USE LESS STUFF WEEK 2002

OKLAHOMA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Press Release
Use Less Stuff Day
April 9, 2002

The first Oklahoma Use Less Stuff Week has been set for April 18-24, 2001. The Oklahoma Department of Environmental Quality (DEQ) is coordinating this campaign and partnering it with Earth Day held annually on April 22. Ellen Bussert, DEQ, says, "Since Using Less Stuff is something everyone can easily do to celebrate Earth Day April 22, we thought combining these events would be helpful to Oklahoma citizens."

Although Americans continue to recycle at higher rates, the massive amount of trash sent to landfill sites continues to grow. The United States Environmental Protection Agency reported that in 1990, the national average of waste was 2.46 pounds per person, per day. However, Oklahomans continue to average 4 to 5 pounds of waste per person, per day. With 45 percent of Oklahoma's population now served by some type of recycling program, we should be doing better. However, to make a real impact on saving resources and energy, we must learn to not create so much waste in the first place, by reducing and reusing products and packaging.

As with recycling, source reduction can be practiced effectively on a corporate, community, or personal level. It helps the environment, but it can also be financially rewarding. If you simply use less stuff, some good things will happen. For one thing, you'll save money every time you shop. Also, your town will save money. That's because the cost of preventing waste is zero, while the cost of recycling, not to mention landfilling, can be very expensive. Thus, prevention means more money for important services such as education, crime prevention, road maintenance and human services. Using Less Stuff therefore plays a major role in efforts to develop a sustainable society, one that makes efficient use of resources while minimizing impact on the environment.

When speaking at the Oklahoma EE Expo in February, John C. Ryan, co-author of, Stuff, the Secret Lives of Everyday Things, described the impact of American consumers' habits, "We all agree that modern technology does wonders for us, but the American way of life has the biggest impact on the world's resources than any other country. We consume 120 pounds a day in resources. Americans comprise only five per cent of the world's population, yet we use 25 per cent of the world's energy. We own one-third of the world's cars, computers, paper and plastic. We consume one-fourth of the world's aluminum and one-fifth of its beef and coffee. We use or degrade forty per cent of the world's vegetation that grows each year, we use one-third of the fresh water used by inhabited regions, degrade two-thirds of the world's forests and three-fourths of its grasslands."

Ryan, who does not even own a car, told the Expo crowd, "The issue of how we live and the choices we make in our daily life make impacts worldwide. Most of the resources needed to produce our 'stuff' are used behind the scenes somewhere and not seen by us, but everything we use has an ecological wake or a ***secret life***."

To foster a sustainable society, Americans must strive to Use Less Stuff. With the mounting support of government, non-profit organizations, business and the public, awareness of this vital issue will continue to grow dramatically. Oklahoma's Use Less Stuff campaign, spearheaded by the Oklahoma Department of Environmental Quality, provides information and promotional materials for interested citizens. Contact Susie Shields, Use Less Stuff campaign coordinator, at 405.702.5166 or <susie.shields@deq.state.ok.us> for more details.

The Secret Life of A Potato

The Oklahoma Department of Environmental Quality is encouraging citizens to examine and rethink their consumption habits during the first Oklahoma Use Less Stuff Week from April 18-24, 2002. DEQ's Fenton Rood announced, "The DEQ wants to provide citizens with food for thought and viable alternatives to often wasteful habits through information available from our Use Less Stuff Campaign." Rood practices waste minimization in his own life, often riding his bicycle to work and striving to reduce amounts of paper consumption in the workplace. "This article examines the environmental impact of French fries, a popular American food, from start to finish," said Rood.

Listening to John C. Ryan, co-author of Stuff, the Secret Lives of Everyday Things, speak at the Environmental Education Expo in February certainly made the crowd think about their consumption habits. Ryan confessed to the Expo attendees, "I am a compulsive consumer of french fries."

Ryan's lastfFrench fry purchase, a "biggie" order from Wendy's, was served in a bleached white, then dyed yellow and red paper carton made from pine pulp from an Arkansas mill. It was inside a bleached white sack with a bleached white then dyed yellow napkin. These packages no doubt required trees prepped in a pulp mill, which is fueled by oil, with about half probably from the Middle East and then bleached with chlorine, which is discharged along with other water waste into the nearest stream or river.

