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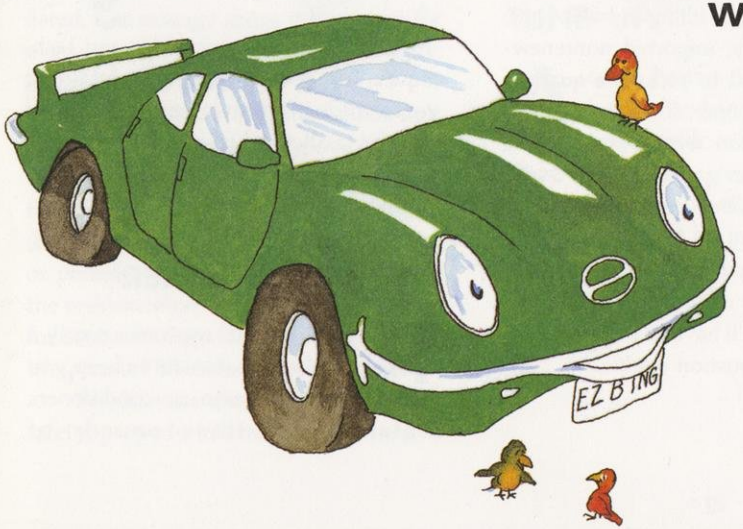
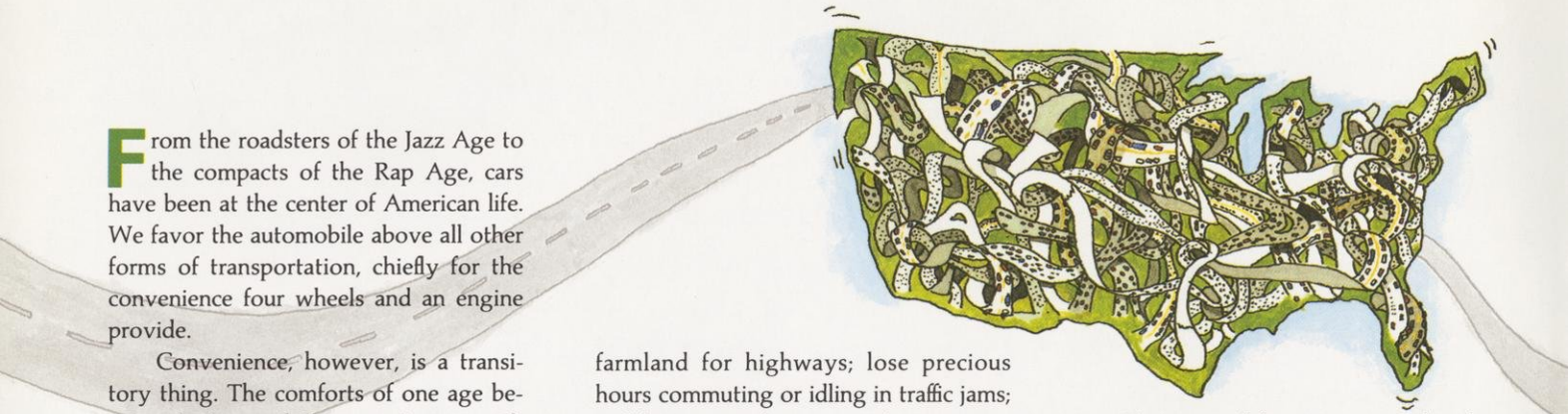
THE GREEN MACHINE



The Green Ma•chine Rap

Mo•to•rists, an ex•cla•ma•tion:
this book has important in•for•ma•tion!
About your car,
au•to•mo•bile,
and what you do when you're be•hind the wheel.
We're talk•ing habits,
fos•sil fuels,
ex•haust e•missions,
Clean Air rules.
So turn the pages,
take this ad•vice,
to make your car
environ•men•tally nice.
If• you• think
all this is on•ly talk
do the world a favor—
WALK.



