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Every year, the United States produces at least 236 million metric tons of hazardous waste. Hazardous waste is defined as solid waste that can pose a substantial threat to human health and the environment when disposed of incorrectly. Some commonly used household products, when disposed of, become hazardous waste; historically, much of this household hazardous waste (HHW) has been disposed of into systems not designed to safely handle hazardous waste. One solution to this disposal problem is providing safe disposal systems for household hazardous waste in the community.

The purpose of this study was to survey the population of Benton County, OR to assess the residents' HHW disposal practices, attitudes and beliefs about HHW as an environmental health risk, and preferences for a safe disposal system. Benton County residents' awareness of the current community program for recycling used household items was also investigated.

This study indicated that incorrect disposal methods were used by the majority of subjects for almost all HHW surveyed, and that for nonautomotive HHW, landfilling was the most common means of disposal. The majority of subjects in this study disposed of used motor oil and lead-acid batteries by recycling these HHW. A permanent collection site for HHW disposal was the preferred disposal option for 62% of subjects, and 100% of those subjects choosing this option said they would drive up to 5 miles to use this facility. This study indicates that the largest number of subjects preferred the option of paying a user fee for HHW disposal as a means of funding a HHW disposal system. Three-fourths of the subjects reported a high or moderate amount of concern about the contribution of HHW to pollution of surface and groundwater, and 68% of the subjects stated that they lacked confidence in the landfill to safely contain chemical wastes. Approximately one-half of the subjects recalled reading or hearing about HHW disposal in the past year, and 62% of the subjects stated that they would call their garbage disposal company for HHW disposal information.

The results of this study indicate that 90% of the Benton County residents surveyed were aware of their curbside recycling program.

This study suggests that Benton County residents are concerned about the possible adverse environmental health effects of incorrect HHW disposal, and supports a permanent collection site for the safe disposal of HHW, as well as increased public education, as means of reducing the risks to human health and the environment caused by incorrect HHW disposal.

A Household Hazardous Waste Survey of Benton County, OR

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DEFINITIONS

The Resource Conservation and Recovery Act (RCRA)--Federal legislation passed in 1976 that addresses three broad areas: a) hazardous waste management; b) solid waste management; and c) the procurement of materials made from recovered wastes.

RCRA Subtitle C--This section of RCRA mandates that the Environmental Protection Agency (EPA) develop a comprehensive regulatory program to control the management of the nation's hazardous waste, and includes criteria for the identification of hazardous waste and the regulation of generation, transport, and storage of hazardous waste.

RCRA Subtitle D--This part of RCRA is concerned with the permitting and regulation of waste facilities, particularly landfills. It mandates that the EPA set standards for municipal landfills, and provides for the "phasing out" of unacceptable landfills within a given time frame.

The Hazardous and Solid Waste Act (HSWA)--Enacted in 1984, these amendments to RCRA contain the following key provisions:

1. Establishes standards for handling hazardous waste from generators of between 100kg and 1000 kg per month.
2. Prohibits the placement of bulk or non-containerized liquid hazardous waste in any landfill.

3. Bans land disposal of certain wastes unless EPA finds that prohibiting certain methods of land disposal is not required to protect human health and the environment.

4. Provides that each new landfill or surface impoundment have at least two liners, a leachate collection system, and a groundwater monitoring system.

A HOUSEHOLD HAZARDOUS WASTE SURVEY OF BENTON COUNTY, OR

CHAPTER 1

INTRODUCTION

Every year, the United States produces at least 236 million metric tons of hazardous waste. The safe disposal of this waste, necessary to protect human health and the environment, is an enormous technological and economic challenge (Knox, 1991). The Resource Conservation and Recovery Act (RCRA), enacted in 1976, and the Hazardous and Solid Waste Amendments to RCRA, passed in 1984, established a comprehensive regulatory program for the generation, transport, storage and disposal of commercial quantities of hazardous wastes. RCRA defines hazardous waste as a solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may:

1. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

2. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

These wastes are identified by the following criteria:

1. They are on the list of substances deemed hazardous by the Code of Federal Regulations (1990), 40 Part 261 (Subpart D).

2. They possess one or more of the following characteristics: ignitability, corrosivity, reactivity, and toxicity, as determined by RCRA (Fortuna & Lennett, 1987).

Commonly used household items such as household cleaners, automotive products, paint products, wood preservatives, and pesticides exhibit the aforementioned characteristics; these products can endanger human health and degrade environmental quality if disposed of incorrectly (Bass, Calderon, & Khan, 1990). However, household waste, defined by RCRA as "any material (including garbage, trash, and sanitary waste in septic tanks) derived from households including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas" (Code of Federal Regulations, 1990, 40 Part 261.4), is exempt from regulatory control. The Environmental Protection Agency (EPA), which writes hazardous waste definitions and regulations, did not intend to imply by the exclusion of this waste that it could not be hazardous. In the preamble to the proposed RCRA legislation, the EPA stated that the intent was to exempt certain wastes from regulation based on their source of generation, rather than on the absence of hazard from the wastes (SCS Engineers, 1986).

Americans produce about 146 million metric tons of solid waste per year, of which 10% is recycled, 10% incinerated, and 80% landfilled. Various studies have found that 0.3% to 0.5% of this solid waste is hazardous waste from households (Dana Duxbury and Associates, 1990). Thus, approximately 4.7 million metric tons of household hazardous waste (HHW) are disposed of annually into systems not designed to handle hazardous waste.

In the early 1980's environmentally concerned citizens became increasingly aware that current disposal methods of household hazardous waste did not ensure the protection of public health or the environment (Tufts University Center for Environmental Management, 1986). Programs giving citizens a safe option for disposing of these wastes were designed and implemented across the country. The majority of these activities were community "collection days," which allowed residents to dispose of HHW safely and free of charge by bringing these wastes to a site where the wastes were then collected and handled by hazardous waste disposal companies. In some communities, permanent collection sites were opened to provide regular access to a safe disposal system. Between 1981 and 1989, more than 2000 collection programs operated in the United States ("Household hazardous waste programs boom", 1990), and at the end of 1989, 36 permanent collection sites were operating in the US, with many other sites being planned (Dana Duxbury and Associates, 1990).

This study investigated the disposal of household hazardous waste by residents of Benton County, OR. The objective of the study was to obtain data on HHW in Benton County which could be used to: (a) assess current and recent disposal practices; (b) plan for future HHW disposal programs; and (c) guide educational and informational resource strategies that could be part of community efforts to provide for the safe disposal of household wastes that can be hazardous. Data on the recycling of other household wastes also was collected to ascertain the level of awareness of present recycling services in Benton County.

Significance of the Study

It was important to investigate the issue of HHW disposal in Benton County for the following reasons:

1. County residents had not been surveyed regarding HHW disposal and related issues prior to this study.

2. County residents' participation in local HHW collection events has demonstrated a need for a HHW disposal system in Benton County. At the 1990 "Household Hazardous Waste Cleanup Day" in 1990, 477 vehicles brought 2903 gallons of liquid HHW for disposal. A survey showed that 57% of the participants believed an annual HHW collection day was needed in the community (Corvallis Disposal Co., 1990).

3. A HHW disposal system must be cost-effective due to the large expense of HHW handling and disposal. The Benton County 1990 HHW collection day cost an estimated $67 per participant, or about $11 per gallon of HHW collected at that event (Corvallis Disposal Co., 1990). Some of the costs for a HHW disposal system are fixed; for example, the expense of employing a toxic waste management team for a collection day is constant regardless of the number of participants at that event. Similarly, the costs of building and maintaining a permanent disposal site are fixed regardless of the amount of use. It is therefore important to provide the HHW disposal option that will be best utilized by the community.