The ten-ounce potato took one-half square foot of sandy soil in Idaho's Snake River Valley to grow, along with seven gallons of water from the Snake River to irrigate. It was no doubt treated with fertilizers and pesticides to ensure that its shape and quality were just like all of the other potatoes. These chemicals accounted for 38 percent of the farmer's expenses. Much of the fertilizer's nitrogen leached into groundwater; that, plus concentrated salts, made the water unfit even for irrigation. Some of the fertilizers and pesticides washed into streams when rain fell. Among these were pesticides like Telone II (acutely toxic to mammals, and probably birds, through the skin and lungs) and Sevin XLR Plus (nontoxic to birds but highly toxic to fish). The Environmental Protection Agency's tests of waters in the Columbia Basin found agricultural contaminant in every tributary, including the Snake.

The potato was dug up by a diesel-powered harvester and transported to the processing plant where it was converted to five ounces of fries. The other five ounces of the potato went into a sludge waste that was sprayed on fields to dry. Excess nitrates then seeped into the groundwater, causing blue baby syndrome and, if a beauty parlor operated in the area, someone's hair may have turned purple from the nitrates.

Next the french fries were frozen, with electricity made from a hydroelectric dam on the Snake River. Salmon and fabulous white sturgeon living in the Snake River have been hampered from their journey back and forth from fresh water to salt water for forty years or more by these dams. It often takes **ten times** more energy to make frozen food than fresh food creating a much bigger demand on energy production, but fresh food is on the wane since frozen food is much more ***convenient***. By 1990, Americans ate more frozen potatoes, mostly french fries, than fresh ones,

The fries were frozen using hydrofluorocarbon coolants, which have replaced the chlorofluorocarbons (CFCs) that harm the ozone layer. Some coolants escaped from the plant. They rose 10 miles up, into the stratosphere, where they depleted no ozone, but they did trap heat, contributing to the greenhouse effect. The frozen fries were transported to a retail market in Houston via an 18-wheel refrigerated truck. From the market, the fries were purchased by a Texas teenager who fried them in corn oil from Nebraska and served them up with salt mined in Louisiana and ketchup, made in Pittsburgh from Mexican tomatoes, and packaged in small plastic and aluminum pouches probably made in Ohio.

Ryan told us he did not mean to indicate that french fries are deemed an environmentally destructive food. He said they are middle-of-the-road in that regard, with their impact not even close to that of a hamburger. His point was that the issue of how we live and the choices we make in our daily life make impacts worldwide. Most of the resources needed to produce our "stuff" are used behind the scenes somewhere and not seen by us, ***but everything we use has an ecological wake or a "secret life".***

What can we do about all this "stuff" in our lives? Support sustainable agriculture. In Oklahoma, the Kerr Center for Sustainable Agriculture provides information, programs and funding: <www.kerrcenter.com>. Instead of buying fried, over-packaged fast food, cook some organic produce for yourself and eat it on a real plate. Buy local foods or, best of all, grow your own. Garden produce is fresher, uses almost no energy except the sun, and puts to use un(der)used land--your lawn. The Oklahoma Sustainability Network's conference on May 10, "Sustainable Solutions--Envisioning Oklahoma's Future," will offer several excellent presentation in the sustainable agriculture track. These will include Dr. James Horne, President of the Kerr Center, who will present concepts from his new book, The Next Green Revolution. See: <www.oksustainability.org> for details.

Ryan thinks we all agree that modern technology does wonders for us, but the American way of life has the biggest impact on the world's resources than any other country. We consume 120 pounds a day in resources. We throw out approximately four pounds a day of waste, but most of this resource usage is in the "secret life" of items we consume and is unseen by us. Americans comprise only five per cent of the world's population, yet we use 25 per cent of the world's energy. We also own one-third of the world's cars, computers, paper and plastic.

Obviously, the solutions are often right under our noses. Ryan closed with a plea to the "roomful of super heroes", each with the power to do things better. Even though changing our habits to lower consumption patterns may not yield visible benefits to the environment, a little research on your part will convince you it is working. Just as our lives have much bigger impacts on the world than most of us realize, the benefits when we make simple choices to reduce our consumption of energy or stuff are much greater than we ever see.

For more details on the Use Less Stuff Campaign, contact campaign coordinator, Susie Shields, at <susie.shields@deq.state.ok.us> or 405.702.5166. Information is also available on the web: <www.deq.state.ok.us>.

