Celebrate 40 years of cleaner air!

Clean air,

like many valuable resources, is something we may only appreciate after it is lost.

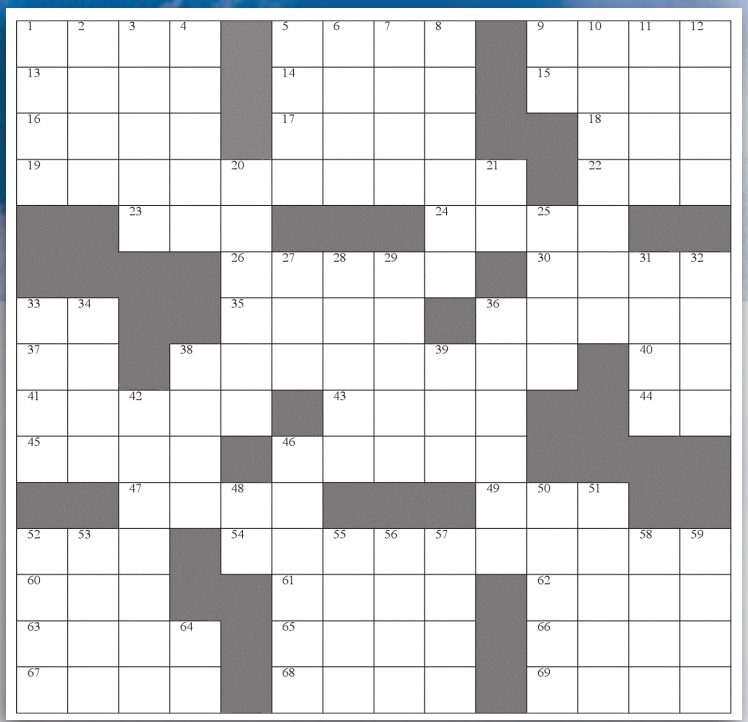
The 1940s were marked by a series of air pollution catastrophes that escalated as new technologies led to greater electricity consumption, increased production of materials like plastics, and a more automobile-based society. Throughout the 1960s, an environmental movement gained momentum. Contributing factors included:

- Damage to natural resources corresponding with new development and manufacturing
- More global awareness due to increased formal education and informal learning through television and pivotal books like *Silent Spring* by Rachel Carson
- The 1968 Apollo 8 photos that gave people views of the whole earth in space, looking both beautiful and vulnerable
- The energized activist culture that had developed around Civil Rights, the Cold War and the Vietnam War

The federal government responded to public outcry in 1970. President Nixon announced environmentalism as his new cause and Gaylord Nelson, a Wisconsin senator, helped found Earth Day. Later that same year, Congress passed strong environmental laws, including the Clean Air Act.

Celebrating 40 years of CLEANER AIR

It All Adds Up to Cleaner Air



ACROSS

1 Place for a compact fluorescent bulb
5 Product of grapes
9 Where to ride a bike or walk
13 Historic time periods
14 Possible tennis score
15 Spanish artist Joan
16 Host of PBS's Scientific American Frontiers/ MASH's Pierce
17 French philosopher Descartes
18 Bygone American motor car company
19 Initials of "10 Ways to Measure Air Quality"
22 Between bump and spike
23 180° from WNW
24 Deep cut
26 Magazine or newspaper article
30 Coffee alternatives
33 What you say for the doctor
35 Small, medium or large, e.g.
36 Country in northeast Africa, including Darfur
37 Not yes
38 What we hope this puzzle gives you
40 Intl. vehicle ID for Romania
41 Possible consequence of breathing toxics
43 Electric sign gas
44 Symbol for compound no longer found in gasoline
45 Metal used in making steel
46 Wrapped in cloth coated with wax
47 Fedl. agency that studies climate and the atmosphere
49 Clean air legislation passed in 1970, e.g.
52 Scale for showing level of air pollution
54 First letter of each of "10 Ways to Improve Air Quality"
60 However
61 Lion's "hair"
62 Wrinkled relative of an orange
63 African cat
65 Spanish compass direction
66 One possible component of particle air pollution
67 American poet Pound
68 Hair salon employee
69 Fencing weapon