CHAPTER 2

REVIEW OF THE LITERATURE

List of Common Hazardous Household Products

The EPA has grouped hazardous household products into five broad categories (Office of Solid Waste, 1988): These categories and examples of each are given below:

1. Household cleaners: Toilet bowl cleaners, septic tank cleaners, drain pipe cleaners, bath, sink, and tile cleaners, and stove and oven cleaners.
2. Automotive products: Used motor oil and antifreeze, oil and fuel additives, grease and rust solvents, and metal cleaners and waxes.
3. Home maintenance and improvement products: Paint, paint thinner and turpentine, wood sealants and stains.
4. Lawn and garden products: Pesticides, herbicides, and rodenticides.
5. Others: Air conditioning refrigerants, household batteries, photographic chemicals, swimming pool chemicals, and all other products not described by the above classifications.

Hazardous Characteristics of Household Hazardous Waste

Detailed listings of hazardous substances in common household products can be found in several studies. A survey by SCS Engineers (1986, pp. 3-4 to 3-13) lists common household products and describes them according to their hazardous waste content, denoting the specific hazardous waste number from the RCRA U or P list, as applicable. The U list is a listing of non-acutely hazardous chemical products, and the P list contains

acutely hazardous chemical products (Fortuna & Lennett, 1987). The Metro Household Hazardous Waste Disposal Project (Metro, 1982, pp. 37-53) reviews products in the major categories of HHW and their hazardous constituents. The EPA study on HHW in wastewater (Hathaway, 1980, pp. 31-39) focuses on the hazardous compounds in this portion of the municipal waste stream, providing a detailed listing of hazardous chemicals typically present and their Priority Pollutant list number, when applicable. The Priority Pollutant list of the Clean Water Act of 1987 identifies chemicals having the greatest potential for harm to human health and the environment as water pollutants.

A given HHW may be deleterious to human health and/or the environment because it is composed of one or more substances that can cause adverse effects (Metro, 1982). These human health effects may include cancer, a wide spectrum of other diseases or conditions, injury, and death. Some commonly used household products contain compounds that would be classified as hazardous waste and subject to all RCRA Subtitle C requirements if they were generated by a commercial source in quantities greater than 100 kg per month (SCS Engineers, 1986; Tufts University Center for Environmental Management, 1986). The ingredients and their concentration must be determined for each individual product, however, since manufacturers may formulate a product specifically for home use that would vary from a commercial product in terms of hazardous characteristics. For example, a household cleaning product may contain a lower concentration of a corrosive chemical than its industrial counterpart in order to reduce the potential for injury to the user (Metro, 1982).

Methylene chloride, a common constituent of paint removers, aerosol spray paint, and adhesive cleaners, is

listed by the EPA as a hazardous air pollutant, is a known animal carcinogen, and is under investigation as a human carcinogen (Maklan, Steele, Dietz, Brown, & Fallah, 1987). Pentochlorophenol is found in wood preservatives and can cause systemic intoxication leading to death in humans (Gosselin, Smith, & Hodge, 1984). Naphthalene, an ingredient of mothballs, can cause dermal and ophthalmological changes, as well as renal toxicity, in humans (Gosselin, et al., 1984). Exposure to inorganic mercury, which is found in paint, household batteries, and fungicides, can cause vascular collapse and death acutely; chronic exposure to this heavy metal has been responsible for neuropathy and nephropathy in humans (Gosselin, et al., 1984). Nickel and cadmium are constituents of rechargable batteries; studies of nickel have provided sufficient evidence for classifying this metal as a human cancer risk, and data on cadmium has shown limited evidence in humans but sufficient evidence in animals that cadmium is a carcinogen (Friberg, Nordberg, & Vouk, 1986). Chronic renal toxicity in humans due to long-term environmental exposure to cadmium has been documented in numerous studies (Levy & Wegman, 1988).

Injuries due to the disposal of hazardous household wastes usually are caused by the waste's corrosivity or ignitability characteristics. Both homeowners and refuse collection personnel can be harmed by contact with a caustic chemical or by an explosion or fire due to a combustible HHW (Household hazardous wastes, 1988).

Environmental consequences that could occur due to HHW disposal include disease, injury, or death to animals and plants, damage to manmade systems and structures, and interruption of natural cycles. It may be difficult to isolate HHW as causative agents of adverse environmental effects from other sources of hazardous waste. A study

of HHW by SCS Engineers (1986), which found no documented cases of environmental impacts caused solely by HHW, states that in many cases of suspected environmental pollution by HHW, there may have been industrial sources as well. The potential for harm to the environment is due to the presence of substances in HHW that are known to be hazardous to exposed biological systems. The National Household Pesticide Usage Study found that 34% of all households throw unused pesticides in the trash or disposed of them down the sink or toilet. (The remaining 66% did not report a disposal method) (Savage, Keefe, Wheeler, Mounce, Helvic, Applehans, Goes, Goes, Milhan, Rench, & Taylor, 1980). The EPA's National Pesticide Survey found that 10% of community wells and 4% of rural wells were contaminated with pesticides (Pesticides contaminate US wells, 1991). Because widespread use of pesticides has resulted in adverse effects on nontarget organisms and contamination of air, soil, and water (Ragsdale & Kuhr, 1987), the incorrect disposal of these wastes threatens to contribute to the environmental problems. Many of the chemicals on the Priority Pollutant list of the Clean Water Act are found in wood preservatives and oil- based paints (Metro, 1982); the chemicals on this list have been found to pose significant threats to aquatic systems (Kovalic, 1987). Both mercury and cadmium are highly toxic to most species; since the background levels of these and other heavy metals are naturally extremely low, anthropogenic increases may be harmful to a wide spectrum of biological systems (Friberg, et al., 1986).

Household Hazardous Waste Generation Rates

Several studies have attempted to quantify the amount of HHW present in municipal waste. In 1983, the city of Albuquerque, NM reported that less than 1% of the

residential waste stream was HHW (SCS Engineers, 1986). This figure was based on estimates derived from a public opinion survey of residents, and relied on the subjects' recall of disposal practices. The Los Angeles County Sanitation Districts published results of two studies in 1984 that stated that HHW comprised 0.00147% of the refuse collected. These data were based on observation of the refuse itself, although this refuse could not be related directly to residential sources (Mitchell & DeMichelis, 1987). Cal Recovery Systems investigated HHW generation in the Seattle-King County area in 1985 and determined that 0.5% of the total residential waste stream was HHW, including both disposal company pickup and self-haul to the transfer stations (Cal Recovery Systems, Inc., 1985,). In 1987, the residential garbage from areas of Marin County, CA and New Orleans, LA was studied directly--the amounts of HHW in the total garbage from each site were 0.40% and 0.35%, respectively (Rathje, 1987). Variables that can cause differences in the amount of HHW generation include:

1. Determinants of product use such as demographics of the area(s); i.e. urban vs rural, geographic location in the United States, residents' income.
2. Which products are defined as HHW.
3. Inclusion or exclusion of self-hauled wastes.
4. Seasonal variations in amounts and types of HHW.

In all studies that physically measured the residential solid waste stream, no other methods of disposal (sewer/septic system, pouring on the ground, burning, etc. were included; thus, these reported figures are conservative.

The results of the just mentioned studies have led to a "working figure" of 0.33% to 0.5% as a national

average of HHW in the residential waste stream (Dana Duxbury and Associates, 1990).

Entrance of HHW into the Environment

Safe disposal methods of HHW vary, depending on each product's chemical composition. Incorrect disposal of HHW can result in the contamination of the waste stream and, eventually, the environment (Scudder & Blehm, 1991). The following data review evidence that HHW contributes to the presence of hazardous substances that can adversely impact human health and the environment:

1. Sewage systems: A number of studies have documented heavy metals and organic chemicals in domestic wastewater (Levins, Adams, Brenner, Coons, Harris, Jones, Thrun, & Wechsler, 1979; Burns and Roe Industrial Services Corp., 1982; O'Farrell, Trick, & Sweeney, 1986). Hathaway (1980) listed 14 organic and 9 inorganic priority list pollutants that most frequently enter the domestic wastewater of small community or individual wastewater treatment systems by disposal of household products. A study in Chicago (Gurnham, Rose, Ritchie, Fetherston, & Smith, 1979) found that non-food commodities contribute significantly to heavy metals in domestic wastewater. Organic pollutants that appear regularly in residential wastewater include chloroform, benzene, pentachlorophenol, toluene, naphthalene, a wide range of phthalates, phenols, and tetrachloroethylene. While these chemicals are generally in parts per billion or lower concentrations in the wastewater, significantly higher levels may occur when larger than normal amounts of wastes are dumped into domestic wastewater systems (Metro, 1982).