The Secret Life of Coffee

The Oklahoma Department of Environmental Quality is encouraging citizens to examine and rethink their consumption habits during the first Oklahoma Use Less Stuff Week from April 18-24, 2002. DEQ's Mary Jane Calvey announced, "The DEQ wants to provide food for thought for Oklahoma citizens about their everyday habits with our Use Less Stuff Campaign. This article examines the entire journey our morning coffee makes on its way to our cup." The following information is provided by John C. Ryan from his book, Stuff--The Secret Lives of Everyday Things.

One cup of coffee takes 100 beans that grew in Columbia on a small mountain farm cleared of forest systems for cattle ranching and coffee and fruit trees. Pesticides were necessary due to the removal of birds and other insect eaters. The beans were picked by hand, the pulp is removed (2 pounds per pound of beans) and dumped into the Cauca River where it consumes oxygen needed by fish. The beans were dried in the sun and shipped to New Orleans on freighter made in Japan from Korean steel made from iron mined in Australia and fueled by Venzuelan oil. In New Orleans, the beans were roasted with oven burning natural gas from Texas—then packaged in four-layer bags made of polyethlene, nylon, aluminum foil and polyester. Finally, they were trucked to a warehouse in Oklahoma City or Tulsa and delivered by a smaller truck to your neighborhood grocery.

The beans were carried out in a sealed, wax-lined paper bag and a large brown paper sack made at unbleached kraft paper mills in Oregon. One-fifth gallon of gasoline was burned during the five-mile round trip to the market.

Before we can conjure up our brew, we will need a grinder. We measure beans into a disposable plastic scoop molded in New Jersey and spoon it into a grinder which was assembled in China from imported steel, aluminum, copper and plastic parts and powered by electricity generated at Ross Dam on the Skagit River in the Washington Cascades. We dump the ground coffee into a gold-plated mesh filter made in Switzerland of German steel and Russian gold and put it into a plastic and steel drip coffeemaker

Oh, yes! We must use water for our brew. Eight ounces of tap water from a processing plant is poured into a coffee pot. Originally the water came from Lake Atoka where it was pumped around 150 miles to Oklahoma City consumers. The pump was probably powered by a coal-fired electricity generating plant in Muskogee, with the coal transported to Oklahoma from Wyoming. An element heats the water to more than 200° F with power generated by an OG&E gas-fired power plant. The hot water seeps through the ground coffee and dissolves some of its oils and solids. The brew trickles into a glass carafe and is poured into a mug made in Taiwan. Later, we wash the mug using two gallons of water.

If you use cream, you stir in one ounce of cream from a grain-fed dairy cow in Union City. The cow liked to wade into a stream and drink and graze on streamside grasses and willows, so the water got warmer and muddier, making life difficult for the sunfish and bass living in the stream. The two teaspoons of sugar you measured out came from cane fields (former sawgrass marshes) in Florida. Water that used to flow across these marshes and into the Everglades was drained into canals and sent directly to the ocean or irrigated fields, where it picked up nutrients and pesticides. Populations of all vertebrates—from turtles to storks—have fallen 75 to 95 percent in Everglades National Park.

When examining the waste involved, we find that the cow's manure was rich in nitrogen and phosphorus. Since the soils of the cow pasture were unable to absorb all the manure, it washed up into the stream when it rained, fertilizing algae which absorbed oxygen from the water. Two hours later, your body metabolizes the coffee. Most of the water and nutrients are passed into the Oklahoma City sewer system where it is mixed with other organic and inorganic waste. They then travel under the streets of the city to Oklahoma City's sewage treatment plant on the North Canadian River in Jones where the solids are filtered, concentrated, digested and sterilized with screens, settling tanks, bacteria and chlorine. An engineer deems the sewage sludge clean enough for agriculture and a trucker hauls it to pulpwood tree farms for use as fertilizer and soil conditioner. A pipe carries the treated liquids a mile into the North Canadian River.

Coffee is the world's second largest legal export commodity (after oil) and is the second largest source of foreign exchange for developing nations. The United States drinks about one-fifth of the world's coffee. If you drink two cups a day, you'll down 34 gallons of java this year, made from 18 pounds of beans. Colombian farms have 12 coffee trees growing to support your personal addiction. Farmers will apply 11 pounds of fertilizers and a few ounces of pesticides to the trees this year. And, Columbia's rivers will swell with 43 pounds of coffee pulp stripped from your beans.

Okay, you don't want to give up coffee--What can you do? Cut back on drinking coffee—it stains your teeth and makes you jumpy anyway. (And nobody likes coffee breath, either!) Buy shade coffee. Coffee grown under the shade of mixed trees requires few or no chemical inputs; the lead litter replenishes soil nutrients and the variety of tree species benefits birds and discourages pest outbreaks. Many brands of shade coffee—often labeled as organic or cooperatively produced—are available.

