Protecting the Environment

A Half Century of Progress

Los Angeles, California, 1960s

Cuyahoga River, Ohio, 1952

EPA Alumni Association

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NEXT PAGE

Contents

The **EPA Alumni Association (EPA AA)** has developed this essay, as well as seven more detailed supporting essays available here, to inform high school and college students and others about the major environmental problems and issues encountered in the United States in the latter half of the 20th century. This essay presents an overview of the major actions taken and progress made in mitigating these problems, as well as the challenges that remain. The supporting essays provide additional information on the air, water, drinking water, waste disposal, "Superfund" land cleanup, pesticides, and toxic substances programs managed by EPA and operated in conjunction with state, local, and tribal programs. The Alumni Association hopes that these essays might inspire some students and others to consider careers in the environmental field.

A number of retired EPA program managers have worked together to produce these essays. Roy Gamse and John Bachmann prepared this overview. This document and the supporting essays were reviewed by the EPA AA Board of Directors as well as a number of other Association members. This update reflects comments by several educational professionals from EPA and secondary AP Environmental Science programs. We welcome additional comments. You may email your comments to the EPA Alumni Association.

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

Introduction

Over the past half century, our country has made enormous strides improving the environment. The laws that were passed to protect the environment and the public policy decisions that were made have yielded substantial progress. The air is demonstrably cleaner, our waterways are getting cleaner, our drinking water is safer, there are lower levels of exposure to toxic chemicals affecting people and wildlife than would have occurred, toxic waste sites are being cleaned up, and millions of acres of the most scenic and valuable parts of our country's landscape—parks, wilderness areas, and wildlife refuges—are being protected.

None of this has come easily. There have frequently been significant costs. The decision-making process has often been protracted—sometimes by lengthy litigation. Still the progress is undeniable.

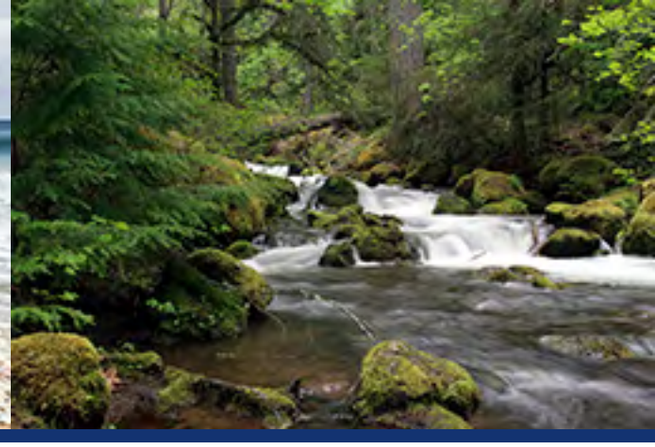
This progress is a result of laws that Congress passed and federal, state, tribal, and local agencies implemented. It is a result of investments of government and private sector dollars and the hard work of many communities, companies, and citizens across the land. They have reduced their environmental footprint and improved the way they do business and live their lives. It is the result of technological and policy innovations and the entrepreneurial spirit built into the DNA of the American people. Most of all, it is the result of Americans' ongoing support for clean air and water, as we recognize that protection of public health and the environment benefits millions of our fellow citizens.

(continued on next page)

Key Conclusions

- **Strong growth of an industrializing country over nearly two centuries led to increasingly negative effects on our air, water, and land, with accompanying serious effects on people's health and the environment.**
- **Beginning in the 1960s, federal, state, and local governments took concerted actions, enacting and implementing legislation that created strong regulatory programs to clean up the environment, protect public health and welfare, and prevent further degradation.**
- **Those programs have dramatically improved the environment, resulting in significant commercial and recreational benefits. They have also greatly enhanced protection of public health.**
- **However, significant cleanup remains to be done, and action is needed to address emerging environmental challenges and maintain the benefits achieved so far.**



It is essential to understand this history and the lessons and insights learned if we as a country are to tackle some of today's formidable challenges, such as:

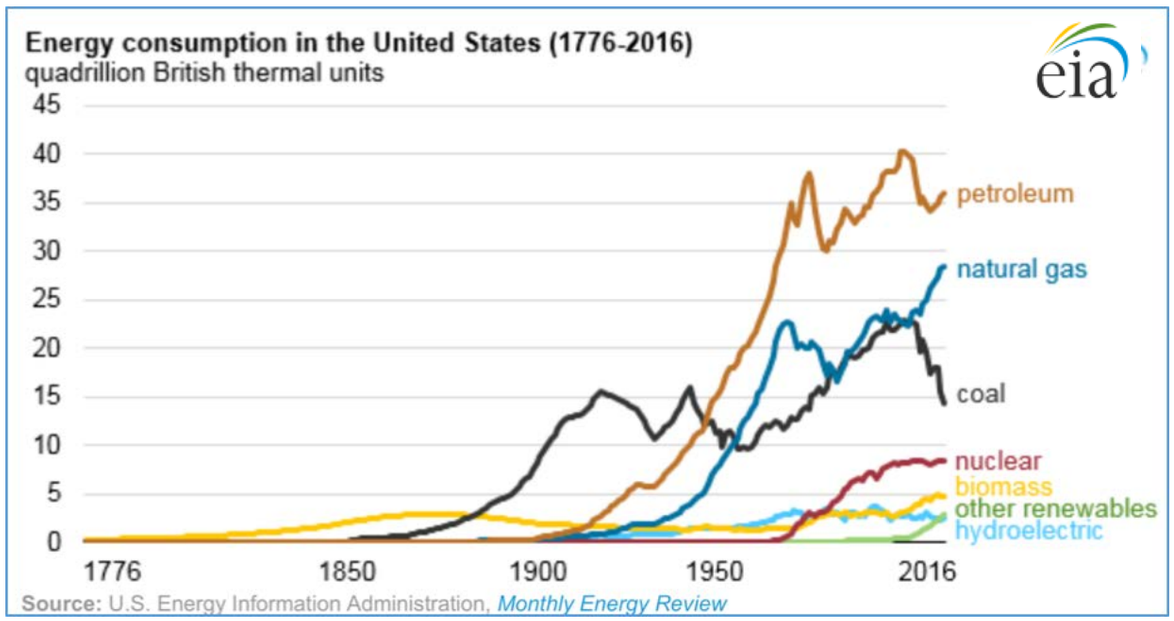
- the adverse impacts of climate change,
- the effects of nonpoint source (runoff) pollution on our waterways,
- issues raised by changing technology, such as biotechnology and nanotechnology, and
- safeguarding the natural resources that are the foundation of our economic and recreational activities.

Many Americans today, including many legislators at the federal and state levels, were not yet born when the U.S. Environmental Agency (EPA) was created by President Nixon in 1970, or they were too young to appreciate how air and water quality were deteriorating until governments, private companies, and individual citizens stepped up to take action.

This report and seven supporting essays that provide more detail on the major environmental programs managed by EPA [available here] have been authored by many who worked long and hard to help achieve this progress. They document what has been accomplished and outline new challenges that need to be addressed to achieve a healthy, productive environment for all Americans, now and for generations to come.

1. Growing Environmental Concerns in the Last Century

The industrial revolution begun in the 1800s dramatically changed how society was organized and how energy and other resources were used in the U.S. and other nations. The result was rapid population growth, urbanization, and growth of extractive industries.



The industrial revolution prompted major changes in the amount and kind of energy used.

The mid-to-late 20th century brought a new understanding of the negative effects on human health, natural resources, and environmental quality. Here are a few of them:

- In 1948 the small industrial town of Donora, PA experienced an episode of dense industrial smoke and gases that sickened 40% of the population, resulting in 20 deaths. Other major episodes in New York City and London in the 1950s and 1960s showed that different kinds of air pollution in those areas could yield widespread effects on public health and far larger numbers of premature deaths.

- Until the 1962 publication of Rachel Carson's book, *Silent Spring*, pesticides were mainly viewed as a boon to the farmer. The initial pesticide legislation in 1910 focused on efficacy—whether the pesticides worked. Carson's book shifted attention to pesticides' effects on birds, nature, and humans.

- In the 1950s and '60s increased automobile emissions and industrial pollution in Los Angeles and other cities, combined with local topography and meteorology, resulted in "photochemical smog" that turned the sky brown, burned the eyes, and increased the rate of breathing disorders among vulnerable populations.

