Public Participation in the Saratoga Springs Household Hazardous Waste Collection Program: Community Based Action Research and Recommendations

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Abstract

Our action research (Creswell, 2003) examined the current household hazardous waste (HHW) program of Saratoga Springs, New York in the hopes of enhancing participation and expansion. We conducted case study research on other municipal HHW programs in New York State and surveyed Saratoga Springs residents to provide insight and comparisons in order to make the best recommendations to the city. We also developed and implemented an elementary school curriculum on the importance of proper HHW disposal and possible alternatives. Our survey findings showed that 73% of respondents had never heard of Saratoga Springs' HHW program, and that only 55% felt confident in their ability to identify what items constituted as HHW. In our analysis of other municipal programs in New York State, we found most programs utilized permanent facilities within the community, held collection days multiple times a year, and provided substantial educational material. Upon compiling our data, we presented our findings and recommendations, in the form of a white paper, to the Saratoga Springs Department of Public Works and spoke at a city council meeting on May 6, 2014.

key words: household hazardous waste; public participation; education; waste diversion

1. Introduction

Household hazardous waste (HHW) is defined by the US Environmental Protection Agency as any products that contain ingredients found to be corrosive, toxic, ignitable or reactive (EPA 2012). Examples of such products include, but are not limited to pesticides, paints, bleaches, light bulbs, fuel, motor oil, medications, and lithium batteries. Because of its uniquely toxic properties, HHW requires special care upon disposal. Improper disposal methods include pouring liquids down household drains, dumping products on the ground, into storm sewers, or throwing them directly into the municipal trash system. Failure to dispose of these items properly can lead to incredibly damaging and unpredictable consequences to both human health and the environment. Though researchers estimate that 1% of the solid waste stream consists of HHW, this small percentage translates to 1.96 million tons of improperly disposed of HHW in 1990 and 2.16 million tons in 2000 (Sulzberg, et. al. 1997). Once in landfills, these items can continue to leach into surface water and groundwater, contaminating fresh water supplies. One gallon of improperly disposed motor oil has the potential to pollute up to one million gallons of water, posing serious threats to community groundwater and surface water supplies, as well as wildlife habitats (Sulzberg, et. al. 1997). Incorrectly disposed HHW will eventually reach sewage treatment plants, where it can then cause serious damage to the system's beneficial bacteria, and may result in the release of raw sewage and chemicals into streams (Bapat, *et. al.* 2005). Furthermore, disposing of HHW along with solid waste poses problems in incinerators, as the burning of the hazardous waste emits toxic gases, such as mercury, cadmium, and lead; the dominant sources of mercury and lead in incinerator ash have been identified as household and automotive batteries (EPA, 1992).

Improper disposal of HHW also has the potential to affect human health. Though HHW comprises 1% of the solid waste stream, this percentage does not account for HHW stored in the home or discarded through other improper means. The average U.S. household generates 20 pounds of HHW per year, resulting in as much as 100 pounds of accumulated HHW in the home during residence (EPA, 2013). If every resident of Saratoga Springs 25,000 population generated 4 pounds of HHW, the town would be responsible for 100,000 pounds of HHW. According to the 2011 Annual Report of the American Association of Poison Control Centers, of the most frequent 25 substances contributing to poisonings, HHW was involved in 14.37% of human poisonings (Bronstein, et. al, 2012). In addition, improper storage of HHW in the home can lead to indoor air pollution, as improper mixing of products can create dangerous gases or as homeowners fail to securely fasten the lid on wastes. HHW, alone or in combination with other substances, poses a threat not only to homeowners but also to waste collectors and landfill workers. Improper disposal of "HHW causes injuries to approximately 3% of waste collectors through explosion, acid or caustic splashes and burns from flammable substances" (Bapat, *et. al.* 2005).

There are many ways to responsibly dispose of and treat HHW, although some are more efficient than others. Various municipal governments in the U.S. have had great success implementing plans such as product exchange programs, designated community collection days and sites, as well as permanent collection sites. While each of these methods have their own sets of costs and benefits, the purpose of our action research project is to evaluate the current household hazardous waste disposal program in the City of Saratoga Springs in comparison to other programs being implemented throughout the state. We will then seek to maximize

economic and environmental benefits, as well as public knowledge and participation through the enhancement of outreach and education components.

1.2 The Legal Framework of Household Hazardous Waste

The enactment of the Resource Conservation and Recovery Act (RCRA) targeted easily identifiable hazardous wastes, such as industrial outputs, and provided the framework for federal and state governments to successfully control large outputs of hazardous waste. However, less obvious, non-point sources of pollution (such as HHW) went overlooked and are not regulated (NYS DEC, 2014).