DOWN

1 Part of milkweed that shows effects of ozone pollution
2 Folk singer Guthrie
3 Spanish mother
4 Tests taken in Soph. or Jr. year
5 Guarded
6 French thought or notion
7 One of Columbus's ships
8 Something to save or use wisely
9 Type of pollution that can cause haze, abbr.
10 Area affected by same pollution sources
11 Source of shade, biofuel, and carbon sequestration
12 "Give a ____, don't pollute"
20 Polite agreement
21 Continent that includes Bra., Equa. and Ven.
25 Shock
27 Small grey crested bird, fam.
28 Pollutant that forms on hot, sunny days
29 Direct (to)
31 Org. for those over 50
32 One who acts superior
33 One opposed
34 Ozone eight- ____ standard
36 Ice cream, bananas, hot fudge, e.g.
38 Philanthropic Irish musician from U2
39 Enemy
42 Device for measuring air pollution
46 Freed from agitation or fear
48 Item to turn down in summer to save energy, abbr.
50 Unrefined oil
51 Retouch a base after a flyball is caught
52 Having the needed capacity or skills
53 Informal test
55 Not hard
56 Before, pref.
57 Poetic "at no time"
58 German river
59 Ceremony
64 USA's continent

Crossword puzzle answers online at dnr.wi.gov/air/

Ten steps that led to cleaner air

1 1970 Clean Air Act

This landmark act laid the groundwork for successful public health and air quality improvements.

2 1973 Phase-out of lead gasoline began

These rules triggered a decrease in lead content in gasoline, which continued with the introduction of catalytic converters and later amendments to the Clean Air Act. By 1995, lead was banned from gasoline for all on-road vehicles.

TOM SABO

TOM SABO

3 1975 Energy Policy and Conservation Act

This law set fuel economy standards, which prompted unprecedented innovation and engineering for fuel efficient motor vehicles including catalytic converter development.

4 1978 U.S. bans chlorofluorocarbons (CFCs) in aerosol cans

The Montreal Protocol of 1987 led to further phasing out of CFCs, as did the 1990 Clean Air Act Amendments. As of 1996, the United States no longer produces or imports CFCs because they destroy the Earth's protective ozone layer.

5 1986 Wisconsin's Acid Rain Law

This law made Wisconsin a leader in acid rain regulation. It required electric utilities to reduce their sulfur dioxide emissions. The 1990 Clean Air Act Amendments limited emissions of sulfur dioxide and nitrogen oxides across the country because they both acidify precipitation.

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6 1988 Wisconsin Air Toxics Rule

This unprecedented state rule set limits on emissions of 438 hazardous air pollutants. The 1990 Clean Air Act Amendments led to toxic pollutant controls across the United States.

7 1990 Clean Air Act Amendments

This legislation targeted urban smog by introducing new permits for businesses, an emissions cap and trade program, and initiatives to reduce single-occupant commutes. It also addressed leaded gasoline, CFCs, acid rain and toxics.

LANCE GREEN

8 1996 Major voluntary initiatives began to reduce air pollution

The DNR formed a partnership called the Wisconsin Partners for Clean Air in Southeastern Wisconsin to encourage businesses and the public to limit polluting activities. Similar partnerships in other Wisconsin regions and throughout the country focus on voluntary efforts to reduce air pollution for public health and to avoid mandatory regulations.

9 2004 Wisconsin mercury rule

Wisconsin required large, coal-fired electric utility plants to reduce mercury emissions. A 2008 revision means emissions reductions will be even bigger and affect facilities of all sizes. Mercury is toxic for humans and wildlife and persists in the environment.

10 2007 U.S. Supreme Court decides that greenhouse gases fall under the Clean Air Act

Later, in 2009, the federal government took further action on climate change. One rule required large sources of greenhouse gases to begin annual reporting of their emissions.