- Water pollution caused Cleveland's Cuyahoga River to catch fire in the late 1960s (see cover photo ▶), a phenomenon also seen in the Houston Ship Channel and the Chicago, Buffalo, and other rivers. Lake Erie was declared "dead" in the early 1970s due to massive algal blooms and widespread fish kills.

- The 1969 blowout of an oil well offshore of Santa Barbara, California, released 80–100,000 barrels of crude oil, killing an estimated 3,500 seabirds as well as dolphins, seals, and sea lions.

- In the 1960s and '70s new reports regularly revealed problems from chemicals, such as people and cattle being poisoned by polybrominated biphenyls (PBBs) mistakenly mixed into cattle feed, chlorofluorocarbons (CFCs) depleting the ozone layer, asbestos causing lung cancer, and the suspected high incidence of cancers from chemicals improperly disposed of in places like Love Canal in New York and the "Valley of the Drums" in Kentucky.

- *Time* magazine raised concerns about chemical exposure with a cover story in September 1980, "The Poisoning of America."

Growing awareness of widespread environmental degradation led to a consensus that we needed to protect American health and environmental quality from the damages and risks of pollution. The nation started to take concerted actions to address environmental issues in an organized way in 1970. Highlights of this transformative year include:

- **President Nixon signed the National Environmental Policy Act** on the first day of 1970, inaugurating what he called "the decade of the environment."

- The **first Earth Day**, April 22, recognized a growing public concern for the environment, with rallies of up to 25,000 people in major cities and "teach-ins" at thousands of schools involving an estimated 20 million mostly young people.

- In July, **President Nixon sent Congress a plan** that combined most existing federal pollution programs into a single department, **creating the U.S. Environmental Protection Agency** in December (play the video below).

- Congress enacted and **President Nixon signed the landmark 1970 Clean Air Act**, which strengthened earlier legislation by requiring nationwide health-protecting air quality standards, state plans to meet those standards, and emissions standards for new industrial plants and automobiles.

This flurry of activity was followed by bipartisan Congressional passage of over a dozen major statutes over the next 10 years, setting ambitious goals and assigning responsibility for attaining them to federal, state, and local programs. These included:

- Clean Water Act (1972)
- Federal Environmental Pesticide Control Act (1972)
- Safe Drinking Water Act (1974)
- Resource Conservation and Recovery Act (1976)
- Toxic Substances Control Act (1976)
- Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as Superfund (1980)

The requirements of these laws varied by program, but they generally involved EPA providing science-based criteria for environmental standards (such as health-protective air quality standards) as well as technology-based requirements to limit releases from new (and, in some programs, existing) facilities to protect human health and environmental quality. States (or tribes) were expected to design and then implement programs to meet these requirements in their jurisdictions. These laws generally required EPA to oversee state and tribal programs, intervene where they were unable or unwilling to meet their obligations under the law, and provide federal grants for municipal wastewater treatment. EPA was also given direct responsibility for licensing pesticides and overseeing safe introduction of new chemicals into our society.

Once among the most polluted rivers in the United States, the Cuyahoga River is now a Cleveland attraction. *Photo courtesy of wyliepoon, flickr.*

2. Progress in Seven Specific Environmental Programs

A lesson of the past half-century is that environmental issues must be addressed in an integrated way. It does no good to capture toxic air or water emissions and deposit them on unprotected land, only to contaminate groundwater or cause public exposure. **That's fundamentally why an integrated EPA was established in 1970**, along with its counterparts in the states. Nonetheless, the statutes governing environmental protection are structured by program and use varying approaches. What follows is a capsule review of the progress made under each such program, with links to more detailed essays for each at the EPA Alumni Association (EPA AA) website. The essays contain relevant materials and references that support key developments and results presented here.

Cleaning the Air We Breathe

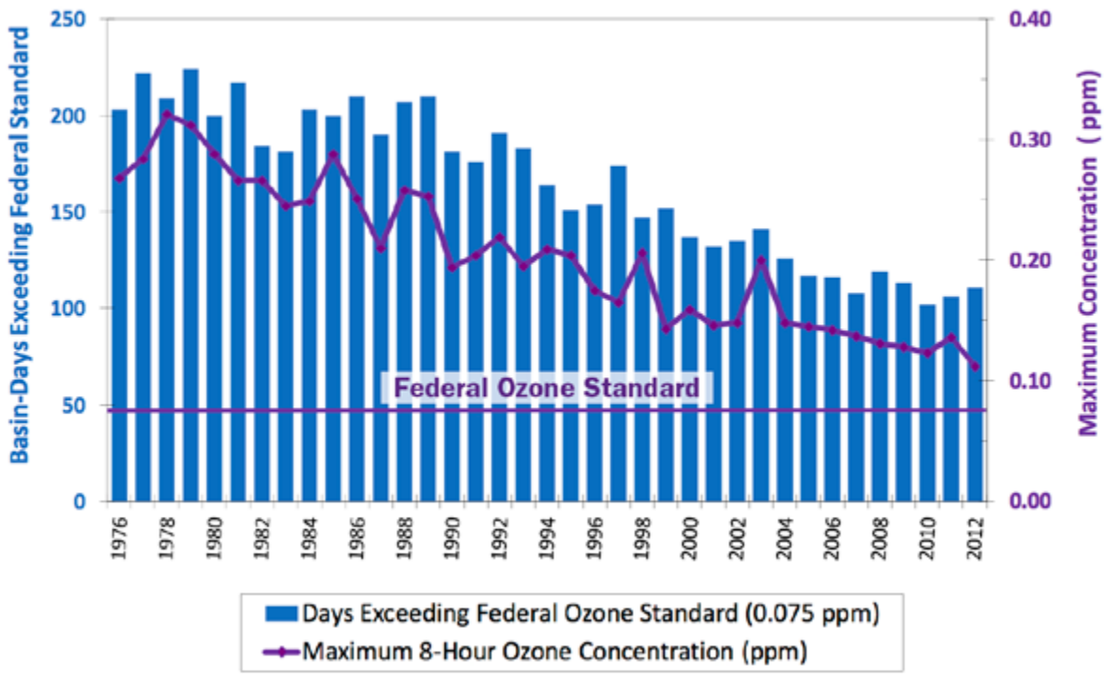
Air pollution was perhaps the most visible environmental problem a half century ago because of the heavy smog in Los Angeles, Pittsburgh, and other industrialized cities. Studies reported excess deaths during severe air pollution episodes in Donora, PA (20 in October 1948), London (4,000+ in 1952), and New York City (200 in November 1953, 170 in November 1966). Air pollution endangered the health of both young and elderly people and threatened the lives of those with lung or cardiovascular diseases.

As science and public awareness tied air pollution to industrial and auto emissions, a broad consensus led Congress to adopt the 1970 Clean Air Act Amendments, greatly strengthening earlier legislation passed in the 1960s. The 1970 amendments directed EPA to set air quality standards based on scientific criteria and to establish national technology-based standards for motor vehicles and new industrial facilities. States were required to develop plans for meeting the air quality standards, including setting emissions standards for existing facilities. Those requirements were augmented and adjusted in the 1977 and 1990 Clean Air Act Amendments, the latter tightening motor vehicle emission standards, addressing acid rain impacts from power plants with an innovative market-based program, strengthening limits on toxic air pollutants, and requiring states to issue operating permits for pollution sources.

