acid batteries, circuit boards and cathode ray tubes, fluorescent light bulbs, academic laboratory wastes, disposable and recyclable spent solvent-containing wipes, and lead mining residuals.
- EPA has issued regulations implementing a hazardous waste electronic manifest system (e-manifest system), which became operational on June 30, 2018.
- RCRA regulations contributed to the safe storage and destruction of chemical weapons in the United States. Each of the U.S. Army's seven chemical material storage

and disposal sites was a RCRA-permitted site, ensuring safe handling and disposal of chemical weapons and guiding the closure process for each facility.¹² International treaty requirements for chemical weapons destruction were met in 2012 after 90% of the U.S. stockpile had been safely destroyed.¹³

Land Disposal Restriction (LDR) Program

The LDR program's stringent treatment standards for hazardous waste disposal have encouraged businesses to minimize waste generation and prioritize reuse and recycling. Due to the LDR requirements and the emphasis on waste minimization, the program has reduced the number of hazardous waste generators and the amount of waste generated. For example:

- From 1980 to 1999 the number of businesses generating hazardous waste decreased from 50,000 to 20,000, and the number of treatment, storage, and disposal facilities declined from 30,000 to 1,330.¹⁴
- Twenty years after the start of the LDR program in 1984, the volume of hazardous waste disposed of in landfills had decreased by 94 percent and the volume disposed of via underground injection had decreased by 70 percent.¹⁵

Regulation of Coal Ash

The most recent and notable advance of waste regulation has been to reduce risks from the land disposal of solid wastes—including new requirements for disposal of coal ash from coal-burning electric power plants. Approximately 130 million tons of ash was generated annually based on 2014 data. Triggered by releases of coal ash from impoundments in Tennessee in 2008 and North Carolina in 2014, EPA established standards in April of 2015 to assure safer disposal of coal ash. These regulations utilized the nonhazardous industrial waste authorities provided by RCRA Subtitle D.¹⁶ (Note: In November 2018, the new administration proposed to revise these standards.)



Coal ash pond.