The Secret Life of A Cola

The Oklahoma Department of Environmental Quality is encouraging citizens to think about all the consequences of their consumption through the proclamation of the first Use Less Stuff Week April 18-24, 2002. DEQ has provided a series of articles such as this one based on the book, Stuff--The Secret Lives of Everyday Things by John C. Ryan. When speaking at the Oklahoma Association for Environmental Education's EE Expo in February, Ryan told the crowd, "Confronting resource consumption is North Americans' principal environmental challenge, although few realize this fact because impacts of consumption are mostly invisible to the consumer. The United States, with less than 5 percent of world population, consumes 24 percent of the world's energy and similar shares of other commodities."

This article outlines the "ecological wake" of cola (aka soda pop). Americans drink more water carbonated in soda than they drink plain from the tap. The world drinks about 70 million gallons of soda every day. Following are the resources used to get you that can of pop.

Corn Syrup. The cola contained high-fructose corn syrup from Iowa, a state where even the rain usually contains traces of pesticides. A milling plant used water, enzymes, acids, heat, grinders, and centrifuges to turn corn kernels into starch and then corn syrup. Making syrup is the second largest use of corn in North America; feeding livestock is the largest. On average, Americans consume 48 pounds of corn syrup a year.

To make your cola, the bottling plant combined corn syrup, citric acid, and flavor concentrate (a secret recipe containing flavors, preservatives, caffeine, and artificial coloring) first with water and then with carbon dioxide. The same corn-milling plant in Iowa fermented corn to make the carbon dioxide. The caffeine was a by-product of making decaffeinated coffee.

Bauxite. Your last cola was in an aluminum can weighing 15 grams (about half an ounce). Five grams was recycled from melted-down cans and scrap. The other 10 grams began as 40 grams of bauxite ore in the Australian outback. Massive machines with 15-foot-high tires and shovels big enough to scoop up a car, strip-mined the ore from a thin layer of underground rock. Bauxite mining destroys more surface area than mining any other ore.

Near the mine, the bauxite was crushed, washed, dried, pulverized, mixed with caustic soda from California, heated, pressurized, settled, filtered, and roasted with calcium oxide from Japan. Forty grams of bauxite yielded 20 grams of the aluminum oxide powder known as alumina, which looks like wet sugar crystals. Most of the caustic soda was captured for reuse. The process also created 16 grams of “red mud”, a skin-burning mixture of oxidized metals and other contaminants. Pipes siphoned the mud to a settling pond, where a fraction of it leached into groundwater.

A Korean freighter hauled the alumina across the Pacific Ocean to the wall of breakers at the Columbia River bar, the four-mile-wide river mouth that Lewis and Clark called “that seven-shouldered horror.” The ship’s captain used sonar and satellite linkups to plot his course through the bar’s chaotic waves and shifting sands. He motored between the two-mile-long jetties. He entered the deep channel dredged into the Columbia’s shallow estuary by the Army Corps of Engineers. The dredging stirred up old sediments containing high levels of heavy metals and pesticides like DDT, which was banned 20 years ago. Jetties, dikes, and dredges have washed away or filled in two-thirds of the river’s tidal marshes. Tidal marshes and other estuary habitats are nurse beds for aquatic life, sheltering young fish, birds, and many other animals.

Despite all the electronic gadgetry and all the effort to tame the river, the bar--where the misnamed Pacific Ocean and the biggest river on the west coast of the Americas pound against each other--remained the most dangerous part of the freighter’s 24-day journey. Once past the entrance, it was smooth sailing upriver toward the aluminum smelter in eastern Washington.

Smelting. The smelter dissolved the aluminum oxide in giant steel pots filled with a bath of cryolite (sodium aluminum fluoride). Carbon electrodes (made from Alaskan petroleum) were lowered into the pots and delivered a massive 100,000-amp jolt of electricity. The powerful charge broke oxygen atoms away from the aluminum and attached them to the carbon, forming carbon dioxide. Small amounts of fluorine attached to the carbon and escaped the smelter in the form of perfluorocarbons (PFCs)-greenhouse gases that trap thousands of times more heat per molecule than carbon dioxide. Few processes are as damaging to the global climate as aluminum smelting.