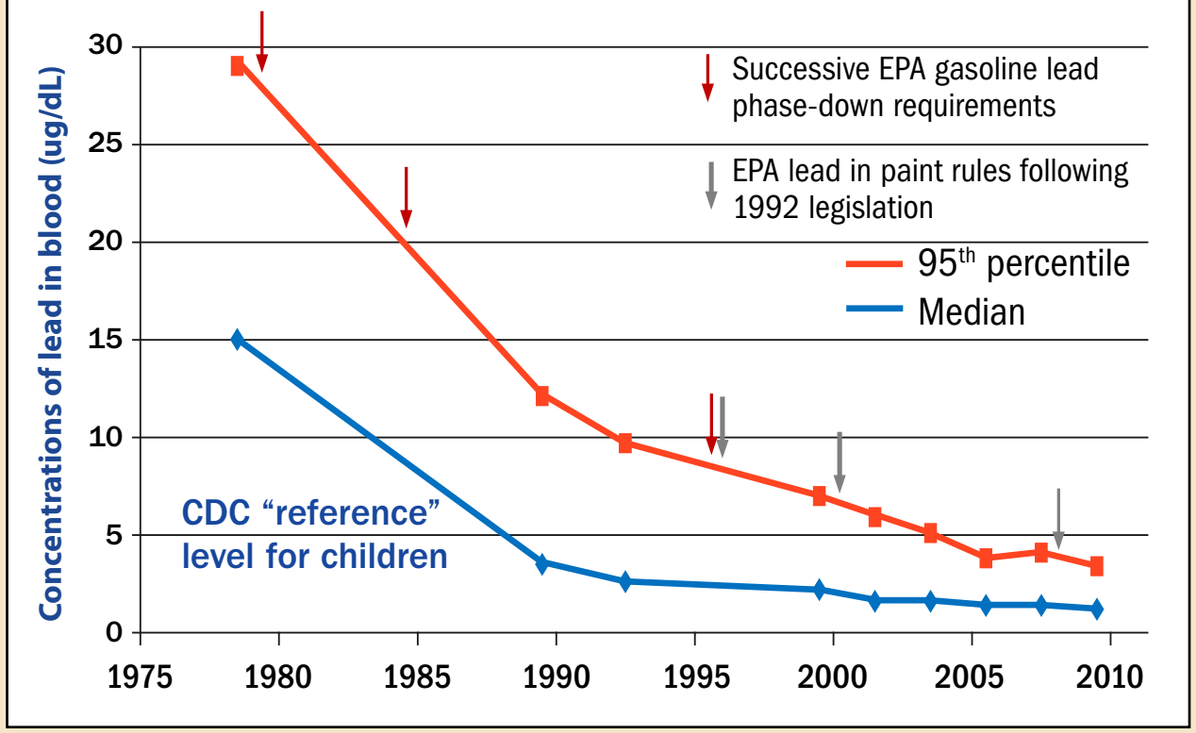
New York City, 1966. **Smog blankets New York City in late November 1966. Records indicate that the city recorded 170 excess deaths during this Thanksgiving episode.** *Photo: Neil Borzoi, The New York Times/Redux.*

As a result, there have been dramatic reductions in levels of air pollution:

- Automotive emissions have been reduced well over 90% per mile driven, leading to significant reductions in national emissions and in smog levels despite 400% growth in miles driven since 1970.
- Average lead concentrations in children's blood (which harms neurological development of children, affecting behavior and IQ) have fallen over 90%, in significant part from removing lead from gasoline.
- Aggregate emissions of six key air pollutants have fallen by 68% since 1970, though population has grown 54% and GDP by 234% in the same period.
- Analysis shows that clean air programs are preventing tens of thousands of early deaths each year.

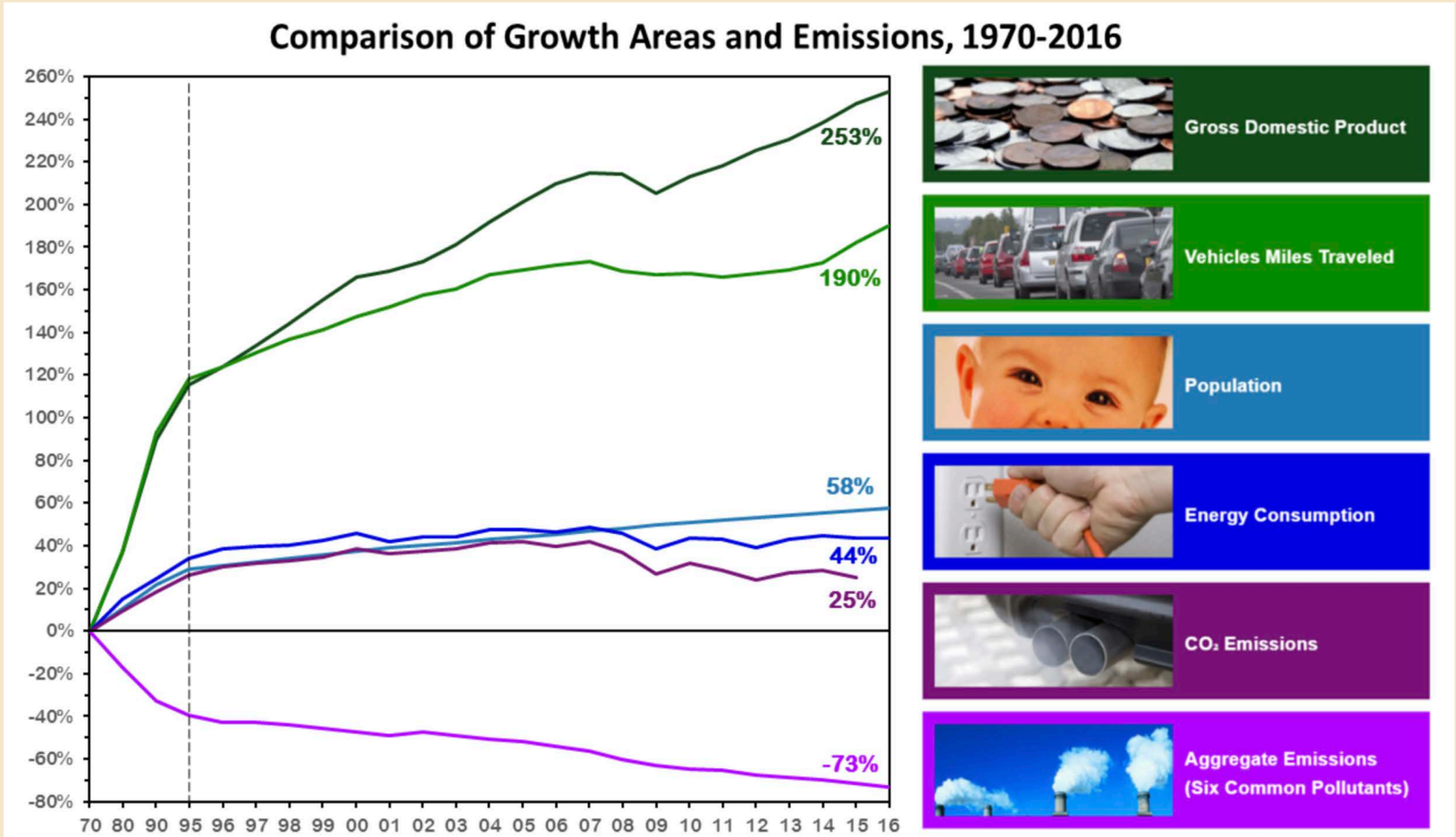


A Clean Air Success Story. Controlling motor vehicle emissions. Catalytic converters were effectively required on new cars nationwide by the mid-1970s, and standards for vehicles and gasoline have been strengthened periodically. *Above:* Air monitoring showed dramatic reductions in Los Angeles smog resulted from these and other regulations.



EPA's phase down (red arrows) of lead in gasoline was a major cause of reduced blood lead levels in the most exposed (red line) and average children (blue line) below Center for Disease Control (CDC) target values. Rules to reduce children's exposure to lead in paint helped to continue the decline in later years.

Clean Air Act programs reduced national emissions of regulated air pollutants despite growth in societal activities. This graph shows the percentage decrease in emissions of six air pollutants (73%) regulated under the 1970 Clean Air Act relative to their combined levels in 1970 (0% change), contrasted with the relative expansion of four societal/economic activities. Since 1970, emissions of regulated pollutants (dark green line) have steadily declined despite continued growth in population, energy consumption, traffic, and the economy. By contrast, carbon dioxide (CO_2), which was not targeted by these programs until 2012, has mainly tracked trends in energy consumption and traffic. The recent downturn in CO_2 emissions that began with the 2009 recession has continued due to several factors, including a leveling of total vehicle miles, a reduction in coal combustion for electric power generation as some power plants switched to natural gas, and a significant increase in power generation from renewable sources, particularly wind and solar (see energy consumption figure on page 5).



Despite this progress, formidable air pollution challenges remain:

- Some U.S. cities still do not meet health-protective air quality standards.
- Recent analyses show that premature deaths may result from fine particles and ozone even after new standards for motor vehicles and power plants are implemented.
- Despite widespread scientific concern (with a few outspoken skeptics) about the contributions of greenhouse gases (GHG) to climate change, there has been insufficient action to slow or reverse these effects. Recent U.S. regulations such as the 2012 GHG auto emissions limits and the August 2015 Clean Power Plan could help, but challenges remain to both. Broad global commitments to GHG reductions from almost 200 nations were formalized in the December 2015 United Nations Paris accords, reflecting a global recognition of the seriousness of the threat of climate change in the 21st century.

For more detail, see the air program essay here.