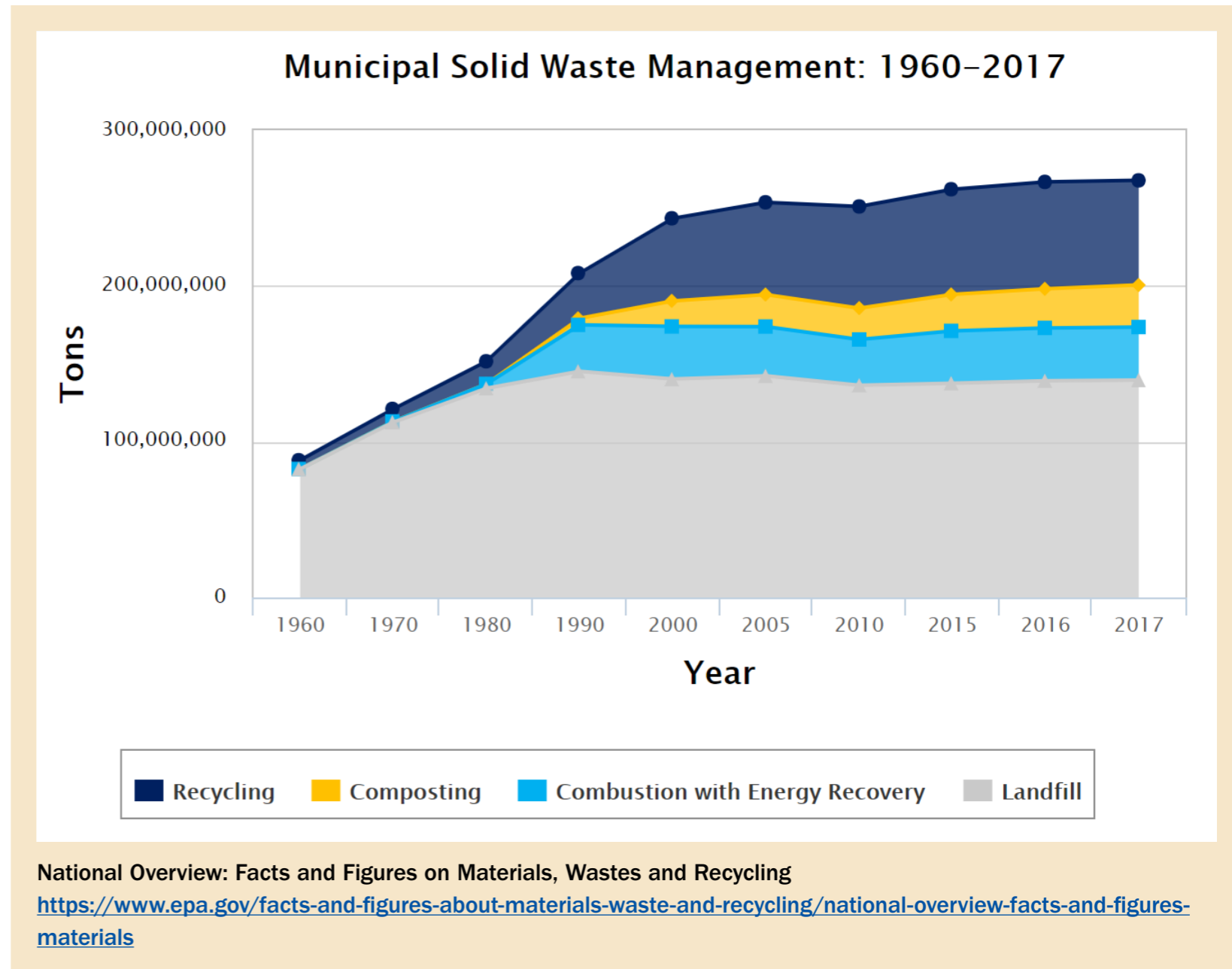


View of coal ash deposits on the Dan River shoreline, North Carolina. A collapsed coal ash impoundment at the power plant (shown in the top photo) caused a spill of 39,000 tons of coal ash into the river in 2014. Photos: USEPA

Municipal Solid Waste

RCRA has strengthened the nation's recycling infrastructure and increased the municipal solid waste recycling rate from less than 7% to almost 35% by providing information and systems that help states set recycling goals, raise awareness, and promote the business case for waste reduction.¹⁷ Materials recovery through recycling and composting has a significant impact on greenhouse gas emissions. In 2017 alone, the 94.2 million tons of municipal solid waste were recycled and composted, equating to an annual reduction of 184 million tons of carbon dioxide-equivalent emissions—or elimination of the emissions from over 31 million cars.¹⁸ Other economic and environmental benefits have been documented over the years, including:

- As the recycling rate has increased, disposal of waste to landfills has decreased from 89% of generated waste in 1980 to about 52% in 2017.¹⁹
- The total amount of municipal solid waste going to landfills has declined from 145.3 million tons in 1990 to 139.7 million tons in 2017.²⁰



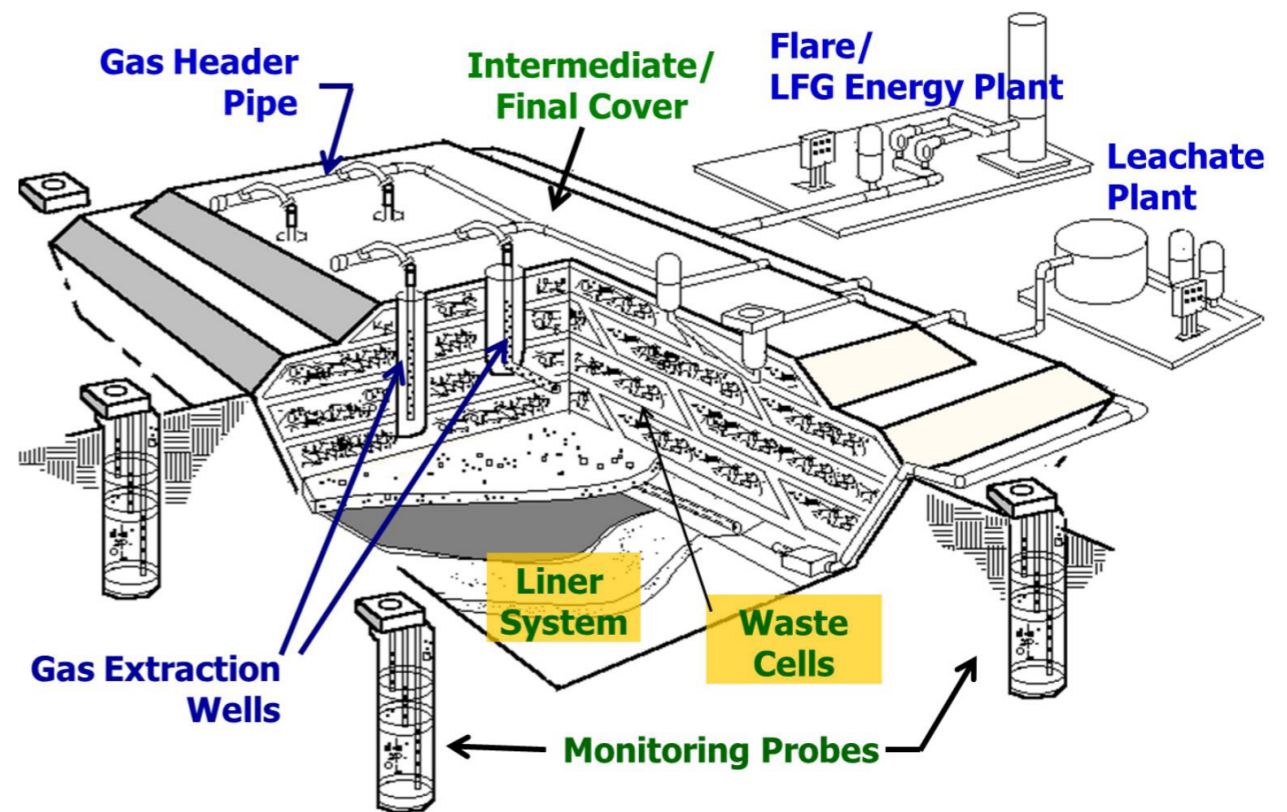
- Before RCRA, municipal solid waste management was a highly fragmented business. With the enactment of RCRA, this changed rapidly to an industry with a few large, consolidated waste management companies, making regulation and compliance much more straightforward. In 1988, solid waste was sent to 6,500 landfills. By 2002, only 2,500 landfills remained open, and the number has