Therefore, under RCRA, HHW is exempt from state and federal hazardous waste regulations. Therefore, HHW can be legally discarded with municipal solid waste, despite the known toxic effects of this waste (Cabaniss, 2008). Despite this exemption, the EPA advocates for the collection of HHW at the state and municipal level, and for these collection programs to manage the waste as industrial hazardous waste would be handled. In response to the EPA's suggestion and the rising interest in disposing of HHW in safe, responsible ways, state and municipal governments began developing various methods of collecting HHW in the 1980s. Some states go beyond federal laws to partially or even fully regulate HHW, such as California, Minnesota, and Washington. The definition of HHW and lists of accepted HHW vary by state and even county, depending largely on local concerns and how the town's solid waste is managed (Cabaniss, 2008). New York's HHW regulations are closer to federal laws, stating that HHW is exempt from hazardous waste regulations at the state level as well. Any HHW disposed of in the rest of the solid waste stream is exempt from being treated as HHW, though the state regulates the collection and disposal of HHW once it reaches a permitted disposal facility (Subpart 373-4, 2006). The New York Department of Environmental Conservation (DEC) does,

however, reference the consequences of failing to dispose of HHW properly and accordingly lists HHW collection programs around the state (NYS DEC, 2014).

1.3 Overview of HHW Collection Programs Nationally

Since there is no federal and often no state oversight of HHW collection, municipalities have interpreted the need for HHW collection programs in different ways. In order to understand what type of HHW collection program would work best for the city of Saratoga Springs, it is necessary to not only analyze the various programs in the nation, but also the programs of similar-sized cities within New York state. Understanding national trends in HHW collection is necessary to creating an effective program for Saratoga Springs.

Permanent HHW collection facilities are sites dedicated to collection of HHW where residents transport their waste to the facility. This type of collection program appears to be the most common in jurisdictions that have programs. According to a 2005 national survey completed on behalf of the Solid Waste and Recycling Department of Portland, Oregon, all but one of the 25 surveyed cities had fixed facilities (Cascadia, 2005). One facility per city was the most common and days of operation differ from program to program.

Permanent facilities provide improved public access to the site, diversion of more HHW from the general waste stream, and greater municipal control over the facility and practices. Many municipalities have also found that permanent sites provide long-term affordability through lower cost per pound or per customer, as well as the ability to bulk and store waste rather than shipping half-full drums off-site (Cabaniss, 2008). Challenges of permanent facilities include: a long-term financial commitment by the state or city, possible liability, low resident turn-out, high start-up costs, and the costs of staff training (EPA, 2007). Managers of permanent facilities also face the difficulty of choosing operating hours that would best benefit the serviced

community. Many municipality temporary collection programs evolve into permanent programs over time due to the high cost of one-day events; however, many of these permanent programs stil service only 5-10% of a target population and operate on a stretched budget (Cabaniss, 2008).

Temporary HHW Collection Programs are collection "events" on designated days, in a designated place. Temporary collection programs also seem to be popular across the nation; 18 out of 25 HHW programs surveyed in Cascadia's (2005) study offered such programs. These events can either be stationary or mobile; mobile events are best suited to populations that are divided by large distances or heavy traffic and are best at gaining participation across the geographic area (Cabaniss, 2008). One-time collection events are best for areas with minimal or no access to county collection programs. Such temporary collection events are often conducted by outside contractors, which are expensive, but provide expertise and labor. However, municipalities often find one day collection events are prohibitively expensive and move their collection program to a permanent site; examples of municipalities moving from one-day events to permanent sites are detailed in the following case studies of New York state municipal programs.

Selective permanent collection programs collect only certain HHW in order to defray costs and possible dangers. Antifreeze, batteries, oil, and paint (ABOP) collection programs accept only the four categories that contribute the most to HHW and can be easily collected (Cabaniss, 2008). Special programs in the state of California hire contractors to handle the majority of HHW, but choose to handle other, less hazardous items themselves, such as used motor oil and cathode-ray tubes (EPA, 2007). The advantage of such programs is eliminating the costs of dealing with HHW with more expensive disposal rates. However, these programs limit

residential participation and leave out some of the more hazardous HHW, such as solvents, fuels, and pesticides.

