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**SPECIAL
RECYCLING
EDITION**

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Benefits of Recycling

Conserves Natural Resources

- Recycling a ton of paper saves 17 trees.
- Recycling a ton of steel conserves 1-1/2 tons of iron ore, 700 pounds of coal.

Conserves Energy

- Recycling a ton of newspaper saves the equivalent of 70 gallons of gasoline. Recycling an aluminum can saves the energy of 6 ounces of gasoline.
- Wisconsin's waste has enough energy to heat 300,000 houses each year.

Economic Value

- Scrap materials are often less costly to manufacturers than virgin materials.
- Recycling reduces the cost of solid waste collection and disposal.
- Wisconsin's waste has a potential estimated economic value of \$100-million a year.
- Recycling and resource recovery provides jobs.

Reduces Foreign Impacts

- The US imports more than 75% of two dozen minerals.

Reduced Need for Landfills

- Recycling a ton of typical municipal waste saves nearly 20 cubic feet of landfill volume.



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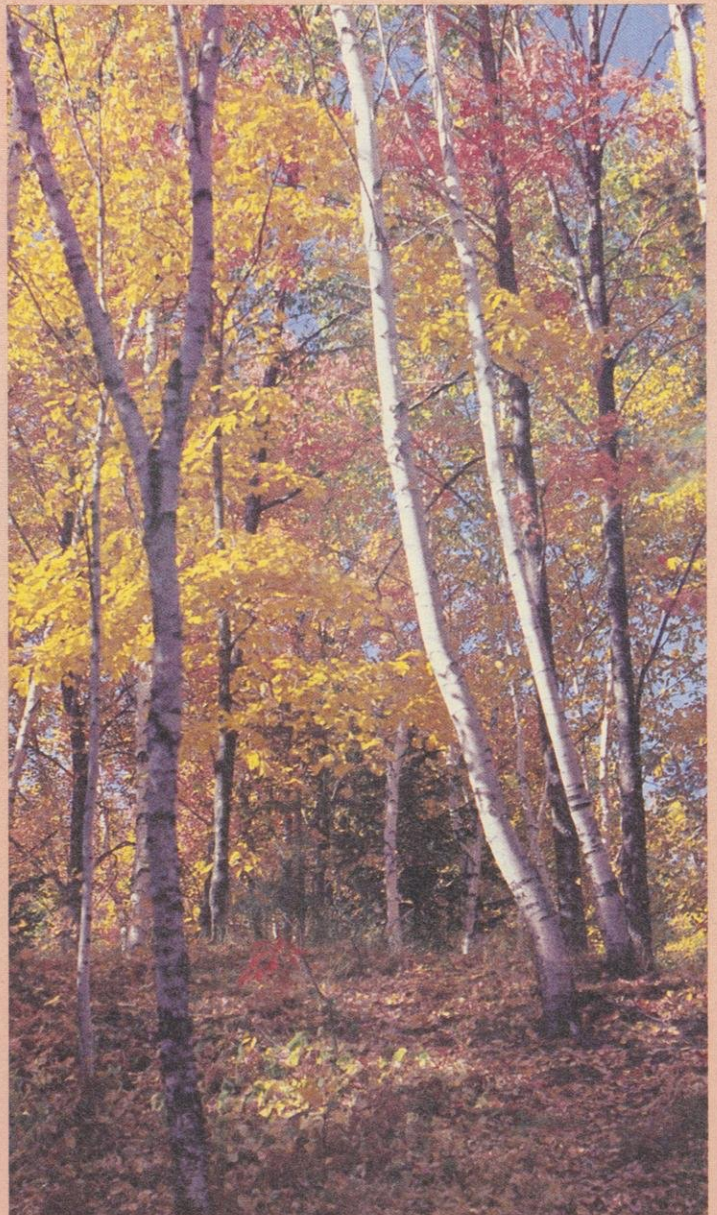


Photo by Robert Keller

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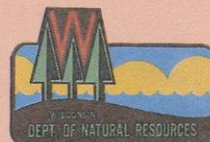
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Changing garbage into gold

If you toss out 6 1/2 million tons of stuff a year, the way we do here in Wisconsin, pretty soon there's no place left to put it. DNR has launched an all-out campaign to recycle our waste or burn it as fuel to create energy.

John Reindl,
DNR Recycling Coordinator

In the world of nature, the concept of waste as trash doesn't exist — all things are recycled. The water we use for drinking, washing, watering the lawn, swimming and anything else goes round and round and has been here since earth began. Put to one use, its molecules reform and show up again elsewhere. The same with plants and animals. Nutrients move through the generations forever. Autumn leaves enrich the soil for future growth. Over the eons, a complex system has evolved to convert the residue of one life form into new life for others.

Imagine a world where nature didn't recycle! What if trees didn't decompose when they fell? If leaves piled up year after year? If water and oxygen were not continually regenerated? Only recycling makes life perpetually possible. Otherwise, it would demise in its own debris.

People today, however, defy the principle. Not only are they ultra-wasteful, the large quantities they chuck out decompose very slowly, if at all. In Wisconsin alone over 6 1/2-million tons of solid waste are thrown away each year. That's enough to pile a typical city street six feet deep, curb to curb for more than 500 miles, about the distance from Superior to Chicago—or if compressed, the way it is in the state's 1,100 landfills, enough to bury your average 200 acre Wisconsin farm under 30 feet of stuff.

Measured by weight, three major materials make up nearly half the waste that burdens Wisconsin landfills: sludge from pulp and paper mills, ash from combustion of coal by utilities or other industry, and foundry sand.

The rest of Wisconsin's trash — 55% — is classified as "municipal waste." It comes from homes,

offices, stores, schools, business, industry, demolition projects, construction sites and similar sources.

Landfilling all this, which unfortunately is how we handle it now, is prodigally wasteful. Natural resources and energy are buried alive and possible environmental effects a constant worry. But better recycling and resource recovery could turn these losses to gold. Not only that, the need for foreign imports would be reduced, cheaper raw materials would be available, and since recycling is labor intensive, jobs would be created.

The idea isn't new—an estimated 5-million tons of material were recovered in Wisconsin in 1984—but it's had its ups and downs. Recycling, and to a smaller extent, energy recovery have been around for generations, sometimes on the margins of public consciousness, other times right up front. Right now, they're up front and public awareness is stimulating action by both state and local government. Wisconsin law and DNR programs have been revamped and upgraded to reflect the change.

The recycling cycle hit a peak back during World War II when everything from farm tractors to metal foil, from chewing gum to peach pits was collected and reused. After the war, interest stagnated and for 25 years, it was status quo. Then came the environmental movement and Earth Day, 1970. Communities, local government and volunteer organizations got involved. Major impetus was to save resources. Grass roots involvement, especially by homemakers, kept it going. Unfortunately, many of the programs finally closed because markets declined, prices dropped and enthusiasm wore off.

Another major recycling and resource recovery revival hit in the late 1970s and early '80s, prompted by anti-landfill sentiment and the energy crisis. Old dumps with problems began to pop up all over the country and the resulting "Love Canal Syndrome" made finding a place to



Annual recycling in Wisconsin

Scrap iron and steel
1.5-million tons

Waste paper
1.3-million tons.

Pavement
1.5-million tons.

Utility fly ash
160,000 tons

Glass
35,000 tons

A pile of money? Maybe! If it were reused, recycled, composted or burned for energy, the 6 1/2-million ton trash pile Wisconsin buries every year would turn into dollars. It's happening slowly, but DNR wants to speed up the process.

Photo by John Reindl



build almost any local landfill highly controversial. Also, real estate, tipping fees and other operational costs had risen drastically, encouraging alternatives to land disposal. By early 1985, there were over 500 active community recycling programs in Wisconsin. They collected newspapers, aluminum cans, used motor oil, glass, plastic, cardboard, magazines, batteries, cooking oils, rags, wood, and leaves and grass for composting.

Waste reduction and energy recovery have now become vital alternatives to land disposal. Reflecting this, DNR will launch an aggressive, all-out push to get active programs operating in every Wisconsin community as soon as possible. It's hoped a four point approach will do the job:

1-Information and education (I&E). 2-Technical assistance. 3-Financial aid. 4-Regulation.

As part of the I & E effort, DNR personnel will talk to local organizations, government, industry and schools; provide fact sheets and audio-visual aids; and develop exhibits for State Fair and other locations. The programs are designed to stimulate an examination of landfill alternatives and illustrate what others are doing in waste reduction, composting and resource recovery. Both advantages and disadvantages of the various alternatives will be presented.

Technical assistance will be given where waste reduction or recovery programs are either operating or being developed. It might include identifying markets, providing

information on processing equipment or techniques, ideas for system design and management, possible funding sources, legal requirements, or analyzing economics of a proposed system. For example, as part of this effort DNR currently issues a directory of recycling markets which lists over 200 companies that handle metal and 130 that take paper, plus businesses that recycle rags, plastic, cooking oils and grease, glass, old barrels and drums, and wood pallets. Most of these materials come from commercial and industrial sources, machine shops, product manufacturers, printers, publishers, and various offices.

DNR financial assistance is available under two programs: the Wisconsin Fund makes grants to local units of government for planning and feasibility studies; and a new program gives aids to businesses and nonprofit organizations as well as local government for demonstration projects that show innovative techniques in waste reduction and recovery.

In certain instances aids are also available from other state agencies. The Department of Development has given community block grants where resource recovery or recycling is tied to local economic development. Local agencies serving the handicapped have received funding from the Department of Health and Social Services for projects that provide work for the disabled. Foundations, private businesses and local government also fund recycling projects.



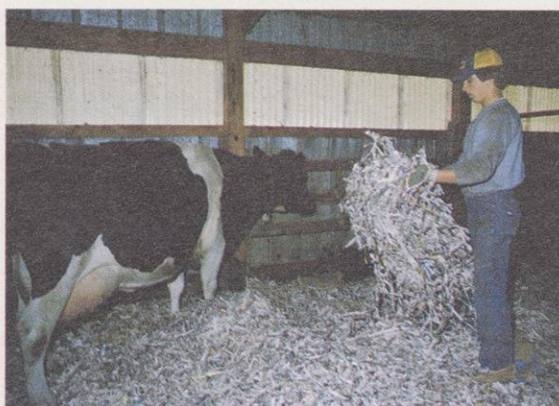
Collecting newspapers for recycling has been a kids' fundraiser for more than 50 years. Only the vehicles have changed—and the amounts produced. Today, 1 1/3-million tons of paper are tossed into Wisconsin landfills every year. An equal amount is recycled, but a lot of that is shipped in from out of state.

Photos courtesy of UW-Extension and the Public Works Historical Society

Financial assistance of a different sort was voted by the legislature in 1984 when it eliminated the sales tax on equipment used in waste reduction, recycling or resource recovery.

The final stimulant is regulatory. State law requires all communities above minimum populations, regardless of whether they have a landfill, to establish recycling collection centers for old motor oil, newspapers, aluminum, glass and plastic if such centers don't already exist. Exemptions are granted for the last four materials when markets are not available. In addition, Governor Tony Earl's new recycling law, enacted in May 1984, requires landfills themselves that are open to the public, whether community-owned or not, to establish collection centers. The law also requires applicants for new or expanded landfills to examine possible alternatives and describe measures to implement them. Another mandate directs each state agency to recommend changes in statutes, administrative rules, or policies to encourage alternatives to landfilling.

Wisconsin law also calls for research and development of recycling and resource recovery systems and declares them preferable to land disposal. Specifically, state policy lists priorities for action in this order: 1-Reductions in the



Shredded newspapers are becoming popular as animal bedding.

Photo by Bob Wallen

amount of waste generated. 2-Reuse of solid waste. 3-Recycling. 4-Composting. 5-Energy recovery. 6-Land disposal.

Under the heading of waste reduction, some companies have switched from chemicals that produce hazardous wastes to nonhazardous chemicals. Others have upgraded treatment systems to reduce the quantity of waste that goes to a landfill. Consumers can help by avoiding nonreturnable and nonrecycleable packaging.

Reuse means using a product over again in the same form as it was previously used. This can range all the way from your paper lunch bag to the billions of soda and beer bottles returned and refilled each year; from the resale of furniture,

For years voluntary door-to-door pickup of familiar waste products has financed local projects because recycling has been profitable. Now the law mandates collection centers in numerous communities for oil, newspapers, glass, aluminum and plastic because it saves expensive landfill space.

Photos courtesy of Western Dairyland and the Salvation Army archives



During World War II interest in recycling was at a peak.

Photo courtesy of the Public Works Historical Society



used books and rebuilt automobile and truck parts to reusable space shuttles.

Recycling is similar to reuse, but involves the manufacture of a new product. For example, old cardboard boxes are ground up, the ink and other contaminants removed, and the fibers reformed into new cardboard. Materials can often be recycled many times.

Composting — nature's method of recycling organic materials — is the controlled decomposition of waste into humus that can become part of the soil. Compost can be made from just about any organic waste—leaves, grass clippings, municipal sewage sludge, residue from food processing plants, and even mixed solids.

Energy recovery systems burn waste to produce hot air, hot water, steam or electricity. Municipal solid waste contains about one-third to one-half the energy of coal on a pound-for-pound basis and a typical steam plant can recover about half of this.

Unfortunately, landfills will always be necessary. Even the most effective waste reduction system ultimately needs one. The amount of space required, however, can be dramatically reduced with some communities able to cut landfill needs by 90% on a volume basis.

The automobile is a good example of how these priorities are implemented. To improve energy efficiency and reduce costs, manufacturers have reduced their car's size and weight. When no

Recycling metal is big business in Wisconsin. Scrap dealers handle 1.5-million tons per year—about \$90-million worth. They get most of what's thrown away. Only about 250,000 tons are landfilled. DNR photo



**Recycling
in Wisconsin**
Rendering
30 companies

longer wanted by the original owner, most automobiles are sold and reused by others. Even parts from inoperable cars can be reused — radiators, transmissions, radios, engine blocks, etc. What is not reused can then be recycled, usually by first shredding the car into small pieces, removing iron and steel with a magnet, and separating other metals by hand, with mechanical systems, or by liquid flotation. Although composting isn't a part of the automobile recovery process, researchers are looking for ways to burn the combustible residue and produce energy. Finally, what can't be economically recovered is landfilled.

As the state's lead agency on solid waste management, DNR will aggressively promote the programs described here. Overall goal is to reduce the amount of landfilled waste by 50% as of 1990. Information, education, technical assistance, financial aid, and regulation, all guided by state policy, are the tools that can make it happen. The goal is both ambitious and achievable, but only possible with the cooperation and participation of every Wisconsin resident—homemakers, students, office workers, factory workers, farmers, industrial managers, and government officials. Solid waste is produced by all of us, and all must be part of the solution. Ultimately, we must learn to emulate nature with a system in which the concept of waste as trash doesn't exist. That way we will avoid burying ourselves in our own debris.

Recycling Cooking Oil, Grease and Fat



Surprisingly, recycled products from rendering plants go into ice cream, margarine, shortening, lipstick, animal feed, tires and many other familiar consumer items.

Photo by Jill Kerttula

Sometimes called the "invisible industry" because few people know it exists, rendering plants in the US annually recycle the second largest amount of material in the country—more than 15-million tons. Only metal recyclers use more. Renderers process old cooking oil, grease, fats and even dead animals into both edible products and chemicals. Restaurants, butcher shops, meat packing companies and farmers are the source of supply. Renderers produce animal feed supplements, tallow and grease for use in lard, shortening and margarine, and chemicals for use in ice cream, ink, paint and plastics. Wisconsin has more than 30 renderers. The largest, the Milwaukee Tallow Company has an annual capacity of 200-million pounds a year.

CASH FOR YOUR TRASH



How do you clean up your recyclables so they're ready for the long road to resource recovery? First, you might ask why that's important. The old adage in the business is that scrap is bought, it isn't sold. People who buy recyclables are not charities who want to give you a few cents for your good deeds. It's strictly a profit-making business. The price a scrap broker gets per pound or ton of waste is pretty low. So the scrap dealer who has to spend excess time cleaning up recyclables for the market will be out of business in a hurry.

Clean recyclables are important to you, too. It can really put a damper on your recycling program's enthusiasm if a scrap broker rejects your shipment because paper, metal and glass are mixed together or otherwise contaminated. It's also embarrassing because your recycling group either spends several hours cleaning up the scrap or carts it to the landfill.

GLASS

should be separated and stored by color — green, brown and clear (flint). All metal caps and rings should be removed, but you usually don't have to soak off glued labels. When glass is recycled, it's heated and melted in furnaces which burn off the labels. Glass should be delivered unbroken for safe handling. All glass isn't created equal either. Window glass, baking glass, windshields, light bulbs, milk-white glass and crystal normally can't be recycled. Make sure all glass has been washed and dried. Food residues can attract bugs and vermin. Cleaning rotting residues from dirty jars and bottles is a smelly, distasteful job!

MOTOR OIL

can be recycled and re-refined for a fraction of the cost of producing new oil. Many communities have public oil recycling tanks and many service stations will also recycle oil for you. Don't contaminate motor oil with antifreeze or other oils and make sure you seal used oil in a leakproof container before transporting it to the recycling center.

FOOD AND ORGANIC WASTES

the single largest part of household waste; see The Green Machine on page 36.