From the roadsters of the Jazz Age to the compacts of the Rap Age, cars have been at the center of American life. We favor the automobile above all other forms of transportation, chiefly for the convenience four wheels and an engine provide.

Convenience, however, is a transitory thing. The comforts of one age become the bane of the next. So it is with the automobile. We now know that the freedom to boldly go wherever the blacktop leads comes with high, sometimes hidden, costs.

We pay dearly for the privilege to drive with smog, ozone alerts, and groundwater polluted by spilled gasoline and oil. We spend billions of public dollars to build and maintain roads, funds that otherwise might be spent on schools, health care or public transportation. We sacrifice urban neighborhoods and rural farmland for highways; lose precious hours commuting or idling in traffic jams; and burn a costly, imported nonrenewable fossil fuel just to pick up a quart of milk and a newspaper. If all the costs of auto transportation were passed on to drivers, a gallon of gas would run $4.50.

Yet the gasoline-powered automobile is here to stay — for a while. Magnetic trains and hydrogen-fueled personal transporters may carry us in the future, but until then, we'll have to make do with the internal combustion engine.

This manual features tips and techniques for operating and maintaining your vehicle in an environmentally sound manner. Follow this advice and soon you'll be behind the wheel of a "green" machine.

AIR CONDITIONER

Turn it off! The AC consumes nearly a gallon of gas per tankful to keep you cool. Furthermore, auto air conditioners contain about three pounds of

chlorofluorocarbons (CFC-12, commonly known as Freon), compared to just a few ounces in a typical home refrigerator. When those CFCs leak out, they damage the stratospheric ozone layer. (see "OZONE")

The use of CFC-12 in cars has been limited by international agreement, with a goal of eliminating it worldwide by 2000. Safer compounds will be part of future auto air conditioners.

What can you do with your current cooler? Have it checked frequently. If it's leaking and must be recharged, bring it to a reputable service station that collects and recycles the remaining CFCs rather than releasing them into the air. Do-it-yourselfers take note: This is a job you should leave to the experts. The over-the-counter sale of small cans of Freon has been banned in Wisconsin.

If you insist on using the air conditioner, drive a light-colored car with a light interior and park in the shade. It takes more energy to cool a hot car than it does to cool a medium-sized home.

BATTERY

That bulky plastic box of lead, sulfuric acid and hydrogen generates electricity for your spark plugs, car lights and radio. If you have the kind of battery that can be opened, check the water level twice a year and add distilled water if it's low. Sealed units with "indicator eyes" will tell you when it's time to replace your battery. Auto batteries last from two to five years, depending on quality, use and maintenance.

Recycling old batteries is a breeze: All vehicle battery retailers in Wisconsin must accept lead-acid batteries at no charge from people who purchased their batteries from them. If you bought the battery somewhere else, the retailer can charge you up to $3; depending on the price of lead, a retailer may pay you for the battery. The recycled lead is used to make new batteries, cable coverings, radiation shielding and other products. The acid may be used in new batteries or fertilizer, or neutralized for safe disposal. Plastic casings are recycled into new casings, wastebaskets and other items.

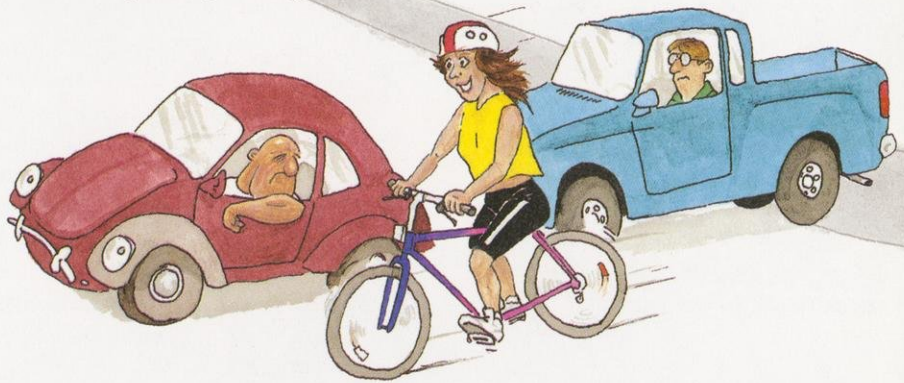
Wear safety goggles and gloves when you pick up a battery, and carry it in a wooden box or leak-proof container. To avoid explosions, don't smoke near batteries. If you drop a battery, neutralize any spilled acid with baking soda or lime.