Smelting is so energy intensive that aluminum earned the nickname “congealed electricity”. Making a soda can of smelted aluminum takes energy equivalent to a quarter-can of gasoline. Your 33-percent-recycled can took about a sixth of a can of gasoline of energy.

Electricity. The smelter ran on purchased hydropower 24 hours a day. The smelter bought the electricity at discount rates from the Bonneville Power Administration (BPA), the Pacific Northwest’s main provider of electricity. BPA markets power from 29 federal dams and a nuclear power plant. Eight of these dams along the main stems of the Columbia and Snake Rivers annually kill millions of young salmon heading to the Pacific. Dams, damaged stream habitats, hatcheries, and overfishing have eliminated more than 97 percent of wild salmon in the Columbia Basin.

Aluminum smelters use almost one-fifth of the electricity sold by BPA, yet employ very few people. The eight aluminum smelters in Oregon and Washington provide about 7,500 jobs-one-tenth of 1 percent of the regional total. The same smelters drink up to 16 percent of all electricity used in the two states-more than the million residents of Portland and Seattle combined. Because BPA undercharges the smelters for electricity, other customers must make up the difference: the average household served by BPA pays about $2 per month extra to subsidize the smelters.

Can. The smelters’ end products--giant slabs, or ingots, of aluminum--were trucked to the Seattle area. There, a mill pressed each thick ingot into a thin rolled sheet of aluminum. Then, at another factory, a high-powered press punched cups resembling tuna cans out of the aluminum sheet. Other machines stretched your can out to its final height, trimmed its edge, printed its colorful design, and applied a clear protective varnish. Ovens baked the can twice, once to dry the printing and once to cure a synthetic coating sprayed on the inside of the can. At the bottling plant, machines filled the can with near-freezing soda and immediately crimped the top on. The can cost more than the soda inside. If you threw your cola can into a recycling bin, it was one of 100 billion beverage cans used each year in the United States; 40 billon are tossed into landfills, and 60 billion are recycled. Your can was later trucked to a recycling center, shredded, and melted down.

Within two months of being tossed, it reappeared as a new can. Recycling the can took 5 percent of the energy required to mine and smelt a fresh one.

What to Do? Buy drinks in refillable bottles, once a common form of drink packaging. Refillables consume much less energy than aluminum cans-even if 90 percent of cans are recycled. Use aluminum only where its light-weight will save energy, as in cars or, better still, bicycles. Drink less soda. It's just fizzy sugar water. Have some water instead.

Secret Life of A Computer

The Oklahoma Department of Environmental Quality's Use Less Stuff Week's goal is to increase citizen awareness about the total environmental impact of some of the items they consume. One crucial item that we can't do without in the 21st Century is computers. Computers use electricity both in production and in usage--chips and chip packages, and circuit boards. They contain glass, copper and about 700 other materials. Many of these materials must be extracted from the earth and about half of them are hazardous, making their disposal difficult. Chemical use and pollution remain heavy in this industry. The United States owns 40% of the world's 300 million computers.

A 150-watt current brings our computer to life—enough to power two incandescent light bulbs. Computers take 5% of the electricity used in American offices. (In comparison, lighting uses 2-25%.) Complicated screen savers with moving images do not save energy. Most of the time personal computers are turned on, they are not actually being used. One-third of computers in the United States are left on all the time, including nights and weekends when they are not used. (Turning a computer off and on is actually GOOD for it.) Consequences of electricity generation depend upon the area served, but in Seattle it is would be powered by a hydroelectric dam walling off salmon habitat in the upper Columbia River.

That beige computer that stares at you 40 hours a week consists of about 55 pounds of plastic, metals, glass and silicon. The heart of it is one-fiftieth of a pound of silicon and metal formed into integrated circuits known as chips or semiconductors. The 400-step process of making the chips generates more waste than any other part of the computer.

The process begins with silica (or silicon dioxide, the basic ingredient of sand) mined in Washington. The silica is heated with carbon in an Oregon plant to form carbon monoxide and 98% pure silicon. This silicon is heated with hydrochloric acid, then with hydrogen gas, and cooled to form a "hyper-pure" silicon rod eight inches across. The crystalline rod was sliced into wafers less than a millimeter thick, and the rod is then sliced into wafers less than a millimeter thick. These are then ground and chemically polished to a mirror-like shine and trucked to the chip manufacturer in California's Silicon Valley.