PLASTICS

can be tricky to recycle because there are so many different kinds. You might start by recycling only two kinds of plastics like milk jugs (high density polyethylene) and the thin, clear plastic bags used for sandwiches, produce and dry cleaning bags (low density polyethylene). Plastics should be separated by type with all caps removed; some markets also require removing or cutting out labels. If you decide to recycle milk jugs, make sure that consumers rinse them thoroughly three or four times and drain them until completely dry. Remove all caps BEFORE recycling. Nothing sours the disposition of recycling center workers like the odor of spoiled milk.

FERROUS METALS

contain iron, so they stick to a magnet. Separate ferrous metals by type: cast iron, sheet steel and tin cans. If you are recycling cans, rinse them, remove labels (recycle them with your mixed scrap paper) and ends, flatten the cans to save space and store them in paper sacks or boxes. Old cars, farm equipment and major appliances ("white elephants," in the trade) are major sources of ferrous metals for recycling and good money makers. Check with your scrap dealer for proper preparation.

NEWSPAPER

is easy to package for recycling. Simply separate any glossy, shiny paper from the recyclable newsprint. Magazines and any paper with glue (like phone books or envelopes) should also be pulled out. Keep newspaper clean and dry, bundled in stacks less than a foot thick and tied with twine. In many communities bundled newspaper will be recycled if placed next to the trash cans on garbage collection day. If it looks like it's going to rain on garbage eve, store your newspaper in a dry place. Rain may make the news very absorbing, but no one will recycle wet paper.

ALUMINUM

is recyclable and, currently, profitable. Aluminum cans should be cleaned and stored separately from other recyclable aluminum like ice cube trays, pie tins, foil, aluminum siding and lawn furniture. If you question whether a metal is aluminum or ferrous, test it with a magnet. Ferrous metals stick to a magnet, aluminum doesn't. Inspect cans carefully. Some cans with aluminum tops and steel sides are not recyclable. These bimetal cans should be separated and discarded. Another clue — usually all aluminum cans have a rounded bottom and no seam. Ferrous and bimetal cans often have a noticeable side seam and a squarer, seamed bottom like vegetable and fruit cans.



Energy recovery— past, present and future

While energy recovery systems may be a “hot” topic on today’s solid waste agenda, its roots date back to the 19th century. The first incinerator was built in England in 1874, without energy recovery. Two incinerators were built in the US in 1885, followed in 1903 by an experimental plant in New York City that produced steam from burning waste.

Wisconsin was an early leader in energy recovery. In 1909, Milwaukee built a 300 ton per day incinerator with four furnaces and four boilers. At the time, it was the largest incinerator in the US. Located at the mouth of Milwaukee harbor, the plant was retrofitted in December 1913 to produce electricity for pumping water from Lake Michigan into the Milwaukee River to flush out the lower mile of river.

While more than 300 incinerators were operating in the US by 1920, few recovered energy. For the next 50 years incineration was not held in very high esteem. It lacked technology to control smokestack pollution; the cost of other fuel was too low to bother; and landfills answered the waste disposal problem. By the late '60s, most incinerators in the US were either closed or about to close because of orders to upgrade air pollution control. The Milwaukee energy recovery plant ceased operations in 1971.

In the early '70s, however, interest in energy recovery rekindled. The Arab oil cartel sent prices soaring and Congress passed the federal Resource Conservation and Recovery Act. It let EPA fund several research projects to convert solid waste into energy, including a project in St. Louis to produce a refuse-derived fuel co-fired with coal and several projects to convert solid waste into a liquid fuel by a process known as pyrolysis.

Wisconsin again jumped into the forefront. Governor Patrick Lucey appointed a task force

on recycling to recommend the best role for the state. The task force suggested developing a solid waste recycling authority to build and operate resource recovery systems throughout Wisconsin on a regional basis. In 1974, legislation establishing the authority was passed and signed into law, and Wisconsin became a model for other states. The city of Milwaukee got involved by signing a contract in early 1975 with a private firm known as Americology to build and operate a resource recovery system. And in 1979, the cities of Madison and Waukesha also developed resource recovery systems.

Unfortunately, not all attempts were successful. The EPA-sponsored research projects were never put into commercial operation and both the state Recycling Authority and the Milwaukee Americology system were closed. However, each of these operations increased our knowledge and improved the opportunities for future success.

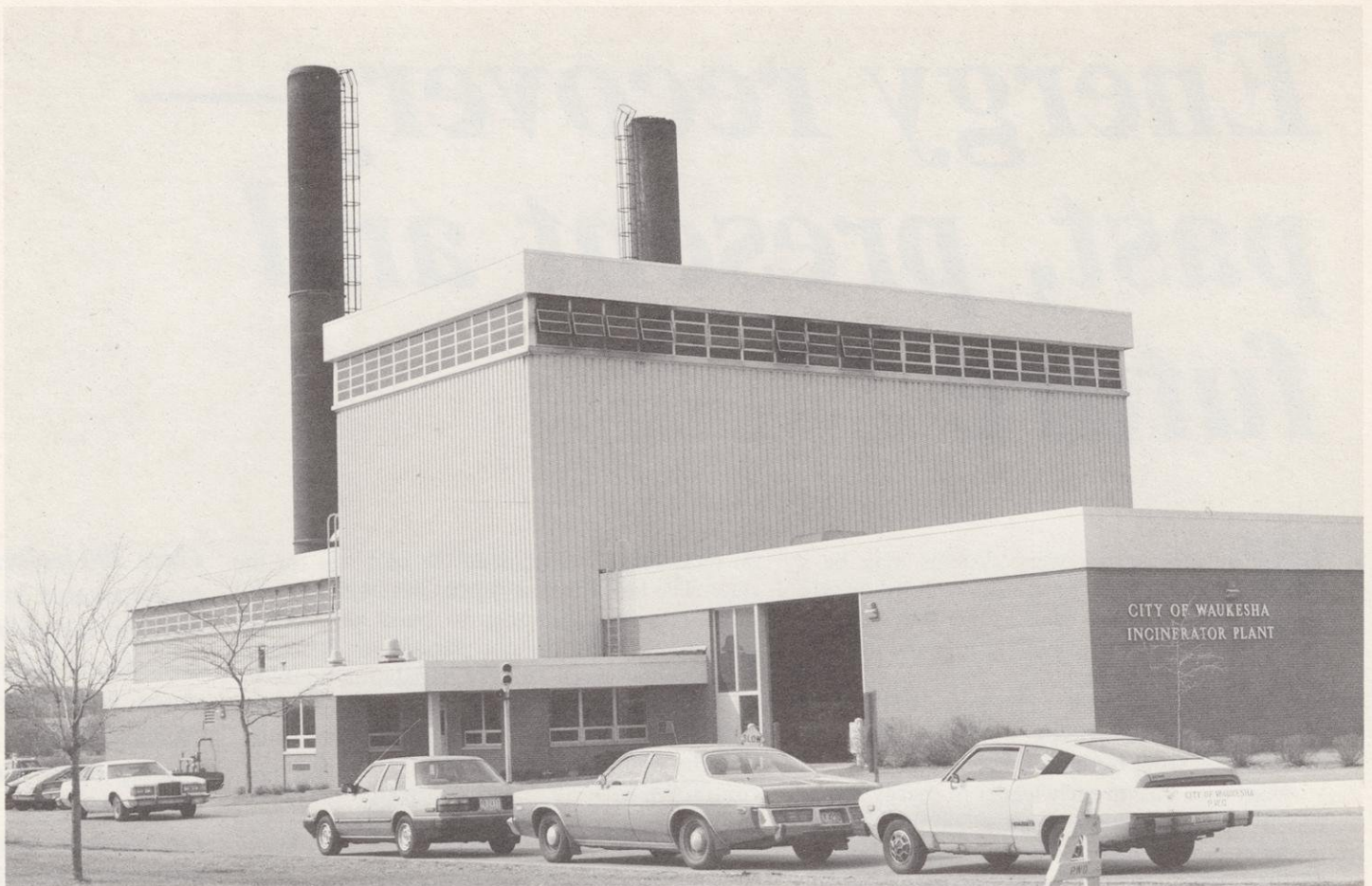
With that as an historical overview, where are we now with energy recovery?

According to a nationwide survey in the fall of 1984, approximately 60 energy recovery systems were operating in the US. Most fall into two major categories—refuse-derived fuel (RDF), and incineration. RDF is waste that is shredded into small pieces. Glass, metal and other noncombustibles are removed. The remaining material is then co-fired with coal or other fuel in an existing boiler. Incinerators, on the other hand, generally burn unprocessed waste in specially designed furnaces. There are two major types—small, modular units built in a factory, and large custom-designed ones constructed on site. Both RDF systems and modular incinerators are relatively new technologies developed in the US. The large mass-burn incinerators have been used for many years in Europe, Japan and elsewhere overseas. Worldwide, more than 400 units are in operation.

Other systems besides RDF and incineration may be in the works. One being tried would capture methane gas from landfills for fuel. And research is being done to convert waste into burnable gas and oil.

Once 300 incinerators operated in the US, but air pollution closed them down. Now they're cleaned up and coming back, but slowly because incinerators cost more than landfills. And some hazardous emissions still threaten.

About 20 Wisconsin communities are studying possible use of incinerators that produce usable energy from trash. At this one, trucks dump trash into the pit and a mechanical arm feeds it into the furnace. Incinerators could handle about 45% of the waste produced by Wisconsin municipalities. DNR photo



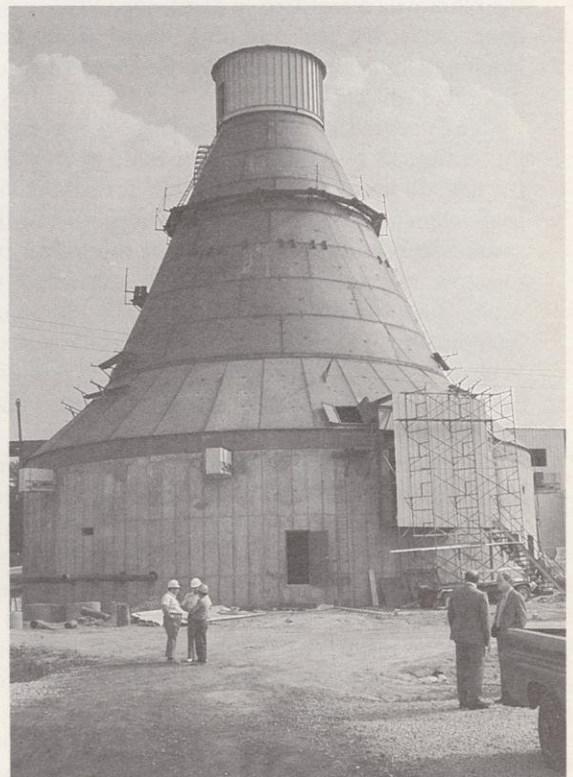
The Waukesha incinerator not only reduces trash volume by 90%, it also produces steam for sale to local industry and for use by the city sewage treatment plant.

Photo by John Reindl



Refuse derived fuel (RDF) is used by the Madison Gas and Electric Company and Oscar Mayer Foods Corporation. Both purchase it from the City of Madison which shreds waste into convenient three-quarter inch chunks. About 55% of all trash can be made into RDF, but most communities balk at it because the economics seem to favor landfills.

Photo by Sara Ballard



This giant storage silo for refuse derived fuel (RDF) in Milwaukee never became operational because potential customers failed to modify boilers to handle RDF. Not so in Madison, however, where 14,000 tons per year are produced.

DNR photo

In Wisconsin, two communities recover energy from municipal solid waste. The City of Madison has a refuse-derived fuel plant shredding waste into 3/4-inch pieces that are used in coal fired boilers by the local electric utility and by Oscar Mayer Foods Corporation. The other municipal waste-to-energy facility in Wisconsin is owned and operated by the City of Waukesha. First built in 1971 as a 350-ton per day, two-furnace incinerator, it was retrofitted in 1979 with advanced air pollution control equipment and a steam recovery boiler. Steam is sold to a local industry and is also used by the municipal sewage treatment plant. Waukesha County may buy this city incinerator and use it as a county-wide waste disposal facility.

Industries that have similar installations burn in-plant refuse, waste wood and shredded tires as fuel.

Energy recovery systems have many advantages. Biggest is the reduction in weight and volume of waste left to be landfilled. A typical RDF system can cut this weight by 50 to 75%, while an incinerator reduces landfill needs 70 to 80% by weight and 90 to 95% by volume. Contrast this with several comprehensive curbside recycling programs in Wisconsin which achieve a 35 to 40% reduction.

Another advantage is local production of energy. Solid waste has about half the energy value of coal and a ton of it equals approximately 70 gallons of fuel oil. Wisconsin's annual production of more than three million tons of municipal waste could heat 300,000 homes a year.

Use of waste as fuel would not only avoid the cost of landfills, it would also keep dollars spent on energy here in the state. It would save additional energy by reducing transportation costs. Waste would no longer go to remote rural landfills, but rather to incinerators and industrial boilers which are usually located right in the urban area.

Resource recovery and the resulting reduction in buried wastes can also lower the likelihood of land and water pollution. A 1979 EPA-sponsored study found that it resulted in lesser amounts of 14 pollutants commonly found in leachate from landfills.

But energy recovery systems aren't without problems. Pollutants like dioxin, furan, hydrochloric acid, heavy metals and fine particulates can be emitted from energy-recovery smokestacks. To control them, several states have enacted stricter air pollution standards. Wisconsin's are currently being revised to require more stringent design, operating procedures and pollution control equipment. Dioxin and furan, for example, can be dealt with by controlling the temperature and holding-time of combustion gases in the furnace. Scrubbers, which add chemicals, can get rid of hydrochloric acid. Heavy metals and fine particulates can be trapped in electrostatic precipitators and fabric baghouses.

Air pollutants aren't the only environmental concern in energy recovery. Many incinerators leave lead and other pollutants in their ash residue. Others don't. The reasons why some do and some don't are poorly understood. This problem will have to be solved before incineration can become a truly viable alternative to landfills. Once it is, ash can also be used as an ingredient of pavement.

Besides the environmental problem with incineration, the other big one is economic. Energy recovery systems are expensive. For a county of 40,000, a typical system to handle 100 to 150 tons of waste a day would cost anywhere from \$7.5 to \$10-million to construct and \$15 to \$25 or more a ton to operate including energy revenues. By comparison, a landfill for this population would cost \$500,000 to \$1-million to build and about \$10 to \$20 a ton to operate.

Another difficulty with many types of energy recovery systems is the question of market stability. While electricity or refuse-derived fuel can be sold to several users, the success of a steam producing incinerator is tied directly to the economic health of its customers.

Finally, there is the issue of energy recovery versus material recovery. Recycling conserves more energy per ton than does incineration, and can be done with a small investment in machinery. In addition, materials can be recycled several times while energy recovery destroys them to create heat. However, studies show the two to be compatible. Wisconsin law, however, gives preference to recycling over energy recovery.

What does the future look like for energy recovery?

Nationally, right now 60 plants are in operation; 21 are under design, construction or shake-down, 30 are being negotiated and 350 are in the planning stage. For the long-range future, a recent study forecast growth in energy recovery from 2 1/2-million tons a year in 1981 to 29-million by the year 2000.

In Wisconsin, the municipal systems at Madison and Waukesha are processing about 300 tons a day. The added capacity of other systems currently under study or development in the state would be more than ten times that amount, or nearly 4,000 tons a day. This would be almost 40% of all Wisconsin municipal waste.

Thus, while energy recovery systems are not a cure-all, they are very important in waste management and becoming more popular. Problems of environmental pollution, high cost, and long-term contracts are being worked on. They will have to be solved if Wisconsin's goal of reducing volume in landfills by 50% is to be met. Use rather than waste of garbage is the key and DNR will push the idea as far as its environmental commitments allow.



Recycling in Wisconsin

Energy recovery plants

Madison and Waukesha. Eighteen other communities are developing plans.

Three-million ton bellyache

Wisconsin landfills are overstuffed by three separate kinds of waste and the current dose of Alka Seltzer can bring only partial relief. Researchers are working on the whole thing.



Above: Sludge is a paper industry waste product and a massive 1.5-million tons is landfilled in Wisconsin every year—enough to bury the football field at Lambeau Stadium in Green Bay 280 feet deep. In an effort to reduce this amount, the industry has launched 30 different research projects and many show promise.

DNR photo

Sludge, fly ash and foundry waste. Sounds like something you could gag on! And that's what's happening to state landfills. These are Wisconsin's "Big Three" industrial wastes and approximately 3-million tons were buried in 1983. They represent about 45% by weight of all the landfilled waste in the state.

In order of volume, pulp and paper mill sludge is first, followed by fly ash from coal-burning power plants, then foundry sands. Depending on your viewpoint, they're either a big disposal headache or one of the great, unexplored business opportunities in Wisconsin. Relatively clean, and super-abundant, the Big Three are ripe and waiting for a good recycling idea. Some ideas have already surfaced. Think of fly ash when you gaze up at Chicago's Hancock Building. At the Sears Tower. Or the Hubert H. Humphrey Metrodome in Minneapolis. Fly ash was used in the concrete that built all three.

As numbers of landfills decline and expenses rise, recycling the Big Three becomes more urgent. On average, it takes between three and five years to develop a landfill and is extremely expensive, even as high as \$1-million. Besides expense, landfilling poses environmental problems. Heavy metals, PCBs, organics and other chemicals the three contain all pose a threat to groundwater.