Protecting and Restoring Our Water Resources

In the 1960s, U.S. rivers, lakes, streams, coastal waters, and wetlands were in deplorable condition. Extraordinary events such as Cleveland's Cuyahoga River catching fire (as did the Buffalo and Chicago Rivers and Houston Ship Channel) accentuated concerns that many rivers were unsafe for drinking or recreational purposes such as swimming or fishing.

The bipartisan 1972 Clean Water Act greatly strengthened laws passed in 1899, 1948, and 1965 by requiring EPA to 1) identify water quality criteria (specifying the level of pollutants allowable for habitat, recreation, and other uses) and 2) establish requirements for treatment of industrial and municipal wastewater. The Clean Water Act outlined a local/state/federal partnership, requiring states to set local water quality standards and implement permit systems for controlling industrial and municipal discharges. The Act also established grant and low interest loan programs, which together have resulted in over $190 billion for construction of municipal sewage treatment systems. Other provisions addressed discharges to or disruption of wetlands, as well as control of stormwater.

There have been substantial reductions in water pollution discharges, and as a result:

- The jarring instances of burning rivers, visible floating discharges, noxious odors, daily sewage overflows, and widespread fish kills have been dramatically reduced.

Detroit River Recovery. ***Top:*** **Waste from the Rouge River flows into the Detroit River. (1966).** *Photo: Michigan Department of Natural Resources.* **Water pollution took a heavy toll on the ecosystem.** ***Bottom:*** **Today, large sturgeon and other fish have returned to the river thanks to clean water programs.** *Photo: U.S. Fish and Wildlife Service.*

- States have written discharge permits supported by EPA guidelines for 57 industries, resulting in a huge reduction of pollutant discharges to U.S. waters.

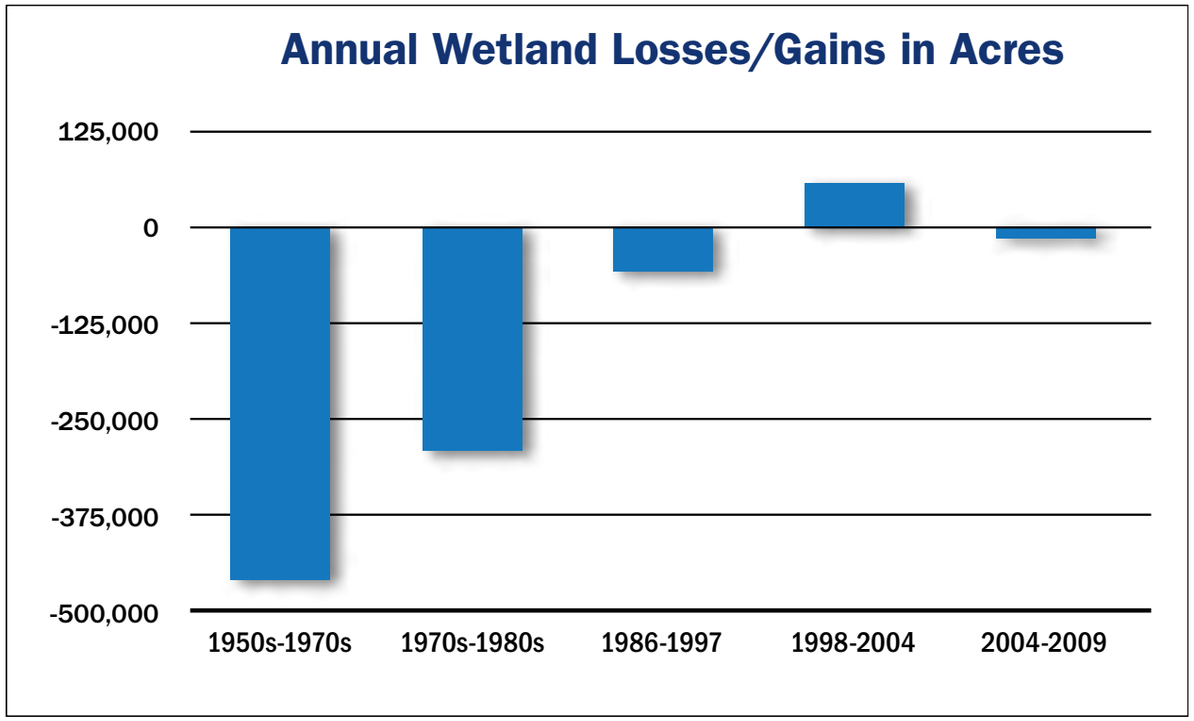
- Between 1972 and 2008, the number of people served by sewer systems increased by more than 50%. Whereas 44% of them provided only basic (less stringent) treatment in 1972, by 2008, 98% included more stringent secondary treatment, removing 85% of solids and organic pollution. Many were built to provide much more stringent tertiary treatment.

- Stormwater overflows to local waterways are now managed by about 7,000 municipal, 90,000 industrial, and 121,000 stormwater discharge permits issued primarily by state agencies.

- The annual loss of wetlands has slowed by 96% from the rates of the 1970s and '80s due to the control of fill and other discharges to wetlands under the permit program operated by the U.S. Army Corps of Engineers and EPA, as well as programs undertaken to restore wetlands.

Significant water resource management challenges remain. For example:

- Polluted runoff from streets, farms, and other land has not been adequately reduced, with nutrients from these sources degrading lakes and estuaries, endangering the Chesapeake Bay ecosystem, and creating a large dead zone in the Gulf of Mexico.



- A variety of pollutants that are not well understood, including pharmaceuticals and plastic microbeads from cosmetics and toothpaste, are entering our waters. They are not completely removed by sewage treatment processes, potentially affecting fish and entire aquatic ecosystems.

- Maintaining and upgrading aging municipal wastewater infrastructure in the face of budget pressures is a major concern.

- The need to address the impacts of climate change and related effects of sea level rise, ocean warming, and ocean acidification is growing.

For more detail, see the water resources program essay **here**.

Delivering Safe Drinking Water

The link between unsafe drinking water and disease (e.g., cholera, typhoid) was first recognized in the 1850s. By the beginning of the 20th century, techniques to reduce microbial content by filtration and disinfection with chlorine had virtually eliminated fatal epidemics of these classic waterborne diseases in industrialized countries. However, in the 1970s, detection of new potentially toxic and possibly cancer-causing chemicals in previously immeasurable concentrations, coupled with uneven state oversight of public water supplies, revived concerns about public health risks from drinking water.

The 1974 Safe Drinking Water Act (SDWA) required EPA to create scientifically based drinking water standards for all systems serving more than 25 people, thus covering systems serving over 300 million people. Under the provisions of this law:

- Enforceable interim standards were to be set, updating preexisting standards that had been largely advisory. Then more comprehensive revisions were to be based on a study of health risks from drinking water contaminants conducted by the National Research Council of the National Academy of Sciences.
- Program grants funds were to be distributed by EPA to build states' institutional capacity and enhance their ability to enforce the interim standards
- EPA established science-based standards for 88 individual chemicals and all radionuclides, disinfection byproducts, and *E. coli* bacteria, as well as technology standards for surface water supplies and groundwater disinfection.
- EPA issued the Lead and Copper corrosion control rule in 1991, which was updated in 2000 and 2007. Water suppliers must regularly test for excessively corrosive drinking water at taps in highest risk distribution system locations. If corrective actions to reduce corrosivity are insufficient, then a schedule for removing lead service lines is required.

- In addition to setting standards, EPA issued a series of Health Advisories that help states and drinking water systems deal with emergencies such as spills and detection of unregulated contaminants of concern.

The Act was further strengthened by 1996 amendments, providing for federal contributions to a State Drinking Water Revolving Fund to help water supply systems achieve the health protection objectives of the SDWA. With federal investment of over $17.3 billion, the fund has provided $27.9 billion to water systems through 2014.

As a result,

- Many states have developed sophisticated programs to oversee the quality of drinking water from public water systems.
- Drinking water systems today treat for a wider range of contaminants, some of which were unknown or unmeasurable a half-century ago.
- Public awareness of drinking water quality issues has been enhanced by requirements for periodic reporting to customers when standards are not met in their water systems.
- The annual number of waterborne disease outbreaks reported by the Centers for Disease Control has progressively declined since 1980.
- By 1995, 70% of the water systems serving fewer than 100 people were providing appropriate treatment (vs. about 33% in 1976, and vs. about 95% for systems serving over 10,000 people).
- By 1993, 79% of the U.S. population got its drinking water from public water systems that consistently met EPA health-based standards, and that percentage increased to about 91% after about 1999 despite the introduction of new health-based standards during that period.