The primary concerns about HHW in domestic wastewater are that these hazardous pollutants may affect water treatment plant processes and cause increased

levels of these hazardous substances in the publicly owned treatment works (POTW) effluent to receiving waters. One study found that approximately 25% of heavy metals in publicly-owned treatment plant influent is from domestic sources (Gilbert, 1979). While it is difficult to pinpoint HHW as the direct sources of these chemicals, the fact that they are present in household products regularly disposed of in domestic wastewater suggests that these products my be the source of this pollution (Metro, 1982).

2. Because groundwater is the drinking water source for 80% of all public water supplies (Dyksen and Hess, 1980), its potential contamination is of great concern. Septic systems can be a major contributing factor to groundwater contamination (Miller & Scalf, 1973). Septic tank sewage has been found to contain a complex of hydrocarbons relatively immune to microbial degradation (Kerr Environmental Research Lab, 1977). Included among the chemicals identified in septic tank sewage are tetrachloroethylene, trichloroethylene, toluene, and ethyl benzene, all of which are present in household products commonly disposed of in domestic wastewater.

3. The 1984 HSWA legislation significantly changed landfill disposal practices of hazardous waste by requiring the EPA to justify the landfill disposal of a specific hazardous waste over other disposal options to protect human health and the environment. Evidence that even state-of-the-art landfills leak has been reported, while RCRA allowed (and even encouraged) landfill disposal of many hazardous wastes over other management options (Fortuna & Lennett, 1987). As of 1986, fewer than half of US municipal landfills had runon/runoff controls, only 25% had groundwater monitoring systems, only 15% had liners, and only 5% had leachate collection systems (Office of Solid Waste, 1986). The contribution

of HHW to hazardous substances in leachate from municipal landfillS is difficult to quantify; two studies have documented hazardous metals and organic chemicals in leachate where HHW is strongly implicated as the source (Dana Duxbury and Associates, 1990). Components of leachate collected from landfills include iron, phenol, pthalates, methylene chloride, trichloroethylene, ethyl benzene, toluene, and other chemicals found in common household products.

4. Concerns about the presence of HHW in municipal solid waste that is incinerated focus on the presence of certain heavy metals, dioxins, and furans that are released into the environment by incinerator emissions. In 1986, 213,652 tons of lead and 1800 tons of cadmium entered the solid waste stream, mostly from lead-acid and nickel-cadmium battery disposal ("Batteries are a source", 1989). Nearly half of the mercury used in this country is used in batteries; a study of three resource recovery facilities in 1987 found that removal of batteries from municipal waste before incineration decreased mercury and cadmium in the ash by 70% and 50%, respectively (Dana Duxbury and Associates, 1990). Many pesticides containing dioxins have been banned by Federal regulation for household use and are not for sale; other products, such as pentachlorphenol and some lawn herbicides, contain dioxins and continue to be used and discarded into the municipal solid waste stream (Tufts University Center for Environmental Management, 1986)

5. Alternative disposal options for HHW to the above "normal waste stream" methods may carry even greater risks for environmental exposure. Burying, spreading on the ground, and burning may be acceptable for some products under certain circumstances, but uncertainty about potentially harmful release of hazardous substances excludes these methods as a viable

routine disposal options. (Metro, 1982). Long-term storage of HHW in lieu of disposal carries the risks of poisonings, fires, air pollution due to evaporation, and leakage due to container degradation.

Regulations affecting HHW

One way to limit the entrance of hazardous wastes into the environment is to regulate the disposal of those wastes. The following summarizes federal and state of Oregon regulations that apply to HHW disposal:

1. RCRA: As previously mentioned, HHW are specifically excluded by RCRA as a regulated hazardous waste.

2. Federal Insecticide, Fungicide, and Rodenticide Act: Disposal of nonbanned household pesticide and pesticide containers is exempt from regulation if the containers are "securely wrapped in several layers of paper and disposed of singly during routine municipal solid waste disposal" (Code of Federal Regulations, 1990, 40 Part 165.2 (e)). It is suggested that prior to disposal, the owner use up the product for the purpose originally intended, or return it to the manufacturer or distributor for potential relabelling, recovery of resources, or reprocessing into other materials (Code of Federal Regulations, 1990, 40 Part 165.2 (f)). Section 19 requires the EPA to accept "at a mutually convenient location" any cancelled or banned pesticide at the owner's request (Code of Federal Regulations, 1990, 40 Part 165.5).

3. The Clean Water Act (CWA): This law controls pollutant discharges from point sources and also from runoff and spills. Section 307(a) lists priority pollutants, which are of special concern because these chemicals may be harmful to aquatic ecosytems. The discharge from publicly owned treatment works wastewater

plants must meet maximum level requirements for these priority pollutants (Kovalic, 1987). Several kinds of HHW contain substances that are on the CWA Priority Pollutant List (Metro, 1982); therefore, introduction of some HHW into the wastewater stream could affect compliance with the Clean Water Act.

Section 311 of CWA prohibits spills or "incident" discharges of oil and "hazardous substances" into or upon navigable waters, directly or indirectly; for oil, a reportable quantity is any amount that will "cause a film or sheen upon discoloration of the surface of the water or adjoining shorelines..." (Code of Federal Regulations, 1990, 40 Part 110.3 (b)). Thus, pouring oil into sewers or storm drains (which discharge into navigable waters) may violate this regulation and be a reportable spill.

4. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): Under this set of regulations, a community potentially would be liable if a disposal site at which HHW was disposed became a Superfund site. (Tufts University Center for Environmental Management, 1986). Because 20% of all National Priority List (Superfund) sites are old municipal landfills (Duxbury and Associates, 1990), this liability, if applied, could have a major impact on community HHW disposal methods.

5. Oregon Statute 459.420(1) (Oregon Revised Statutes, 1989) prohibits disposal of used lead-acid batteries except to a dealer or wholesaler, authorized collection or recycling facility, or permitted secondary lead smelter.

Summary

In the preceding sections, various aspects of HHW are examined. Hazardous wastes from residences may be considered a problem for the following reasons:

1. Analysis of certain household products and their contents reveals that these products contain substances which may have serious adverse effects on human health or the environment through their use or disposal.

2. Significant quantities of HHW can be generated from households, especially since these wastes are often concentrated into common waste streams, such as municipal garbage and residential wastewater.

3. HHW are often disposed of into systems that are are not designed to safely contain hazardous wastes. These disposal systems include municipal landfills, sewage and septic systems, and municipal waste incinerators.

4. Most HHW is unregulated under federal and Oregon State hazardous waste disposal rules, and, therefore, there is no direct control over most HHW entry into the environment.

CHAPTER 3

MATERIALS AND METHODS

Benton County, OR, population 70,811 (Bureau of the Census, 1991), includes the city of Corvallis. the smaller cities of Philomath and Monroe, and a substantial rural population. The objective of this study was to obtain data from a representative sample of Benton County, OR residents about household hazardous waste disposal practices in the past year, preference for community HHW disposal systems, and funding options for such systems. The study also collected information from the sample population about concern for personal health risks and environmental pollution caused by hazardous wastes. Data on the recycling of used household products were collected to measure county residents' awareness of present recycling programs.