So something has to be done, and companies that produce the Big Three have been given incentives. To encourage more recycling and reuse, the legislature has waived certain procedural regulations for them, providing they do some research and start reducing the amounts that go to landfills.

Pulp and Paper Mill Sludge is Wisconsin's heaviest industrial landfill burden. Approximately 1.5-million tons were buried in 1983. The biggest single producer is Fort Howard Paper Company of Green Bay which disposes of 550,000-tons annually in a landfill southwest of the city. The next most bloated site is the Winnebago county landfill, where six papermills cram in 174,000 tons a year.

So far, paper company research has turned up three major uses for its leftovers: landspreading, reclaiming ingredients for further papermaking and burning as fuel.



Foundries in Wisconsin employ 24,000 workers. The green sands that shape their castings can be reused many times but eventually break down and become waste.

Photo courtesy of the Grede Foundries

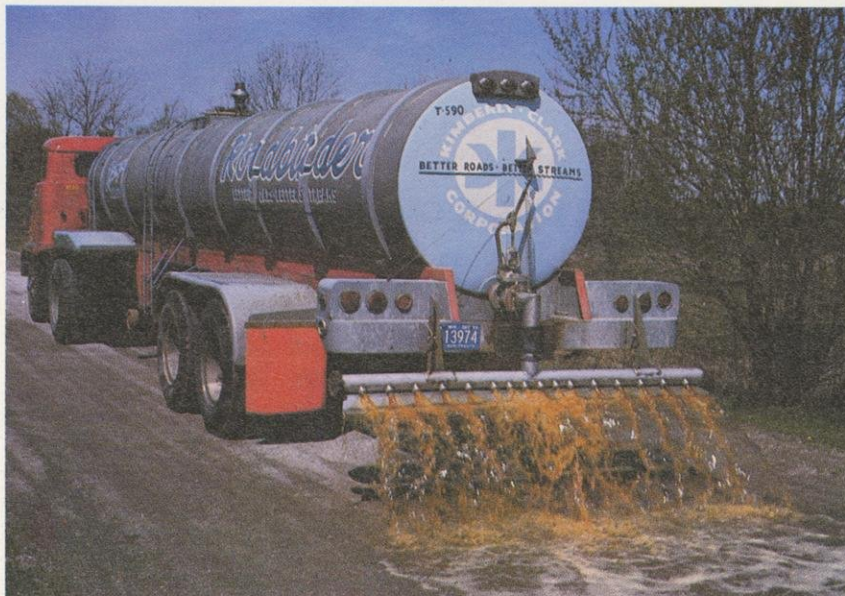
"Recycling efforts have not been made by the state, but rather by individual business-people. Recycling is strictly a product of private enterprise. If there's money to be made, it'll be done."

**Ralph Darch,
DNR employee 1968-1977**

He put together a directory of where recyclable materials are located in the state.



These rollers press the water out of papermill sludge so that it occupies 50% less space in a landfill.
Wisconsin Paper Council photo



Spent sulphate liquor is being tried out as road binder. The paper industry is also experimenting with extracting the energy left in it by burning.

Photo courtesy of the Kimberly Clark Paper Company



These concrete blocks were made from fly ash by the Wisconsin Electric Power Company. If experiments pan out, they might be used as construction material for a giant Lake Michigan reef to improve fishing. Fly ash is the material collected from smokestacks to prevent air pollution. Together with bottom ash, 1.1-million tons are sent to Wisconsin landfills every year. Many utilities are already marketing fly ash as an ingredient of concrete.

Photo courtesy of the Wisconsin Electric Power Company

Sludge spread on the land adds nutrients to sandy soil and helps give it body and retain water, but spread on clay, it has the opposite effect and helps reduce the heaviness by adding organic material. A variation on spreading sludge straight is called "Consogro," marketed by Consolidated Papers of Wisconsin Rapids. Used as a slow-release nitrogen fertilizer, Consogro contains recycled wood fiber, clay, calcium carbonate and other mineral fillers from the mill's settling tanks plus dead bacteria from the aeration process. One way to reduce sludge volume is to remove the water from it. Most mills already do this. In addition, the Weyerhaeuser Company 'cooks' their sludge to remove even more water. Midtec Paper at Kimberly, however, not only removes water, it also reclaims energy from a high temperature and high pressure processing system that recovers fiber and clay which can then be reused to make paper. The process saves Midtec \$1-million per year in landfill costs.

"We can't continue to make the same mistakes as in the past. It's too costly. My priorities would be to reduce the amount of waste through recycling efforts. This would reduce the need for more landfills and avoid clean-up costs from careless handling."

**Rep. Jeannette Bell (D-West Allis),
Chair, Environmental Resources Committee**

Meantime, Fort Howard is now installing a new dewatering system. "If the company achieves its objectives, it will save landfill tonnage equivalent to just about the total amount of waste collected by the city of Milwaukee each year," says DNR's Recycling Coordinator John Reindl.

The company is the largest paper recycler in the country. It hopes to start full scale dewatering in about two years after problems with handling its clay are resolved.

Fly Ash is a waste by-product of coal combustion, and some of it has the same pozzolanic or solidifying properties as Portland cement. This makes it valuable as a concrete mix. It is similar to volcanic ash which the ancient Romans mixed with limestone, clay and water to build the Coliseum. The same kind of ingredients hold today's skyscrapers together. Fly ash comes from the air-cleaners required on industrial and utility smokestacks for pollution control. A quality substitute for Portland cement and a lot cheaper, it gets its name from the fact that it "flies up" the stack with combustion gases as opposed to "bottom ash" which settles out. Some Wisconsin electric utilities have been marketing about 20% of their fly ash to ready-mix concrete companies. The remainder is landfilled. Nationally, the Environmental Protection Agency estimates nearly 50-million tons is generated annually.



It costs \$15 to \$25 per ton to operate a modern landfill.
DNR photo

Landfill Facts

Wisconsin has nearly 1,100 active landfills covering 14,000 acres, including some 900 small town landfills. A 1984 survey also located over 2,700 inactive sites used in the past and now closed.

Many environmental issues are associated with landfills. They include aesthetics, litter, noise, dust, rodents, birds, insects, pollution from open burning, methane gas migration and leachate contamination of surface or groundwater. Probably the most significant environmental issues are gas migration and leachate control.

As wastes decompose, methane, carbon dioxide and other gases are formed. In certain concentrations, methane is combustible or even explosive. Control techniques such as impermeable barriers or gas vents are used to prevent the migration of methane into nearby buildings and fields.

Leachate, on the other hand, is formed when water seeps through the buried waste, dissolving out substances that then are carried into the groundwater. Leachate can be controlled by limiting water infiltration, lining the bottom of the site with clay or other material, and collecting any leachate formed.

Modern landfills are built to strict DNR standards, designed to minimize any possible environmental impact. Most older landfills, however, do not incorporate these control measures.

Building a modern landfill is a major construction project. Costs run anywhere from \$500,000 to \$2,500,000 for a site that would serve an entire county. Adding in operating expenses, net cost is typically \$15 to \$25 a ton.

Unfortunately, even the best recycling systems will never make the need for landfills go away.

The 450,000 tons of foundry sand discarded in Wisconsin every year occupy a big piece of landfill real estate. Some can be used as road base and for covering at landfills, but getting rid of the part that contains hazardous substances is a problem.

DNR photo



Bottom ash is not so big a problem, mainly because much less is produced. It does not have pozzolanic properties, but is coarser and can be used as aggregate for road beds, bricks and other purposes.

The various electric companies in Wisconsin are working on an array of imaginative ideas for handling fly ash. Wisconsin Electric Power Company, which produces 500,000 tons annually wants to build six giant reefs in Lake Michigan to improve the fishing. A small experimental one will go in next year if laboratory tests are favorable, and if all goes well, the big ones, 160 feet long by 30 feet wide would be installed by 1989.

The Wisconsin Public Service Corporation, which produces 120,000 tons of fly ash annually, sells about all it produces in the summertime to ready-mix plants. But there's no winter market so they're experimenting with storage systems so they can save the product until it can be sold. This is a good deal for the ready mix plants because fly ash costs them only around \$4 a ton as compared to \$70 to \$80 for Portland cement. Public Service Corporation is also experimenting with fly ash as a substitute for the sub-base under asphalt pavement and DNR is evaluating the environmental effects of a stretch of road built with it in Marathon County. It looks promising. Federal policy already calls for fly ash use on national highway projects. And Public Service Corporation is trying to interest a plastics company in using fly ash as a filler in production of plastic boards.

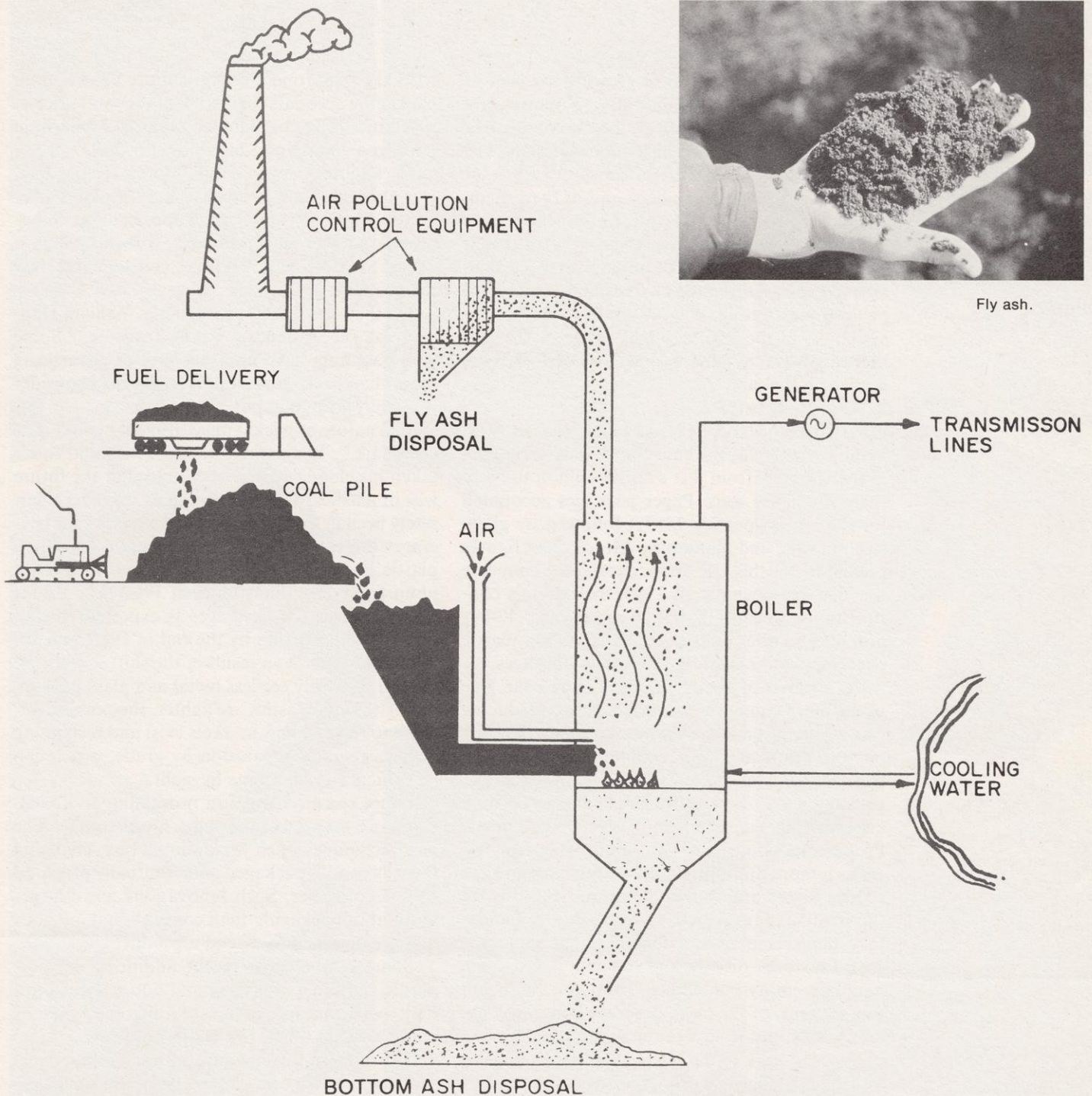
Another approach is being taken by the Wisconsin Power and Light Company, which has to deal with 400,000 tons of fly ash per year. The utility is working with soils experts who think fly ash could be used as a liming material on soil and for its trace elements. Fly ash contains sulfur,

boron, calcium and molybdenum. It would be excellent for alfalfa, which needs boron, but might harm corn or soybeans. A special spreader would also have to be developed to handle it. Wisconsin Power and Light is also looking into fly ash as a liner for landfills to prevent migration of contaminants.

Foundry Sands are the last of the big three wastes. About 450,000 tons were buried in Wisconsin in 1983. Some components can contain phenol, formaldehyde, furan and heavy metals. DNR is encouraging the industry to recycle or reuse as much of their product as possible and is researching its effects on the environment. Foundries are experimenting with separating out their most badly contaminated wastes so that the remainder can be used for beneficial purposes. Among uses allowed by DNR are: as a covering material at landfill sites, as fill in road or bridge construction, as an ingredient of asphalt or concrete, and as a treatment for foundry-produced hazardous wastes through use of bentonite-bearing sands which neutralize heavy metals.

All in all, prospects are good that the amount of big three wastes going to landfills will become smaller as time passes. DNR is encouraging more research on the hazards of these wastes in the environment. Incentives for the producing companies should start to work soon. The biggest is that alternatives to land disposal save money. It might take years of research, but landfill space is diminishing, disposal costs are increasing, and marketing their wastes could easily become a profitable part of a company's business. This would be a benefit to both the environment and the stockholders, a very desirable outcome indeed.

TYPICAL POWER PLANT OPERATION



Fly ash.

“Recycling efforts haven’t gotten nearly as far as they should have by now.”

US Senator Robert Kasten (R)

He offered two amendments to the Resource Conservation and Recovery Act that were approved and are now law. One encourages innovative treatment of hazardous waste, including recycling. The other requires federal government purchasers to give preference to products made with recycled materials. Paper was the initial and main interest, but it also includes other materials such as tires.

Surprise Packages

The big surprise is cost. Pricetag on packaging food alone in the US is more than \$24-billion a year, not counting what you pay to get rid of the empties.

Packages are the fastest growing segment of solid waste in the country. Not only are there more and more of them, they're coming in a whole new array of hard-to-handle materials. The people who wrestle with this endless supply of trash usually work at the back end of the system. They don't get a chance to focus on the source and many accept as a given the tons of packages thrown away daily. But more and more, today's local officials, interested citizens and solid waste professionals are looking at the front end of the system — at the production of waste — to see if there are ways to reduce it. Packaging has become a major target and the numbers show why.

According to EPA data, packaging materials made up 30 to 40% of all municipal waste in 1971. From 1958 to '71, the consumption of packaging in the US grew from just over 33-million to more than 60-million tons. Paper packages accounted for the largest portion (45%) followed by glass, steel, plastic, and aluminum. More recent figures published by the US Department of Commerce are also eye opening. In 1983, the nation's consumers used nearly 92-billion metal cans, 42-billion glass bottles and jars, and 16-billion plastic containers for a total of 150-billion packages.

As a subset of the overall packaging issue, one of the more controversial approaches to reducing waste generation is the proposal to place deposits on soft drink and beer containers. Bottles and cans are some of the most visible components of packaging and account for just under 60% of all discarded metal, glass, and plastic containers. Proponents point to refilling returnable containers as a more appropriate use of resources, to the energy gained and to the savings in landfill space (up to 20% in rural areas). Opponents to mandatory deposits express concern about increased costs for stores, distributors and manufacturers in handling empty containers. They also point out that in terms of the total, beverage containers are a relatively minor part of the waste stream.

Turning back to the big picture, packaging is a true double-edged sword. It protects the product from damage and waste during shipment. Packaged process foods result in less food waste in both the store and at home. In preparing food for packaging, processors remove inedible or undesirable materials, often reusing or recycling them. The typical homeowner might discard these substances. On the other edge of the sword, though, is the large number of packages that end up in our homes to be discarded.

Packaging also costs money—a great deal of it—and whether the package is necessary or extra-neous, you, the consumer, pay for it. According to

1983 US Department of Agriculture figures, food packaging accounts for 10.5% of the total price of a product. The cost jumped from \$9.4-billion in 1973 to a whopping \$24.2-billion in 1983.

Packaging does more than protect the product. It is also a method of advertising. Carolyn Palzer of the National Alliance of Supermarket Shoppers says "Money is no object, it seems, when it comes to packaging if it'll get consumers to buy the product."

On the other hand, according to William Hancock of the American Paper Institute, "Some manufacturers have no other way of advertising other than packaging. Ralph Nader may consider this overpackaging, but we don't."

The nature of packaging is also changing. "The Graduate," Benjamin Braddock, should have taken his elders' advice when told that the future was in plastics. The shift in recent years has definitely been in that direction. The statistics for beverages are especially dramatic. About 8.5-billion plastic beverage containers were used in 1982, a jump from 15-million units in 1967. The use of plastic bottles for beverages is expected to skyrocket to 12.6-billion by the end of 1985, and 20-billion by 1990. As a result of the shift to plastics, we will probably see less metal and glass packaging. Although plastics are lighter, they can be difficult to recycle. Few markets exist and reclaiming plastics requires separation by grade, which can be difficult to determine by sight.