A cooperative collection event is a coordinated collection effort among nearby towns or counties. These programs operate in the same way as temporary collection events, but under the control of multiple local governments; there is also the opportunity to create cooperative permanent facilities (EPA, 2007). Operating a cooperative collection program shares the costs among multiple bodies and can build upon already existing relationships between towns. However, this type of program assumes a high start-up cost, possible liability issues, and the need for staff training (EPA, 2007). Cooperation can also exist between multiple county agencies, such as the Department of Public Works and the Department of Public Health, or in a private-public partnership with a business interested in improving its environmental impact.

Collection programs run by a contractor or by hired staff are not necessarily considered a wholly separate type of program, but the difference in management types is important to look at. The presence of both contractors and locally hired staff occurs throughout the nation, often concurrently. In Cascadia's (2005) survey, all surveyed HHW collection programs used a combination of contractor and hired staff. Contractors provide broader knowledge and resources, can be more affordable (due to contractor bidding processes), assume responsibility in settling labor issues, and reduce liability and insurance costs for local governments. Hired staff provide increased customer service through direct personal contact, less expensive services, and increased flexibility.

Though HHW collection programs currently exist in all 50 states, the concept of HHW is still relatively new. Therefore, as this section shows, there are multiple methods for dealing with

HHW, some more effective than others. This section exhibits the current state of HHW collection programs, but is by no means exhaustive of new, innovative programs.

1.4 Increasing Public Participation

As within any academic debate, the most effective way to increase public participation for an environmental program is highly debated. Most of the research in this area is not even focused on HHW, but on municipal recycling programs. Some researchers believe targeting certain attitudes and traits based on behavioral psychology will create lasting change, while others disagree. Other researchers believe behavioral studies have been ineffective and only create short-term change and look to community organizing instead. In actuality, achieving increased public participation most likely results from a combination of all these theories or on a case-by-case basis.

One theory focusing on behavioral psychology is the Theory of Planned Behavior (TPB). This theory provides a framework for systematically investigating factors that influence behavioral choices, where intentions are influenced by attitude, the subjective norm, and perceived control (Tonglet et. al., 2004). Of the variables studied by Tonglet et al. (2004), pro-recycling attitudes were found to be the major deciding factor to recycling participation. These attitudes were influenced by having the appropriate facilities and knowledge in order to participate and as well as sufficient time or space. Other significant variables were previous experience and concern for their community's well-being (Tonglet et. al., 2004).

Keramitsoglou and Tsagarakis (2012) looked at the recycling behaviors of Didimoticho, Greece. They found that recycling participation is not necessarily due to variables associated with TPB but on personal traits, which are not necessarily incorporated into TPB models. They believe participation relies more on practical knowledge than on intrinsic motivations

(Keramitsoglou & Tasgarakis, 2012). Nevertheless, their findings were in line with TPB model projections, of positive recycling attitudes translating into participation. However, they also pointed out that positive attitudes does not translate into participation if facilities are unavailable or inconvenient (Keramitsoglou & Tasgarakis, 2012).

Another study focusing on electronic waste in the United States used a new scale, the New Ecological paradigm, to predict which behaviors would be most important. The New Ecological paradigm is based off theories of norm-activation and value-belief-norm and was formed in attempts to understand the current state of human understanding and our relation to it (Saphores et. al., 2011). The study found people are more likely to recycle their electronic waste if they have personal environmental morals or if there is a strong social pressure to do so (Saphores et. al., 2011). The second most important factor was the convenience associated with the program (Saphores et. al., 2011).

There is also a concept called Community-Based Social Marketing, which does not believe behavioral sciences will create lasting community changes. Behavioral methods under this research branch only cause changes for short time periods and are based on the assumption that "if people only knew, they would surely do the right thing (Cabaniss, 2008)." For example, if only people knew that household hazardous waste was toxic and bad for people's health and the environment, they would not dump it in their backyards or store it for long periods. The basis of Community-Based Social Marketing uses four steps to create lasting changes in a community through social psychology and applied research methods. The four steps are: (1) identifying barriers to a targeted behavior; (2) using behavior change tools to overcome the barriers; (3) piloting the selected tools using empirical research methodology and a control group; and (4) evaluating the project once it has been widely implemented (Cabaniss, 2008). Community-Based

Social Marketing looks directly at the barriers perceived or felt by people not directly participating in the program and assesses how to fix them.