The major remaining issues are:

- addressing disease risks from inhalation of aerosols with bacteria such as Legionella that regrow in plumbing during water distribution,
- facilitating the introduction of new technologies for reusing treated wastewater and desalinating water in water-short areas, and
- maintaining, upgrading, and replacing deteriorating infrastructure (e.g., 100-year old pipes). Cost estimates are from $384 billion to $1 trillion in the next 20 years.

For more detail, see the safe drinking water program essay here.

Managing the Generation and Disposal of Waste Streams

Before the U.S. began seriously regulating waste disposal, public health was put at risk by solid and liquid waste, often containing toxic materials, disposed of in rivers, burned in open pits, or dumped into unlined landfills or evaporation ponds. The result was fire hazards, odors, and contamination of land, surface water, and groundwater.

The 1976 Resource Conservation and Recovery Act (RCRA) amended the 1965 Solid Waste Disposal Act. It established federal requirements for waste management that states implemented according to their needs, resources, and economies. RCRA set requirements for managing hazardous waste, from generation to disposal. It banned open dumping, regulated municipal solid waste landfills, and promoted reduction of waste at the source, recycling, and safe disposal of non-hazardous waste. States implement RCRA through permits for waste management and disposal.

The 1984 Hazardous and Solid Waste Amendments (HSWA) required states to implement a Corrective Action Program for managing and cleaning up hazardous waste sites. It also required rules for land disposal to protect groundwater and for underground storage of petroleum products and hazardous substances.

This legislation has created a comprehensive federal/state cradle-to-grave infrastructure for hazardous waste and a framework for states to govern disposal of municipal and non-hazardous waste. As a result:

- Municipal solid waste (MSW) recycling grew from under 7% in 1960 to 34% in 2013.

- Restrictions on industrial and commercial wastes and on land disposal encourage minimization of waste disposal through reuse, recycling, and reduction of waste generation, helping to protect the 80% of U.S. citizens who live within three miles of the 60,000 facilities generating 20–40 million tons of hazardous waste annually.

- Up to 18 million acres of contaminated lands have been cleaned up and restored to productive use.

The remaining challenges include:

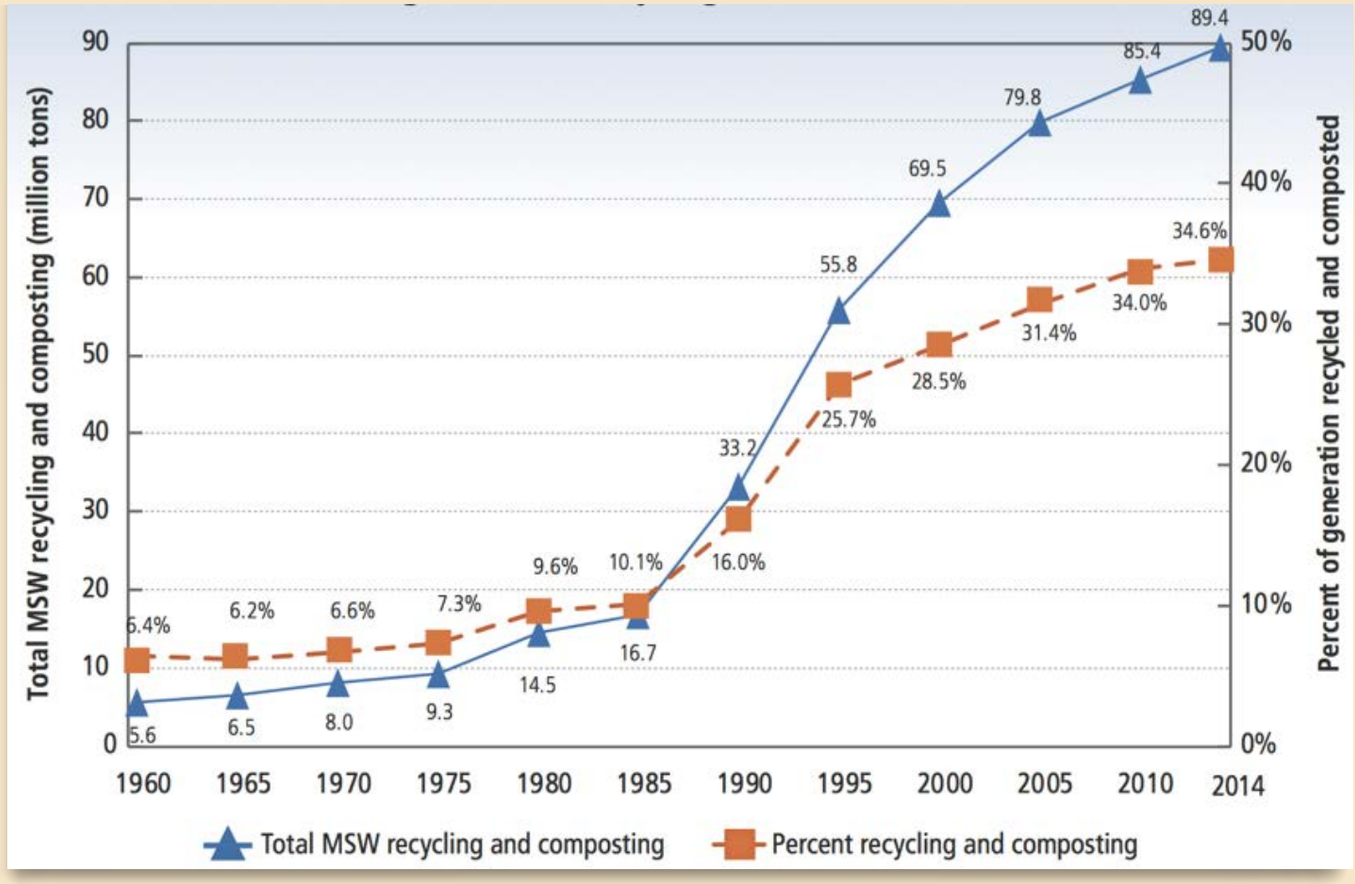
- completing corrective actions on thousands of facilities that have not yet been cleaned up under the Corrective Action Program,

- improving approaches to managing existing complex waste streams (e.g., medical wastes, electronics), and

- developing approaches for new chemicals and activities producing newly identified waste streams (e.g., nanotechnology).

For more detail, see the managing waste streams program essay here.

Municipal Waste Recycling 1960 - 2014



Containing and Restoring Hazardous Waste Sites (Superfund)

Before the 1970s, there were few controls on hazardous waste disposal. Wastes were disposed of onsite or frequently taken elsewhere by contractors to locations unknown by the waste generators. Unscrupulous transporters often used dump sites and disposal methods that led to significant harm to groundwater, surface water, and soil, leaving a legacy of sites exposing the public to health risks and damaging the environment.

In the late 1970s, revelations of some of the worst such sites—such as Love Canal in Niagara Falls, NY and "the Valley of the Drums" outside Louisville, KY—led to recognition of the need to clean up hazardous sites where the waste generators were often unknown or financially incapable of doing so.

Cleanup of Superfund site in Edgewater, N.J.
Photos: EPA (above), NOAA (left).

In 1980 Congress passed the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), soon nicknamed "Superfund." The new law ensured cleanup of hazardous waste sites at the expense of owners, waste generators, or transporters, where identifiable, or at public expense where they were not. Superfund funding started at $1.6 billion, subsequently increased to $8.5 billion.

Early emergency response efforts reduced public health threats at a number of sites. However, cleanup of the more complex sites was problematic, criticized by some because of huge costs, long timeframes, and concerns about program management capabilities and approaches. More recently, with clearer delineation of processes and responsibilities, remediation of hazardous waste sites has continued. Responsible parties carry out the cleanup under supervision of EPA and the states (for less contaminated sites). The federal government is responsible for cleaning up former or current federal facility sites, such as those under the Energy and Defense Departments.