Other recent changes in processing and packaging are aimed at improving food storage. The new techniques open a Pandora's box, changing the way food is packaged and eventually prepared by the consumer. Such innovations use a larger amount of packaging than conventional methods and are designed to extend a product's shelf life.

Some of the most recent additions are new plastic containers for food and liquor. Many are built with multiple layers of different types of plastics, while others are made from new grades.

The "freeze-flo" method allows frozen items such as juice concentrates to be poured immedi-

Left: Paper products make up the largest portion of the state's annual trash pile—about 1.3-million tons.

Wisconsin Solid Waste Recycling Authority photo

Center: Wisconsin uses 300-million plastic bottles per year and 20,000-tons are landfilled. Recycling markets for plastic are limited and sorting the different kinds takes a practiced eye.

UW-Extension photo

Right: Almost a billion glass bottles are filled in Wisconsin every year. Half are beer and half soda pop. Only 5% are recycled.

UW-Extension photo



ately after being removed from the freezer, or frozen fruit pies to be eaten right away, eliminating a long thawing period.

"Aseptic packaging" has changed many people's refreshment habits. With this type of packaging, fruit juices and other drinks are put in small boxes with straws attached, making these once perishable items popular shelf products. Made of several layers of different types of material, at least one state has proposed banning this package because of the difficulties in recycling it.

Another development in food packaging is the "retortable" pouch. Food products are wrapped in a flexible aluminum pouch that does not require refrigeration, freezing or additives. While it has not caught on at the retail level, it is a popular technology for the military, which consumes 48-million units of retortable pouch items a year.

"Irradiation" is another process used to extend shelf life of a product and reduce the need for chemical additives or preservatives. Products are treated with gamma rays, which kill insects, bacteria, germs, fungus, molds and other microorganisms and leave no radiation residue. All food NASA astronauts eat in space has been preserved by irradiation. The US Food and Drug Administration has approved this technology for various spices, natural flavorings and vegetable seasonings and is considering its use on some produce and meats.

"If the state and the environmental movement slows itself down to a reasonable pace (regarding 10% recycling of all waste), we will probably be able to accomplish it with full agreement by the majority of the people in 10 years. If the state and environmental groups pressure for a more rapid pace, people will retaliate. You can't force people to do something. When they want to do something, it goes so much more smoothly."

*Rep. Cloyd Porter (R-Burlington),
Member, Environmental Resources Committee*

Another change occurring now is in the type of sack used to carry groceries and other merchandise home. Plastic grocery bags, made of polyethylene are gradually replacing the traditional paper bags. Plastic bags are cheaper, lighter, (and therefore less expensive to ship) and require less storage space under a checkout counter. Paper bag costs have more than tripled over the past 10 years. In 1974, 57 pounds of checkout bags cost \$17.15, compared to today's price of \$55.90, a 226% increase.

With the development of new types of packaging, there is a simultaneous shift in problems. For example, what are we going to do with the billions of plastic containers that are expected to accumulate this century? Throw them into a landfill? Separate them for recycling? Burn them for energy? Without conservation and recycling efforts, the disposal situation could turn into a nightmare. The door of opportunity is wide open for innovators to develop new ways to collect and recover these plastic products.



Separating bottles by color and other trash by type makes marketing possible.

Photo by Bob Wallen

All types of waste can be recycled, if separated at the source. UW-Extension photo



Catch-all

Edited by Dave Kunelius, DNR Public Information, Madison

WILD classrooms

Poynette — Flycatchers, frogs, and foxes are about to enter Wisconsin classrooms, all part of a new natural resources education program entitled Project WILD (Wildlife in Learning Design).

With Project WILD it's easy for teachers to teach and fun for students to learn about wildlife and the natural environment. The classroom, whether indoors or out, becomes alive. Kindergarten through 12th grade students learn the basics of how to live in harmony with their environment, while also learning basic skills.

The core of Project WILD is two activity guides, one elementary and one secondary, containing approximately 80 activities each. The activities are designed to teach wildlife and environmental concepts through subjects in the school curriculum. They help students appreciate and understand wild things and their relationship to people. The activities allow

young people to explore and learn for themselves.

How to think — not what to think — about issues concerning wildlife are part of the WILD teaching agenda.

Project WILD materials are designed to be neutral on value-sensitive topics like consumptive use of wildlife and land development. This approach recognizes that young people need information from a variety of sources in order to independently make informed decisions.

Besides teachers, Project WILD will be especially useful to environmental educators, park and nature center personnel, and youth group leaders who want to tie the principles of the natural world to wildlife conservation and management. DNR and the Department of Public Instruction are sponsors of the program in Wisconsin.

Project WILD was developed through a joint effort of the Western Regional Environmental

Education Council and the Western Association of Fish and Wildlife Agencies. The Wildlife Society, the US Fish and Wildlife Service, Defenders of Wildlife, American Humane Association and Canadian Wildlife Federation are associate organizational sponsors. The program has been endorsed by the National Science Teachers Association and the National Council for Social Studies. **Thirty-four states are now associate sponsors.**

Interested educators can obtain the Project WILD activity guide and an array of supplementary materials by attending a six-hour workshop. These workshops provide educators with the training and necessary materials to make environmental concepts part of their existing lessons.

Facilitator workshops are also being held to train interested individuals to conduct local Project WILD workshops.



Workshops, held during April and June trained more than 80 facilitators around the state. Other similar workshops are scheduled for August and November. A list of trained facilitators is available to those interested in setting up a workshop.

Educators interested in becoming WILD facilitators or attending WILD workshops should write Project WILD Wisconsin, DNR, Box 7921, Madison, WI, 53707. By phone, call Dennis Yockers or Dolly Zosel at (608) 266-0870, or 267-2463.

DNR at State Fair

West Allis — A Great Lakes Fish Boil; A Look at Acid Rain; Wisconsin Rock and Roll; special guest appearances by Count Compost; and The Wiley Ways of the Wisconsin Walleye are among the information-packed, fun-filled entrees at DNR's Little Theatre in the Woods at this year's State Fair. Dates for the event at State Fair Park in West Allis are from August 1 through August 11. **Hours for DNR's Little Theatre in the Woods are from 11:00 am to 6:00 pm with different shows hourly.**

The Department's theme at State Fair this year is "Water: Everyone's Business." Exhibits and displays will amplify this concern. There will also be an educational and interacting exhibit on wildlife presented by

the Wildlife Animal Rehabilitation Center in cooperation with DNR. Visitors will have the opportunity to view various species of small mammals and raptors.

The last Friday of the Fair, August 9, has been designated Natural Resources Day, and will have as its theme, "Life is Wild in Wisconsin." Natural Resources Day is sponsored by Klements Sausage, State Fair Park, and DNR. It will feature activities and exhibits around the wildlife theme with presentations by various Wisconsin groups.

Awards will be given to this year's winner of a Natural Resources Poster contest. The winner will be selected from 3rd, 4th, and 5th grade participants from all over the state.



Dr. Cheryl Charles helped to conduct Wisconsin's first Project WILD leadership workshop held during April at the MacKenzie Environmental Center near Poynette. Dr. Charles of Boulder, Colorado, is the National Director of Project WILD. She discussed wildlife issues with the 40 facilitators at the workshop who will be conducting similar workshops for educators around the state.

Gas near Gitche Goumee?

Ashland — When you talk about producing gas in Wisconsin, most folks envision an excessive mixture of beer, cheese curds and kielbasa, but oil and gas magnates have other ideas.

In the past year several major oil companies have leased extensive areas of northern Wisconsin for preliminary seismic investigation. According to DNR Mine Reclamation Specialist Gordon Reinke, more than a million acres are under lease. Lands in the Chequamegon National Forest and several county forests are included. Agricultural Economics Professor Duncan Harkin of UW-Extension says register of deed records show leases have been taken by nine oil companies in 10 counties. The counties are Ashland, Bayfield, Burnett, Douglas, Iron, Pierce, Polk, St. Croix, Sawyer and Washburn. Among the companies are Amoco, which has expressed interest in exploratory drilling quite soon, as well as Texaco, Chevron and Hunt.

Amoco's plans call for a test well in Bayfield County. It could go 12,000 feet deep and cost \$3 to \$5-million. Considered a "rank wildcat" (oil talk for a real gamble) because no one has previously produced oil or gas in the region, the exploratory well would require clearing about two acres of land to accommodate the large drill rig, water and mud slurry ponds needed to dig a deep well.

DNR anticipated oil and gas exploration last year and started drafting environmental regulations to protect water and land resources. The proposed rules have been approved by the Natural Resources Board and will be given legislative review this summer. **Patterned after state mining regulations which stipulate how metallic mineral exploration, prospecting, development and abandonment must be conducted, the rule is designed mainly to protect groundwater.** It requires DNR approval for construction and abandonment of drillholes and sets reporting, licensing and bonding requirements for prospectors.



Phase 3 of the Little Rock Lake Artificial Acidification Research Project began this spring with the addition of sulfuric acid in concentrated form to the lake. Enough acid was added to the water to lower the pH to 5.5, the level it will be maintained at through the openwater season of 1985. The acid is added using this boat and a gravity feed line into the water. The acid is mixed partially by the prop wash. Researchers will closely observe any changes in the aquatic life in Little Rock Lake as the pH is gradually lowered to 4.5 during the next three to four years. Specifically being watched will be the changes in species diversity and abundance of phytoplankton, zooplankton, benthic invertebrates, macrophytes and fish.

Lake Michigan fishing lures nonresidents

Madison — The popular Lake Michigan charter boat business has brought lots of out-of-state tourists to Wisconsin's "East Coast" for trout and salmon fishing, a report prepared by the Department of Natural Resources shows.

"Word is going around the Midwest and beyond that Lake Michigan is definitely worth traveling to for a fun and satisfying fishing trip," said Mike Hansen, Great Lakes sport fishery specialist for DNR's Bureau of Fish Management. "That interest has proved to be a real boon to the charter boat industry, which will probably continue to expand for the time being."

The number of licenses issued to charter boat captains has tripled since 1979, the report notes, and now totals 477. Close to 50,000 out-of-state residents plied Lake Michigan's salmon-laden waters last year — a 10-fold increase since 1976. **Nonresidents made up 68% and residents 32% of the charter boat captains' clientele last year — the reverse of figures compiled for the 1978 season.**

"The number of Wisconsin anglers who hire charter boats has remained at a steady 22,000 for the past several years," Hansen said. "The real growth in the business has come from anglers traveling to Lake Michigan from other Midwestern states."

For charter boat trollers, Chinook or King salmon have truly become the "kings" of the lake. These Pacific Ocean natives, planted in Lake Michigan since the late 1960s, made up 42% of the charter boat catch in 1984, the report said. Native Lake trout came in second, providing 30% of the catch, while Coho salmon wound up a solid third at 22%.

The total trout and salmon catch by charter boaters has jumped from 20,000 nine years ago to a record 117,000 last season. Hansen said anglers fishing from piers, tributaries and boats, including charter boats, catch a total of about 700,000 trout and salmon a year now. July and August remain the most popular months for charter boating.

Hansen said anglers pay between \$100 and \$200 for a four- to six-hour trip on a charter boat. Usually groups averaging five people split the cost and fish together. **Fees charged by charter boat captains as a whole total between \$2.5 and \$3-million.**

"Anglers who hire charter boats also spend about \$60 million a year on lodging, meals, fishing tackle and other expenses related to fishing in Wisconsin's portion of Lake Michigan," Hansen said. "A good portion of that is spent in Wisconsin ports and other communities located up and down the lakeshore."

The report also notes catch rates and pinpoints by port which fish species are being hooked the most.

For more information and for copies of the charter boat fishery report, contact Mike Hansen, DNR Bureau of Fish Management, Box 7921, Madison, WI 53707, (608) 267-7501.

Catch-all

Bear dilemma

Madison — DNR wants to give the black bear more protection while at the same time keeping the hunting season open, but a law change is necessary to do so. Until a change is made, the Natural Resources Board has closed the season.

Last year 12,500 people hunted bear in Wisconsin and racked up 40,000 hunter days of recreation. Accommodating this kind of demand while at the same time adequately protecting the species is the primary objective of

DNR's bear management program.

Harvests during the past four seasons have all been substantially higher than the 343 animals taken in 1957 when mandatory registration first began. **Bear hunters took 1,130 in 1984, 934 in 1983, 1,433 in 1982 and 1,243 in 1981. These increasing harvests have reduced the population below a desired pre-hunt fall population of 5,500.** The desired level is derived from a population model with densities of one bear per three square miles of habitat. Wisconsin has about 15,000 square miles of bear habitat. A population of 5,500 could sustain an annual harvest of no more than 700 to 900 bear.

DNR feels harvest controls must be implemented this fall to start rebuilding the population to 5,500. To do so will require both a quota on the number of bear

that can be taken and a limit on the number of hunters who participate. Currently DNR has no authority to impose such restrictions and therefore, a change in state law is required. Without the change, DNR's alternative was to close the season, which statutes allow.

Under proposed legislation, everyone interested in bear hunting would be eligible for a bear pursuit license. Persons holding a pursuit license would be eligible to be selected for a

harvest permit. Harvest permit numbers would be restricted to allow the bear population to rebuild.

So far, support for the new legislation has been mixed. While most hunters agree harvest control is necessary, related restrictions on dog and bait use have received considerable debate and law change delays have resulted. It is hoped a compromise can still be worked out.



Jacobs and Lawin join Board



Helen Jacobs and Tom Lawin. DNR photo by Sara Ballard

Shooting range grants for cities help hunter safety

Madison — Matching grant-in-aid monies for shooting ranges in Wisconsin metropolitan areas will soon be available from DNR through the Federal Aid in Wildlife Restoration Act.

Recent action by the department's policy making Natural Resources Board makes it possible for governmental units or agencies, clubs, organizations, corporations and educational institutions to receive the grants. **Hunter education is one of the primary purposes as well as serving the general public's shooting needs.**

Sponsors receiving grants must provide live firing for hunter education on their shooting ranges for at least 15 years. Outdoor range construction grants will cover backstops and

berms, target holders, shooting benches, baffles, protective fencing, signs, trenches, gun racks, platforms and restrooms.

First consideration will be given to projects in major metropolitan areas where ranges are not available for hunter education. Secondary consideration will go to localities where ranges for hunter education are not available within a 20-mile radius.

Promotion of shooting range construction and matching grant funding has been supported by the Wisconsin Wildlife Federation, Wisconsin Rifle and Pistol Association, Wisconsin Conservation Congress and several volunteer hunter education instructors.

Madison — Two new Natural Resources Board members appointed by Governor Anthony Earl have been approved by the state Senate.

They are Helen Jacobs, Shorewood and Tom Lawin, Bloomer. Jacobs is assistant director of nursing at Sacred Heart Rehabilitation Hospital in Milwaukee. An active environmentalist for many years, she is a past member of the state

Air Pollution Control Council, which advises the Natural Resources Board on air quality issues. Jacobs succeeds Don Haldeman of Norwalk.

Lawin is editor of *The Country Today*, an agricultural newspaper. He will succeed Dan Trainer of Stevens Point.

Both Jacobs and Lawin will serve six year terms ending May 1, 1991.

Fish squeezers finished, rearers take over

Madison — The fish squeezers are done for another year in Wisconsin. DNR's piscatorial propagation experts have just completed stripping 350 million eggs from a variety of species in lakes throughout the state. Fish are captured alive in fyke nets. The females are gently squeezed to strip out the eggs, the eggs fertilized and then taken to hatcheries for incubation. After stripping, adult fish are returned to the lake unharmed. This annual ritual is necessary to carry out DNR's propagation and stocking program for warmwater fish such as muskies, walleye and northern pike.

Hatcheries at Woodruff and Spooner incubate most of the eggs, but Wild Rose is important too. It incubates most of the northern pike while Spooner and Woodruff hatch all walleye and musky eggs. **Surprisingly, warmwater hatcheries handle more sucker eggs than anything else — about 250 million of them.** It takes that many little food fish to make muskies fingerlings.

DNR's stocking scheduled for 1985 includes 13-million northern pike fry and 12-million walleye fry. Fingerling stocking will include 3.2 million walleye, 154,000 muskies, 76,000 northern pike, 14,000 hybrid muskies, 560,000 largemouth bass and 60,000 smallmouth bass.

To get that many walleye and

musky fingerlings requires stocking specially prepared ponds with about a million musky fry and 12-million walleye fry. Walleyes are placed in about 25 ponds throughout the state where they live on the organisms produced in the pond itself and are generally stocked when two to five inches long.

Musky fingerling are raised to about three inches at Spooner and Woodruff, then many are shifted to ponds in other parts of the state until they're ready for stocking at 5 to 12 inches. Ponds at Woodruff and Spooner as well as several in Jackson County produce the bulk of the larger musky fingerling. All northern pike and hybrid muskies are reared at Wild Rose on pellets. Pellet feeding has been used on these species for several years, but isn't applicable on a large production basis for muskies or walleyes.

Most bass are raised at the Lake Mills Hatchery as well as at a pond in Jackson County. Hatchery incubation isn't necessary for bass. Instead of stocking fry, adults are allowed to spawn in the ponds. Fingerlings live on food produced in the pond and are stocked when they reach about 1½ inches.