An example of Community-Based Social Marketed was backyard composting program in Nova Scotia. New province regulations banned organic wastes from landfills and municipalities were charged with developing initiatives to meet these new regulations. Two counties decided to promote backyard composting (McKenzie-Mohr, 2000). Using Community-Based Social Marketing, the counties surveyed residents in order to find barriers and found that 56% of residents were already composting. Those who were not composting found it inconvenient, unpleasant, and not the 'right thing to do' and lacked basic knowledge (McKenzie-Mohr, 2000). Program planners used psychology to create a program that would overcome these barriers. Planners reasoned that the lack of composting support came from the invisibility of it compared to recycling, so planners had residents who composted to put a decal on the side of their garbage bin (McKenzie-Mohr, 2000). When residents who did not compost were asked if they would like to start, an employee of the city for assistance visited them. At the end of the program outreach project, 80% of those who stated an interest in composting were composting several months later (McKenzie-Mohr, 2000). This method is a new way of looking into program design where instead of implementing a program top-down, the needs and desires of the community shape planners' designs.

Involving the public in the decision-making process takes Community-Based Social Marketing to the next level. This approach operates under the assumption that residents will be more invested if they are involved in program design and implementation from the start (Folz, 1991). Top-down designed programs, created and implemented without public input, may not necessarily be the most effective or convenient program for the public and may result in poor

participation. Researchers found that the opportunity to influence how things are decided contributes to a sense of ownership among the public, increasing participation (Folz, 1991). Individuals who help implement a program feel more obligated to participate and will be more likely to get other community members involved. Implementing or refurbishing a HHW program in Saratoga Springs should include public commentary and input if it wants to have any public participation success.

Models are never correct, as they can never fully incorporate every variable surrounding a certain topic, thus why none of the studies described can point to one single motivation for participation in environmental waste events. While convenience was present in multiple studies, none of the studies agreed on the methodology of other researchers. While it is important to have a user-friendly program, having a great program is useless if nobody knows of its existence, which is where bottom-up approaches come in. Each of these researchers methodologies are valid and helpful for increasing participation. Planners should incorporate behavioral predictions and the participants themselves while planning. Designing a program is only half the battle though, education and outreach will always be needed. Several other studies looked not only at what predicted behavior, but the best methodology for educational outreach to promote a program.

The United Kingdom implemented a public education campaign called the 'Recycling Roadshow' in the Royal Borough of Kensington and Chelsea, London. The campaign relied on direct household visits by trained home advisors to 8% of residents. The program resulted in an increase of 24% in the average tonnage of recyclable material. Household visits focused on improving understanding of the programs, and the toxicity of the waste to the environment to promote environmental household behavior (Grodzinska-Jurcak et. al., 2003).

An educational campaign in Poland, based off of the U.K.'s 'Recycle Roadshow' program, trained advisors to visit households to conduct a short survey and provide people with educational materials. After this campaign, they saw an increase in participation and in the variety of waste material collected across the whole study area with fluctuations depending on housing type (Grodzinska-Jurcak et. al., 2003). Grodzinska-Jurcak et. al. (2003) found residents who lived in tenant buildings in Poland had higher participation rates before the study than the other residential demographics. They believed it was due to the increased visibility of participation to prevent against judgment from neighbors. They believe the success of their education campaign was due to their 'active methods' of face-to-face interactions (Grodzinska-Jurcak et. al., 2003).

According to recent research, municipal programs are doomed to fail without considering the needs, behaviors, norms, and desires of the community. If they do not, the service will be ineffective and have low participation, thus making the potential environmental benefits programs can achieve negligible.

1.5 The Role of Education

By increasing environmental knowledge, it is likely that an increase in pro-environmental behaviors will follow. "One is unlikely to knowingly be concerned about the environment or deliberately act in pro-environmental ways if one knows nothing about the problem or potential positive actions. These two factors were among the strongest predictors of responsible environmental behavior" (Gifford, Nilsson 2014). An overall increase in environmental education, particularly human impacts on the environment, are one of the most effective ways to combat environmental issues on a local level. Since "those individuals with greater knowledge of environmental issues and knowledge of how to take action on those issues were more likely to

have reported engaging in responsible environmental behaviors than were those who did not possess this knowledge," it is imperative to provide the public with knowledge of ways in which they can incorporate pro-environmental behaviours into their everyday lives (Hines *et al.* 1987).

According to the EPA, watershed practitioners believe that peer education is "the most effective way to change local practices [concerning watershed behaviors]" (EPA 2001). By implementing Constructionist theories of education in environment based education, in which, "individuals create their own new understandings, based upon the interaction of what they already know and believe, and the phenomena or ideas with which they come into contact" (Richardson 2005), peer based learning will increase, thereby leading to extended dialogues between students about environmental issues as well as best practices. Additionally, incorporating activities that increase participants' self-efficacy, or "belief in [their] capabilities to organize and execute the courses of action required to manage prospective situations" (Gifford, Nilsson 2014) can also facilitate increased "political activism for environmental causes in the U.S. as well as various other pro-environmental behaviours" (Gifford, Nilsson 2014).