Much progress has been made, but there is much more to do. From 1980 through 2016 EPA Reports:

- Over 1700 sites were included in the Superfund list
- 393 sites were cleaned up and removed from the list (23%)
- 1190 sites had completed construction of cleanup facilities, but require ongoing operation to remain safe (69%)
- 63 sites had some area removed from the list (4%)
- 83 sites had not completed cleanup (5%)
- 50 new priority Superfund sites have been proposed

Valley of the Drums, near Louisville, KY 1981. *Photo: EPA.*

Despite this progress, important challenges remain for the Superfund program:

- With the easier sites remediated, the remaining sites tend to be difficult, massive sites, such as mine tailing and sediment cleanups, with costs in the hundreds of millions, even billions of dollars per site.
- With such large, difficult sites dominating the program, other smaller sites are not getting the attention that local residents demand.
- Ironically, contamination of past or current federal facilities presents particular problems because of the number of such sites, EPA's difficulty in requiring action from other agencies, and the complexity of dealing with Energy Department radioactive waste sites.

For more detail, see the "Superfund" program essay here.

Controlling the Use of Dangerous Pesticides

Publication of Rachel Carson's book, *Silent Spring*, led to a shift in legislative focus from boosting agricultural production to reducing negative effects on birds, people, and nature.

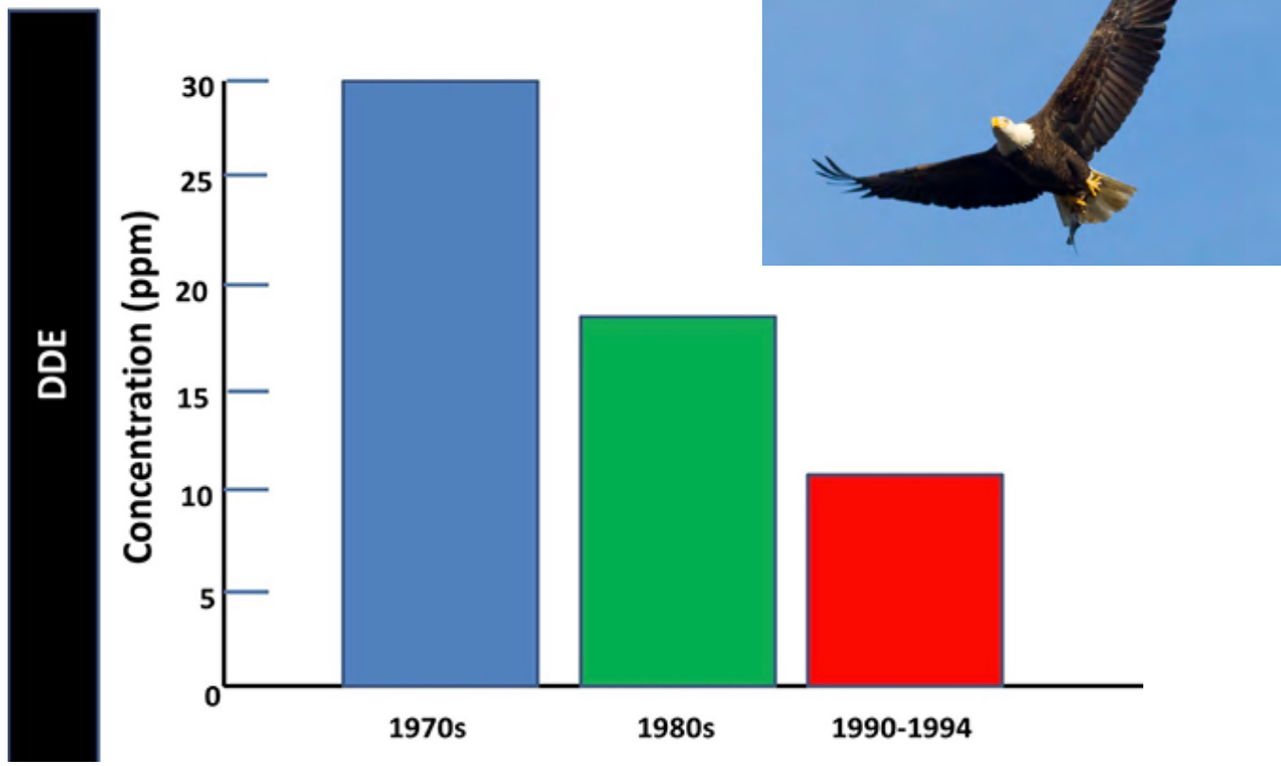
Driven by that concern, the 1972 amendments to the Federal Insecticide Fungicide and Rodenticide Act [FIFRA] required EPA to assess the potential risk of pesticides to humans, wildlife, and the environment. That legislation allowed EPA to refuse to allow pesticides in the market based on adverse health or environmental effects. However, many pesticides allowed in the market under the pre-1972 rules were essentially grandfathered. EPA was required to reconsider whether existing pesticides would be allowed to stay on the market, which required test data using more modern requirements.

New scientific concern about the effect of pesticides on children led to the 1996 Food Quality Protection Act which required EPA to review allowable limits of pesticide residues in food products, with extra safety factors for children and consideration of additional routes of human exposure, such as through drinking water.

The total reorientation of pesticide regulation from focusing on efficacy to protecting health and the environment has had major impacts:

- In 1972, EPA banned virtually all uses of the pesticide DDT and began the process of removing similar chemicals (the organochlorines) from the market. Endangered bald eagles, brown pelicans, and peregrine falcons have recovered from the brink of extinction, and organochlorines are now off the market in the U.S.

- The process of EPA reviewing whether to allow pesticides to remain on the market led to removal of some risky pesticides and discontinuation of thousands of other products by their manufacturers.



Pesticide Residues in Bald Eagle Eggs on Lake Erie 1970–1994. **Banning DDT in 1972 reduced associated pesticide residues (DDE) that had weakened bird eggs, leading to recovery of bald eagle, brown pelican, and peregrine falcon populations in the US.** *Photo: U.S. Fish and Wildlife Service.*

- The review of nearly 10,000 limits for pesticide residues on food under the 1996 Food Quality law led to removal of many of the more toxic products from the market.

<u>New issues are appearing that may alter the future of pesticide regulation:</u>

- Pesticides are suspected of contributing to the dramatic decline in the number of butterflies, honeybees, frogs, and other species. Declining numbers of pollinators is particularly of concern in food production.

- Concerns about the effects of certain pesticides on endocrine systems that produce hormones affecting physical or intellectual growth, as well as reproduction, are causing EPA to review pesticides and other chemicals in drinking water for endocrine effects, requiring development of new test methods.

- Genetic modification of plants to repel insects or resist herbicides results in these plants being classified as pesticides that must be approved by EPA, drawing EPA into the controversies surrounding genetically modified organisms (GMOs).

- Growing use of nanotechnology (extremely tiny particles) in pesticides requires new testing and analytic methods since nano-sized particles often have different characteristics than their larger counterparts.

Wild honey bee (*Apis mellifera*). *Photo: Bob Peterson, flickr.*

For more detail, see the pesticides program essay here.

Providing Information On and Protecting Against Risks From Toxic Chemicals

News reports in the 1960s and '70s highlighted concerns about chemicals causing health or environmental problems, such as asbestos-causing lung cancer, chlorofluorocarbons depleting the Earth's ozone layer, PBBs poisoning cattle and people in Michigan, and PCBs showing up in unexpected places. A consensus evolved that the risks from thousands of unknown chemicals being released into the environment with little knowledge of their health or environmental effects should be addressed.

Photo Above: National Oceanic and Atmospheric Administration.

PBB Found In Mother's Milk

Preliminary scientific reports have found traces of PBB in mother's milk, the state health director revealed last week.

Dr. Maurice Reizen, state health director, said that 22 samples of milk taken from 26 nursing mothers in Michigan contained PBB, the substance that was identified as the cause of death for several thousand cattle in the state during 1973 and 1974.

PBB–polybrominated biphenyls –is a fire-retardant chemical that was accidently mixed with cattle feed and sold to farmers in the lower peninsula.

Because PBB is biologically magnified as it moves up the food chain, people eating PBB-contaminated food end up with a higher percentage of PBB than they actually consumed.

The level of PBB found in the breast milk of the women tested averaged 90 parts per billion (ppb), with the highest amount found reaching 500 parts per billion. The Food and Drug Administration allows food to be sold containing up to 300 ppb.

Because the study was actually done to find the level of pesticides in mother's milk, officials are not recommending the end of breast feeding as yet.

Reizen said a further study is now underway to determine the level of PBB in breast milk, and until the results are in he is recommending caution.

In 1976 Congress passed the Toxic Substances Control Act (TSCA), authorizing EPA to gather information on and require testing of chemicals. EPA was required to develop an inventory of existing chemicals, and industry was required to notify EPA about new chemicals before they were introduced. TSCA generally grandfathered existing chemicals, but gave EPA authority to regulate chemical production and use, specifically including PCBs.