FILE PHOTO

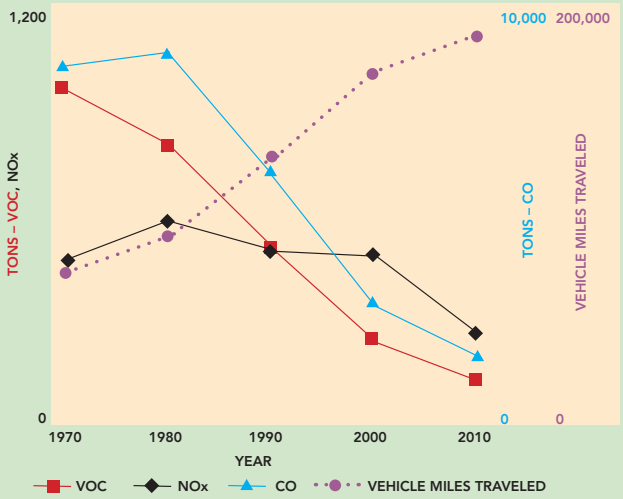
Ten air quality accomplishments

1 From 1970 to 1990, the Environmental Protection Agency estimated the Clean Air Act prevented 205,000 premature deaths and millions of cases of illnesses including heart disease, chronic bronchitis, asthma attacks and more.

2 Blood lead levels in children plummeted 78 percent from 1976 to 1994, thanks in large part to the phase-out of leaded gasoline.

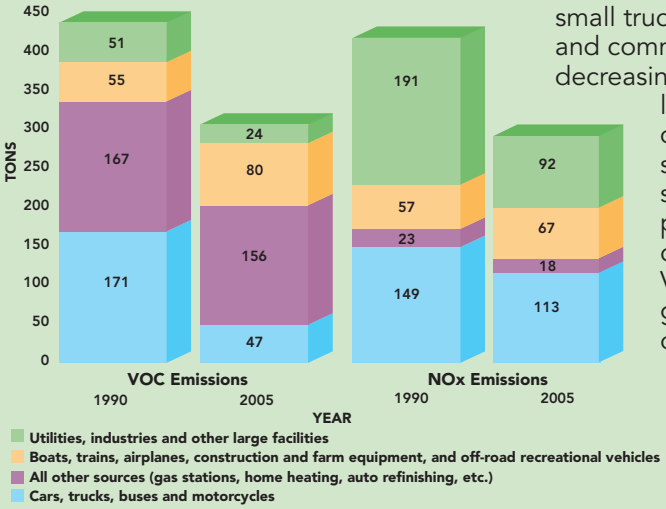
3 Carbon monoxide (CO) pollution reductions from automobiles are credited with saving 11,700 lives through 1998 due to Clean Air Act regulations. As seen in the graph below, levels of volatile organic compounds (VOCs) and nitrogen oxides (NOx) also declined drastically from 1970-2010, due to air pollution controls on cars, even though vehicle miles traveled have dramatically increased.

Wisconsin Highway Vehicle Emissions/Vehicle Miles Traveled



4 Drops in sulfur dioxide (SO_2) and NOx emissions kept rain from becoming too acidic. By 2006, Wisconsin's electric utilities' SO_2 emissions were 67 percent lower than 1980 levels according to DNR data. Overall NOx emissions in Wisconsin fell by 31 percent between 1990 and 2005, with the biggest decline from large commercial and industrial facilities and on-road vehicles.