Success of the propagation program will be measured in late summer and fall when harvest time comes.

Governor Nelson State Park development begins

Madison — Initial development at Governor Nelson State Park at an estimated cost of \$1.35 million has been approved by the Natural Resources Board and will begin this year.

The park includes about a half mile of frontage on the northwest shore of Lake Mendota in Dane County to be managed and developed for multi-season day-use activities. **An estimated 300,000 visitors per year are expected.**

Recreational opportunities will include fishing, swimming, boating, picnicking, hiking, skitouring, nature study and open field sports. The park property includes a diverse ecological community featuring oak-hickory woodland, upland grassland, and lowland marsh. The park will preserve and protect adjacent Six-Mile Creek, Spring Creek and associated wetlands.

More than 10 years have been spent in land acquisition and planning for the park through public participation.



Bucket by bucket, nearly 200 tons of carp passed through this grinding operation on way to becoming rich farmland fertilizer.

Fish for fertilizer

Marquette — "Recycling" has taken on a new twist at Lake Puckaway in Green Lake County where a carp eradication project is producing free fertilizer for area farmers.

Over 400,000 pounds of carp have been removed from the lake's Dead River Bay, transported by boat to DNR's rough fish camp, and there ground-up into fertilizer.

A cherry picker unloads the crated carp from boats and drops the fish into a five foot long grinder. A manure spreader is parked alongside the grinder and loaded with 9,000 to 11,000 pounds of fertilizer.

The resultant "fish manure" is then land spread as fertilizer on alfalfa fields slated to be plowed under this fall and planted to corn next year.

This unique project is the brainchild of DNR Horicon Area fish managers Jim Congdon and

Dale Brege, along with natural resources technician Dennis Michael.

Mr. Brege, who oversaw the three week operation, points out that the nutrient values of fish fertilizer, compared to cattle manure, are four and ten times greater for nitrogen and phosphorus, respectively.

The fish to fertilizer process has been enthusiastically received by local farmers and the Lake Puckaway Rehabilitation District, the latter also supplying and paying five person crews to assist DNR in picking-up fish.

In the past, rough fish removed from Lake Puckaway had been buried in shallow three foot deep trenches.

"Grinding the carp into fertilizer and land spreading it is a more beneficial and efficient use of the natural resource than simply burying dead fish," adds Mr. Brege.



Recycling Hazardous Waste

Best way to handle wastes that can burn, maim or kill is to use them over and over. That way they never get into the environment to cause harm.

Wisconsin is lucky. It only produced, according to filed reports, 125,000 tons of hazardous waste in 1983. Heavily industrialized states had much more, including Illinois, which generated 350,000 tons in 1981 and California with 5-million hazardous tons in 1981. Nationally, the figure is a startling 300-million tons of hazardous waste.

Today, unlike previous practice in Wisconsin, most hazardous materials are not landfilled. Use of environmentally sound alternatives is widespread. They include source reduction, recycling, reuse, treatment to render the material harmless and of course, disposal in technically secure landfills when necessary. Of Wisconsin's 125,000 tons generated in 1983, only 26,000 went to landfills, mostly out-of-state. The trend is downward—30,000 tons were landfilled in 1981 and total pro-

duction was 90,000 tons. At that time Wisconsin had its own hazardous waste landfill sites, before EPA set standards no Wisconsin operator would meet. Today all hazardous waste destined for land disposal must be shipped out of state.

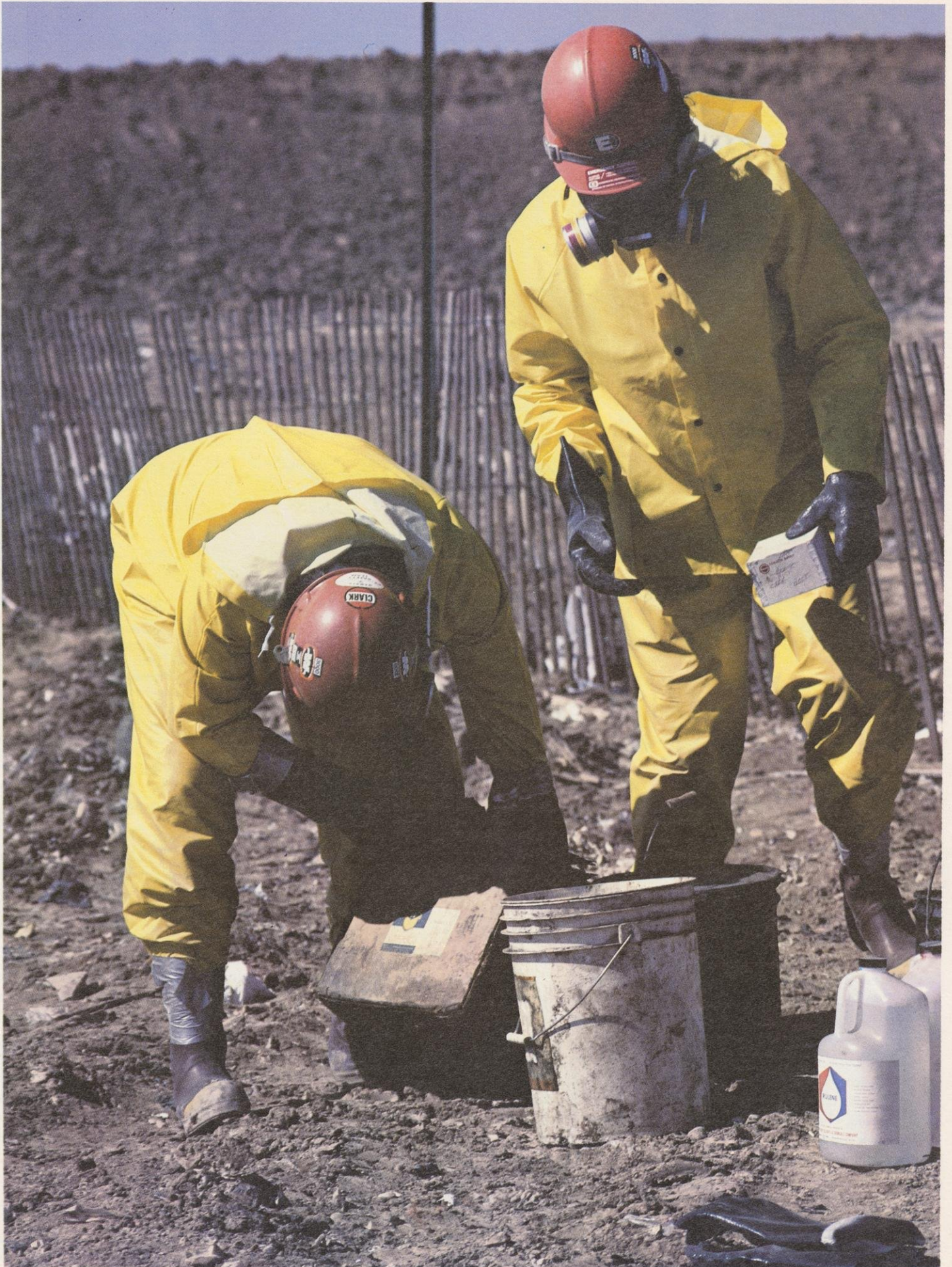
As of now, only the largest Wisconsin producers are required to file manifests showing production and disposal of hazardous materials. Firms that turn out less than 220 pounds per month are exempt so DNR doesn't know what happens to their hazardous waste and statistics don't include them. It's certain, however, that such materials can sicken, burn, disfigure and kill when human beings or fish and wildlife are exposed. Fortunately, no injuries or fatalities from mismanagement have been reported in Wisconsin, but dangerous sites exist and several are on EPA's Superfund list for immediate cleanup. Reduced groundwater quality has already occurred at several existing sites, leaving the potential for future worries.

Wastes are considered hazardous when they are any of the following:

- *Ignitable—flash point of less than 140 degrees F.
- *Corrosive—chemically “eats through” things.
- *Reactive—reacts violently or gives off deadly cyanide or sulfide gases when exposed to water or other substances.

Many communities conduct “Clean Sweep” campaigns to collect unwanted hazardous home products like paint, turpentine, nail polish remover, toilet bowl cleaner, insecticides and weed killer. Some are recycled and the remainder disposed of properly in protected landfills. The average person uses about 50 pounds of these items per year.

Photo by Ken Satyshur





Left: All hazardous waste has to be handled by someone. Manifest reports made to DNR keep track of it from cradle to grave. They show that state industry produces about 125,000 tons of hazardous waste per year. However, those producing less than 220 pounds per month are not required to report.

Photo by Dave Crehore

Wisconsin has no landfills for disposal of hazardous materials. All must be shipped out of state for burial at approved sites.

DNR photo



Recycling in Wisconsin

**Industrial
barrel and
drum restorers**

15 companies

*Toxic—harms the health of plants or animals.

And there are three approved methods of recycling them: 1. Reclamation—distilling spent solvents, for example. 2. Energy recovery—burning in boilers or furnaces for heat or electricity. 3. Beneficial use or reuse—substitution of hazardous waste for raw material, for example, spent acid as an ingredient of fertilizer.

A 1983 DNR report emphasized that reducing the amount of hazardous waste produced is “the most environmentally preferable alternative” to land disposal. It recommended that financial incentives be directed toward that goal. Incentives given industry so far include a variety of valuable tax exemptions on machinery and equipment; income tax deductions; authority to issue local tax-exempt revenue bonds to finance pollution control equipment; and tax write-offs for research and experiments. Companies that recycle rather than landfill are also exempt from certain DNR licensing regulations.

The five most-prevalent Wisconsin waste streams have several possible land disposal alternatives:

1. **Toxic metal solutions** are by-products in metal plating and finishing. Reduction and recovery is possible through redesign of the electroplating process to cut down on contaminated rinse water. Evaporating the water is also feasible. Or chemical treatment can make this waste less toxic and soluble.

2. **Organic residues** include solvent-based paint sludges, metal cutting oils and leftovers from solvent recovery. Such residues can contain cadmium, chromium and lead. Substitution of water-based paints is an alternative, or the solvents can be commercially recovered. Incineration is also possible.

3. **Corrosive acids and bases** may contain heavy metals but treatment can make them safe.

4. **Emission control dusts** from iron foundries are commonly contaminated with heavy metals. They can be solidified or leached to pull out the heavy metals.

5. **Cyanide residues** come from heat treatment of metal or from metal plating and also are found in pesticides and paint pigments. Plating processes not using cyanide are one alternative or it can be treated and destroyed. Since recycling and recovery won’t handle every situation, other approaches can keep hazardous materials out of landfills. One is waste exchange. The idea is that one company’s waste is another company’s raw material. To get out information on who wants to swap, sell or buy an Industrial Material Exchange Directory regularly publishes classified ads listing chemicals companies want to get rid of or ones they need. In Wisconsin, a good example is the metal

industry’s spent pickle liquor. Of no use to the industry, it is picked up by municipalities for treatment of sewage. In 1983, about 30,000 tons of pickle liquor were recycled this way.

According to Ken Weissner in DNR’s Bureau of Waste Water Management, “Any company that doesn’t put in a recovery system, if feasible, is really missing the boat.”

As an example, Weissner cites the electroplating industry which uses rare metals like chromium, nickel and silver. With a closed loop or evaporation method, these metals can be recovered and reused.

“If you let it go down the drain,” said Weissner, “you pay three times over. You lose the metal, you have to pay for an expensive waste



Sediment sampling for a dredging project. Harbor improvement often turns up large quantities of hazardous substances in dredge spoil. Whether to landfill it is an important environmental issue. DNR photo



Hydrite Chemical Company of Cottage Grove is typical of firms that recycle industrial solvents, degreasers, cleaners and electroplating chemicals. So much of Wisconsin's hazardous materials are recycled that, although we produce 125,000 tons per year, only 26,000 tons are landfilled—and all of it out of state.

DNR photo

Recycling Old Barrels and Drums

Old barrels and drums don't need to go to a landfill — they can be washed out, reconditioned and reused. Industries use barrels and drums to ship chemicals and other products and buy more than 75-million annually, mostly 55 gallon metal ones. Only one-third of all drums purchased are new; the rest are reconditioned. According to industry data, reconditioning a metal drum uses only 10% of the energy it takes to make a new one. In Wisconsin, 15 companies recondition approximately one million a year.

water treatment program, and hazardous sludge is produced that must be properly disposed."

While most attention is focused on hazardous materials in factories, the average home contains more than you would think. Every year, a typical community of 200,000 uses about 10-million pounds of hazardous substances—50 pounds for every man, woman and child. The list includes bathroom and kitchen cleaners, fingernail and silver polishes, mothballs and bleaches; pesticide and herbicide products such as rodent bait, insect repellent and weed killers; and automotive and paint products such as motor oil, transmission and brake fluid, paint, lacquer and varnish.

"We want to make Milwaukee a starting place to show that we can do it (recycling) the right way. I'm trying to get the DNR to require refuse to be separated and to outlaw hazardous materials in landfills, including flashlight batteries and many types of kitchen pesticides. We're also working to see if we can burn refuse with dry sewage sludge in small module incinerators, rather than large ones that give off emissions and have dioxin or corrosion in the boilers."

*Milwaukee Alderman Robert Anderson,
Chair, County's Resource Recovery Committee*

Just a few parts of motor oil will contaminate a million parts of water. Powerful chemicals poured down toilets or sinks can devastate the environment. Tossed in the garbage, it winds up in a landfill where it can leak into the soil and find its way into lakes, streams or drinking water.

To get rid of this threat, one Saturday in 1984 the City of Madison conducted operation "Clean Sweep." People swamped two pickup points to get rid of unwanted, hazardous household items. It was a rave success! Almost 3,000 pounds of pesticides, solvents, paints, poisons, aerosol cans and acids were taken out of circulation, including 50 pounds of the banned pesticides 2,4,5-T, DDT, lindane, chlordane and arsenic.

Madison wasn't the first community in the country to conduct a household reclamation program, but the idea is certainly catching on. Brown, Manitowoc, Kenosha, Rock, Outagamie and Waukesha counties are all planning similar programs.

Because of health-related consequences, DNR has made reducing the volume of hazardous wastes, both at home and in industry a top priority. Landfilling is wasteful and dangerous and the public demands that there be no contamination of the environment. Recycling, therefore, is the alternative of choice and should be universal before the turn of the century if DNR has its way.

Recycling and Papermaking

Earl J. Gustafson,
Energy & Project Manager,
Wisconsin Paper Council

Solid waste and recycling! While not as closely tied as "love and marriage" or "horse and carriage," they seem inseparable and the past 20 years have shown remarkable progress for both. Wisconsin's papermakers have been part of it—in their efforts to recycle and to reduce the volume of waste being landfilled. And those efforts are anything but routine.

Wisconsin is the leading papermaking state in the country, producing nearly 3.7-million tons annually. It also ranks second nationally in the volume of waste paper consumed by recycling mills. About 25% of the paper manufactured here is produced from recycled fiber. This means use of waste paper by Wisconsin's mills is increasing. In 1980, consumption was just over a million tons. For 1984, estimates are above 1.3-million. By 1987, it is projected at more than 1.4 million tons, a 34% increase in just seven years.

Where does all the recycled paper go? Nationally, nearly 97% is turned back into useful paper products. The remaining 3% is transformed into a range of related products like insulation, animal bedding, flower vases, egg cartons, fireplace logs and other items. The majority of it—about two thirds—is made into paperboard (cardboard) products. About 12% becomes construction paper, another 10% tissue products, and about 5% each, newsprint or printing and writing paper.

Fiber recycling cannot be repeated indefinitely because grades of paper have specific uses and specific physical requirements for adequate performance. Generally, wood fiber may be recycled about two to four times. Recycled fibers represent all, or much of, the basic raw materials of such companies as James River, Pope and Talbot, P. H. Glatfelter, Scott Paper, Fort Howard, Wisconsin Tissue Mills, Kimberly-Clark and others.

The result is extremely stable employment for more than 47,000 men and women employed in paper and allied industries who earn above average wages exceeding \$1.3-billion annually. Papermakers also support employment for some 125,000 non-paper industry employees.

Besides paper, the industry recycles or reuses a variety of other materials and is working to do more. The sludge generated in its air and water pollution control programs is comprised of organic material which is largely cellulose and biomass, plus clay, minerals and trace elements including a range of nutrients. In 1983, over 1.5 million tons of pulp and paper mill sludge were landfilled. However, the industry is aggressively researching alternative, beneficial uses for these wastes. More than 30 projects are underway that focus on such diverse uses as landspreading of sludge on farms and forests to improve plant and tree growth, recovery of components for reuse in

Wisconsin mills recycle nearly 1.5-million tons of paper every year. Most become cardboard boxes. An equal amount of sludge wastes are landfilled but the industry is working on ways to burn it as fuel or use it to enrich soil.