BICYCLE

It's not just for recreation. This practical form of transportation deserves your respect and attention. Try biking to work once or twice a week. Add a wire basket and you can run errands on two wheels instead of four. When you do drive your car, give bicyclists a break — share the road!

CAR WASH

When you give your ride a bubble bath, choose mild soaps without phosphates and use them sparingly. (Why? Aquatic weeds thrive on phosphates, and oxygen is used up when the overgrown weeds decompose, leaving little for fish to breathe.) Rinse the suds onto grass and let the soapy water be absorbed gradually through the soil. Avoid washing detergents down stormwater drains — few cities treat stormwater before it's flushed into lakes and rivers. Encourage your favorite car wash to use phosphate-free soaps. Wax the beast every now and then to hold rust at bay. (see "PAINT")



CARPOOL

Here's a quick, easy, mathematically elegant way to eliminate rush hour and cut auto exhaust emissions by 50 percent: Put two commuters in a car instead of one. Besides doing everybody's lungs and blood pressure a favor, carpooling commuters save gas and cash; can be relieved of daily driving chores; meet new people; catch up on reading; and witness democracy in action when riders debate the choice of radio station. Some companies provide vans for ride-sharing employees and the Department of Transportation offers loans to companies seeking to purchase carpool vans. Call (608) 266-9476 for details. For general ride-sharing information in the Milwaukee area, call (414) 272-RIDE. In Madison, dial (608) 266-RIDE.

CITY PLANNING

Nearly half the space in American cities is used to accommodate the car. But six-lane highways and cavernous concrete parking ramps make cities less livable and suburbs more accessible. Car commuters converge on downtown workplaces in the day, creating traffic jams and smog, then abandon the city at night.

More compact, pedestrian-designed urban spaces with a mixture of residences, offices, stores and parks shorten the distance people must travel to work and shop. Safe bicycling and efficient mass transit then become more viable. Work for measures to control urban sprawl in your community and urge planners to consider sound urban design in future transportation policies.

CLEAN AIR ACT

The 20-year-old law cleared much of the smoke from America's skies, but we can't stop there. Amended in 1990, the act sets tougher limits on auto emissions and proposes transportation controls, especially for southeastern Wisconsin and other urban areas where ozone is a problem.

DRIVING TIPS

Idling wastes gas and can damage pollution control equipment. Cars need only warm up for a few seconds to allow oil to circulate. Turning off the car and starting it again uses less gas than idling for a half-minute or more.

— Combine errands into one trip. The engine uses less gas once it's warmed up.

— Accelerate and decelerate slowly and smoothly. Anticipate stops and coast up gradually: It takes 20 percent less gas to accelerate from 5 mph than from a full stop.

— Drive a steady 55 on the highway. At higher speeds, you'll burn more gas for each mile you drive.

— When you're driving in summer, close the windows and turn on the fresh air vents. At speeds over 40 mph, the drag caused by open windows eats up more gas than a working air conditioner.

— Shift a manual transmission into the highest gear as soon as possible to use the engine most efficiently.

EXHAUST

Produced when gasoline is burned in an internal combustion engine. (see "INTERNAL COMBUSTION") The main offenders:

Carbon monoxide — An invisible, odorless, poisonous gas emitted when engines burn gas inefficiently and when cars are idling or moving slowly in traffic. Levels are highest in urban areas just after morning and afternoon rush hours.