Summer Daily VOC and NOx Emissions in Southeastern Wisconsin

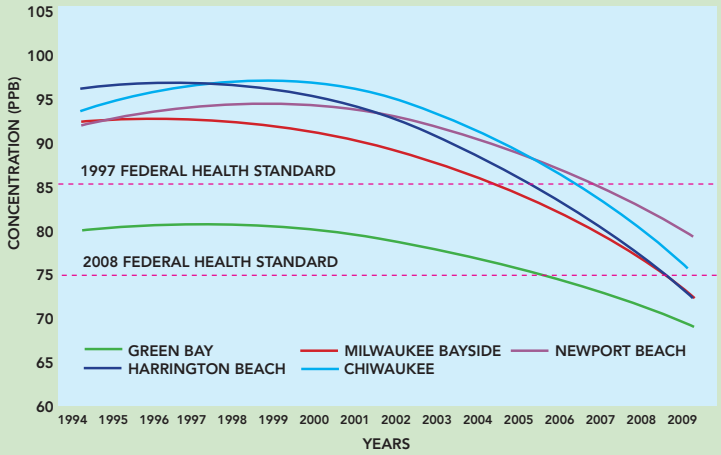


5 Nationally, total toxic air pollutant emissions decreased by 40 percent between 1990 and 2005, due to regulations on cars and small trucks, businesses with chemical-intensive processes and incinerators.

6 VOC emissions have decreased by 43 percent across the United States since 1970. VOC emissions in Wisconsin have decreased by 31 percent from 1990 to 2005, with releases from cars and small trucks, industrial plants, and commercial businesses decreasing the most. Gasoline, lighter fluids, dry cleaning solvents, cleaning solutions, fingernail polish and paints all contain VOCs. These VOCs contribute to ground-level (bad) ozone formation.

7 Ozone pollution has declined in response to control measures. This graph shows that ozone levels reported at monitors in eastern Wisconsin have dropped between 1994 and 2009.

Wisconsin Lakeshore and Green Bay Ozone Trends



Ten ways to improve air quality

8 Particle pollution decreased by 88 percent across the United States between 1970 and 2000. Particle pollution is separated into sizes. Coarse particles (PM10), which decreased the most, are usually the result of mechanical processes like crushing or grinding. Fine particles (PM2.5) are directly emitted or created through chemical reactions.

9 Added up over 20 years (1970-1990), EPA estimated the benefits of the Clean Air Act to human health, human welfare and the environment to be $22 trillion. This outweighs the actual cost of $523 billion spent over the same time to achieve air pollution reductions.

10 Real-time air quality information appears on The Weather Channel and Airnow. Forecasts are published in *USA Today*. In Wisconsin, announcements from the National Weather Service are broadcast by radio and TV. DNR has an online tool (dnr.wi.gov/air/aq/health/status.asp) and an Air Quality Hotline (1-866-DAILY-AIR) that operates seven days a week, 24 hours a day. Children, the elderly and people with respiratory and heart conditions can stay healthier by reducing strenuous outdoor activities during advisories.

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1 **Cut back on driving by car-pooling, biking, or taking the bus, especially on Air Quality Watch Days** (days when air quality may become unhealthy).

2 **Learn to be an ecodriver.** Combine trips and avoid jack rabbit starts and stops.

3 **Energy conservation at home reduces greenhouse gases.** Set the thermostat lower (in winter) or higher (in summer) while your family is sleeping or away.

4 **Always turn off** your computer when you leave home or work.

5 **Nurture native plants instead of a big lawn.** Native landscaping provides food and habitat for wildlife, helps water infiltrate and cuts down on the need for fertilizing and mowing.

6 **Enjoy locally grown produce.** Reducing food miles (how far food travels to reach your plate), supports nearby farmers, brings you fresh meals and limits transportation-related emissions.

7 **Recycle mercury-containing items** to keep this hazardous material out of the air, land and water. Contact your health department for information on free recycling programs for fluorescent lights, switches, old lawn chemicals and more.

DNR FILE

8 **Ask store managers to stock Earth friendly items**. Energy Star appliances, green cleaning products and goods with minimal packaging are excellent choices. Don't forget your reusable shopping bags.

9 **Instead of buying new, try to repair damaged items or buy gently-used products.** When you no longer need an item, donate it or sell it through a consignment shop or on the Internet.

10 **Reach out** to your friends, family and neighbors to teach them practices that promote cleaner air!