declined further over the years, though the average landfill size has increased.^{21,22}

- About 34 million tons of municipal solid wastes were combusted for energy recovery in 2017.²³ Many landfills also include methane capture and combustion for limited power generation.



Dump trucks empty trash into a pit where the waste will be converted into energy and used on the installation at the landfill on Marine Corps Air Station Miramar, California. MCAS Miramar sources 54% of its total energy consumption from on-site renewable energy sources, such as the landfill. Photo: U.S. Marine Corps photo by Cpl. Victor Mincy/Released

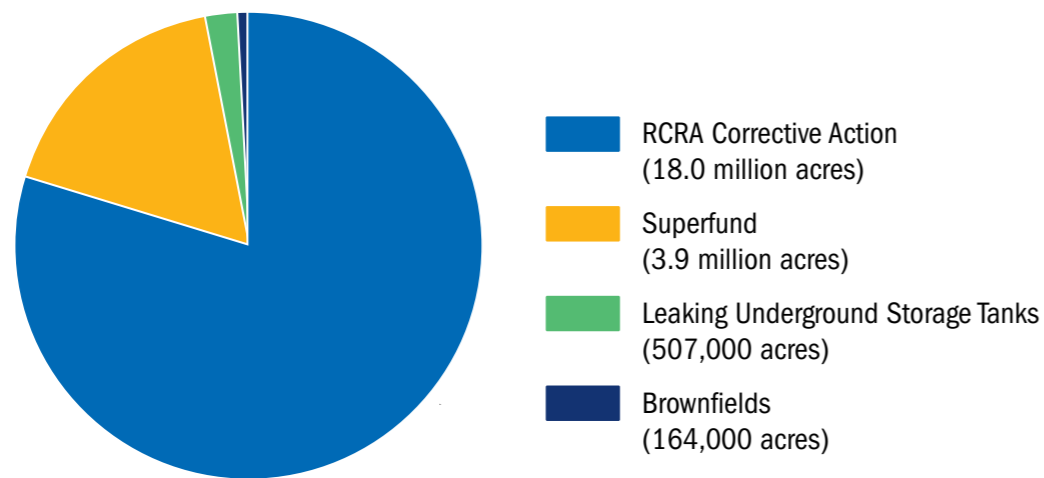


Landfill Gas Collection System. USEPA Landfill Methane Outreach Program

Corrective Action Program

The RCRA Corrective Action program has led to the restoration and readying for productive reuse of 18 million acres of contaminated lands. Facility owners—rather than taxpayers—are primarily responsible for the costs of these cleanups. EPA estimates that over 35 million people—12% of the U.S. population—lives within one mile of a corrective action site. By October of 2018, EPA was working on a highest priority universe of 3,779 facilities that were in need of corrective action. Within that universe, 117 facilities were ready for their anticipated future use. In the sites completed, thousands of jobs were created at facilities able to reuse the land for productive purposes.²⁴

In addition, 3,612 facilities had all human exposures to toxins under control, 3,347 facilities had contaminated groundwater under control, and 98 facilities had “final remedy” construction complete. EPA has set goals to achieve 95% of these facilities in compliance with these three goals by 2020.²⁵



Acres Addressed Per Clean-Up Program

To provide just one example: an explosives manufacturing site that operated for over 100 years in Pompton Lakes, New Jersey, caused extensive contamination to the site and surrounding waterways and properties from wastes containing mercury, lead, copper, trichloroethylene (TCE), and tetrachloroethylene (PCE). Groundwater contaminated with the solvents TCE and PCE migrated beneath more than 400 houses. In a process known as vapor intrusion, chemical vapors can migrate from groundwater to indoor air through pathways, such as cracks in building foundations, posing a risk to human health. As part of the RCRA



Pompton Lakes Dredging

corrective action cleanup, over 200,000 tons of contaminated soil and sediments have been removed, 10 acres of wetlands have been replanted, a pump-and-treat system installed in 1998 removes contaminants from groundwater to prevent TCE and PCE from migrating offsite, and vapor mitigation systems have been installed in more than 285 houses. Cleanup continues, especially with respect to vapor intrusion, a phenomenon not well understood until the later phases of the cleanup.²⁶

Underground Storage Tanks

When the UST program was established in 1984 to protect land and water from petroleum leaks, there were approximately two million underground storage tanks. Since that time, the program has accomplished the following, as of 2018:

- Over 1.87 million substandard underground storage tanks have been properly closed, leaving 550,379 active tanks regulated by the program. EPA is working with state and tribal partners to inspect each of these active tanks every three years in order to minimize leaks and avoid associated cleanup costs, which average about \$125,000 per site.²⁷
- The program has cleaned up 88 percent of all releases, or leaks, reported since its inception—a total of 478,366 out of 543,812 reported—and reduced the number of annual releases from almost 67,000 in 1990 to 5,654 in 2018.