The chip factory, called a wafer fab, stretched longer than two football fields and housed equipment manufactured by more than 100 companies around the world. One computer's worth of chips or "wafers" are made in "clean rooms", where only one to five particles are present in each cubic foot of air and workers wear gowns, booties and gloves to avoid contaminating the chips. Keeping these rooms particle free requires pumping the inside air thorough special filters that remove fine particles. But the filters do not remove solvent vapors, some of which are toxic, from the air the workers breathed.

Next the silicon wafer is cleaned with acid, then heated to form a protective surface layer of silicon dioxide. Workers look through microscopes using ultraviolet light, light-sensitive chemicals, chemical developers, patterned masks and some of the most precise machinery ever invented to etch a pattern of minute circuits across the wafer.

Further etching created holes in which high-energy machines planted phosphorus and boron, which would eventually carry electricity through the finished chips. Each of these steps is repeated several times, and after most of the steps, the chips were chemically or mechanically cleaned. Producing the chips in your computer generated 89 pounds of waste—4500 times the chips' own weight!—and used 2800 gallons of water.

Paper-thin layers of Arizona copper are applied to each chip's surface, chemically etched, cleaned, then oxidized for insulation. Machines apply an even thinner layer of gold to the back of each chip. After more chemical cleaning, a ship carries the wafer to Malaysia in a box of unbleached Oregon Douglas-fir pulp with shock-absorbing insets of black polypropylene foam from Japan. The shippers will reuse the box and inserts six times before recycling them.

Chip packages are made In a factory operating around the clock in Malaysia. Workers earning about $2 an hour and Japanese robots running on coal-fired electricity cut the wafer into hundreds of individual chips and assembled into packages. Each package consists of a chip, frame, wires and plastic housing. Face-masked, gloved workers glue each chip to an etched copper frame, run tiny wires of South African gold between the frame and the chip, and a molded plastic compound around the package. Because gold is so expensive, gold miners can profitably mine ores that have less than one part per million of gold, leaving behind huge piles of mineral waste contaminated with toxic metals and the cyanide used to extract gold.

After the completed chip packages are shipped back to the United States, the computer manufacturer inserts them into printed circuit board in the disk drives, keyboard and other devices, as well as into the "motherboard," the main circuit board on which most internal components are mounted. When a Texas factory makes the circuit boards, the manufacturing process uses more chemicals, energy and water as well as generates more hazardous waste, than the making of any other part of my computer. Machines cut boards made of copper, fiberglass, and epoxy resin to size, drilling holes in them and cleaning them.

In a process not unlike making chips, the holes are plated with a thin layer of copper and the boards etched with circuit patterns. This process generates airborne particulates, acid fumes, VOC's (volatile organic compunds) and other chemical wastes. Then the boards are plated with layers of copper and tin-lead solder. The tin is imported from Brazil and the lead is recovered from dead car batteries in Houston. (Recycled lead meets 60% of U.S. demand annually.) The U.S. consumes half the world's lead, mostly for car parts. Because lead is highly toxic and hard to dispose of legally, 90% of car

batteries are recycled. Yet lead waste from electronic goods is almost never recycled because it is scattered throughout the computer. Etching and cleaning left behind a pattern of copper wiring on the circuit boards. Assembling and soldering the boards also produced lead, copper, VOC's and solvent wastes.

What we spend all of our time looking at is the wide end of a cathode-ray tube (CRT), a vacuum tube made of glad with electron guns at the far end. If the CRT was made in Japan, a manufacturer there used various chemicals and ultraviolet light to etch a minute pattern of black stripes and then red, green and blue phosphors on the glass for the monitor's front panel. Every color we see on the screen is actually a combination of these three colors.

The sides of the CRT are soldered to the front panel with lead oxide and heated, fusing the parts together to form a bulb. Discarded color monitors are classified as hazardous waste because of lead in the glass. By the year 2005, about 150 million personal computers will have been sent to landfills in the U.S. They will occupy about 300 million cubic feet, equivalents to a football field stacked a mile high in computer trash

Ships, planes and trucks brings the various computer components to the California plant where they are assembled. The finished computer is carefully boxed with polystyrene foam inserts and trucked to a suburban superstore just for you. In all, factories making a 55-pound computer generate 139 pounds of waste and use 7300 gallons of water and 2300 kilowatt-hours of energy (about one-fourth the energy the computer would use over its four-year lifetime). State-of-the art factories could have made the same computer with half to two-thirds less waste and different computers—with flat-panel displays (like laptops) instead of today's big vacuum tube monitors, for example—could have been made with even less waste

Computers were supposed to herald paperless offices, but with multiple drafts and reprinting to correct every little error, computerization has probably increased paper—and energy—demand. For a typical computer system, it takes at least as much energy to make a year's worth of paper as it does to run the computer for that time.

