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ABSTRACT

Every active family and business produces solid waste, some of which are the nonhazardous discards of society. Taken as individual substances, our newspapers, food leftovers, containers and wrappings, grass clippings and tree limbs seem harmless enough. But huge volumes of these materials are generated daily. It has been projected that many counties in Ohio may run out of approved landfill space by the end of this century. The purpose of this publication is to promote student research on litter prevention and recycling. This science workbook contains 26 student research project ideas submitted by business, industry, trade associations, and others. Also included are "The Solid Waste Crisis in Ohio"; "Background on Litter Prevention and Recycling"; and "How to Find Information on Litter Prevention and Recycling" (including information on using the library, reference books, journals, indices, abstracts, vertical file and letter writing). "References and Resources" include the addresses of 40 organizations and agencies, and a bibliography of over 200 references. (CW)

Ohio Science Workbook:
LITTER PREVENTION & RECYCLING

1987 Edition

Edited by

Lynn Edward Elfner

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FOREWORD AND ACKNOWLEDGEMENTS

The purpose of this publication is to promote student research on litter prevention and recycling. The concept of a science workbook with student research project ideas submitted by business, industry, trade associations and others dates back to 1964 when The Ohio Academy of Science cooperated with the Ohio R & D Foundation in the production of the first workbook of ideas. Since then nearly 20 different workbooks have been produced.

This publication is the result of work by many people. I especially want to thank Ms. Mary Wiard, Mr. George Peters, Jr. and Ms. Anne Filbert of the Office of Litter Prevention and Recycling for financial support. They also spent many hours reviewing drafts and providing background information.

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Lynn Edward Elfner

THE SOLID WASTE CRISIS IN OHIO

The following section is a reproduction of the text of a publication of The Ohio Alliance for the Environment, FOCUS on the Issue: Understanding Ohio's Solid Waste Crisis. The publication was based on a report prepared for the Alliance by Lynn Wasnak and was funded in part by contributions from the Columbus Audubon Society, the Ohio Conservation and Outdoor Education Association and Waste Management Inc.

There is also the problem of correctly estimating the actual cost of disposal of any given product. So far there is not much accurate information available on this subject.

Recycling

Recycling, or reusing discarded products or materials, seems to be a very sensible way to reduce the waste stream. Some experts estimate that under optimum conditions as much as 50 percent of the typical municipal waste stream could be recycled. Both glass and aluminum container manufacturers encourage recycling, since reusing these materials saves them money in processing and in the price of raw materials. Even some plastics such as milk jugs can be recycled efficiently.

Ohio supports an active recycling program, both through the efforts of the State Office of Litter Prevention and Recycling (OLPR), and a non-profit, industry-based group called the Ohio Business & Industry Recycling Program, Inc. (OBIRP).

Established by law in 1980, OLPR has been appropriated over $30 million for litter control and recycling programs during the past six years. In 1986 nearly 150 Ohio communities received grants for litter prevention and recycling. Programs supported by these grants included educational programs, public awareness, increased enforcement of litter laws, litter collection projects and household recycling opportunities. In addition to administering the grants programs, OLPR provides technical assistance to both grant and nongrant communities and coordinates statewide events.

The Ohio Business & Industry Recycling Program sponsors consumer-centered recycling of newspapers, aluminum, glass and other materials by for-profit and nonprofit recyclers. Multi-material recyclers who meet its standards are entitled to use the distinctive green and white logo and promotions of The Recycling Station.

In the first 18 months since The Recycling Station program began, some 30 multi-material recycling stations qualified for membership. About $6.5 million was paid out to the public for recycled materials.

But there are roadblocks to effective recycling that should be overcome. The first problem is collecting the material. If it is not convenient or cost-effective for the consumer to separate waste and turn it over to recyclers, everything will wind up in one garbage can.

Secondly, markets for recycled materials fluctuate. If a recycler collects a material, but then cannot resell it at a profitable rate . . . or, in some cases, can't even give the material away . . . it might just as well not be collected separately. To please the public, recycled materials must be stored in a nonoffensive way. That requires considerable space, especially if the recycler is waiting for prices to rise so resale is profitable.

Some groups have proposed curbside collection of separated recyclables. The householder would make separate garbage bags for papers, glass and metal, which would be picked up by the recycler. If householders found the separation process inconvenient, a financial incentive could be offered: those who separate their waste materials would pay less for disposal than those who lump it all together. But even then, there is the problem of how to prevent unauthorized pickup of the most valuable materials such as aluminum.

New Jersey and some other states rebate a portion of landfill disposal tipping fees to communities that support active recycling efforts. Whether they exist as profit-making or nonprofit entities, recycling centers benefit the community by removing material from the waste stream and reusing it.

Container Deposit Legislation—Pro & Con

At this time Ohio does not have a container deposit law. However, legislation has been proposed to charge a deposit on every beverage bottle and can sold in the state. The intent of this legislation is to encourage recycling and discourage littering at the same time.

Several consumer groups believe this type of legislation would help reduce the problem of solid waste disposal. They cite the experience of other states, notably Michigan, which has had a container deposit law in effect since 1978. Michigan's Resource Recovery Division estimates that 600,000 tons of containers have been removed from the solid waste stream annually, since the law went into effect. The containers are reused or recycled.

However, many businesses oppose this type of legislation. They argue that the volume of beverage containers is just a fraction of the waste stream. Even if all containers were recycled, the solid waste problem would hardly be touched.

Businesses also cite the hidden costs of container deposit legislation: more trucks, larger warehouse space and more employees are required to handle returned containers. Those costs are not covered by the small handling fees passed on in legislative rulings, they claim.