DNR FILE

Ten ways to measure air quality

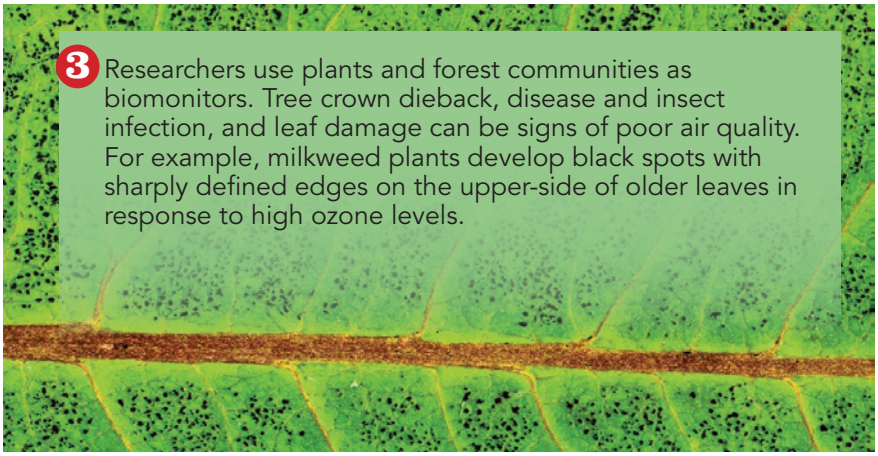
1 Fish higher up the food chain, such as walleyes, and the people who eat them, are at risk of ingesting and accumulating dangerous levels of toxins like mercury. Mercury enters the air by various means including fossil fuel combustion, falls to Earth, and then makes its way into streams and lakes.

PETER BLOCK

2 Ozone around Lake Michigan was measured by monitors attached to a DNR airplane and the Badger Ferry.

DNR FILE

3 Researchers use plants and forest communities as biomonitors. Tree crown dieback, disease and insect infection, and leaf damage can be signs of poor air quality. For example, milkweed plants develop black spots with sharply defined edges on the upper-side of older leaves in response to high ozone levels.



ED JEPSEN

4 The Air Quality Index (AQI) is a color-coded system for telling the public about air quality conditions. When the AQI is red or orange, people should avoid strenuous outdoor activities and change their activities to pollute less.

AQI
AIR QUALITY INDEX

5 Yearly, businesses across the state submit information collected from their facilities to DNR's Air Emissions Inventory. DNR tracks the data to ensure that the air is safe to breathe.

MARTHA MAKHOLM

6 You can find unique organisms – known as lichens (fungi and algae living together) on rocks and tree trunks. Lichens are air quality indicators. Each type of lichen varies in its sensitivity to air pollution, particularly sulfur dioxide.

7 Even though many types of air pollution are invisible, some manifest as haze, including fine particles of sulfates, nitrates, organic carbon, elemental carbon (similar to soot) and dust-like materials. View real-time haze conditions, taken by haze cameras in Milwaukee and elsewhere around the Midwest, at mwhazecam.net.

8 A National Core monitoring site, housed at the Horicon Marsh State Wildlife Area in Dodge County, measures air pollutants as part of a nation-wide network. The highly sensitive instruments detect low levels of pollutants and will help us understand regional air pollution trends.

9 Research about carbon dioxide, a greenhouse gas, is underway in Wisconsin. A tower in Park Falls is part of a national network measuring carbon storage and release by different plant communities. An experiment near Rhinelander is studying how carbon dioxide and ozone might impact northern forests.

10 Smoke schools around the country help environmental staff estimate air pollution emissions by reading smoke plumes.

MIDWEST HAZECAM

Create your own pinwheel!

What you need:

- Scissors
- Thumbtack or pushpin
- Pencil or straw

KRISTINA TEETER

To create the pinwheel:

- Cut out the pinwheel on the solid lines only.
- Cut the dotted lines from the four corners towards the center circle, being careful to stop before cutting into the center.
- Use a thumbtack or pushpin to poke a hole through the center and the four tiny dark circles in the corners.
- Then, push the pin through the center circle from the patterned side of the paper to the back.
- One at a time, push the ends of the pin through the holes on the pinwheel corners, bending in the corners.
- Place the pencil or straw on the back side of your pinwheel. Push the pin through the straw or pencil eraser leaving a little space between the pinwheel and straw/eraser so the pinwheel can spin.
- Now you are ready to try out your pinwheel. All you need is a little bit of wind!

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