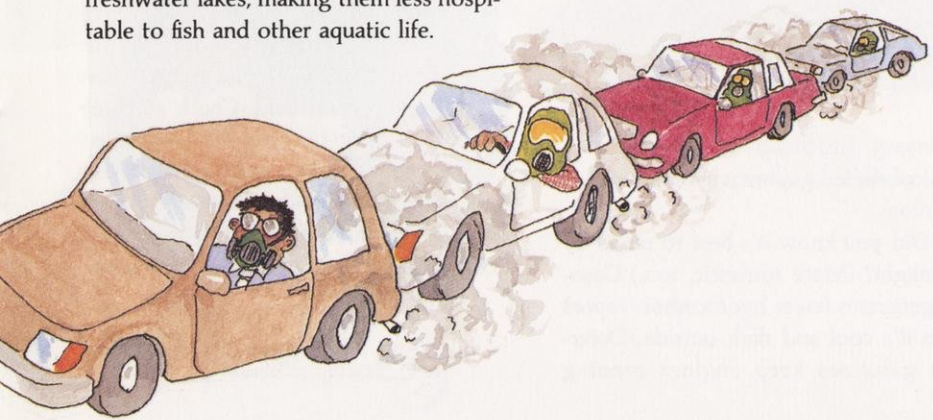
Carbon dioxide — Humans and animals inhale oxygen and exhale carbon dioxide; plants take in carbon dioxide and release oxygen. Large-scale burning of coal, oil and gasoline have overloaded the air with CO_2. (see "GREENHOUSE EFFECT")

Hydrocarbons and *nitrous oxides* — Cars discharge hydrocarbons (organic compounds present in gasoline) and ni-

trous oxides. In the presence of sunlight, these compounds form ground-level ozone, the primary component of smog. Children, the elderly, people with respiratory ailments and healthy people exercising outdoors may have difficulty breathing when ozone levels are high.

Nitrous oxides and other compounds, notably sulfur dioxide, contribute to acid rain. Acidic precipitation destroys forests and raises the pH of freshwater lakes, making them less hospitable to fish and other aquatic life.

Lead — Lead used to be added to gasoline to improve engine performance, but it didn't do much to enhance human health. In 1978 the federal government mandated that automakers build cars able to run on unleaded gas. Today, unleaded accounts for nine out of every 10 gallons of gas sold. Unfortunately, there are still plenty of old beaters out on the roads fueled by the leaded stuff. These vintage vehicles crank nearly 250,000 tons of lead into the air each year through their tailpipes. They belong in museums, not on the highways.



F.Y.I. Owners of registered vehicles in Milwaukee, Waukesha, Racine, Kenosha, Walworth and Ozaukee counties will be required to pass tailpipe emission tests. (see "TUNE-UP.")

The U.S. has improved emission standards, but the number of cars on the road has doubled since 1970, offsetting any pollution reductions. The recent Clean Air Act amendments mandate that by 1994, cars must have even more effective pollution control equipment. But how many more cars will be on the roads then? Only you can decide.

FEET

Use 'em for transportation whenever you can. It's easy: Put one foot in front of the other and go. Best of all, you never have to worry about locking your keys in the car.

FILL'ER UP

Volatile hydrocarbon vapors are released into the air when you fill your tank. Whenever possible, patronize service stations with vapor-recovery nozzles on gas pumps. Thanks to new Clean Air Act rules, you can expect to see more of these nozzles soon, especially in southeastern Wisconsin. Take care when the tank is nearly full — those little drips and

drops of spilled gas are a major source of pollution.

Did you know it's best to refuel by moonlight? (More romantic, too.) Gasoline generates fewer hydrocarbon vapors when it's cool and dark outside. Detergent gasolines keep engines running cleaner and emit fewer pollutants. And that dastardly gas cap you always leave on the roof of the car? Try to remember to screw it back on, because it vents gas vapors into a canister, preventing them from escaping into the atmosphere.