Additional laws passed to address chemicals in society included:

- the 1986 Emergency Planning and Community Right-to Know Act, which authorized assembling a national Toxics Release Inventory (TRI) to inform the public about releases of toxic chemicals,
- the Pollution Prevention Act of 1990, which created a national policy to reduce pollution at the source wherever possible,
- amendments to TSCA in 1986 to address asbestos in school buildings, and in 1992 to implement a program to reduce lead exposures from paint in buildings.

Learn about and access the Toxic Substances Control Act (TSCA) Chemical Substance Inventory at http://www.epa.gov/tsca-inventory

As a result of this legislation:

- EPA has created a national inventory of chemicals in commerce and provided databases and tools to enable the public to understand and use the information.
- EPA has evaluated over 50,000 new chemicals, with action taken before they were introduced into commerce when needed to protect against potential risks.
- Significant reductions in human blood concentrations of lead have resulted from EPA's regulation of renovation and remodeling practices that affect children's exposure to lead in paint. Earlier EPA rules reducing and eliminating lead from gasoline also contributed significantly to reductions of lead in blood (see children's blood lead figure on page 9).
- While some existing chemicals have been successfully regulated under TSCA (e.g., ozone-depleting CFCs, PCBs), EPA has had more difficulty regulating existing chemicals than new ones after the courts overturned its regulation to phase down most uses of of asbestos, a known carcinogen.

The key unfinished business involving toxic substances includes:

- TSCA's authority as interpreted by the courts has left EPA struggling in its attempts to properly control the use of existing chemicals (e.g., asbestos), suggesting the need for new legislation.
- As states have begun regulating chemicals on their own, there are controversies regarding whether and how to allow federal pre-emption of state action.
- As with pesticide regulation, nanotechnology and biotechnology developments require new assessment techniques to assess and manage any associated risks.

For more detail, see the toxic substances program essay **here**.

3. Other EPA Programs and Activities

EPA has many other programs and activities that support the Agency's mission. Examples include an emergency response team, international activities, managing voluntary programs, and supporting research on environmental issues done by scientists at EPA laboratories, universities, and other research groups.

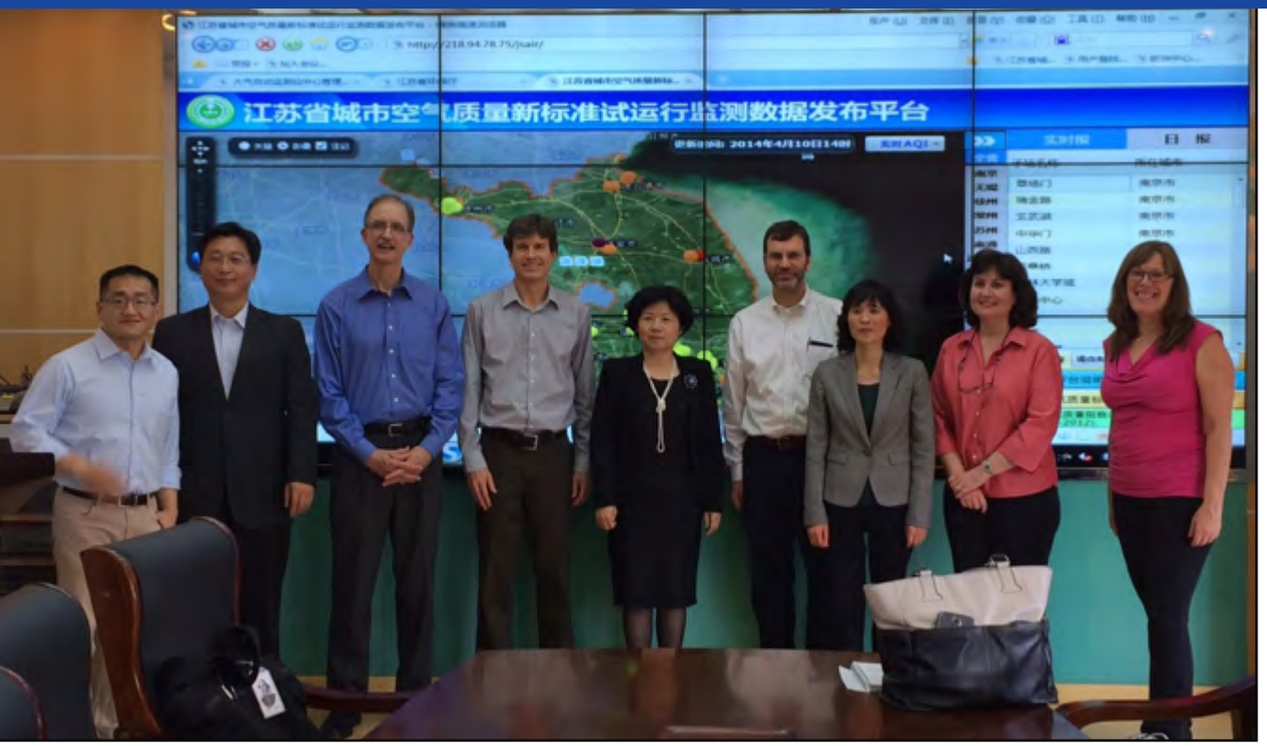
Emergency Response to Hazardous Waste Releases

EPA's most visible operational responsibility is the emergency response to releases of hazardous chemicals, such as from oil and chemical spills, and abandoned leaking oil drums.

EPA operates an Emergency Response Center 7 days a week, 24 hours a day. It deploys emergency responders and on-scene coordinators in response to catastrophic events to assess the situation and work with partners in other federal and state agencies to reduce human and environmental risk. Notable examples of situations where the Emergency Response Center has played a key role include responses to:

- Hurricanes Katrina (New Orleans) and Sandy (NJ), and
- the BP oil spill in the Gulf of Mexico.

Top: EPA Cincinnati Laboratory. ***Bottom:*** EPA Emergency Response Team. *Photos: EPA.*



EPA Staff in China. **Air office staff met with provincial environmental officials in Nanjing to help develop a model air quality improvement plan.** *Photo: Dale Evarts, EPA.*

International Programs

Besides its regulatory and environmental leadership roles in the U.S., EPA also works with over 60 countries via multilateral and bilateral partnerships to address environmental issues of regional or global scope and to help some nations with their environmental challenges.

An important example of global negotiations involving EPA and the Department of State is the 1987 Montreal Protocol, in which nations agreed to reduce and then phase out production of chlorofluorocarbons (CFCs) and halons that deplete the protective stratospheric ozone layer. This agreement was strengthened in subsequent London (1990) and Copenhagen (1992) meetings. The concentration of stratospheric ozone has been stabilized, and the ozone layer is expected to recover over time.

EPA has worked with the State Department in developing and administering international agreements. EPA has long-standing bilateral relationships with China, covering air, water, solid waste, climate change, and more.

Voluntary Programs

EPA also encourages environmental improvement through voluntary actions, including cooperative pollution reduction programs as well as providing information to help individuals and companies make informed decisions. EPA has more than 40 voluntary programs that encourage actions to improve the environment without imposing any legal or regulatory requirements, such as Nonpoint Source (polluted runoff) Demonstration Projects, WasteWise, and the Global Methane Initiative. Public awareness programs include Energy Star, the Toxics Release Inventory (described above), and AIRNOW. EPA provides educational resources to educators through the Environmental Education Grants Program and free materials developed by various program offices.

4. Implementing Federal Environmental Laws

Developing regulations to implement the environmental legislation that EPA oversees entails following a rigorous regulatory development and review process, structured with many checks and balances:

- Congress passes and the President signs laws requiring EPA to promulgate regulations that specify requirements for state and local governments, businesses, and individuals, including due process for all interested parties. In most cases, the laws provide criteria for regulations, but delegate the specifics to EPA, which has the technical expertise to determine the details.

- Development of specific regulations is governed by the Administrative Procedure Act, which requires that proposed regulations be published and subject to comment by all interested parties. The agency must respond to all major comments before finalizing regulations.

- Since 1974, a series of Presidential Executive Orders and internal management practices have, in combination, prescribed a detailed Executive Branch review process that mandated the analysis of the costs, benefits, and other impacts, of proposed "major" regulations as well as alternatives to them.