A random digit dialing (RDD) system (Dillman, 1978) was used to obtain a random sample of the Benton County population. By reviewing current telephone directories, it was found that 14 telephone prefixes service the geographical boundaries of Benton County. Approximately 4.7% of Benton County households do not have a telephone (Bureau of the Census, 1980).

A table of random four digit numbers (Owen, 1962) was added to each prefix, forming a set of 14 complete telephone numbers. Each number in a set was called in succession; when completed, a new set was drawn and called. To select a respondent, the interviewer asked to speak to the adult in the household with the most recent

birthday. This protocol provides a random sample of adults within households (Frey, 1989).

The possible consequences of dialing each number were handled as follows:

1. Working number answered--interview begun. The result was a complete interview, incomplete interview, refusal, or termination of the interview because the telephone number called was not a household number.

2. If a series of at least 6 unanswered rings, an answering machine message, busy signal ("slow beep"), or miscellaneous sounds (static, "fast beep", etc.) resulted from the dialing, the interviewer called back during daytime or evening hours. A total of three callbacks were made before the number was considered as "respondent not available"; at least two callbacks were made during the evening hours (6:30 p.m. to 8:30 p.m.) and at least one call made during afternoon hours (3:30 p.m. to 5:30 p.m.).

3. A telephone number was considered to be a nonworking number if the call resulted in a recorded message identifying the number as nonworking, or if all four calls to a number resulted in the aforementioned miscellaneous sounds.

The response rate for this survey was defined as the proportion of completed interviews among eligible numbers called. Eligible numbers were defined as numbers yielding complete interviews, incomplete interviews, refusals, and unanswered numbers. This method of calculating the response rate yields a conservative estimate because it assumes that all unanswered calls were to working household numbers (Groves, Biemer, Lyberg, Massey, Nicholls, & Waksberg, 1988). The survey was begun on January 21, 1991 and completed on April 13, 1991.

Responses to each question in the survey were tabulated by calculating simple percentages.

The survey method and survey instrument (see Appendix) were developed with the assistance of the Oregon State University Survey Research Center. The survey instrument was pretested to assure the utility of the questionnaire by interviewing eight nonrandom subjects.

CHAPTER 4

RESULTS

Complete interviews were obtained for 100 of 154 household numbers dialed, resulting in a response rate of 66%. Twenty-nine respondents refused to be interviewed, 21 numbers were unanswered after four calls, 1 interview was incomplete, 1 household could not be contacted again after two calls (telephone service was disconnected), 1 potential respondent was unable to be interviewed due to a hearing impairment, and 1 potential respondent was non-English speaking.

Tables 1 and 2 contain demographic data reported by the respondents of this survey and the comparable 1990 US Census Bureau figures for Benton County. In this survey, 47% of the respondents were male, and 53% were female; the 1990 US Census Bureau data for the gender of persons 18 years of age and older in Benton County was not available at this writing. A larger proportion of city residents (75%) were surveyed than are present in the county population (68%). Persons in the 18-24 age group were underrepresented in the survey, with only 12% of respondents belonging to this age group, compared with 27% in the county population. Persons in the 55-64 age category comprised 14% of the survey sample, while this category represents 8% of the entire county population. Household and housing demographic variables indicated that household sizes were 2.6 and 2.5 persons per household for the survey and the known county population, respectively. Single family unit households responding to the survey represented 68% of the sample, while 71% of

Table 1

Demographic Data for Survey Compared with 1990 US Census

(Populations and Age Groups)

Demographic Variable		1991 Survey	1990 US Census
City residents:			
Corvallis		70%	63%
Philomath		3%	4%
Monroe		2%	1%
Total		75%	68%
Age groups in Benton County:			
Years of age:	18-24	12%	27%
	25-44	46%	40%
	45-54	12%	11%
	55-64	14%	8%
	>65	13%	12%

Table 2

Demographic Data for Survey Compared with 1990 Census Data

(Household and Housing Characteristics)

Demographic Variable	1991 Survey	1990 US Census
Mean persons per household	2.6	2.5
Single family housing units	68%	71%
Duplex or apartment	32%	29%
Own home	57%	55%
Rent home	43%	45%

the county population live in single family housing units. In this survey, 57% of the respondents owned their home, while 55% of county residents are homeowners.

When asked if they believed Oregon residents were doing a good job of recycling used household items, 75% of respondents answered affirmatively, 21% said that Oregonians were not doing a good job of recycling, and 4% did not know. Respondents were then asked whether curbside pickup of common recyclables was available to them. For those living within the city limits of Corvallis and Philomath, where curbside pickup of household recyclables is available (Corvallis Disposal Co., personal communication, April 24, 1991), 90% of respondents knew of this service, 7% said they did not have this service, and 3% said they did not know. Respondents were asked if curbside pickup of used motor oil was available where they lived; of those Corvallis and Philomath subjects who have this service, 49% knew this service was available, 11% said they did not have this service, and 40% said they did not know if used motor oil pickup was available. To determine Benton County residents' knowledge of currently recyclable household products, respondents were asked in an open-ended question to name household items they would like to be able to recycle that presently cannot be recycled. Fifteen percent of respondents named items that are currently recyclable in Benton County.

Table 3 summarizes the results concerning overall disposal of HHW by Benton County residents for the past year. Questions measuring disposal practices of household battery disposal were added to the questionnaire after the survey was begun; therefore, only 56 respondents provided information about batteries. Household batteries had the highest rate of disposal (83%), followed by used motor oil (33%) and paint and

Table 3

Frequency of Household Hazardous Waste Disposal

Household hazardous waste	No Disposal Number of subjects (%)	Disposal Number of subjects (%)	Don't know Number of subjects (%)	Refused Number of subjects (%)
Cleaners	88 (88)	11 (11)	1 (1)	
Paint/paint products	78 (78)	22 (22)		
Pesticides	88 (88)	12 (12)		
Wood preservatives	94 (94)	6 (6)		
Household batteries[a]	8 (17)	48 (83)		
Used Antifreeze	86 (86)	11 (11)	2 (2)	1 (1)
Used motor oil	65 (65)	33 (33)	1 (1)	1 (1)
Used automobile batteries	93 (93)	6 (6)		1 (1)

[a]A total of 56 interviews

paint products (22%). Tables 4 and 5 specify the disposal method for each category of HHW. Incorrect disposal methods were used by the majority of respondents for almost all HHW products surveyed; for two wastes (household batteries and wood preservatives) incorrect disposal methods were the only methods reported. Used motor oil was an exception (55% recycled vs 42% incorrectly handled); however, a majority (57%) of respondents who had curbside pickup of used motor oil available to them disposed of this HHW by incorrect methods. Only one lead-acid battery was put in the landfill, and six were recycled. Putting these products in the garbage can or self-hauling to the landfill was the most frequent form of disposal for each of the nonautomotive HHW in the survey.