FLUIDS

Besides oil and gas, there are three other essential automobile fluids: Antifreeze, brake fluid, and transmission or power steering fluid. Check all three regularly. When they need to be changed (antifreeze every two years; power steering and brake fluid every 20,000 miles or so), collect the old fluid in a leak-proof container with a lid and bring it to a ser-

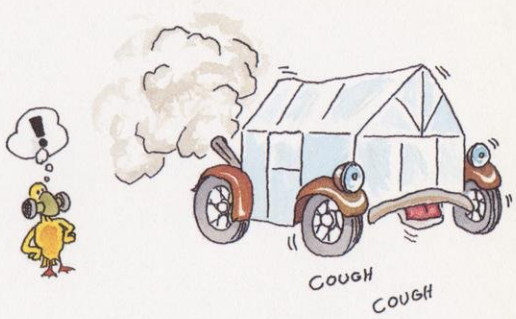
vice station or mechanic shop for recycling. You may be charged a small fee. By the way — please don't mix these or any other liquids with used oil you want to recycle. (see "OIL") Easier yet, bring the car to the service station and let the mechanic change those fluids for you.

There's one more fluid worthy of mention. When the temperature is above freezing, dilute your windshield wiper fluid with water. Half-and-half or even 75 percent water will still give the desired results.

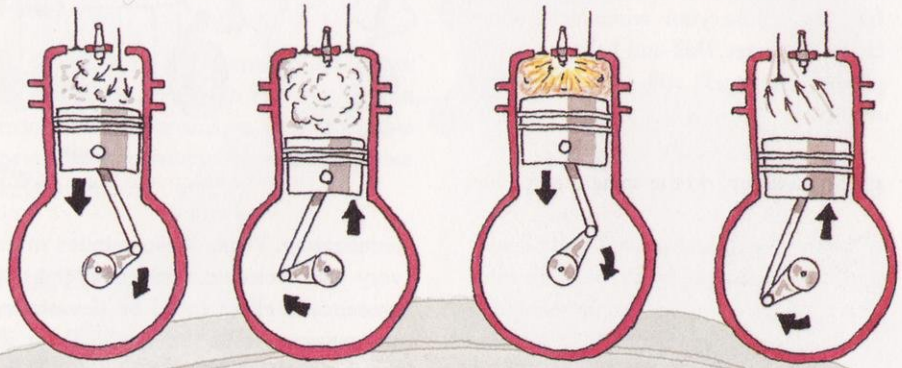
GREENHOUSE EFFECT

Burning gasoline, oil and coal releases carbon dioxide into the air. Eventually, the CO_2 collects in the upper atmosphere, where it acts like glass in a greenhouse, trapping heat and reflecting it back to Earth.

Scientists speculate this "greenhouse effect" will gradually raise the planet's temperature. While Wisconsinites might very well welcome warmer winters, the greenhouse effect could be devastating for many parts of the world. Polar ice would melt, raising sea levels and swamping coastal areas. Temperatures higher by only a few degrees could disrupt rainfall patterns and create deserts in major crop growing regions.



Cars pump about 45 percent of the CO_2 emitted into the atmosphere. The general rule is that a car releases its own weight in CO_2 each year. Ever try to pick up a car?



INTERNAL COMBUSTION

This is what happens when a) you consume pizza, a jumbo burrito and a bowl of chili in a single sitting or b) you drive. Briefly, here's what's going on in the engine:

When you step on the gas pedal, volatile, flammable gasoline, one of the many products refined from crude oil, is mixed with air. The vaporized gasoline is channeled into a cylinder, a tube sealed at one end and blocked at the other by a movable plug called a piston. Most cars have four, six or eight cylinders.

As the piston moves up the cylinder, it compresses the gas/air mixture. When the mixture is tightly compressed, the spark plug produces a spark that ignites the mixture trapped in the cylinder. The gas explodes, increasing the pressure on top of the piston and forcing it down. As the piston moves up a second time, an exhaust valve opens at the top of the cylinder and the gases created from burning the gasoline vapor rush out with a loud noise. This cycle is repeated several hundred times a minute in each cylinder.