Sustainable Materials Management

EPA and states have promoted sustainable materials management to encourage source reduction and reuse of wastes as valuable commodities that can be part of new products, leading to resource conservation, energy savings, and reduced greenhouse gas emissions.

- EPA has encouraged electronics recyclers to become certified under the *Responsible Recycling Practices* standard or the *e-Stewards* standard, accredited third-party standard programs that maximize reuse, minimize exposure to human health and the environment, ensure safe management of materials by downstream handlers, and require destruction of all data on used electronics.²⁸
- EPA has convened dialogues and formed coalitions around sustainable materials and has established challenges for particular sectors like electronics and food.

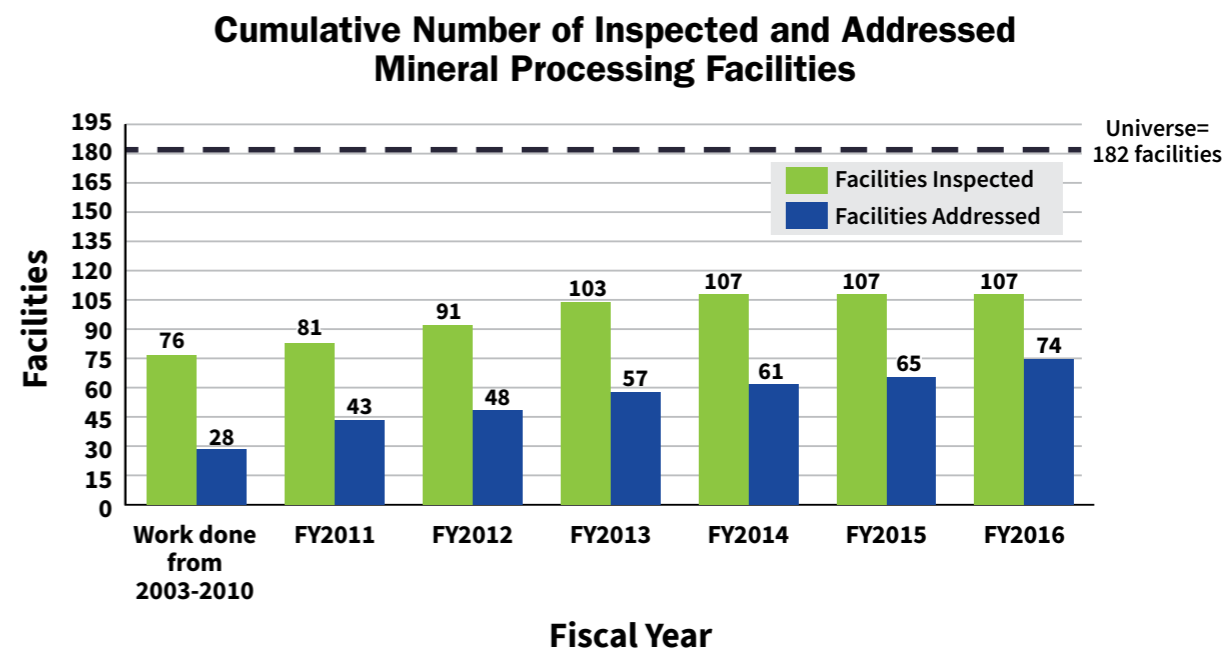
RCRA Enforcement

Early enforcement efforts under RCRA focused on treatment, storage and particularly disposal facilities. Within resource constraints, EPA working with states, strove to meet the required inspection frequencies prescribed by RCRA Section 3007. Inspections frequently found violations. Some could be easily resolved using compliance assistance, letters, or administrative

orders. Others involved more complex steps to come into compliance. Those often included compliance schedules contained in administrative orders or judicial consent decrees. Over time, as the treatment, storage and disposal facilities (TSDs) achieved better compliance, states urged EPA to expand its focus to include generators. States were finding that mismanagement of waste by generators could also result in significant environmental harm. This finding resulted in a shift to include more inspections of generators rather than a singular focus on TSDs.