Regarding preference for HHW disposal options, a permanent collection site was favored by 62% of respondents. Home pickup of HHW and a collection day system were the next most preferred options (25% and 13% respectively). Table 6 shows the expected frequency of use of a collection day and a permanent collection site. Most of the subjects choosing the collection day would utilize it for HHW disposal once or twice a year (46% and 39%, respectively). Only 15% would use it 3 times a year. A larger proportion of subjects choosing a permanent site would use it 3 or more times a year (49%). When asked how far they would be willing to drive to use a permanent collection site, 100% of respondents preferring this disposal option would be willing to drive up to 5 miles to use a permanent site, and 44% would drive up to 10 miles. Only 10% would drive up 15 miles or further. Respondents were asked which of three options (if any) for funding a HHW collection system they would be most willing to accept. These options were: a charge on each item at the time of disposal, a small

Table 4

Summary of Disposal Methods for Nonautomotive Household Hazardous Wastes

Disposal Method	Household cleaners Number of subjects (%)	Paint and paint products Number of subjects (%)	Pesticides Number of subjects (%)	Wood Preservatives Number of subjects (%)	Household batteries Number of subjects (%)
Put in garbage can	9 (82)	12 (55)	8 (67)	6 (100)	47 (100)
Self-haul to landfill	1 (9)	1 (5)	1 (8)		
Bury or pour on the ground		1 (5)			
Store for later disposal	1 (9)	5 (23)	3 (25)		
HHW Collection day		3 (14)			

Table 5

Summary of Disposal Methods for Automotive Household Hazardous Wastes

Disposal method	Antifreeze	Used motor oil	Lead-acid batteries
	Number of Subjects (%)	Number of subjects (%)	Number of subjects (%)
Put in garbage can	3 (27)	5 (15)	
Self-haul to landfill	1 (9)	2 (6)	1 (14)
Bury or pour on the ground	4 (36)	5 (15)	
Store for later disposal		1 (3)	
Burn		2 (6)	
Recycle	3 (27)	18 (55)	6 (86)

Table 6

Frequency of Using Two Household Hazardous Waste Disposal Options

Collection Day	Frequency of use per year	Permanent Site
46%	Once	23%
39%	Twice	26%
15%	Three times	26%
0%	More than three times	23%

increase in garbage collection fees, and a tax on hazardous household products. The charge for HHW disposal option was preferred by the largest number of respondents (47%), followed by the increase in garbage disposal fees and the tax on hazardous products (Figure 1).

Respondents were questioned regarding their concern about the contribution of HHW to the chemical pollution of surface and groundwaters. A high or moderate amount of concern was expressed by 75% of respondents, 18% reported that they were not too concerned about possible water pollution by HHW, and 5% were not at all concerned. One percent of respondents did not know, and one percent did not respond to this question (Figure 2). Figure 3 summarizes data regarding respondents' confidence in the landfill to safely contain chemical wastes. A majority of respondents (68%) stated that they lacked confidence in the landfill, 25% were somewhat confident in the safety of chemicals in the landfill, and 5% of respondents said they were very confident in the landfill for safe disposal of chemical wastes. Two percent of respondents answered that they did not know whether the landfill protected the environment against chemical waste leakage.

Respondents were asked to rate on a scale of one to ten the amount of personal health and safety risk they perceived from the following hazards: accidents in and around the home, medical x-rays, chemical wastes in rivers and groundwater, motor vehicle accidents, exposure to radiation from nuclear plants, and chemical pesticides in food. These data were obtained to compare the respondents' perception of risk from two potential hazards in this study, contamination of water by chemical waste and pesticide exposure, with other commonly encountered hazards. In this question, one on the scale represented minimal risk and ten on the scale represented

FIGURE 1

PREFERENCES FOR FUNDING OPTIONS FOR HOUSEHOLD HAZARDOUS WASTE SYSTEMS

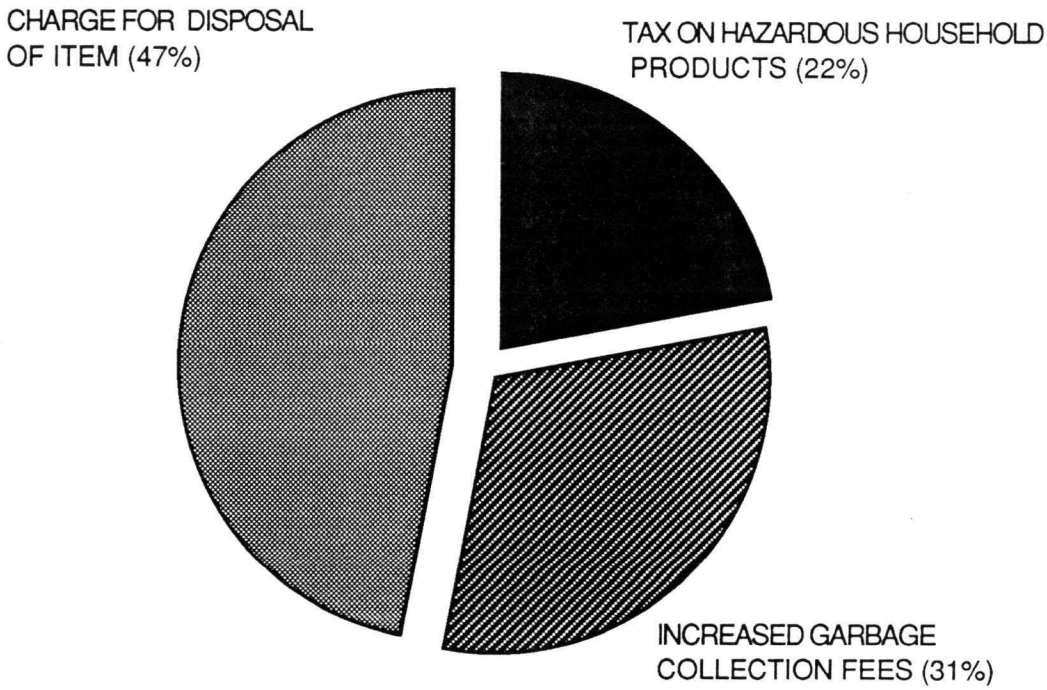


FIGURE 2

CONCERN ABOUT WATER POLLUTION BY HOUSEHOLD HAZARDOUS WASTE

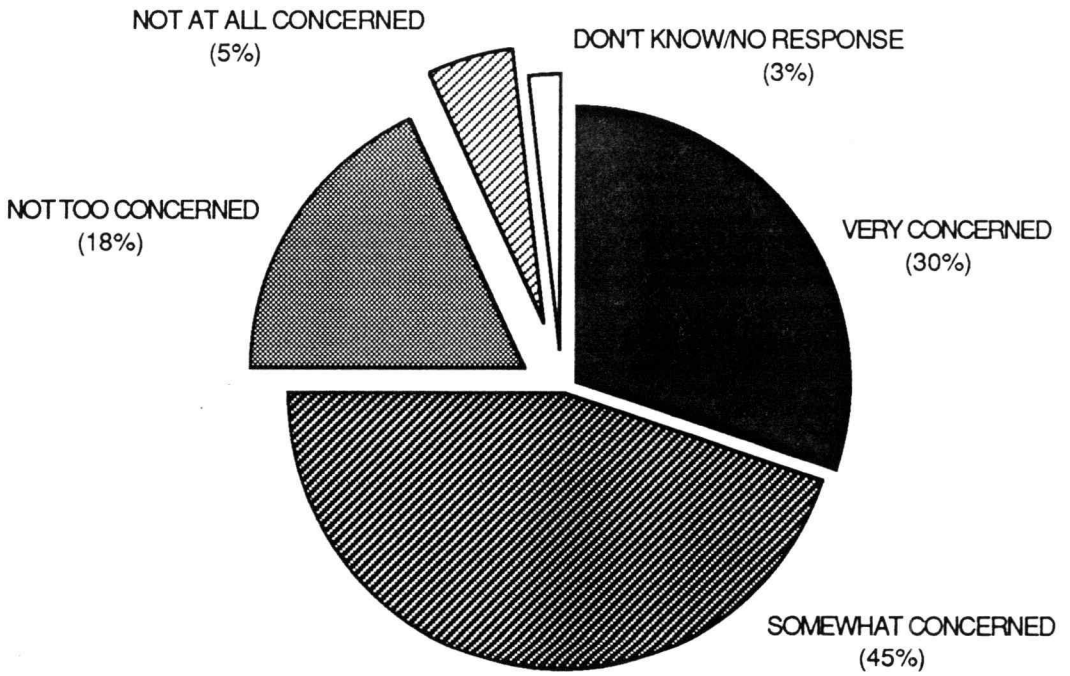
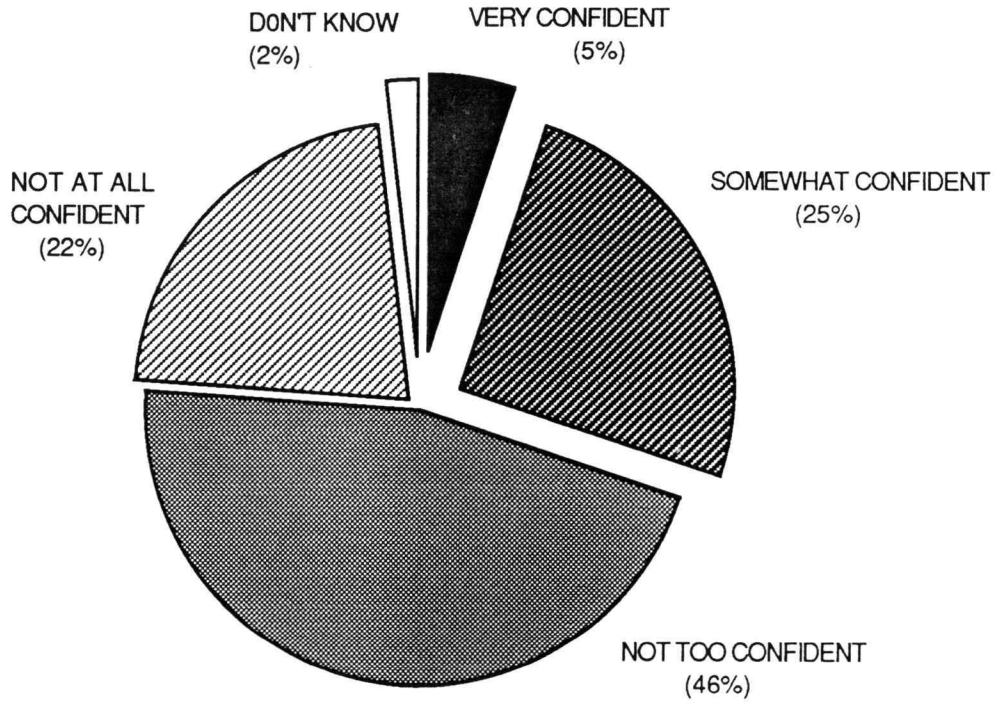