Gases that don't burn completely pass through a catalytic converter and other pollution-control features and are recycled back into the engine. What's left is piped though a muffler, then released out the tailpipe. These exhaust gases are what give environmentalists and anyone else who breathes gas. (see "EXHAUST EMISSIONS")

LEAKS

Slimy spots on the driveway mean it's time to check the engine, transmission and radiator for leaks. When it rains, oil and other automotive fluids are washed off pavement and into storm sewers, lakes and rivers. Plug those holes!

MPG

Miles per gallon, a measure of how efficiently your car uses gasoline.

Lump America's gas guzzlers and compacts together and you arrive at an average of 26 miles per gallon (mpg) per car nationwide. That's a lot better than it used to be (Remember those 10-mpg gashogs of the '60s and '70s?) but more people are driving today, which offsets the benefits of higher mpg.

Our cars are thirsty rascals, soaking up about 72 billion gallons of gasoline nationwide each year. (Wisconsin consumes about 2.2 bil.) Here's the pitch: If each driver could reduce gas consumption by only 10 percent — a measly 10 percent! — we'd save six million gallons daily. Put another way, we could import 52 fewer supertanker loads of crude oil each year.

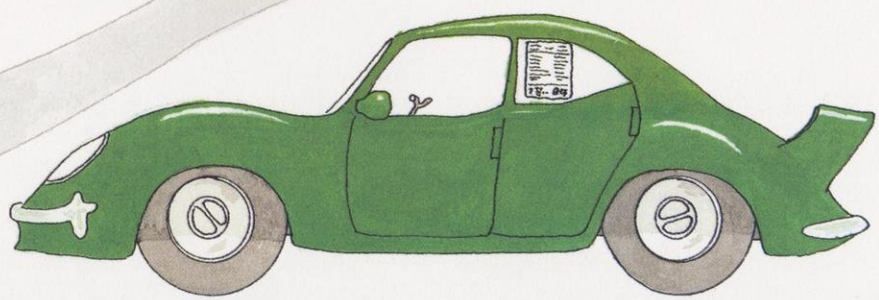
Keep tabs on your mpg. Fill the tank until the nozzle clicks. Write down the number of miles on the odometer. Next time you fill up, do the same thing. Then divide the number of miles you've gone since the last fill-up by the number of gallons you just put in. That's your mpg. When the mpg drops by more than five miles, it's time for a tune-up.

NEW CAR

Go for the highest mpg in the vehicle that will best suit your needs.

— The new automatic transmissions get better mileage than manual transmissions (stick shifts).

— Avoid buying a light truck unless you really need it. Pickups generally are less fuel efficient than passenger cars.



OIL

Low or dirty oil (or low *and* dirty oil) hurts engine efficiency. Check the dipstick each time you fill up and change the oil about every 3,000 miles or three months, especially if you do a lot of stop-and-go driving or tow boats or trailers.

Americans use more than one billion gallons of motor oil each year. Over a quarter of that oil is discarded into places where it doesn't belong, like lakes, streams, wetlands, backyards, storm sewers, open fields and road shoulders. Not a good idea, friends. (Go ahead and say it: YUK!)

Most automotive service centers recycle used oil. With a minimum of reprocessing, oil can be used again in cars or burned as a high-energy industrial fuel.

Do-it-yourself (DIY) oil changers can recycle oil in four simple steps:

1. Drain the oil into a pan large enough to hold as many quarts as your vehicle's crankcase. (The average car uses about five quarts.) The pan should be clean, and not have been used for paint, solvents, antifreeze or anything else that might contaminate the oil.

2. Using a funnel, pour the oil from the pan into leak-proof containers with lids — clean plastic gallon milk jugs work well. Don't mix that oil with anything else. If you change the filter, drain the old one by punching a hole in the top and inverting it over the pan. Plug the hole of the old filter with paper towels, put it in the box the new filter came in, and place the box in the trash. Put on the new filter, put in the drain plug (very important) and add the new oil to the crankcase.

3. Bring the old oil to a used oil collection site. It may be at a service station, auto parts store, quick oil change business, oil retailer, or city or county vehicle maintenance shop. For the site nearest you, contact your county or town public works department.