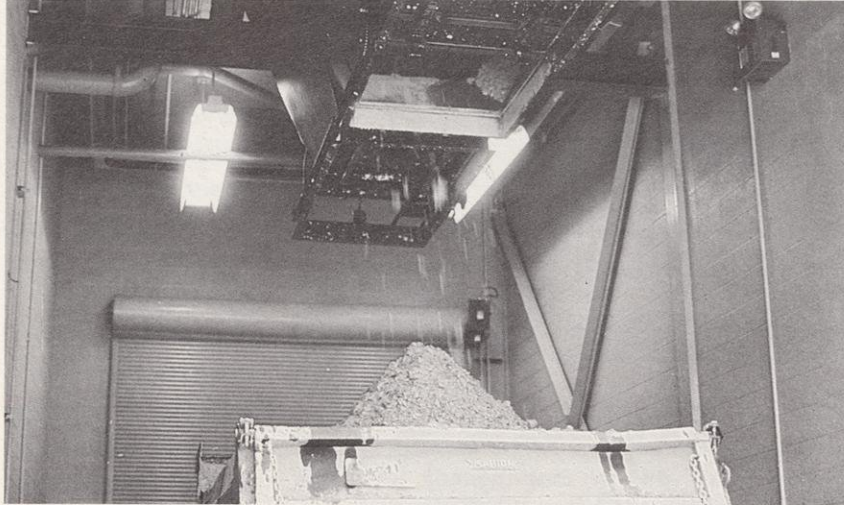
Soil application of composted paper mill sludge is being tried as a way to reduce the mammoth burden at landfills. The compost has been found to add nutrients and organic material.

Photo courtesy of Consolidated Papers





Wisconsin papermills reclaim 1.3-million tons of paper per year. Photo by Bob Wallen



Partially dehydrated paper mill sludge comes off a conveyor belt onto a truck ready for transport to a landfill. Wisconsin Paper Council photo

How Paper is Recycled

Paper is the largest part of municipal waste, comprising about half of all household, commercial and industrial refuse. It is also the most commonly collected material for recycling. Of the state's 500 community programs, over 300 collect paper. There are also 130 paper recycling companies in Wisconsin, including local scrap dealers, insulation manufacturers, animal bedding processors and paper mills.

Recycling paper saves resources and energy as well as landfill space. Most paper is recycled back into paper. Recycling a ton saves 17 trees and anywhere from 70 to 100 gallons of gasoline.

Usually, the recycling process begins with the user. Both at home and at work, people separate out their recyclable paper for collection. From the collector, the paper normally goes to a scrap dealer where it is sorted into one of 50 grades. The dealer processes the paper to specifications set by the mill for quality and removal of contaminants and generally compresses the paper into bales for shipment.

At the paper mill, the bales are opened and dumped into large vats of chemicals and hot water where the fibers are separated from one another, washed, and the contaminants removed. When they are finally fed onto the moving wire screen of a papermaking machine, the fibers have an oatmeal-like consistency. Excess water drains through the screen and the fiber mat then runs between a series of more than 40 cylinders which squeeze and dry the mat into paper. The paper is rolled onto a cylinder and cut to the size required by the paper mill's customers. Paper making machines are very precise and complicated and can produce paper at rates of up to 5,000 feet a minute.

Nationwide, in 1984 about 21-million tons of waste paper were collected for recycling. Eighty percent was recycled in the US and the other 20% exported.

papermaking, incineration for energy recovery, as an additive to bricks and road building materials and as kitty litter. The goal is to conserve resources and reduce the amount of sludge going to landfills.

Besides this effort, pulp and paper mills generate more than 22% of their energy needs from waste materials. Two approaches are common. One is the recovery of spent pulping liquors which are used in the pulping process to break down wood chips into fibers for the papermaking machine. The liquors are recycled several times and eventually become too weak for pulping, but they still contain energy. Mills in Wisconsin recovered over 1.2-million tons of spent liquor solids in 1984. Another technique is recovery of bark and other unpulpable wood waste. In 1984 the industry burned 786,500 tons of such waste for energy.

While the commitment to recycling and resource recovery is a very deep one, various issues impinge on it. For example, a variety of common items—staples, paper clips, adhesive tapes, printing ink and others—must be removed prior to recycling waste paper. Some of these contaminants may be dealt with effectively through special equipment, such as centrifugal devices, which spin metals and other solid contaminants out of the paper stock being readied for pulp making. Other substances, however, can be more persistent. "Stickies" are one. Dating back to the 1940s and the advent of synthetic resins, "stickies" in the form of synthetic glues are a continuing concern for today's recycling mills. If not removed prior to papermaking, they become an unwanted impurity in the paper being manufactured or may stick to equipment, hampering production. Continual diligence concerning waste streams, plus newer, improved recycling equipment, are a way of life for recycling mills.

Another problem is contamination by PCBs. At one time used in electrical equipment and carbonless paper, their manufacture is now restricted and PCBs have not been intentionally used in paper since 1972. However, paper containing them is recycled, and PCBs end up in mill discharges. As the level of PCBs in waste paper decreases, the problem should also decrease.

Another, nontechnical problem involves government attempts to mandate a percentage of recycled fiber in the types of writing and printing paper it purchases. Government buys only a very small amount of recycled products. Most is made into paperboard (about two-thirds). Consequently, "fiber mandates" miss the target while interfering with the marketing efforts of both recycler and virgin pulp mills. The paper industry believes government purchasing specifications should not provide preferential treatment for products based on their fiber content, but rather on performance of the product and intended end use.



Another concern of Wisconsin's paper industry is state "tipping fees" at landfills. These fees, imposed by the legislature, are used to finance groundwater cleanup expenses. While to a narrow extent, business costs, including regulatory expenses, may be absorbed or passed along to consumers, this isn't automatic—particularly if a firm's competitors in other states are not facing similar costs. State policy makers must be cautious that their programs do not place Wisconsin's business community—including papermakers—at a disadvantage with the industries with which they compete.

Despite the problems, the future of recycling and resource recovery appears bright for the paper industry. Wisconsin is a national leader in waste paper consumption. Surveys show a trend toward both increased domestic consumption and increased exports of waste paper. At the same time, innovative research into alternative uses for sludge show promise and energy recovery is a well established practice likely to become even more efficient and use more materials. With government stimulating and assisting, rather than arbitrarily regulating or discouraging recycling efforts, DNR's goal of a 50% waste reduction by the end of this decade should become a reality.

Roll of recycled paper. Wisconsin is the leading papermaking state in the nation, but one-third of all fiber used to produce paper here has been recycled.

Photo courtesy of Consolidated Papers

Wood Pallets



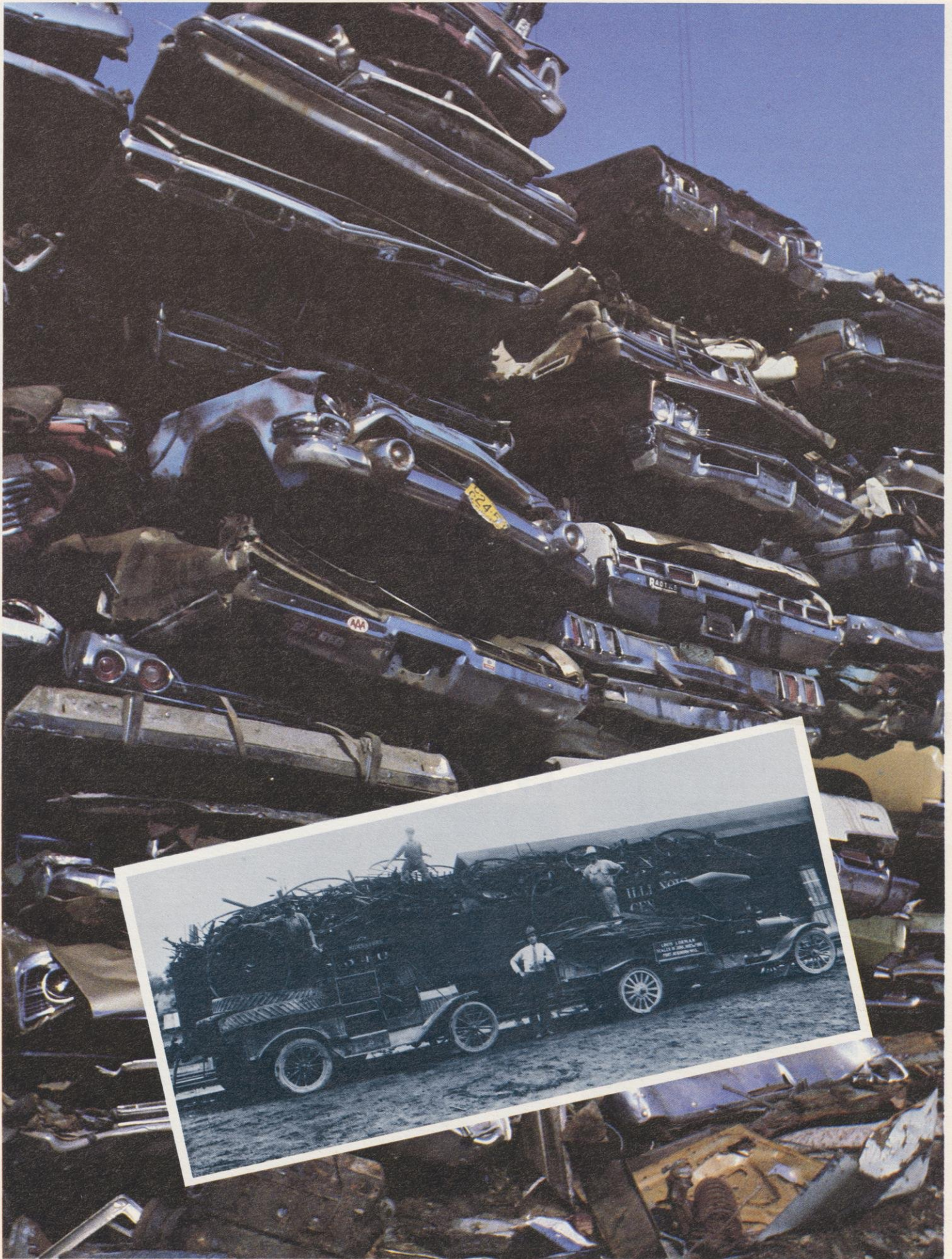
**Recycling
in Wisconsin
Wood pallets**

44 companies

Wood pallets are portable platforms used in the shipping and warehousing business to transport materials. Pallets are easily moved with a forklift truck. Made in over 150 sizes, the most popular ones measure 40 by 48 inches and are about six inches high. More than 250-million are produced annually, and over 2-billion are currently in use in the US.

Built primarily of wood, pallets become damaged during use. Disposal is cumbersome and expensive, so many users sell their broken pallets to be repaired for reuse, or may give them away for firewood.

Wisconsin has approximately a dozen pallet remanufacturers that pick up from all parts of the state.



Metallic scrap: the supernatural resource

Sybil Letzing,
Wisconsin Chapter,
Institute of Scrap Iron and Steel

Have you ever wondered what happened to the old washing machine you junked after it died in the line of duty? Or the push button DeSoto your Dad was so proud of years ago? Or any one of the thousands of household appliances, automobiles, farm machines, railroad cars, and other metal items that get scrapped each year?

Chances are you'll see them again, perhaps in your new car or appliance or in the steel beams of a new shopping center or a bridge. It's a pretty good bet your old gadget found its way into the metal recycling process, a continuous round of metal use and reuse, kept in motion by the scrap metal recycling industry.

This "supernatural" resource has an endless life cycle. There is no limit to the number of times it can be changed into new products and no limit, apparently, to the scrap metal resource itself, either. In 1983, working at only 30% capacity, scrap metal firms in the US reprocessed 41.6-million tons of ferrous scrap and over 5.5-million tons of non-ferrous metals, including aluminum, copper, lead, stainless steel and zinc. In Wisconsin, the industry recycled over \$90-million worth of scrap—1.5-million tons. And the potential is hardly tapped! Current estimated iron and steel backlog in the US alone available for recycling is approximately 744 million tons, and each day we add an estimated 80 tons to this vast mountain of metal.

Metallic scrap processing has positive effects that range from economic to the conservation of natural resources and environmental protection. The industry employs more than 2,500 people in Wisconsin. Using reprocessed metal for manufacturing consumes 75% less energy than new materials. And for every ton of ferrous scrap used, about 1 1/2 tons of virgin ore and 700 pounds of coal are conserved. This is important because at the present rate of consumption iron deposits could be gone in 200 years.

Scrap processing is an expensive and complex business that requires an investment of millions of dollars in heavy equipment, buildings and land. To transform scrap into prepared grades for foundries and mills involves separating metal, eliminating impurities, and composing the finished material into sizes and shapes required by customers. Some of the equipment is formidable.

Shredders, which can cost between \$400,000 and \$4-million, depending on size, are the Godzillas of the industry. Automobile "hulks," "white goods" (stoves, refrigerators, washing machines), and sheet steel are ripped apart in these monster machines by a series of steel hammers. Pieces then pass over a metallic drum which separates iron and steel from other materials. A shredder can process anywhere from 25,000 to 250,000 auto bodies each year, depending on size; a large one can eat a car a minute, chewing it into bite size pieces.

Shears slice up heavy pieces of scrap such as I-beams, ship plate, pipe and railroad car sides. They cost up to \$3-million. The largest can cut through steel plates six inches thick. Hydraulic balers, or baling presses are familiar to oldtime James Bond fans. They're the compactors that can squeeze an auto body — hopefully without 007 inside — into a tidy bundle about the size of a console television set. They cost up to \$1.7-million. The largest, a 600 horsepower job, can compress three flattened autos into a 5,400-pound bale of scrap in less than two minutes.

Recycling firms get their metallic scrap from both industrial sources and private collectors. Once processed, it is distributed by rail, truck, and ship to mills and foundries, worldwide, to be made into new products. It is a fluctuating market that responds to economic principles of short term supply and demand. When more scrap is needed, prices go up to bring it out; if supply begins to exceed demand, prices, of course, drop.

The industry's ups and downs reflect recent national trends. In the "boom" years of the mid-70s, business was good; in 1974, a record 60-million tons of iron and steel scrap were recovered. In 1983, after several years of recession, the amount recovered was down to 34-million tons. According to industry sources, Wisconsin scrap metal

Giant machines and 2,500 workers in Wisconsin keep our used metal going round and round. Where it stops is in just about every new product you buy.

Left: Automobiles are Wisconsin's major source of scrap metal and about 1.5-million tons are recycled in the state every year. Only 250,000 tons of metal are landfilled.

Photo by Sara Ballard

processors finally recovered from a three year slump in fiscal 1983-1984. Foundries are the main consumers of Wisconsin's scrap metal, and although demand from them is still not strong, the outlook is improving.

The scrap metal industry has a long and honorable history in the United States, starting with the earliest days of colonial life. Then, the need to conserve was born largely of scarcity. Throughout the 17 and 1800s peddlers or traders collected the worn, broken, and discarded metals of pioneer life and work. Perhaps the most famous early metal recycler was Paul Revere. He, along with all metal workers of the time, used scrap extensively. In 1801, he established the first American copper rolling mill and won the contract to sheathe the dome of the Massachusetts statehouse. Even the Liberty Bell, our symbol of independence, is a product of recycling. It was recast twice in Philadelphia, in 1752 and 1753, to improve its color and strength through a change in metallic content.



A giant magnet feeds metal into a shredder. Shredders cost anywhere from \$400,000 to \$4-million.

Photo by Sara Ballard



Baled aluminum cans ready for recycling. Wisconsin uses 1.4-billion aluminum cans per year—all for beer and soda pop. Only half are recycled. In mandatory deposit states, 95% are recycled. Aluminum Assn. photo

Over the years, metal recycling has met with a mixture of problems and pluses. One persistent problem, inequitable freight rates as compared to virgin materials, has been largely resolved through federal legislation and administrative action. Another, newer problem involves production of coated steel and steel containing other metal alloys. With steel metallurgy becoming more complex, recyclers face a difficult situation because electric furnaces have no capability to change the content of the scrap they process: what goes in is what comes out and can't be changed.

On the "plus" side are two major developments—expansion in the use of electric furnaces and the advent of steel mini-mills. The steel industry is rapidly turning toward electric furnaces, which use 100% scrap. By 1984, almost one-third of the steel produced in the United States was made in electric furnaces. Estimates indicate that by 1990 scrap-made electric furnace steel may rise to as much as 40% of the entire market. Mini-mills are small steel mills which produce specific products for specific market areas, and they use electric furnaces exclusively. Ten years ago mini-mills had less than a 10-million ton capacity. By 1983 that had doubled, and estimates say that in 1985 they will account for 20 to 24% of the US market with production of approximately 22 million metric tons. By 1990, their capacity could well top 26-million tons.

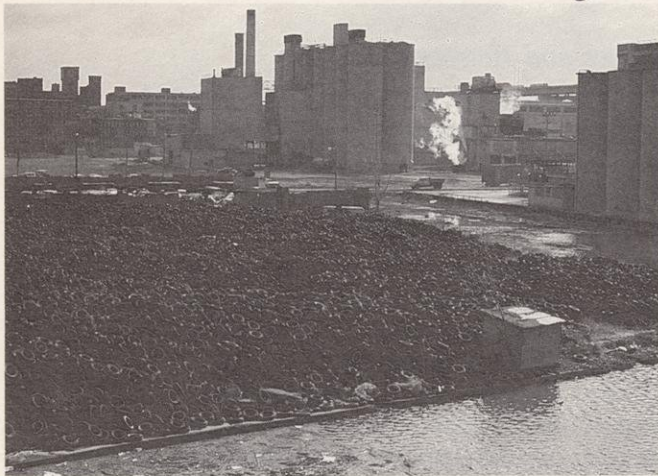
Public policy will also play an important role in the future of the scrap metal industry. In general, policies favoring conservation, reclamation and environmental protection will also support the industry. However, there are several areas of concern. For example, state tax law ought to be clarified with respect to how recycling is to be treated as a form of manufacturing. This would then exempt the industry from the property tax on machinery and equipment used for recycling, a benefit given to other manufacturers.