About 700 different materials and chemicals go into manufacturing your computer—half of these are hazardous. Computer plant workers exposed to toxic chemicals suffer lung diseases, skin rashes and even increased rates of miscarriage. Electronics manufacturers have bestowed California's Silicon Valley (Santa Clara County) with large areas of contaminated groundwater and the highest concentration of Superfund hazardous waste sites in the U.S.

Chemical use and pollution remain heavy in the industry, but computer manufacturers, at least in the U.S., have made progress in reducing their toxic releases. According to EPA's Toxic Release Inventory, computer manufacturers generated 10 million pounds of toxic waste in 1990, two-thirds less than they did in 1997.

A glassworks in Kobe made the glass for the front of your monitor, using mostly local sand and electricity from a power plant burning Australian coal. The glass also contained 5-0% each of strontium oxide (from Mexican ore), sodium oxide (from local salt), potassium oxide (from Russian ore), and barium oxide (from Chinese ore).

A different manufacturer made the CRT's sides. Its glass contained 22 % lead oxide (to absorb x-rays generated by the CRT) from Australia and was coated with graphite made from Saudi petroleum. Because a monitor contains five different types of glass, and their compositions vary by manufacturer, the glass from old monitors is seldom recycled.

Your computer was enclosed in a shell of ABS (acrylonitrile-butadiene-styrene) plastic. It was mostly Saudi Arabian oil, refined near Los Angeles. A nearby chemical plant turned the oil, along with benzene (from Wyoming coal), ammonia (from Texas natural gas), heat, catalysts, and chemicals, into the ABS ingredients. These ingredients were mixed into small pellets and injected under heat and pressure into a mold. They fused together, taking the basic shape of your computer.

Plastic has a deservedly poor environmental reputation, but it began as an environmental good guy. In 1868, during a severe shortage of tusks, a New England manufacturer of ivory billiard balls offered a $10,000 prize to anyone who could come up with a suitable substitute for ivory. A few years later, a printer from Albany, NY won the prize with a product he called celluloid. The world's first plastic, celluloid, would later be used (even synonymous with) motion-picture film. Yet when a British scientist had invented the substance in 1850, he deemed it useless; he gladly sold the patent rights to the American printer.

Your computer's 2.5 pounds of copper began as copper sulfide ore, much of it mined from the Chilean Andes for export to Asia. By law, 10% of Chile's copper revenues go to the Chilean military. If the ore contained 0.9% copper (the global industry average), making your computer required excavating 280 pounds of ore and at least 300 pounds of other rock lying on top of the ore. The ore was pulverized, mixed with water and chemicals, and boiled to obtain pure copper. Boiling also produced sulfur dioxide (SO_2), which causes acid rain. Worldwide, the SO_2 emitted in copper production is equivalent to one-fourth the SO_2 emissions of all industrial nations. Even though your computer contains less copper than your car (40 pounds) or the pipes and wires in your house (even more), it is still enough to have a big impact. Mining, crushing, grinding and smelting the 2.5 pounds of copper required the energy equivalent of 73 gallons of gasoline. Mining and producing metals accounts for about 7% of global energy consumption.

What can we as citizens do to reduce the impact of our best friend, the computer? Print less often.

Turn off your computer, or at least your screen, whenever you're not using it. Choose the most power-saving settings in your computer's setup. Look for EPA's Energy Star logo if you buy new equipment. If you need to upgrade your computer, have new memory or circuit boards added rather than replacing the whole thing. If you need a new computer altogether, refurbish a used one or buy a laptop, before buying a new desktop. Laptop computers weigh about one-tenth as much as desktops and require about one-third the electricity.

Seven Wonders of Sustainability

According to Seattle author John Ryan, people can do plenty by simply digging through their cupboards or picking up everyday tools. He outlines a bold and powerful prescription in his new book, "Seven Wonders: Everyday Things for a Healthier Planet." Each chapter begins with a simple, everyday object: Pad Thai, ladybug, ceiling fan, condom, bicycle, clothesline and public library. If used by more people, each could effect enormous changes on the environment, Ryan says. Then he launches into engaging discussions of the benefits of each "wonder" and about the broader issues they symbolize.

"There's a huge gap in this country between how much stuff we take from the Earth and how much we can take from the Earth if we want to have a healthy world and future," Ryan says. "Yet all the tools to close the gap exist. The problem is we're not using them enough."