Over the years a number of emerging problems created the need for more focused inspection and enforcement efforts. In the early 90s, EPA, working with states, began a non-notifier initiative to search out companies that were operating completely outside of the law with respect to obtaining permits and following regulatory requirements. Other early enforcement initiatives focused on environmental problems caused by lead contained in hazardous waste and industrial boilers and furnaces. Significant problems involving workers at waste management facilities resulted in a combined EPA/OSHA initiative to address health and safety of TSD workers. Another initiative, which relied on the imminent and substantial endangerment authorities of RCRA, was undertaken when it was discovered that dioxins were being emitted from municipal waste incinerators. While regulations were being developed under the Clean Air Act, RCRA Section 7003 orders were issued for a number of municipal incinerators requiring the installation of scrubbers to reduce dioxin emissions.

In the 2000s, EPA further refined its process for targeting enforcement resources at the most significant environmental problems. During much of this time, EPA's enforcement priority for RCRA was mineral processing (e.g. smelting). According to EPA, mineral processing and mining facilities generate more toxic and hazardous waste than any other industrial sector. The U.S. has approximately 180 mineral processing facilities. The results of this effort on facility inspections and compliance actions addressed are shown in the graph below:



*Addressed means that a facility is subject to an enforceable order (judicial or administrative) requiring compliance, or has been inspected and found to have no significant violations.

*Mineral Processing sites are defined as such based on EPA Rules found at 54 Fed. Reg. 15316, 15324-25 (April 17, 1989) and 54 Fed. Reg. 36592, 36619-20 (September 1, 1989).

Many significant criminal enforcement actions have also been taken for violations of RCRA. Cases involving infractions—such as improper hazardous waste storage and disposal and illegal hazardous waste exports—have resulted in convictions, with penalties in the millions of dollars and/or jail time for corporate officers.

RCRA Enforcement: A Case Study

In August of 2016, Richard Delp—the owner of Central Valley Electroplating of Cedar Falls, Iowa—pled guilty in federal court to a charge of unlawfully storing hazardous waste. Evidence presented in Court revealed that from about January 1, 2004, to October 2012, the 62-year-old Delp knowingly stored drums, tanks, totes, and vats containing corrosive and toxic hazardous waste at his electroplating facility without a permit authorizing the storage. The illegal storage continued even though the owner was alerted to the problem in 2005 and again in 2010 by inspectors from EPA. Instead of addressing the problem, Delp abandoned the hazardous wastes when he closed the business in September 2011. This resulted in the public paying more than \$789,000 in cleanup costs. On January 18, 2017, Delp was sentenced to 24 months incarceration. Delp was also sentenced to three years supervised release following his imprisonment and was required to reimburse the U.S. Treasury for the full costs incurred in cleaning up the facility he had abandoned.

Other Notable RCRA Activities

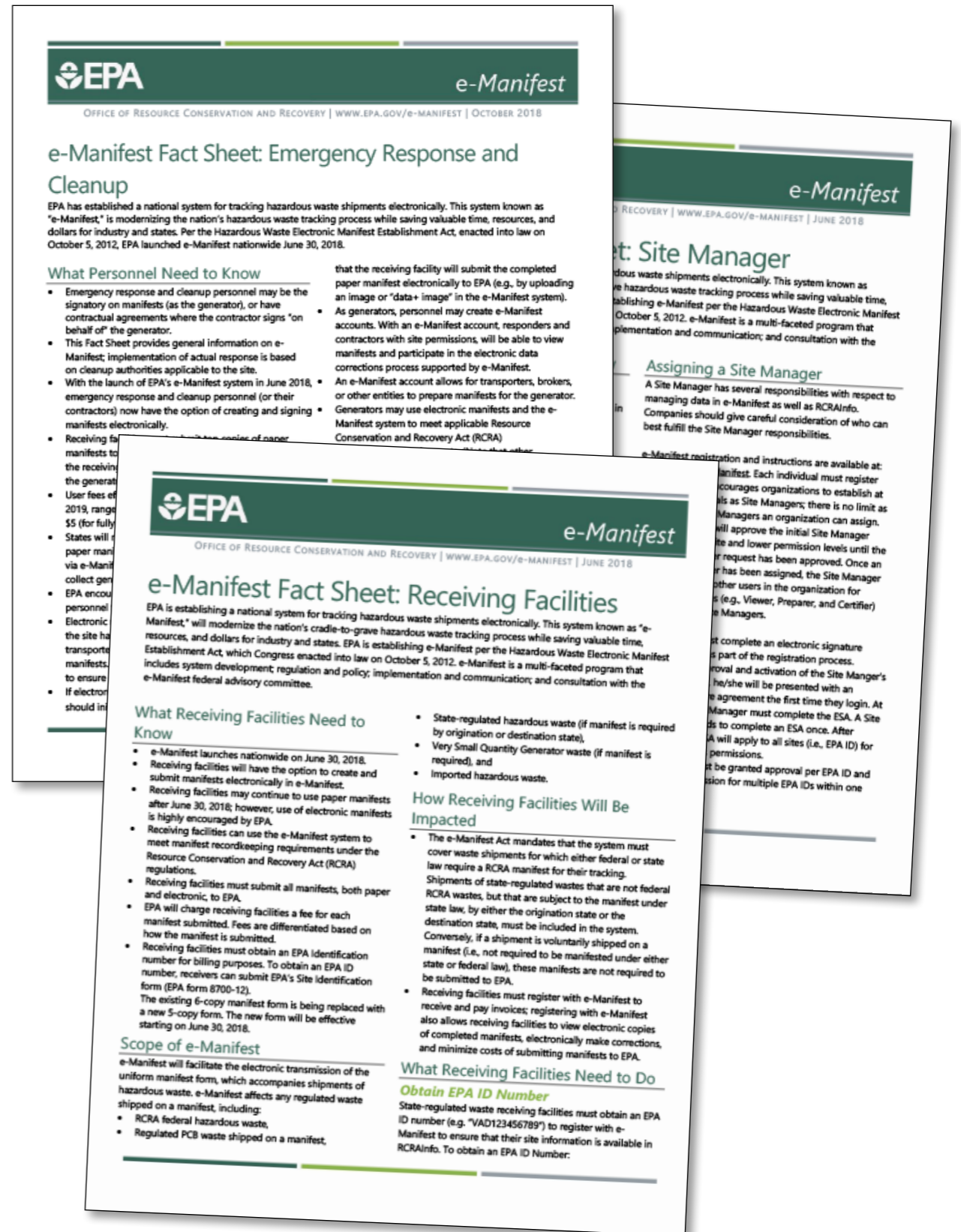
Under RCRA, EPA has provided leadership, planning, preparedness, and expert technical support on waste management and disposal issues resulting from natural and manmade disasters. This has included waste disposal and cleanup support in responses to the September 11 attacks, the anthrax-contaminated letters sent to the U.S. Capitol (a documentary video about the EPA-led response to the anthrax attack can be found at <https://youtu.be/KUfSuu-YOOA>), Hurricane Katrina, the Deepwater Horizon spill, the Fukushima Daiichi Nuclear Power Plant disaster, Superstorm Sandy, and numerous floods and tornadoes.²⁹