Another economic problem is the state tipping fee on landfills used to fund environmental cleanup programs. These fees affect the disposal of residues from scrap dealers as well as residues from foundries, which are the major scrap metal customers. State policy must use caution to make sure that these fees do not place Wisconsin business at a competitive disadvantage with businesses outside Wisconsin. A smaller problem is the possible required installation of airbags in automobiles. Metal recyclers who routinely process autos worry because airbags cannot be easily detected and will explode on impact.

On balance, the industry is hopeful about its future. The odds are good that national needs will demand continued support for recycling, that key problems will be favorably resolved, and that the industry will respond positively. It is pretty certain that the economic and environmental advantages of recycling will prevail over other transitory considerations for a long time to come.

Playtime tires

The Dragon Fly, The Donut Tunnel, and the Trolley Track



This giant tire pile in Milwaukee has now been landfilled. A pile with 8-million tires still plagues St. Croix County. Tires can be burned as fuel, but must be shredded first. So far, only Owens Illinois at Tomahawk uses them regularly in Wisconsin. Photo by John Reindl



Playground equipment is one way to recycle tires. With such a big supply, the opportunities are unlimited.

Photo by Len Polczynski

There is a monstrous, black, humpbacked pile at a certain location in northern Wisconsin that contains 8-million old car and truck tires. That's a lot of flats! Placed side by side, rolling cross-country, they'd cut a swath 800 miles wide. Other piles like it, big and small, dot the landscape. They're fire hazards, they look bad, and they breed mosquitoes, some of which carry sleeping sickness.

Making a small dent in these big eyesores are people who recycle tires. One is Milt Heinrichs of Playtime Tires in Menomonee Falls.

"If you look at almost any elementary or pre-school playground, about 50% use these tire products," said Heinrichs.

His is the only company in the country manufacturing them and he owns the patent rights. "I like to think they're products that give kids the ability to use their imaginations. As a climbing apparatus, they also build upper motor skills."

Heinrich said the tire toys are safe and make youngsters feel secure. "Kids like to play with cardboard boxes at home. Tires do basically the same thing on a larger scale. The younger kids can crawl through the tires and the older ones can jump off."

Heinrichs said Playtime used about 150 tires to make about 75 toys in 1984. The largest item, a tire house with an attic, uses 31 large truck tires and costs \$695. The smaller pieces use about 12 tires each.

All the names are fun: The Dragon Fly sells for \$525 and according to the sales brochure, "It doesn't sting, bite, eat children or gobble up your budget."

The Donut Tunnel at \$275 is "a warm gathering place, a low climbing apparatus, an inviting tunnel."

And the Trolley Trak goes for \$575 to \$1,050, depending on size. You're invited to "Slide It, Glide It, Ride It, Race It."

Playtime gets its tires from many sources, including 15 suppliers, mostly large tire sales companies or fleet trucking outfits. It also receives tires from people who just want to get rid of them.

An Illinois company, Newtoys, used to make and sell tire toys in the Chicago area. During its peak, Newtoys sold \$60,000 worth annually, but no more. Owner Jack Gleason said vandals started throwing gasoline on the tires and set them afire. "It's pretty unbelievable because they're great toys. But we stopped selling them because customers were no longer replacing the burned tires," said Gleason.

Heinrichs said there has been no similar vandalism in Wisconsin. He is reluctant to say whether tire toys are a profitable enterprise. "Let me put it to you this way: it's not a living for me; it's a secondary business. If someone wants to go into it, I wouldn't sue them for infringing on my patent, but I'd tell them how much money they'd make. I doubt that many would go into the business," he said.

Playtime sells to public and parochial schools nationwide.

The Green Machine

Len Polczinski,
DNR Grants Coordinator

All those pretty leaves, lawns, shrubs, trees and flowers that grow berserk, turn brown and end up in monster quantities at some landfill ought to be composted or mulched. It would save space and dollars and help the soil.

Parks, grass, trees and landscaping around offices, factories, boulevards and yards all add to the aesthetics of a community. But believe it or not, vegetation also produces "waste" — a lot of it. In fact, organic "greens" from urban areas range as high as 30% of all mixed municipal solid waste. Trees drop leaves, are pruned, shrubs are trimmed, grass is mowed and gardens thinned and weeded.

And all are enhanced by many tons of fertilizer and pesticides applied to make things grow even faster and greener. Figures from the United States Department of Agriculture and the US Environmental Protection Agency show that in 1984 Wisconsin's nonfarmers used more than 52,500 tons of fertilizers and 800 tons of pesticides.

Residential areas in most communities generate an estimated 1,000 to 1,500 tons of vegetation waste per square mile, and this doesn't take into account green wastes produced by urban parks and cemeteries, or the food waste generated by households, restaurants and institutions!

Unfortunately, most of these materials end up at the local landfill. It would be much wiser, however, and more economical to use them as compost or mulch and return their nutrients to the soil.

What is composting? Briefly, it is the process by which microorganisms break organic materials into rich, crumbly humus for use as a soil conditioner. It is the world's oldest and most natural form of recycling and also an excellent waste management tool. Composting can significantly reduce a community's dependence on landfills, increase the heat value of waste incinerated to produce energy, reduce collecting and hauling costs and lower tipping fees charged at the landfill.

Composting has long been common practice in India and Europe. Because of heavy population densities, those parts of the world cannot spare agricultural land for landfills and they also recognize that compost benefits soil. But there's not

much interest in the US. Our seemingly endless tracts of land for disposal, mass quantities of relatively inexpensive commercial fertilizers, and consumptive habits seem to preclude the necessity. How much does it cost each year to collect, haul and dispose of vegetative and food waste in Wisconsin? Estimates from DNR and the Taxpayers Alliance show that municipalities spent more than \$42-million to throw these materials out in 1982.

Two California cities, Davis and Sacramento, have found that collecting lawn and garden waste separately from other municipal waste can save money. Davis saves \$16 per ton and Sacramento \$14. Actually, amounts are even higher because gate fees at landfills were avoided. Similarly, Roseville, Minnesota found that composting 80% of its leaves was cheaper — \$35 per ton — than landfilling at a cost of \$75. The City of Madison saves \$15,000 annually by composting leaves. Other Wisconsin communities including Brookfield, Shorewood Hills and Waukesha enjoy similar savings. New Jersey, which has a severe landfill crisis, recently issued leaf composting permits to more than 160 communities. The immediacy of the landfill crisis in Jersey has made it a leader in recycling and composting.

Perhaps the reason municipal composting hasn't caught on in a bigger way is that local governments don't perceive it as a program that needs public funding like sewage disposal, water treatment or landfills. This reluctance might be overcome if compost were recognized as a marketable product that could be sold to cover operational costs. However, composting shouldn't have to be any more profitable than a landfill or any other publicly financed amenity. It should be viewed as just one segment of a more comprehensive resource recovery program.

Right: Food and yard wastes make up 20 to 30% of all household trash in Wisconsin. Communities spend \$42-million per year to get rid of it.

Photo by Len Polczinski





Madison composts 4,000 tons of leaves per year for use on various public projects. Stevens Point, Brookfield, Shorewood Hills, Waukesha, the Town of Cedarburg and several other communities also make compost from plant waste. They find it pays off in dollars.

Photo by Len Polczynski

Farmers and communities could work together in a composting program. Local governments could separate leaves, grass clippings, and food from other wastes and deliver them to nearby farms. This would save landfill space and tipping fees and probably some collecting and hauling costs. Farmers could then mix these materials with crop residues and livestock manures to build soil humus.

Using compost to improve soils will be increasingly important in light of statistics from the Wisconsin Land Conservation Board's 1984 report. That report shows an average annual erosion rate on cropland soil of 6.8 tons per acre — approximately 70% above what is needed to maintain long-term soil productivity. Cropland erosion has increased an estimated 25% statewide since 1977. And erosion from construction sites is often 10 to 20 times that of cropland!

As local governments try to manage their solid wastes more efficiently, they will more and more adhere to priorities established by the state. First, they should reduce the amount of solid waste produced. Then they should re-use, recycle, compost or recover energy from it before considering land disposal. Communities could even go a step further and set priorities for composting.

Local ordinances could prohibit citizens from mixing yard and garden debris with other trash. People could be encouraged to mow lawns more frequently and mulch the clippings. Mowers should be adjusted to about two or two-and-a-half-inches. This would help incorporate clippings into the turf and eliminate the need for bagging, hauling and disposal. Similarly, when old lawn

mowers need replacing, people should consider purchasing new ones that mulch as they cut. These mowers chop grass, leaves and small twigs more finely than conventional mowers. Left on the lawn, the clippings decompose quickly, and do not contribute to thatch build-up.

Citizens who collect clippings or garden debris should be encouraged to compost them in their backyards. Local UW Extension and DNR offices have instructions. Backyard composting saves buying commercial soil conditioners, mulches, fertilizers, and other lawn and garden products.

Local governments should establish central collection points where vegetative waste from parks, cemeteries, and municipal tree removal or pruning can be composted. Citizens could also drop off materials at the centers. The compost produced would be returned to local parks, used in reseeding projects, or given to citizens for use on lawns and gardens as a reward for participating in the program.

Eventually, when it's practical, communities might explore composting their solid waste with sludge from the sewage treatment plant.

The majority of us have a poor argument for not composting in our back yards. At the very minimum, we should exert pressure on local government to establish a central site where citizens can bring waste for recycling and composting. We can turn the haul-it-to-the-dump mentality around by taking action. Let's face it, since we're all part of the solid waste problem, each of us should help eliminate it.



Home gardeners make compost from kitchen and yard waste to condition soil and help it retain water. Compost also makes good mulch.
Photo by Len Polczynski

Compost Benefits to Soil



Benefits of Compost as Mulch

1. Reduces drought damage by increasing water-holding capacity of soil.
2. Improves tilth. Makes soil easier to cultivate.
3. Supplies part or all of the 16 essential elements needed by plants.
4. Helps buffer the soil and reduce adverse effects of excessive alkalinity, acidity, or over fertilization.
5. Increases cation exchange capacity, which lets soil retain more plant nutrients over a longer period of time.
6. Improves physical and chemical characteristics and increases biological activity that stimulates plant growth.

1. Reduces rainfall runoff and evaporation, making more water available to plants.
2. Keeps soil cooler in hot weather and warmer in cold.
3. Helps prevent freeze-thaw activity which can injure plant roots.
4. Helps prevent wind and water erosion of soil.
5. Helps control weed growth.
6. Good for land reclamation projects at mines, gravel pits, eroded hillsides and other damaged locations.

Down home, they use it again

Dannette B. Turner,
Assistant Recycling Coordinator

Antigo, Mauston and Medford as well as Ashland, Bayfield and Columbia Counties have unique recycling programs. But hundreds of other places are doing it too. And so can you.

In Wisconsin, many communities have made recycling almost a cottage industry. Their success should provide an inspiration to other communities that haven't yet done it, but want to. The original organizers would probably be honest and tell those about to try recycling that the road to opening day was rocky and operations sometimes a bit of a struggle. But they all undoubtedly would say it has paid off in countless ways.

According to DNR's Recycling Directory, more than 500 groups in Wisconsin are recycling materials. Of those, 60% collect newspapers, 43% collect aluminum cans, 34% handle motor oil, 24% glass, 12% plastic and 10% cardboard. But the different groups set themselves apart by how their programs are administered. For example, some are voluntary while others are mandatory by law. Some are run by municipalities or counties, others by private waste haulers or community-based organizations. Some hire municipal employees, the handicapped and developmentally disabled while others use volunteers, public aid recipients and even prisoners on work-release.

Here is a look at a few diverse programs selected because of the unique way they got started and because of their success:

Members of Antigo's Knights of Columbus, a community-based non-profit organization, meet regularly in a new clubhouse, financed, in part, by money made from recycling. It all started in 1973 when the group was looking for ways to raise money for clubhouse construction. One member, assigned to investigate fundraisers, discovered to his surprise that bundles of newspapers would bring in up to \$45 a ton. That began a successful newspaper and cardboard drive that continues today, featuring curbside collection in Antigo and all over the surrounding area. Modern Insulation Company of Spencer buys the newspapers. To



More than 500 community recycling programs operate in Wisconsin. About 60% of them recycle paper.
Photo by Len Polczynski

date, Antigo's Knights of Columbus have kept 350 to 400 tons of newspapers out of the local landfill.

In addition to these efforts, the city of Antigo itself for the past two years has been asking citizens to separate refuse, including motor oil, for recycling.

Another project—which sounds kind of extra-terrestrial—is very much down to earth. MARS, the Mauston Area Recycling Service, not only uses materials that were once thought unusable, it also employs those who were once considered unemployable — handicapped and developmentally disabled persons. The incentive to start MARS was economic. In 1980, the Juneau County Solid Waste Committee imposed a \$10 per ton tipping fee at their landfill, effective January 1, 1985. These increased costs prompted Mauston Mayor Larry Taylor to investigate landfill alternatives, including the underutilized option of recycling. He felt a recycling program to both collect and process materials would be ideal for his city, located 65 miles from Madison and close to prospective markets.

Mauston opened its new recycling center in 1983. In addition to curbside collection of its own sorted garbage, MARS pays its neighbors for their recyclable refuse. Eighteen communities now use the center. In 1984, nearly 1.1-million pounds of refuse were processed and revenues reached \$90,000. Since MARS started, the amount of material that went to the landfill has been reduced by 42% and so far, this has extended the landfill's life by a year.

In Ashland and Bayfield counties, New Horizon Inc. is a sheltered workshop for the handicapped and developmentally disabled. One of its projects, among others, is a non-profit recycling program. The group has a contract with the Uni-



**Recycling
in Wisconsin**

Solvents

17 companies



Waste oil collection now takes place in more than 100 Wisconsin communities. Soon it'll be required wherever populations exceed 3,500 people.

Photo by Dean Tvedt

It pays to recycle aluminum and about 200 Wisconsin communities do it. By recycling, manufacturers save 95% of the energy required to make the metal from virgin ore.

UW-Extension photo





By July 1, 1986, all communities with a population of 10,000 or more will be required to have collection and separation centers for plastic, glass, aluminum and newspaper.

UW-Extension photo

On specified days residents of Wausau and a few other communities bring their recyclable materials to collection centers. The money raised helps fund food co-ops, youth groups, bands, handicapped, senior citizen and other community projects.

UW-Extension photo



fied Services Board of Bayfield County to provide employment for this special group of people. The program started in 1979 by collecting newspapers in the two counties, but has now expanded and recycles other materials too. Unlike most recycling programs, New Horizons operates a resale shop. Residents have donated about 1,000 pounds of clothing plus various furniture. Usable items are repaired and retailed, while others are turned into cleaning rags and sold to area businesses or made into rugs on a loom. Some furniture pieces are made into pallets. The program has been able to continue operating, thanks to a number of county and community block grants. It's hoping for a state grant in the near future. New Horizon Employment and Marketing Director Alan Ralph says, "Our goal is to become a one-stop, one-shop recycling program."

Down in the southern end of the state, Columbia County has had a county-sponsored recycling program since 1981. Its main facility is located in Portage. Households are encouraged to separate paper, glass, aluminum, ferrous metals and plastics from their garbage and drop off the material at any one of 19 points around the county. A total of 17 townships and the cities of Lodi and Wisconsin Dells donate materials to the center. Those collected so far would save landfill space the equivalent of a hole 90 feet wide, 90 feet long and 67 feet deep. In 1984 alone, nearly 2,000 tons of material were collected. Columbia County is also working on a special composting project of statewide significance. DNR recently gave the county \$250,000 to study optimum conditions for composting municipal nonhazardous solid wastes with municipal sewage treatment sludge. The project's goal is to develop a manual for design and operation of a full-scale compost-processing facility.

At Medford, Dave Kmosena, a private waste hauler, is also doing what he can to save landfill space. Dave's Disposal Service collects household refuse and separates out the recyclable material. He now separates newspapers, cardboard, aluminum cans and glass and hopes that an anticipated larger facility will allow for plastic recycling. Dave's motto speaks for all the other people involved in community efforts throughout Wisconsin: "Every pound of waste recycled saves a pound going into landfills."

All in all, recycling is "what's happening" in solid waste today. But there's still a big need and plenty of room for more. Effective July 1, 1986, a new Wisconsin law will require certain landfills and municipalities to provide collection facilities for recyclable materials. This will make more available so the state is trying to encourage markets. The idea is to use things again and save resources and energy.

Mildred Zantow

"It seemed like it would be a terrible idea to build another landfill. . ."



When plastics didn't pay as well as they'd hoped, their recycling business expanded into newsprint.

Photo by Monica Liegel



Recycling in Wisconsin

Plastics

30 companies

"The fact that an old woman could start it and it could work, aroused people's curiosity," said Mildred Zantow modestly. She not only got the attention of her Sauk County neighbors, but of the entire state and even people throughout the country.