FIGURE 3

CONFIDENCE IN SAFETY OF LANDFILLING CHEMICAL WASTES



very serious risk to health and safety from the aforemention hazards. Both chemicals in rivers and groundwater and pesticides in food were rated as equal or greater risks compared to other hazards by 33% of the respondents. Chemical pollution in rivers and groundwater was perceived to be at least as great a threat to personal health and safety as other named hazards for 20% of respondents, and 4% rated pesticides as a comparable or greater risk compared to those hazards listed. An incomplete response was given by 9% of those surveyed.

When asked if they had heard or read about HHW disposal in the last year, 52% of respondents answered affirmatively, 47% said they had not been exposed to HHW educational materials in this time period, and 1% did not know. Among subjects who had seen or heard about HHW disposal in the last year, 90% could recall at least one source of this information. The most common source of HHW disposal education was the newspaper (42%); pamphlets or mailers were named by 21% of subjects, and 17% of respondents had seen HHW disposal information on television. The radio and the disposal company were each named by 13% of respondents, followed by school (6%), and conversation (4%), as sources of information. Four percent of respondents had heard about HHW disposal through conversation, while 2% named the county extension service or the workplace as a source of this information. Ten percent of respondents could not recall where they had read or heard about HHW disposal.

When asked whom they would call for information on HHW disposal, 62% of respondents said they would call the disposal company, 8% named the County Health Department, and 6% said they would contact a state or federal government agency such as the EPA, Dept.of Natural Resources, or the Department of Environmental Quality.

Four percent of respondents reported they would contact various county sources (the county extension service or the county annex) for HHW disposal information, 3% named Oregon State University, and 9% of respondents reported they stated they would contact such sources as their landlord, the Chamber of Commerce, and the landfill for HHW disposal information. Eight percent of respondents did not know whom they would contact for HHW disposal information.

CHAPTER 5

DISCUSSION

Comparison of demographic data reported by survey respondents and 1990 US Census figures indicates an overrepresentation of Corvallis residents (70% vs 63%) in this study. This variation could be due to: (a) error related to the sample size, (b) the random digit dialing method employed causing a bias toward reaching proportionally more working Corvallis telephone numbers, and (c) rural exchanges having more problems with bad connections, rings without answer, etc. than urban exchanges (Groves, et al., 1988). Demographic characteristics affecting nonresponse such as age, education, and urban-rural status (Kish, 1965) also may have been a factor, because the non-Corvallis population is largely rural. Younger residents were underrepresented; 12% of survey residents were in the 18-24 year age group, as compared with 27% of county residents in this age group. During the 1990-1991 academic year, 5293 Oregon State University students (7% of the Benton County population) lived in group housing units such as dormatories, fraternities, sororities, and co-operatives (Oregon State University Fact Book, 1991). Group living units often have greater numbers of residents per telephone than other types of housing, which might have resulted in undersampling of this younger age group. The 55-64 age category in the survey comprised 14% of the sample, while 8% of county residents are in this age group. One study suggested that older persons disproportionally refuse to be interviewed (Groves, et al., 1988); however, older persons are more

easily contacted by telephone at their homes than are persons in younger age groups. (Kish, 1965).

The recyling data indicate that a large majority of respondents are aware of their curbside recycling service, but many (51%) do not know that this service includes pickup of used motor oil. Over one-half of the respondents who reported an improper disposal method for this HHW were Corvallis or Philomath residents, all of whom have curbside pickup of used motor oil. Because used motor oil is a HHW that is currently recyclable, community HHW educational efforts should target this hazardous waste in order to improve the frequency of its correct disposal.

The results of this study indicate that Benton County residents dispose of the majority of their HHW by methods that may not protect human health and the environment. These methods are depositing in the landfill, pouring on the ground or into the sewer/septic system, and burning. Studies done in other states also report high percentages of HHW disposal by these incorrect methods. A survey of Massachusetts residents (Stanek, Tuthill, Willis, and Moore, 1987) found that 57% of used motor oil was disposed of by incorrect methods, as well as 91% of paint, 98% of pesticides, and 95% of radiator fluid/antifreeze. A study of the Seattle, WA, metropolitan area revealed that HHW products were deposited in the trash or garbage 56% of the time; sewer disposal ranked next at 18%, followed by placing material on or in the ground 16% of the time (Metro, 1982). Finally, a summary of surveys done in three California communties (Office of Solid Waste, 1988) report incorrect disposal of 11 types of HHW at greater than 90% frequency, with 54% of used motor oil disposed of in this manner.

Several factors may be responsible for the high frequency of incorrect disposal methods observed. Many people may not consider most HHW to be hazardous. A survey of Albuquerque, NM found that 12% of the respondents did not identify any disposed household waste as HHW, and 28% named only one (Salas, 1983). Scudder and Blehm (1991) found that 20% of respondents were unable to name a single toxic household product, and an additional 19% could name only one product.

Another reason for incorrect disposal of HHW could be that the perception of the hazardous nature of HHW is limited to the risk of certain products being involved in poisonings and injury due to skin contact. The Metro study (1986) asked respondents to rate the hazard level of each of ten types of HHW; chemical drain openers and herbicides and pesticides were rated the highest. Motor oil and automobile and furniture polishes were rated as least hazardous. In all cases, households with young children tended to assign higher risk ratings than households without small children. The Albuquerque HHW study (Salas, 1983) had similar findings--household cleaners and pesticides were identified most commonly as hazardous products.

Inadequate labelling of hazardous household products may be a factor influencing HHW disposal behavior (Dana Duxbury and Associates, 1990; Tufts University Center for Environmental Management, 1986). Many household product labels do not list all the ingredients present in the product, and correct disposal information often is not given.