Superstorm Sandy Response. EPA and the Coast Guard assessed a private property in Rumson, NJ, on November 10, 2012 and found an overturned propane tank in the debris. Source: https://archive.epa.gov/region02/sandy/web/html/response_11-10-12.html

Recently, the RCRA program has been working to improve efficiency. To provide just one example, EPA is in the process of transitioning the hazardous waste manifest (a record of hazardous waste movement and management from generation to final disposal), which began as a paper system in the late 1970s, to an electronic system, referred to as *e-Manifest*. Beginning on June 30, 2018, receiving facilities had to begin submitting manifests to EPA and pay a user fee for each manifest submitted. Although users can continue to mail manifests to EPA, the fees charged for mailed manifests are significantly higher than fees for electronically submitted manifests. These fees are dedicated to pay costs for developing and operating the national e-Manifest system. In the first ten months of operation the system handled more than 1.5 million manifest submissions. However, only 4,005 of those submissions were fully electronic—most were submissions where a paper manifest was used until the wastes reached the treatment storage or disposal facility. EPA is working on eliminating the barriers that prevent full utilization of electronic manifests from the point of generation.³⁰

RCRA has also incorporated environmental justice into its mission and has focused on communication with disadvantaged communities. RCRA has partnered with tribes to support the development of their programs and has collaborated with other countries and international organizations to share expertise.



Addressing Future Challenges

The RCRA program has established a number of goals and will face new challenges during the 2020s and beyond. New approaches encouraging life-cycle product development, use, and retirement are also turning the focus from waste management on the back end to waste avoidance through improved design and reuse/recycling strategies.

In the future, in addition to overseeing the management of known hazardous wastes, EPA and the states will need to adapt their programs to encompass newly identified hazardous wastes. EPA has not identified any new listings for hazardous waste for over 30 years. Instead, the agency has focused on situations where those initial listings were not justified upon further evaluation. In addition, EPA-characterized wastes have only focused on the presence of toxic metals that can leach from wastes, or the presence of ignitable, corrosive, or reactive properties. No attempt has been made to create a characteristic based on the presence of toxic organics in wastes—in the past, this was left to the issuance of new waste listings. New technologies, manufacturing, and energy production processes involving hundreds of new chemicals each year have led to a backlog of uncharacterized waste streams that EPA now needs to consider—e.g., nanotechnology and medical wastes, in addition to the ongoing challenges posed by complex wastes that the program has already begun to address, such as electronics. Another large group of wastes that is the subject

of intense scrutiny are those containing per- and polyfluoroalkyl substances (PFAS). PFAS contamination exists at locations where the chemicals were manufactured, used in products, and disposed of at a wide range of sites—including municipal and industrial landfills and some 400-plus military installations.³¹

For waste disposal, EPA's focus has turned toward long-term stewardship of permanent land disposal units that leave waste in place, such as landfills, land treatment units, or surface impoundments. EPA has communicated that it will continue to develop guidance to clearly detail roles and responsibilities for managing such units over the long term.³² For example, hazardous waste landfills will require monitoring for leaks and any needed repairs to liners for the foreseeable future. While some toxic organic compounds may biodegrade over time, others that are stable and persistent will remain. Treated toxic metals placed in landfills also will require monitoring to prevent releases to groundwater, since metals are elements and do not degrade.