Zantow, 62, brought plastics recycling to Wisconsin and eventually diversified into other areas such as aluminum, tin, glass, newspapers, cardboard, waste oil and grease.

It all started in 1978 when Zantow was an executive with the International Crane Foundation and went to Japan to explain to the Imperial family why the United States could not ship some of their sacred but sick, quarantined cranes back to Japan. During her six-week stay in Japan, she recalled, "I saw very efficient garbage management. When I went out jogging, I noticed there were different garbage cans out every day. When I asked why, I was told they separate their garbage and throw different items out each day."

She began to think of the unorganized garbage collection procedure back home in Baraboo. With this in mind, she returned to Sauk County and to a screaming headline, "Sauk County Landfill Must Close." The article explained that the landfill, once a model for all the state, was improperly built on sandy, rather than water-retaining soil.

"It seemed like it would be a terrible idea to build another landfill when they already had one. I thought, Why not recycle like the Japanese?"

When she first thought of getting into the recycling business, she received discouraging signals—20 years ahead of her time, she was told. But Zantow was headstrong and ambitious. After observing the county landfill, she realized plastic products made up a great deal of the garbage, largely because of the many plastic manufacturers in Baraboo. One of the plastic companies told her that if she bought a grinder at her own expense, they would in turn buy her recycled product.

"I had no money, so I cashed in my life insurance policy," she remembered. She maintains that this decision was neither courageous nor risky. "It all depends on how determined you are to see something through."

After studying a plastics encyclopedia, she set up the business, E-Z Recycling at Bluffview Acres in Sauk County. Her first sale was 1,000 pounds of plastic. It took seven one-gallon milk jugs to make a

pound. Zantow and her partner, Jenny Ehl, found various markets. Companies making drainage tile and lumber, for instance, became customers. But since plastics didn't pay as well as they'd hoped, they expanded the business to include aluminum, glass, newsprint, cardboard, grease and oil. Zantow and Ehl, plus two assistants, did all the work themselves—collected the materials, baled cardboard and cleaned and delabeled plastic milk jugs.

The materials came from a number of sources. Many Sauk County groceries set up drop-off areas behind the stores, and a hospital became a collection point, as did an elderly housing center, a rural transfer station and the county landfill. In addition, people brought material directly to E-Z. Cardboard was delivered by a local municipality and a local industry. A plastic bag manufacturer delivered several hundred pounds of imperfect bags and local residents were paid for aluminum cans.

The business grew by leaps and bounds, and by the spring of 1982, it had outgrown its founders. "I wasn't looking for a future for myself, so I decided to sell it," Zantow said.

E-Z was eventually sold to WINR - Wisconsin Inter-County Nonprofit Recycling Company.

"I think the business brought more attention to the issue of recycling. Through all of my programs, people were alerted to what was really happening. And county officials began to listen," she said.

"People are going to be much more particular about their landfills now. They're discovering more and more polluted wells. It's the old landfills that are doing the polluting, not the new ones." While Zantow emphasized the necessity of recycling, she was less encouraging about the profitability of starting such a business today. "No one could start a recycling program and make a living at it. Aluminum prices are low and you have to depend on aluminum. Cardboard prices are quite high, but it is labor intensive." Altruism and a lot of community support would help, she thinks.

Even though retired, Zantow has not lost her zest for recycling. She helps out wherever she can, but is purposely cautious about not interfering in other people's programs.

"Most of them are aware of the need for recycling, but every individual has to participate in order for it to be effective," Zantow said.

That includes, she explained, sorting out garbage, encouraging counties to provide separate receptacles for different items, rinsing out containers and putting them by the curb for pickup by the county or an independent recycling project. She said she thinks there are enough recycling programs and landfills in the state now, but as population grows, there will have to be more.

"Recycling is the only way to go," said Zantow. "There's a tremendous future in it. There's just no alternative."



Mildred Zantow stands next to the plastics grinder paid for by cashing in her life insurance policy.

Photo by Monica Liegel

Irvin Vincent

"If everyone would take a good hard look at their industries, we could solve a lot of problems."



Irvin Vincent with products made from plastic milk bottles. Most are substitutes for lumber.

"Somewhere, someplace, we have to quit putting things in landfills," said Irvin Vincent, president of N.E.W. Plastics in Luxemburg, Wisconsin, east of Green Bay.

Vincent decided to practice what he preaches four years ago and began a unique business in Wisconsin and perhaps in the entire country. N.E.W. Plastics developed a way to chop up and remelt plastic gallon milk jugs to make new products, some of which are not made by anyone else, anywhere. While Vincent said the manufacturing process is difficult and expensive, he is committed to the business because it eases the problem of finite space for landfills. "If everyone would take a good hard look at their industries, we could solve a lot of problems," he said. Here are some of the products N.E.W. Plastics makes out of milk bottles that would otherwise have been thrown into landfills:

Plastic boards. These are sold to dairy farms to make holding pens for young calves.

Decking for boat docks on inland lakes. These replace wooden boards that are famous for splinters. Vincent admits, however, that the product is not "100% proven. We don't know how long the boards will last in sunlight."

Corner posts. These replace wooden posts used in the four corners of crates filled with bags of frozen food. Wooden posts sometimes puncture the plastic bags.

Chicken cage dropping boards. These comprise 70% of Vincent's sales. Chicken manure rots the traditional galvanized steel boards and they have to be replaced every three years. However, plastic can easily be sanitized by simply washing

it. Vincent says no other company makes this product using only recycled plastic.

Elevator flooring. This is used in locations that retain water, such as cheese plants.

N.E.W. receives the bulk of its plastic jugs from the Manitowoc-Green Bay area. Collection centers have been established in a barn adjacent to Manitowoc High School and at church parishes in Green Bay.

At present, Vincent's company can haul approximately 2,000 pounds or about 14,000 milk jugs in one truckload. These are taken to his grinding plant for processing, but new equipment is planned in about two years that will make it possible to grind jugs directly on the truck. With that, Vincent predicts, he will be able to haul up to 4,000 pounds at one time. In all of 1984, N.E.W. Plastics recycled about 7-million bottles, or one million pounds.

The firm has 126 employees and sold half a million dollars worth of products in 1984, not all of them recycled. Vincent expects to double that in 1985. But he would like more financial help from the state in the form of incentives. He thinks it would help him purchase sophisticated equipment to produce plastic highway guardrail posts that could replace wooden ones.

"I think that if you can find ways to stop going into landfills, you will help the whole nation," says Vincent, and adds, "I've been called a yo-yo because of some of my ideas about recycling."

One of these ideas that's never been accepted envisions school children helping to recycle magazines and newspapers. Since these items can't be recycled together, he would have youngsters bring them in on the school bus on separate days. "That way, the students would learn about recycling, we would only need one baler because the papers would already be separated and we could go to different school districts on different days. The school system could even get half of the profits as an incentive to do the project."

But Vincent's school bus idea has never received support from either the state or school districts.

He thinks his ideas are not nearly as controversial as projects actually underway elsewhere and cited a company in Florida that recycles plastic two-liter soda bottles into insulation for jackets.

"I think we're four or five years too early in Wisconsin," laments Vincent.

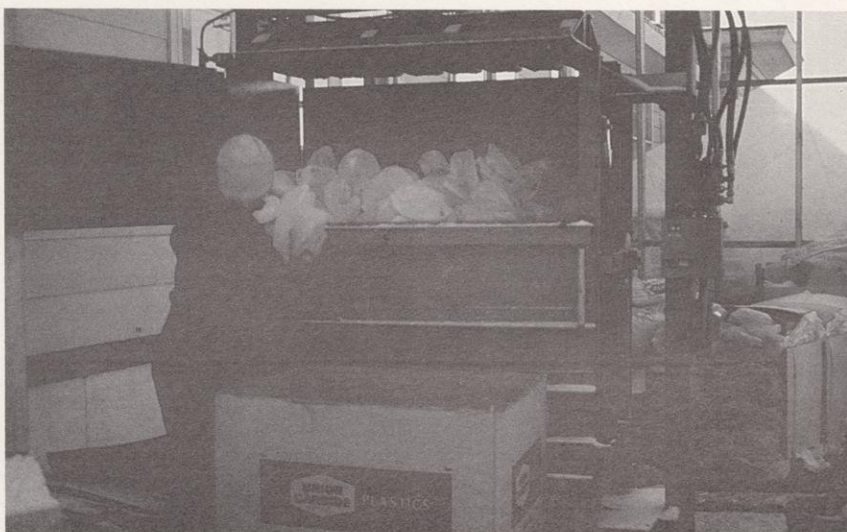
Vincent is proud of the fact that he is doing his share to save landfill space, especially since it's becoming harder to find places to build them.

"The question is: Do you want a landfill in your neighborhood? I'm just trying to find ways to recycle products and clean up the mess. I want to find answers. And I believe we will. We'll find more and more ways to recycle products," says Vincent.



Milk bottles are the largest single source of recycled plastic in Wisconsin. They have to be crushed and baled prior to sale.

UW-Extension photo



Plastics baler. UW-Extension photo



Wisconsin's Municipal Waste

Paper

The largest portion, equal to a forest of 20-25-million trees a year.

Yard Wastes

10-15% of the total, and easily recycled back into soil through composting.

Glass-Bottles

Just under a billion bottles and jars a year.

Metal Cans

We use 2 1/2-billion a year, including enough beer and soda cans to circle the earth four times, or run a row down every street and highway in the state.

Plastic Bottles

300-million a year and expected to double within 5 years.

Tires

4-million thrown away a year — some storage piles have double this number.

Madison Recycles

Dannette B. Turner,
Assistant Recycling Coordinator

Shredding waste and collecting papers plus some other activities have saved the city a million cubic yards of landfill space.

In recycling, success can be different things. For Madison, it's defined in terms of longevity. Last October the US Department of Energy recognized Madison's program of recycling waste into energy with a national award.

Madison has recycled over 300,000 tons of materials since 1968 ranging from newsprint to waste oil. Estimates are that it has saved more than one million cubic yards of landfill space. In addition, the city has earned approximately \$2-million from sale of recovered materials. Besides its successful recycling program, Madison also has an eminent resource recovery plant which converts municipal solid waste into a high quality supplemental fuel.

However, despite these successes, the city has problems. The cost to run the energy recovery program has exceeded revenues made from sale of the fuel supplement. A study is planned to find ways to make the plant's fees comparable, if not equal, to landfill fees, and to identify other possible markets.

Madison has the oldest, and some say most successful, newspaper collection program in the state and possibly the country. Over 32,000 tons of newsprint have been collected so far. This success can be directly linked to the city's commitment to reduce the amount of paper being landfilled. Residents too, can pat themselves on the back, since without their cooperation, there would be no program. Collections began in 1968, as a six-month pilot project with the National Committee for Paper Stock Conservation. It was a mutually beneficial program, since the committee needed large volumes of paper and Madison needed to conserve landfill space. Operated at a loss the first three years, it showed a profit in 1971 and has continued to do so ever since. But there have been some lulls.

Citizen participation waned in 1984, with only 25% of the city's residents bundling newspapers for pickup. Ted Jagelski of Madison's Department of Public Works believes that with more publicity 30 to 40% of all Madison residents would participate, and if the program were mandatory, the figure could reach as high as 65%.

Madison sells the newspapers to Midwest Steel/Madison Paper Recycling. Earnings have fluctuated a great deal. As much as \$80 a ton was received in 1980, but only \$6 in 1971.

In addition to recycling newsprint, Madison has collected office waste paper from its own City-County Building since 1975 but will soon add 13 other buildings to the program. Collection bins

will be placed in each office and emptied once a week.

Paper is only one phase of Madison's extensive recycling effort. It earns about \$5,000 a year recycling metal, collects 30,000 gallons of waste oil annually, composts about 4,000 tons of leaves, and chips tree trimmings into landscaping material for use by city parks. Since 1975, Madison salvaged over 57,000 tons of concrete from old curbs, gutters and sidewalk slabs which were eventually recycled for road construction.

Even though all the recycling programs are profitable, broader public participation is needed. Jagelski is planning a consumer education effort plus media coverage to attain this goal.

"Recycling makes economic as well as environmental sense. For local government, recycling can reduce solid waste handling and landfilling costs. For businesses, recycling can cut material and energy costs. For homeowners, recycling can condition your garden, heat your home or reduce your household bills. We might be starting small, but recycling can make a big difference in Wisconsin."

DNR Secretary Carroll D. Besadny

To some communities, shredding waste to reduce volume is something new. But to Madison, it's commonplace. At first, only shredding and landfilling was done. Since 1979, however, the quality of the shredded waste has been improved so that it can now be sold as a fuel supplement. It goes to two buyers under a long term agreement, Madison Gas and Electric Company and Oscar Mayer Foods. At MG&E, a feasibility study indicated this "refuse-derived fuel" could replace up to 20% of the coal burned in the company's Blount Street generating plant. Oscar Mayer could use about 10,000 tons a year.

Today, the shredding plant, called the Edwin Duszinski Energy Recovery Facility, is running under capacity. It has a daily output capability of 400 tons of processed waste, including over 200 tons of refuse-derived fuel. However, in 1984 fuel production averaged only 65 tons a day because of limited demand. Plant officials hope they will be able to get a third customer, possibly the University of Wisconsin. If the university buys the material, the center could operate in the black, something it has never been able to do.



Madison was the first municipality in the nation to collect newspapers for recycling. The program started in 1968 and has since expanded to office paper, oil, concrete, asphalt, appliances, leaves and other materials. Saving landfill space is the name of the game.

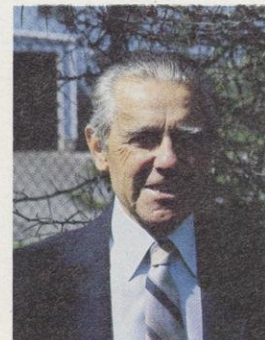
Photo by Danette Turner

Duszynski was a pioneer in municipal waste reduction. He was first to collect newspapers, first to shred waste to reduce its volume and first to make refuse derived fuel from city trash.

Photo by Sara Ballard

EDWIN DUSZYNSKI

“Landfill sites were not inexhaustible”



Dane County is talking about not accepting any more landfill garbage that contains recyclable materials. “They finally realize the problems I had in the 1960s, but it’s 20 years late,” said Edwin Duszynski, the City of Madison’s director of public works from 1962 to 1978.

Under Duszynski’s supervision Madison became the first city in the country to shred refuse before putting it in a landfill. This perfectly obvious method of compacting garbage was newfangled and controversial back in the early ’60s when he did it. No longer! Duszynski also started Madison’s first newspaper recycling program, one of the longest-running curbside pick-up operations in the country.

“We realized landfill sites were not inexhaustible. In addition, requirements became so stringent landfills were no longer economically feasible. It used to be that you could just dig a hole, put in your refuse and cover it up. You can’t do that now,” he said.

As public works director, Duszynski agreed to participate in a federal demonstration project to shred refuse prior to landfilling it.

“The Heil Company put up the up-front money to build the plant,” he recalled. “If it didn’t work out, we could simply drop the project. If it did, we’d pay them back.”

The rest is history.

“It was one of the most successful projects that the federal government started in the 1960s,” said Duszynski. “Europe was the only other place this type of recycling was being done.”

Duszynski said University of Wisconsin studies found that shredding prior to disposal yielded multiple benefits. The practice eliminated odors, got rid of flies, cut off food for rodents by dispersing it in the refuse, and compacted materials so that more could be put in a landfill. Duszynski also discovered that landfills with shredded waste did not need to be covered every day. “This was important because in many parts of the country with a cold climate like Wisconsin’s, the ground freezes hard as concrete. It’s very difficult to cover every day under those conditions,” he said.

Today, the plant shreds refuse, separates out the ferrous metals, then sells the combustible materials to Madison Gas and Electric and Oscar Mayer Company to help produce energy.

Besides shredding waste for energy, Madison also has the largest municipal curbside newspaper recycling program in the US, thanks to Duszynski. It began in 1968 after a paper industry chemist approached Duszynski about separating newspapers and salvaging them. Duszynski was skeptical. He thought there were inherent problems, but agreed to try and sell the project only if a market could be guaranteed. Not only did markets materialize, so did a firm that would de-ink the newspapers, which meant their fibers could be recycled back into newspaper.

Duszynski set up a curbside pick up system and soon Madison was being paid as much as \$60 a ton for paper that used to be landfilled. “In time, the city’s newspaper project netted, not grossed but netted, enough to pay my salary and fringe benefits.”

Even though many of Madison’s recycling projects were successful, Duszynski is disappointed. “It’s been coming along slower than I thought.” He points to the political climate, personnel and the economy as reasons.

“In the beginning, when we talked about recycling, we talked about the wrong thing: where would the new markets be? But you shouldn’t look for new markets, rather for materials to replace raw natural supplies. One problem is that some industries have 20 to 30-year contracts to supply pulp, trees and other things. They can’t just cancel the contracts. How do you change the system when contracts exist and things are running real smooth?”

Duszynski thinks the newspaper salvage project can stand on its own, but that Madison does not have enough users for the shredding project. “The plant has more capacity than markets. Madison Gas and Electric and Oscar Mayer can’t take it all. We should try and interest the university,” he suggested.

Since his retirement, Duszynski lectures once or twice a year on the virtues of recycling. He’s still selling the idea of how it can make all the difference in a municipality’s garbage and landfill situation.