A final reason may be that the high frequency of incorrect disposal methods for HHW may be influenced by the lack of an accessible system, such as a collection day or permanent disposal site, for its safe deposition. Storage of HHW in the home, especially flammable or toxic

materials, is associated with increased risk of property damage and personal injury (Sarnat, 1990), discouraging long-term storage of some HHW until a correct disposal method is available. Motor oil and lead-acid batteries can be correctly disposed of as HHW by recycling in Benton County; the majority of subjects in this study disposed of these items by this correct disposal option. This finding suggests that providing a correct disposal option may significantly reduce the incorrect disposal of HHW.

This survey indicates that three-fourths of Benton County residents are concerned about the potential for HHW being sources of surface and groundwater pollution. Prior to this question in the interview, specific HHW items were identified as threats to human health and the environment if improperly handled; this information, as well as the asking of the question itself, could have prompted the expression of concern to some degree. A majority of county residents surveyed (68%) were not confident in the safety of landfill disposal of chemical wastes. This response did not apply to HHW specifically, or assume that chemical wastes are necessarily hazardous; therefore, this information should be interpreted cautiously. Two studies have investigated attitudes about the importance of disposal of HHW. The Metro (1982) survey of Seattle, WA residents found that over one-half of the respondents considered HHW disposal a matter of some or high concern. Scudder and Blehm (1991), however, found that a majority of respondents in Larimer County, CO rated HHW generation and disposal as a low concern compared with government or small business generation of hazardous waste. A majority of the respondents in this study were unaware of the possible adverse health and environmental consequences of incorrect HHW disposal. HHW educational programs must

increase public awareness of the hazards of HHW as a potential environmental pollutant as well as an acute health and safety risk in the home.

The data from this survey support the establishment of a permanent collection site as the most viable disposal system for HHW in Benton County. The location of this permanent site could be a critical factor in its use by the public, since 90% of those subjects choosing this disposal option stated they would drive no further than 10 miles to use this facility. In this study, a user fee was found to be the most acceptable funding option for a disposal system.

Approximately one-half of those surveyed stated they had heard or read about HHW disposal in the past year; the impact of this information on knowledge about HHW and HHW disposal behavior is unknown. Community waste disposal companies were named by 62% of respondents as their primary source for HHW disposal information. These companies should be able to provide all necessary information on HHW disposal and, ideally, serve as an a major HHW educational resource for the community.

Reducing the amount of HHW generated in Benton County, and correct disposal of the HHW that must be managed, will decrease the risk of adverse human health effects and environmental damage in Benton County. Recommendations for achieving source reduction and safe disposal of HHW include the following:

1. Public Policy: Changes in the packaging of some household products could reduce the amount of HHW generated when unused amounts of product are discarded. Household products such as paint products and pesticides are often packaged and sold only in relatively large quantities, or priced to encourage the purchase the larger amounts. The unused product may deteriorate during storage, or present a potential hazard, and thus

require disposal. The packaging of some products, therefore, should be designed to reduce potential waste of that product.

Manufacturers of household products should be required to label each product with a list of all ingredients, and, if appropriate, instructions for the safe disposal of that product.

Legislation is often necessary to eliminate some hazardous components from household products, especially when alternatives to using that product do not exist. An example is Oregon House Bill 3661, which would prohibit the sale of alkaline manganese batteries containing more than 0.025 percent mercury manufactured on or after January 1, 1992.

2. Education: Public education about HHW in the US began in the early 1980's. Educational programs must be continued to increase consumer awareness of the potential for some household wastes to pose human health and environmental risks. Safer alternatives for some household products are readily available, and their use should be encouraged. Finally, the public must be informed about the potential hazards of incorrect disposal of HHW to decrease this behavior.

3. Research: A better understanding of which HHW pose significant threats to human health and the environment is needed to direct efforts at source reduction of those HHW. The high cost of safe disposal of certain HHW requires development of alternative products that are not hazardous, or mitigation of the hazardous nature of the waste so that it may be disposed of safely.

Further study of the effectiveness of HHW educational efforts is necessary. These studies should determine the impact this education has on: (a) greater public awareness of the hazardous nature of some

household products; (b) the increased use of safe alternatives to hazardous products; and (c) the decreased frequency of incorrect HHW disposal methods.

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APPENDIX

QUESTIONNAIRE

Hello, this is _____. I am conducting a research project for the Oregon State University Department of Public Health about recycling and disposal of household products. Your number was selected by randomly choosing telephone numbers in Benton County. May I speak to the adult in the household who has had the most recent birthday if he or she is home right now? **(IF R IS NOT AVAILABLE, ATTEMPT TO SET UP AN APPOINTMENT. IF YOU HAVE CONTACTED A BUSINESS, TERMINATE POLITELY).**

(WHEN YOU HAVE CORRECT R, CONTINUE WITH): Before we continue, I need to know if I have dialed the correct number. Is this _____? And do you live in Benton County? **(IF YES, CONTINUE. IF NO, TERMINATE POLITELY).** As I said, this survey is about recycling and disposal of household products and will only take about ten minutes. All the information you give me is strictly confidential and the results are summarized for the county as a whole, not for any one person. If you do not wish to answer any of these questions, we can skip over them, OK? **(IF NOT, TERMINATE POLITELY).**

1. Would you agree or disagree with the following statement: People in Oregon are doing a good job recycling used household items such as newspapers, tin cans, and glass bottles.

AGREE.....1
DISAGREE.....2
DON'T KNOW.....8
NO RESPONSE.....9

2. Does the garbage collection company pick up these used items for recycling on the street where you live?

YES.....1
NO.....2
DON'T KNOW.....8
NO RESPONSE.....9

3. Can you think of any used household products that you would like to be able to recycle but that are not made to be recycled?

YES **(GO TO 4)**.....1
NO **(GO TO 5)**.....2
DON'T KNOW.....8
NO RESPONSE.....9

4. What product would that be?

Do you farm, or do you run a business from your home? **(IF YES, GO TO STATEMENT. IF NO, GO TO 5).**

STATEMENT: For the rest of the survey, please answer only for the products you dispose of from your home.

5. I am going to read a list of household products that you may wish to dispose of as waste before the container is empty. Will you please tell me if you have disposed of any of these products in the last year?

	YES	NO	DON'T KNOW	NO RESP
A. Household cleaners such as tile cleaners, oven cleaners, and floor cleaners.....	1	2	8	9
B. Paint products, such as paint, paint. thinner, and terpentine.....	1	2	8	9
C. Pesticides, such as powders and sprays that kill insects and fungus.....	1	2	8	9
D. Wood preservatives, such as varnishes, wood sealants, and waxes.....	1	2	8	9

6. I see that you have disposed of....**(READ PRODUCTS CIRCLED 1).** Would you please tell me how you disposed of it?

FILL IN DISPOSAL METHOD(S) USING NUMBER CODE(S) OR WRITE IN METHOD USED. READ LIST IF NECESSARY.

A. Household cleaners....._____ _____ _____ Other_____

B. Paint products....._____ _____ _____ Other_____

C. Pesticides....._____ _____ _____ Other_____

D. Wood preservatives....._____ _____ _____ Other_____

1. Putting them out for your garbage pickup.
2. Taking them to the landfill yourself.
3. Giving them to someone else for them to use up.
4. Burying or pouring them on the ground.
5. Putting them away in storage for later disposal.
6. Pouring them down the sink or toilet.
7. Pouring them on the street or down the storm sewer.

7. I am going to read a short list of another kind of waste. Would you please tell me if you have disposed of any of these as waste in the past year.

		YES	NO	DON'T KNOW	NO RESP.
A.	Automobile antifreeze.....	1	2	8	9
B.	Used motor oil.....	1	2	8	9
C.	Automobile batteries.....	1	2	8	9
D.	Household batteries, such as flashlight batteries.....	1	2	8	9

8. How did you dispose of .....**READ PRODUCT(S) DISPOSED. FILL IN DISPOSAL CODES AS WITH QUESTION 5.**

A. Automobile antifreeze...._____ _____ _____ Other_____

B. Used motor oil....._____ _____ _____ Other_____

C. Automobile batteries....._____ _____ _____ Other_____

D. Household batteries....._____ _____ _____ Other_____

1. Putting them out for your garbage pickup.
2. Taking them to the landfill yourself.
3. Giving them to someone else for them to use up.
4. Burying or pouring them on the ground.
5. Putting them away in storage for later disposal.
6 Pouring them down the sink or toilet.
7. Pouring them on the street or down the storm sewer.