Disastrous weather events pose challenges for waste management, requiring EPA to continuously improve guidance and tools to manage huge amounts of storm debris and flood residues properly.³³ Other catastrophic events, such as chemical accidents or homeland security attacks, require planning and preparation as well.

For the Corrective Action program, EPA and the states have established a goal of completing the ambitious goals described earlier at 3,779 priority facilities—of some 6,000 facilities that need to be cleaned up under the program—by 2020. This is an interim step in achieving all cleanup standards and implementing long-term controls at these facilities.³⁴ The Underground Storage Tanks program’s priorities going forward include continued work to regularly inspect all federally regulated tanks, minimize future releases, and clean up old and new leaks, while also encouraging the sustainable reuse of thousands of abandoned gas stations and ensuring newer ethanol-blended fuels and biofuels are safely stored.³⁵

Future goals for program improvement related to permitting include improving efficiency, developing better permit status tracking systems, enhancing compliance reporting, reducing paperwork burdens, increasing data accuracy, and growing the technical assistance capacity needed to institute these processes. Where pilot programs or innovative approaches have been successfully implemented in certain segments of the RCRA program—such as standardized permits or electronic reporting—these need to be rolled out across entire programs, to the extent they are applicable.

EPA has collaborated nationally and internationally with communities and stakeholders to work on addressing waste and materials management. To achieve its goal of expanding beyond *waste management* to *sustainable materials management*, EPA’s RCRA program has developed plans to continue to encourage

process substitution, materials and energy recovery, recycling, reuse, and treatment. EPA has developed sustainable materials action plans through 2022.³⁶ Included are goals for increasing recycling of construction and demolition debris, increasing the use of industrial byproducts as construction materials, decreasing food loss and increasing composting and anaerobic digestion, and increasing the recycling of packaging materials. Developing good measures of progress, convening stakeholders to chart the path forward, and challenging manufacturers to innovate around sustainable materials will be essential to this mission.

On November 15, 2018, EPA was one of 45 signing organizations of the *America Recycles* pledge, designed to improve the recycling system within the U.S.³⁷ In addition, by establishing November 15 as National Recycling Day the signees acknowledged that much more needed to be done to improve domestic recycling. They determined that while the benefits of recycling are clear, growing and strengthening the U.S. recycling system to create more jobs and enhance environmental and community benefits will require multi-stakeholder collaboration to address the challenges currently facing the system, such as:³⁸

- Most Americans want to recycle, as they believe recycling provides an opportunity for them to be responsible



caretakers of the earth. However, it can be difficult for consumers to understand what materials can be recycled, how materials can be recycled, and where to recycle different materials. This confusion often leads to placing recyclables in the trash or throwing trash in the recycling bin or cart.

- America's recycling infrastructure has not kept pace with today's waste streams. Communication between the manufacturers of new materials and products and the recycling industry needs to be enhanced to prepare for and optimally manage the recycling of new materials.
- Domestic markets for recycled materials need to be strengthened in the U.S. Historically, some of the recycled materials generated domestically have been exported internationally. However, changing international policies have limited the export of materials. There is also a need to better integrate recycled materials and end-of-life management into product and packaging designs. Improving communication among the different sectors of the recycling system is needed to strengthen the development of existing materials markets and to develop new innovative markets.
- Stakeholders across the recycling system agree that more consistent measurement methodologies are needed for measuring recycling system performance. These more

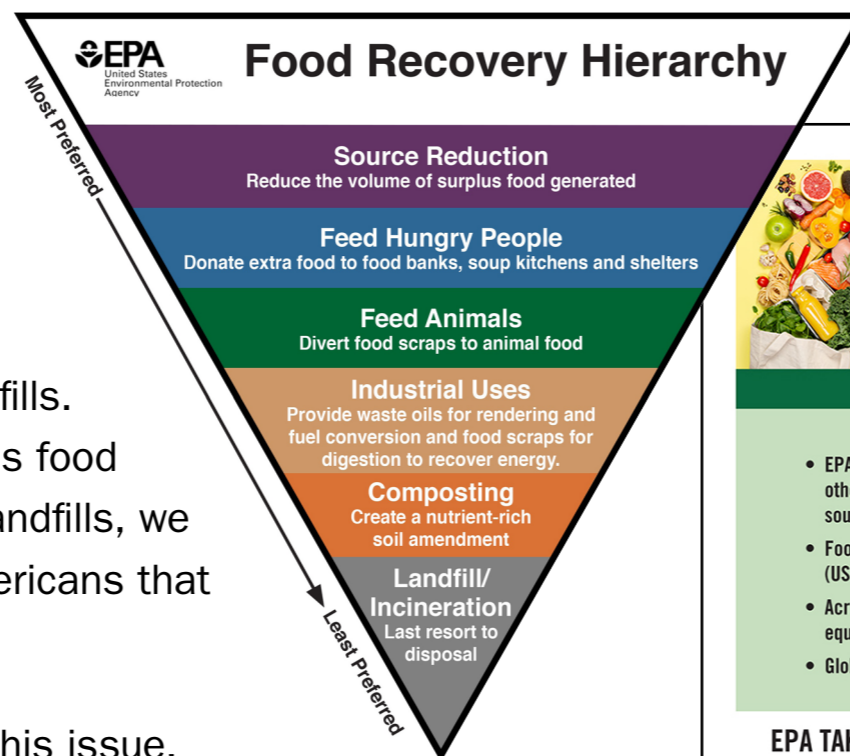
standardized metrics can then be used to create effective goals and to track progress.