Though the book's title sounds formulaic, it is surprisingly lively and informative, upbeat without sounding sappy, educational but not professorial. The writing style is light-hearted, sometimes wry, yet has a deadly serious intent: to wean Americans from their overconsumptive ways.

A liberal sprinkling of gee-whiz facts, carefully researched and documented, adds spice to the narrative. For instance, he points out why people should think twice before buying halogen floor lamps, which he says ". . . are basically 700-degree F electric heaters that emit 5 percent of their energy as light." And by allowing office workers to dress casually, employers can save about $150 a year per person in cooling and electrical equipment costs.

The book has generated positive feedback from local environmental organizations. "Our board of directors has not taken a position on Pad Thai," joked Tom Geiger, the outreach director for the Washington Environmental Council, a statewide group that represents 90 environmental organizations. "But, yeah, if people rode bicycles more and used air conditioning and ceiling fans more, they could make a difference. Small actions, multiplied by millions of people, really add up."

Professor John Palka, co-director of the University of Washington's Program on the Environment, believes the book provides a public service. "There's hardly anything (in the book) that hasn't been said before," Palka said, "but (Ryan) has put it together in a neat package." Although many people can't incorporate all of Ryan's "wonders" into their own lives, Palka said, the book has a greater purpose.

"The broader message," he said, "is to live a life mindful of the impact each of us has on the planet's resources."

Here's a brief look at four of Ryan's wonders and why they're worth considering:

Bicycles: Ryan (and many others) considers bicycles to be one of the most efficient forms of transportation ever invented: "Pound for pound, a person on a bicycle expends less energy than any creature or machine covering the same distance," he writes. According to Ryan's research, it's the world's most widely used transport vehicle, outnumbering automobiles by a ratio of 2-to-1. Yet in the United States only about 2 million people are regular bicycle commuters. Besides the obvious benefits of not consuming fossil fuels and not causing traffic jams, bicycles also are much safer than cars, the leading worldwide killers of men 15 to 44 years old. Many people scoff at the idea of using bicycles because of the long distances they must drive. But research shows that half of all commuter trips in the U.S. are three miles or less, well within bike range.

Ceiling fans: A simple ceiling fan can make a room feel up to 9 degrees Fahrenheit cooler, yet operates on about one-tenth of the electricity required to run an air conditioner. Although the Northwest's mild year-round temperatures don't tempt many homeowners to install air conditioners, commercial buildings often use them.

Ryan advocates a greater use of ceiling fans because air conditioners consume about one-sixth of the electricity produced in the U.S. On a hot summer afternoon, air conditioners devour "43 percent of the nation's peak power load - enough to occupy (and require the construction of) 2,000 giant power plants, each costing over $1 billion." Energy conservation, Ryan says, is a key component of reducing America's use of natural resources and of arresting global warming.

Pad Thai: The highly seasoned Asian dish made of noodles, garlic, and vegetables, sometimes with bits of chicken or shrimp thrown in. Ryan doesn't mean to celebrate that particular dish so much as the basic principle of "peasant" cooking around the world: Start with starch, mix in veggies, add great seasonings, and use meat sparingly if at all. Could as well be tortillas and beans, curry and rice, or spaghetti and tomato sauce. Healthy, cheap, do-it-yourself, easy on the planet, delicious.

The ladybug: Constantly searching out and destroying plant pests, without charge, without environmental damage. Your average ladybug scarfs up forty to seventy-five plant-sucking aphids a day. Multiply that by 75,000 beetles per gallon, which farmers can order through the mail, and you've got one heck of an efficient pesticide. Something like 98 percent of sprayed chemical pesticides never even hit a pest, but ladybugs zoom right in on the aphids and nothing but the aphids.

Donella Meadows, recently deceased renowned sustainability author, had to say this about Ryan's Seven Wonders, "What do all these wonders have in common? Well, their kindness to the Earth and to human health is what qualifies them for a sustainability list. They are accessible to anyone, inexpensive to obtain and maintain. Many of them serve not only practical but also esthetic needs; they satisfy the eye, the palate, or the soul. Most are old in concept, though they may have modern variations. Something like them has evolved in many different cultures. Most are objects you can buy, but usually from a local maker, not a multinational corporation. Maybe that's why we don't much appreciate the humble, sustainable wonders around us. Their value is too obvious to need touting. You only have to spend billions "marketing" something if its worth is in doubt. "