9. Do you live in a city or the unincorporated county?

COUNTY **(GO TO 10)**.....1
CITY **(GO TO 9a)**.....2
DON'T KNOW **(PROMPT)**.....8
NO RESPONSE.....9

9a. Could you please tell me in which city you live?

CORVALLIS.....1
PHILOMATH.....2
OTHER_____3
NO RESPONSE.....9

10. How long have you lived in this county?

YEARS IN COUNTY_____
DON'T KNOW.....98
NO RESPONSE.....99

We are finding that some wastes that are improperly handled do pose threats to human health and the environment. These wastes include items we just discussed, which are the household wastes--cleaners, paint products, pesticides, and wood preservatives--and also the used motor oil, antifreeze, and batteries. The county is considering a number of different ways to help residents dispose of these wastes in the safest way possible. In the next few questions, I'd like to get your opinion about the types of services you would use to dispose of these wastes if they were offered by the county.

11. I am going to read three possible options for disposing of these household wastes. **(READ A, B, AND C).**

A. A collection day in your community to which you bring these household wastes.
B. A permanent collection site located in or near your community to which you bring these household wastes.
C. A service that would come to your home by appointment and pick up these items.

Which of these options, if any, would you most likely use?

A. COLLECTION DAY **(GO TO 11a)**.....1
B. PERMANENT SITE **(GO TO 11b AND 11c)**..2
C. HOME SERVICE **(GO TO 12)**.....3
OTHER....._____ 4
NONE **(GO TO 12)**.....5
DON'T KNOW **(GO TO 12)**.....8
NO RESPONSE **(GO TO 12)**.....9

11a. How many times a year would you use a collection day to dispose of these household wastes? **(PROMPT IF NECESSARY)**

ONCE.....1
TWICE.....2
THREE TIMES.....3
MORE THAN THREE TIMES....4
DON'T KNOW.....8
NO RESPONSE.....9

INTERVIEWER: GO TO 12

11b. How far would you be willing to drive to dispose of these household wastes at a permanent collection site? **(PROMPT IF NECESSARY)**

UP TO 5 MILES.....1
UP TO 10 MILES.....2
UP TO 15 MILES.....3
MORE THAN 15 MILES.....4
DON'T KNOW.....8
NO RESPONSE.....9

11c. How many times a year do you think you would use a permanent collection facility? **(PROMPT IF NECESSARY)**

ONCE.....1
TWICE.....2
THREE TIMES.....3
MORE THAN THREE TIMES...4
DON'T KNOW.....8
NO RESPONSE.....9

12. Which one of the following ways, if any, would you be most willing to pay for having a safe place to dispose of these household wastes? **(READ A, B AND C)**

A. A tax on each item, such as a 5% tax on a quart bottle of pesticide.
B. A small increase in garbage collection fees, such as $1.00 per month.
C. A charge on each item at the time of disposal--for example, 50 cents for each gallon of paint that you dispose of.

A. TAX ON EACH ITEM.....1
B. INCREASED COLLECTION FEES.....2
C. CHARGE ON EACH ITEM.....3
OTHER..._____4
NONE.....5
DON'T KNOW.....8
NO RESPONSE.....9

13. Does the garbage collection company pick up used motor oil on the street where you live?

YES.....1
NO.....2
DON'T KNOW.....8
NO RESPONSE.....9

14. Now I am going to read you several health and safety risks most of us face. As I read each one to you, please tell me on a scale of 1 to 10 how serious a risk it is to you personally. 1 is not all serious and 10 is very serious. **(START WITH RED CHECKED ITEM AND WORK YOUR WAY THROUGH THE LIST).**

		SCORE	DON'T KNOW	NO RESP.
A.	Accidents in and around the home...	_____	98	99
B.	Medical x-rays.....	_____	98	99
C.	Chemical wastes in our rivers and groundwater.....	_____	98	99
D.	Motor vehicle accidents.....	_____	98	99
E.	Exposure to radiation from nuclear plants.....	_____	98	99
F.	Chemical pesticides in our food....	_____	98	99

15. How concerned are you that households, including motels and dormitories, could be sources of chemical wastes in our rivers and groundwater? Are you...**(READ LIST)**

VERY CONCERNED.....1
SOMEWHAT CONCERNED.....2
NOT TOO CONCERNED.....3
NOT AT ALL CONCERNED.....4
DON'T KNOW.....8
NO RESPONSE.....9

16. How confident are you that chemical wastes that go into the landfill are safely disposed of? Are you.....**(READ LIST)**

VERY CONFIDENT.....1
SOMEWHAT CONFIDENT.....2
NOT TOO CONFIDENT.....3
NOT AT ALL CONFIDENT.....4
DON'T KNOW.....8
NO RESPONSE.....9

17. I have just two more questions about the household waste we have discussed earlier--the cleaners, paint products, pesticides, wood preservatives, and also the used motor oil, antifreeze, and batteries. Do you recall reading or hearing about ways of disposing of these wastes in the last year?

YES **(GO TO 17a)**.....1
NO **(GO TO 18)**.....2
DON'T KNOW..... 8
NO RESPONSE.....9

17a. Would you please tell me where you heard or read about this information?

TELEVISION.....1
RADIO.....2
CONVERSATION.....3
NEWSPAPER.....4
MAGAZINE.....5
OTHER_____6
_____6
DON'T KNOW.....8
NO RESPONSE.....9

18. Who would you call if you needed information about disposing of these household wastes?

GARBAGE DISPOSAL COMPANY.....1
COUNTY HEALTH DEPARTMENT.....2
OREGON STATE UNIVERSITY.....3
OTHER_____4
_____4
DON'T KNOW.....8
NO RESPONSE.....9

Finally, I would like to ask you some questions about yourself. This information is for statistical purposes only, and please keep in mind all information is strictly confidential.

19. Do you live in a:

SINGLE FAMILY HOME.....1
APARTMENT OR DUPLEX.....2
MOBILE HOME.....3
OTHER...____4
DON'T KNOW.....8
NO RESPONSE.....9

20. Do you rent or own your home?

OWN.....1
RENT.....2
DON'T KNOW.....8
NO RESPONSE.....9

21. How old were you on your last birthday?

AGE.....____
REFUSED.....77
NO RESPONSE.....99

22. What was the highest grade you completed in school? **(READ LIST IF NECESSARY)**

GRADE SCHOOL.....1
HIGH SCHOOL.....2
A TRADE SCHOOL.....3
SOME COLLEGE.....4
FOUR YEARS OR MORE OF COLLEGE.....5
REFUSED.....6
DON'T KNOW.....8
NO RESPONSE.....9

23. I am going to read you some broad income groups. When I come to the one that represents your total household income before taxes in 1990, please let me know.

UNDER $20,000.....1
$20,000 to $29,999.....2
$30,000 to $39,999.....3
$40.000 to $49,999.....4
$50,000 to $74,999.....5
$75,000 OR OVER.....6
REFUSED.....7
DON'T KNOW.....8
NO RESPONSE.....9

24. Could you please tell me how many people 18 years of age or older live in your household?

ADULTS IN HOUSEHOLD....._____
REFUSED.....77
NO RESPONSE.....99

24a. And how many people under 18 years of age?

CHILDREN IN HOUSEHOLD....._____
REFUSED.....77
NO RESPONSE.....99

25. Is there anything you would like to add to the subjects we have discussed?

BY OBSERVATION:

MALE.....1
FEMALE.....2

CLOSING: That concludes the survey and I'd like to thank you for your time and information. Have a nice day/evening.