4. Pour the oil in the collection tank, cap your containers, save them for the next change, and pat yourself on the back for a job well done.

OTHER FUELS

The time when we all can say "no tanks" to gasoline may be coming soon. Cleaner-burning fuels such as propane are already being used in buses and fleet vehicles. Gasohol, a combination of gasoline and 10 percent ethanol distilled from corn or wood, produces less carbon dioxide emissions; it's sold at a few service stations and farm co-ops in the state. Solar-powered electric cars or vehicles fueled by compressed hydrogen will whisk motorists several decades down the road. Give new fuels a try as they become available. And encourage your elected public officials to support research into alternative fuels.

OZONE

O_3. There are two kinds, chemically identical: Good ozone, a naturally occurring layer in the stratosphere, and bad ozone, produced at ground level by car exhaust. The stratospheric ozone layer prevents cancer-causing ultraviolet rays from reaching the earth. Chlorofluorocarbons leaking from auto air conditioners poke holes in the layer, allowing more UV rays through. (see "AIR CONDITIONER")

On hot, sunny days, hydrocarbons and nitrous oxides emitted from autos form ground-level ozone. (See "EXHAUST"). Humans, designed to breathe O_2(oxygen), don't take well to ozone's additional atoms. Children, the elderly and people with respiratory ailments have difficulty breathing when ozone levels are high; many are forced to stay indoors. Healthy people exercising outdoors during ozone alerts may be gasping for more air than usual.

PAINT, PARTS CLEANER, POLISH AND WAX

Buy small quantities of these automotive products; avoid those that come in aerosol cans. Share what you don't use with neighbors, community groups or school auto classes. Don't dump leftovers down the drain, on the ground or in a storm sewer. If you must throw these items in the trash, first place the can in a sheltered outdoor place away from children, pets or flames. Open the lid and let the liquid evaporate. Wrap the dried material in newspaper and discard.

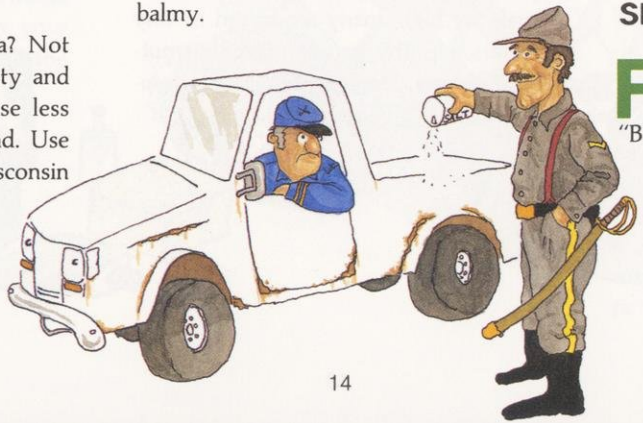
ROAD SALT

The South may have lost the Civil War, but it won the battle with road salt. Here in the northern climes, winter presides over an annual conflict between slippery roads, driver safety and environmental degradation. Road salt pollutes surface and groundwater, kills trees and grass, corrodes auto bodies and metal bridges, rots underground cables and causes pavement to disintegrate. But the 250,000 tons spread on state highways each year (at a cost of $5-6 million) make car travel possible from October to March.

An insurmountable dilemma? Not quite. Encourage your city, county and state highway departments to use less salt, or a mixture of salt and sand. Use sand on your driveway. The Wisconsin Department of Transportation regularly tests new melting compounds; someday, they may discover a replacement for salt that's efficient, inexpensive and environmentally safe.

Until then, wash your car in winter to remove encrusted salt and prevent corrosion. Better yet, hire a sled-dog team and keep the coupe in the garage until April Fool's Day.

Or make tracks to Atlanta, Phoenix or southern California — cars typically last twice as long where the weather's balmy.