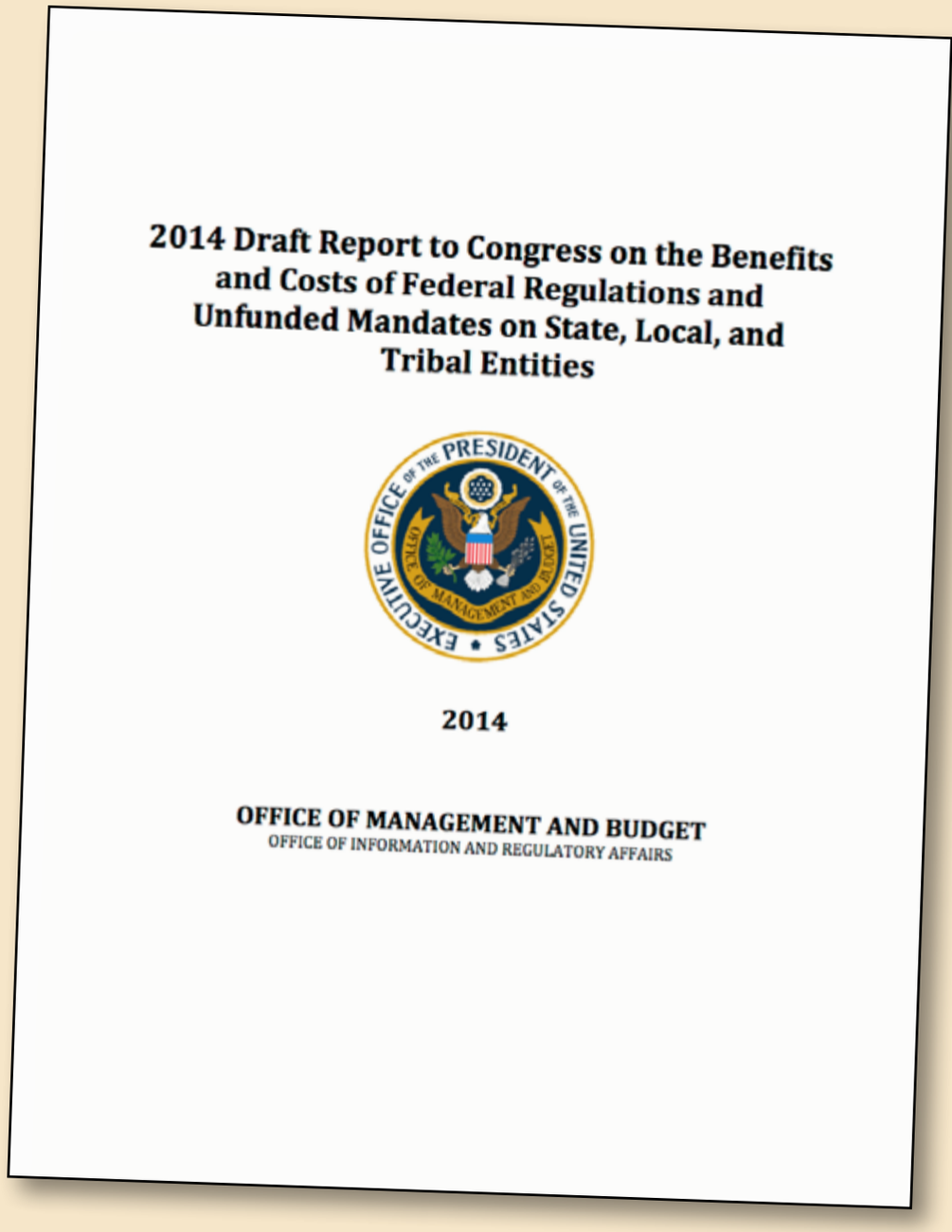
- Consequently, EPA's proposed regulations go through a rigorous review process involving other government entities representing the interests of those regulated. The science upon which regulations are based also goes through a peer review process with independent science advisors to ensure appropriate use of scientific data.

Congress plays a major role in overseeing EPA activites, including regulations.

- EPA (like other regulatory agencies) must conduct cost-benefit analyses of major regulations, which are reviewed by the Federal Office of Management and Budget (OMB) and other agencies. The benefits stemming from all EPA major regulations introduced from 1993 through 2013 were about $501 billion, compared to societal costs of about $57 billion (both numbers being the midpoint of broad ranges), according to OMB's annual Reports to Congress on the Benefits and Costs of Federal Regulations.

- Affected parties can challenge regulations in court if they believe that EPA lacked legal authority for specific rules or that it did not follow the criteria or due process requirements set by Congress. Legal challenges are frequent, and some have been elevated to the Supreme Court.

- Many EPA programs are primarily implemented by state or local government permit or enforcement programs, with EPA limited to oversight and enforcement when states are unable or unwilling to fulfill their legal responsibilities.


2014 Draft Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities

2014

OFFICE OF MANAGEMENT AND BUDGET
OFFICE OF INFORMATION AND REGULATORY AFFAIRS

5. Compliance and Enforcement

Having environmental laws that protect public health and the environment does not guarantee everyone will comply. These laws generally require those regulated (e.g. industries) to get permits that include site-specific limits on pollution releases, to monitor their performance, and in some cases, to report on permit violations and adverse effects. The laws give EPA the authority to take environmental samples, conduct inspections, and enforce against violators. Federal environmental laws contain a range of actions to address violations, including notices of violation, monetary penalties, and even prison time for criminal violations.

Verifying compliance and taking enforcement actions are necessary to ensure reduction of threats to public health and the environment. Effective enforcement programs create a level playing field so those who comply are not at an economic disadvantage vs. those who do not.

Most (but not all) environmental laws have provisions for EPA to delegate programs to states and Indian tribes that adopt adequate laws and have the authority, resources, and procedures to enforce them. EPA generally retains its authority to inspect and enforce, as a backup to these partners. Since the 1970s, EPA has worked closely with states/tribes to delegate authority to those who wished to carry out environmental programs themselves. EPA provided considerable federal grant money, technical assistance, training, and oversight to states and tribes so they could do so.

Today, most environmental programs are delegated. States/tribes carry out the majority of environmental inspections and take enforcement actions under their state laws.

EPA works closely with its state/tribal partners to implement environmental laws. EPA conducts 15,000 to 20,000 inspections/ investigations a year. EPA's annual enforcement results for 2015 are at https://www.epa.gov/enforcement/enforcement-annual-results-fiscal-year-fy-2015. Searchable data can be found on EPA's Enforcement and Compliance History Online (ECHO) website for the approximately 800,000 EPA-regulated facilities nationwide at https://echo.epa.gov/.

EPA inspector using an infrared camera to detect invisible organic chemical emissions. ***Photo: EPA.***

Looking Forward

The progress made in reducing and cleaning up pollutants affecting our air, land, water, and food supplies over the past half-century has turned the tide, reducing environmental risks to public health and mostly slowing negative impacts on wildlife and recreational opportunities. These efforts have yielded innovations that saved resources, not only compared with the projected costs of cleanup, but also cutting overall costs in some industries due to process changes.

But in a number of areas, **the accomplishments thus far leave much to be done**, such as in the cleanup of hazardous waste sites; polluted runoff from streets, farms, and other lands; and reduction of exposures to certain pollutants that continue at levels dangerous to public health and welfare. Moreover, much of the developing world is experiencing environmental risks comparable to or greater than those seen in the U.S. in the 1960s.

As health and environmental research advances, we become more aware of **serious issues that were not as well understood when the original environmental legislation was adopted**. These emerging challenges include climate change, bacteria-laden aerosols in drinking water, and new complex waste streams linked to medical research and treatment and nanotechnology. Like peeling an onion, we find that making progress in overcoming threats known earlier has revealed other, more complex challenges, some of which have no clear path yet to resolution.

It is clear that **despite tremendous progress thus far, environmental risks continue in different forms**, requiring research, process changes, and new approaches to containing and reducing threats to public health and to our natural environment. It is therefore critical for our future that we engage a new generation of Americans to pursue careers that take on these environmental challenges, and that continue to identify risks and implement innovative solutions.

With well over three million jobs devoted to environmental improvement (per the Bureau of Labor Statistics [BLS] in 2013), almost 500,000 job openings available in 2015,—and forecasts by the BLS that careers in environmental sustainability will grow by nearly 20% annually—there is plenty of opportunity for those who are inspired to take action to protect the environment and public health and welfare.

The same clear-headed determination that led to tremendous progress in environmental cleanup over the last half century will be needed to protect the public and the Earth from the risks that remain.