However, many businesses support The Recycling Station efforts. If Ohio's recycling program is given time to prove itself, they believe container deposit legislation may be unneeded.

Because present charges for waste removal are so low, it is difficult to get the public excited about recycling. This will change as the price tag for disposal rises in the next few years.

Composting

Composting is a sometimes controversial method of dealing with organic wastes. Ohio currently does not license composting facilities, although the method has been used on a small scale in backyards and residential communities.

Composting involves layering organic materials with dirt and permitting the material to return to earth or decompose. Grass clippings, ground-up tree limbs and some types of food leftovers can be used. Cities such as Columbus have mixed these materials with municipal sludge from sewage treatment plants, in a process called co-composting, to make a dry, fertile soil additive. The soil developed by composting is rich and nutrient laden, but its use is limited when substances such as pesticides or sludge containing heavy metals are introduced into the mixture.

Problems with composting are comparable to those affecting all basic recycling efforts: collection, separation and marketability For example, the composted material prepared in Columbus is not recommended for use on food crops. Its part-sludge composition is

deemed safe only for flowers and lawns, thus limiting the market for this compost.

Incineration and Energy Recovery

Incineration is a disposal method that reduces the volume of solid waste. The ash that is left over after burning must be landfilled, or used in products such as roadsurfacing material. Thus incineration does not eliminate the need for landfills, but it greatly extends their life.

Papers, garbage and plastics release energy when burned. Heat recovery equipment, such as boilers and steam driven turbines, can be incorporated into incinerators to produce steam or electric power. These plants capture and distribute the energy resource that is usually untapped in solid waste. There are five licensed, waste-burning incinerators currently operating in Ohio, and two trash burning power plants.

Several types of incinerators and energy recovery systems are now available. Refuse-derived fuel (RDF) plants involve a preprocessing unit that grinds or chops the waste before feeding it into the burn units. Mass burn plants dump unprocessed waste directly into the burners. Either of these incinerator types can be fueled on a batch feed or continuous feed basis.

In earlier days, energy recovery plants were very expensive. Only the largest urban areas could afford them. Only a high waste-generating region produced enough burnable waste to keep the energy flow constant, and thus make the plant economically sound.

Some Ohio incinerators have had serious safety and maintenance problems. In the past, plants have been built for cities by contractors who simply handed over the keys, and the problems, to the city once the plant was built.

But today, smaller modular incinerators and energy recovery systems are being built, and developers and contractors are frequently tied into the long-term operation of the plant. That means any problems that crop up become the developer's or contractor's responsibility, not just that of the municipality or regional waste control district.

A state-of-the-art system of this type is planned for Marion, Ohio. In addition to waste energy recovery, this plant includes front-end waste separation, to remove materials for recycling. Innovative financing methods have been used to fund the Marion project including state loans, federal grants, industrial revenue bonds, and private investment.

New businesses will locate there, says Marion's mayor Ronald Malone, to take advantage of low cost energy produced by the plant. If all goes well, the project is expected to bring up to 1000 jobs into the area. This particular project points out how waste disposal and resource recovery projects may benefit Ohio's employment picture, while preventing a solid waste crisis.

However, concerns about the safety of incineration have not disappeared. Greatest fears are of dioxin and furan emissions from ash. In Europe, municipal waste incinerators are targeted as the prime source of dioxin in the air. Many scientists feel that current technology to control dioxin is not satisfactory.

The typical mass burn incinerator could be a serious pollutant source, unless plant operation and air emissions are rigorously monitored.

Landfills

Although landfills are the most commonly used means of solid waste disposal in Ohio, they are probably the least popular with the public. Odors, dirt, noise, heavy truck traffic and possible groundwater contamination are some of the arguments used to discourage landfill siting. Because liquid residues or leachates have migrated from some older sites into the underlying groundwater, there is serious concern by citizens and environmentalists about this problem and how to solve it.

However, no matter how many alternatives there are in recycling and incineration, some landfills still will be needed for the future. To protect the environment new landfills should be located where the underlying geologic formations and soils will act as a barrier to off-site leachate and methane gas migration. Rigorous geologic site reviews and the use of impervious liners and leachate collection systems in state-of-the-art landfills significantly reduce the risk of groundwater contamination.

Most of these modern landfills are operated by large waste management companies. The small mom-and-pop landfill cannot afford the sophisticated equipment needed to build or maintain these sites as required by the Ohio EPA.

New compacting methods are also used to help conserve landfill space and reduce odors, but compacting may produce problems.

Trash is compacted at a sanitary landfill site by first spreading a uniform layer of waste, then covering it with a certain approved depth of soil, and running over the mass with huge machines that press the soil and trash together. This process creates a layer of organic material that contains very little oxygen. As the waste material is decomposed by bacteria, without the presence of oxygen, methane gas and carbon dioxide are produced.

Methane gas carries odors and is flammable. Because it can migrate underground, it has occasionally caused explosions, even beyond the boundaries of the landfill itself. Modern landfills include methane monitoring, venting, and collection systems, to prevent gas-related dangers.

However, there is an up-side to the methane gas problem. When collected and cleaned, its energy can be tapped just the same as natural gas. Methane recovery systems that pipe methane into gas utility pipelines are now being installed at several sites in Ohio.

An additional obstacle to siting comes from misinformation or misunderstanding on the part of the public. Some people are not aware of the difference between hazardous waste disposal sites and those for solid waste. They may challenge a new or expanded solid waste site, believing it will poison the environment with dangerous chemicals. An open dialogue between waste industry representatives and the public is an important part of the educational process.