SALVAGE YARDS

Old cars never die; they just rust away. So follow a regular maintenance schedule to keep your heap off the scrap heap. Ask for rebuilt or used parts when the time comes for repairs. And while you're at it, why not write Lee Iacocca et al. to demand that the auto industry use recycled and recyclable materials in new car construction? Today's average car contains about 177 pounds of recyclable aluminum and 225 pounds of plastic, some of which can be recycled.

SHORT TRIPS

Follow the A.I.A.I.P. rule for short hops: **A**void **I**n **A**utos **I**f **P**ossible. See "BICYCLES," "FEET."

TIRES

Inflation. It's a dirty word to economists, a necessity to green motorists. We waste four million gallons of gas each day because our car tires are underinflated. Gas mileage drops one percent for every pound of tire pressure below the recommended level.

The solution: Regular check-ups. Keep a hand gauge in the glove box and check tire pressure twice a month when the tires are cold. Add air if necessary. (Look at the sidewalls for the proper psi, or pounds of air per square inch.) Check the pressure more frequently in winter — for every 10-degree drop in temperature, tire pressure decreases by one pound.

Besides increasing fuel economy and safety, properly inflated tires last longer, so there are fewer to add to the waste stream. (Statistic fans will want to know that nationwide, about 240 million scrap tires are discarded each year.) If you rotate your tires regularly, say every 5,000 miles, you can keep them even longer. And while you're at it, use radial tires — they reduce gas consumption by five to 10 percent and deliver a more comfortable ride.

TUNE-UP

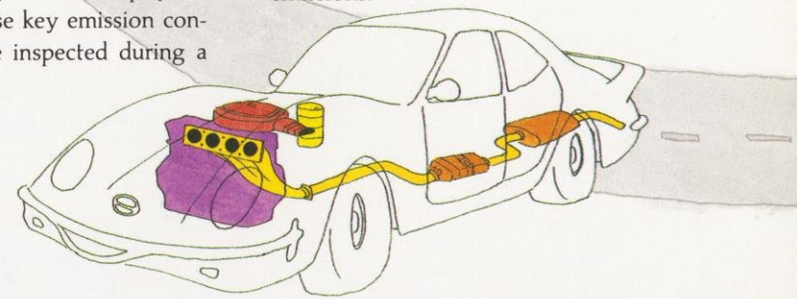
A car in tune consumes 20 percent less fuel and spews less heat-trapping carbon dioxide into the atmosphere. Tune-up twice a year to keep your machine green. These key emission control parts should be inspected during a tune-up:

Charcoal canister — Absorbs gasoline fumes from fuel system and routes them into the engine.

Positive crankcase ventilation valve — The PCV system recycles gases into the engine for combustion.

Exhaust gas recirculation — The EGR system cuts down on the formation of nitrous oxides, which sunlight transforms into smog.

Heat control valve — Helps the carburetor run efficiently. What's a carburetor? In cars without fuel injection, it's the part where gasoline is mixed with air in the right ratio for efficient combustion. A properly adjusted carburetor cuts back on emissions.



Catalytic converter — Turns carbon monoxide and unburned gas into carbon dioxide and water. Newer converters also break down nitrous oxides.

Other items to check during a tune-up: Dirty *air filters* cause the air/fuel ratio in the carburetor to be too rich. Clogged *fuel injectors* produce a mix too lean. Worn *spark plugs* misfire, causing fuel to pass through the exhaust system unburned. A *thermostat* that lets the engine run too cool or too hot wastes gas. Change or adjust these parts to keep emissions down.

TRUNK

No ifs, anvils, or buttresses: You get four percent less gas mileage for every 100 pounds of excess weight carried in your car. Clean out that trunk today!

WINTER WHEELING

Avoid using quick-start aerosol sprays on your carburetor. Many contain chlorofluorocarbons (CFCs) and volatile organic compounds (VOCs), which are released into the air the moment you press down on the nozzle. Keep the engine tuned up and use a heater block to guarantee winter starts. If you keep the gas tank full, you won't need to pour in fuel additives to dry up the water that condenses in a half-empty tank. Instead of using petroleum-based solvents to loosen frozen locks, try an electric hair dryer.

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