In February of 2019, EPA convened working groups of its 44 partners to identify the actions needed for the future. The groups recommended the following:³⁹

- Develop consistent messages for key recycling issues;
- Create a virtual clearinghouse of information that is publicly available, including case studies, best practices and funding opportunities;
- Explore opportunities to spur regional and local market development activities (including continuing to promote government programs to purchase recycled-content materials and products, such as EPA's *Comprehensive Procurement Guidelines*); and
- Compile existing information on a range of metrics and measures for recycling and identify data gaps and needs.

Providing this support and leadership will require this effort to continue to be a top priority for EPA despite the temptation for the agency to withdraw into its strict regulatory role under RCRA. Similarly, EPA has recognized the need for the reduction in the amount of food loss and food going to waste.⁴⁰ EPA estimated that in 2015, more food reached U.S. landfills and combustion facilities than any other single material in our everyday trash, at 22 percent

of the amount landfilled and at 22 percent of the amount combusted with energy recovery. Reducing food waste will help the nation address climate change, because 20 percent of total U.S. methane emissions come from landfills. By keeping wholesome and nutritious food in our communities and out of our landfills, we can help address the 42 million Americans that live in food insecure households.



In recognition of the importance of this issue, EPA has established a joint 2030 goal with the U.S. Department of Agriculture to reduce by 50% (using a 2010 baseline) the amount of food waste going to landfills and combustion from residences, commercial establishments, and institutional sources. This goal will align the U.S. with key United Nations Sustainable Development Goals.⁴¹ Achieving these targets will be a significant challenge to both EPA and USDA, especially considering the relatively limited regulatory tools available. The agencies hope to use a mixture of leadership, technical assistance, outreach, information sharing, new tools, and stakeholder engagement to meet the challenge.

EPA
U.S. ENVIRONMENTAL PROTECTION AGENCY
FOOD LOSS AND WASTE FACTSHEET
JANUARY 2020

DID YOU KNOW?

- EPA estimates that more food (over 76 billion pounds per year) reaches landfills and combustion facilities than any other material in everyday trash, constituting 22% of discarded municipal solid waste.¹ Landfills are the third largest source of human-related methane emissions in the United States.²
- Food waste not only impacts landfill space and emissions, it hurts the U.S. economy. The U.S. Department of Agriculture (USDA) estimates the value of food loss for retailers and consumers each year to be over \$161 billion.³
- Across the globe, food loss and waste have a combined carbon footprint of 4.4 billion metric tons of carbon dioxide equivalent according to the United Nations Food and Agriculture Organization.
- Globally, food waste consumes 21% of all fresh water.⁴

EPA TAKING ACTION TO REDUCE FOOD WASTE

Winning on Reducing Food Waste Month - EPA and USDA worked with President Trump to successfully designate April 2019 as "Winning on Reducing Food Waste Month" to garner national attention on the need to address this important issue.

Winning on Reducing Food Waste Initiative - In October 2018, EPA, the Food and Drug Administration (FDA), and the USDA signed a formal agreement to align efforts across the federal government to educate consumers, engage stakeholders, and develop and evaluate solutions to food loss and waste.

In April 2019, the three agencies released a **federal strategy** prioritizing six main areas for action:

1. Enhance Interagency Coordination
2. Increase Consumer Education and Outreach Efforts
3. Improve Coordination and Guidance on Food Loss and Waste Measurement
4. Clarify and Communicate Information on Food Safety, Food Date Labels, and Food Donations
5. Collaborate with Private Industry to Reduce Food Loss and Waste Across the Supply Chain
6. Encourage Food Waste Reduction by Federal Agencies in their Respective Facilities

Food Recovery Challenge - A voluntary incentive program in which EPA works with over 1,000 businesses and organizations to set data-driven goals, implement targeted strategies to reduce food waste in their operations and report results to compete for annual recognition.

30-40% OF ALL AVAILABLE FOOD IN THE U.S. IS WASTED
Do your part. Join your federal partners in reducing food waste.

www.epa.gov/sustainable-management-food

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Acknowledgement: This document was produced by the EPA Alumni Association, with graphic design and production support provided by Regina Scheibner (courtesy of Tetra Tech).

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- ³⁵ *Underground Storage Tank Program*, p.3

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