In light of these examples of increasing public participation and the importance of educational outreach initiatives, we now apply this methodology to the local community.

1.6 The Saratoga Springs HHW Collection Program

Saratoga Springs usually hosts one HHW collection day per year, either in spring or fall; however, due to lack of funding and/or public participation, occasionally the event does not occur. The collection event happens at the city's Weibel Avenue Skating Rink Facility parking lot, in a centralized and easily accessible location 2.6 miles from the Saratoga Springs City Center. Participants must pre-schedule appointments to drop off waste between 8 A.M. and 1 P.M. This time frame varies depending on how high the projected participation is for that year.

Lower participation rates result in less funding, leading to a shorter window. The scheduling allows 23-25 participants every 20 minutes. The program annually services about 270 residents to a projected 375 participants, or 0.1-1.4% of the Saratoga Springs total population.The Department of Public Works provides traffic coordination for cars entering and exiting the site, while the department contracts out to a company specializing in HHW disposal, who is responsible for the unloading and handling of all items. The contracted party is also be responsible for all costs associated with mobilization, insurance, permitting, staffing, security, equipment, safety and contingency plans, waste handling, packaging of all acceptable materials, transportation, as well as HHW disposal. Materials Saratoga Springs currently accepts are listed in Table 1.

Items accepted in Saratoga Springs' Household Hazardous Waste collection program:	
liquid latex paint	Products containing mercury
Pesticides	Photography Chemicals
Corrosives	Compact Fluorescent Lamps/light bulbs and ballasts
pool chemicals	Fluorescent light tubes
driveway sealers	Vehicle Fluid
hazardous based paints and stains	Antifreeze
polishes and waxes	Hazardous cleaning products
Adhesives	Solvents

Table 1. List of materials accepted by the Saratoga Springs Household Hazardous Waste collection program according to the Department of Public Works' website.

After the collection, the contracted party submits a complete description of all materials received as well as cost per unit, cost per material category and summation of total project cost to both the city of Saratoga Springs and the NYSDEC in order for the city to qualify for NYSDEC

reimbursement funding. (The DEC provides up to 50% in grants to help fund programs.) The city releases a bid for potential contractors for the event about every three years, with the last occurring in 2008 and the next projected bid to take place in 2015. In the past, the bid has been awarded to CARE Environmental Corp. and Maumee Express, Inc. (Department of Accounts, Saratoga Springs, 2013).

The city advertises its HHW program through advertisements and press coverage in the local newspaper and places information on its website.

1.7 Exploratory Findings and Need for Research

In our initial meetings with members of the office of Public Works, we learned the city of Saratoga Springs is interested in intensifying their current efforts concerning HHW collection. More specifically, the city is interested in attaining its own permanent collection site or implementing a countywide program, as well as increasing the program's public visibility through enhanced education and outreach programs. Our research utilizes a methodology called action research. This method involves the systematic collection of information (in collaboration with a stakeholder) that is designed to bring about social change (Bodan & Biklen 1992; Creswell, 2003). During this process, evidence or data is collected to expose issues and analyzed to uncover actions for change. We conducted our action research, taking into account both the goals of our stakeholders (the Public Works Department) and the desires of our participants, creating a list of recommendations that we felt would satisfy both parties.

2. Methods

2.1 Purpose Statement

The purpose of our action research is to evaluate the current HHW disposal program in the City of Saratoga Springs in comparison to other programs being implemented in New York

State. We will then seek to maximize economic and environmental benefits, as well as public knowledge and participation, through the enhancement of the current HHW collection program and increased education (adult and youth) and outreach efforts. Questions that guided our research are:

- How can we increase public knowledge and education surrounding household hazardous waste?
- What are the current successes and failures of HHW programs in other municipalities? And what alternative methods have they utilized to fund their program?
- What do the residents of Saratoga Springs wish to see in their city's program?
- What are potential short and long term goals that we can recommend for the Saratoga Springs program?

2.2 Population and Setting

Saratoga Springs is a small city located in the Capital Region of New York State, it is approximately a three hour drive from New York City, Boston, and Montreal. As of the 2010 census, the population was 26,586 people, with 11,312 households (United States Census Bureau, 2010). The town relies heavily on summer tourism due to their famous racetrack and mineral spring water (City of Saratoga Springs, 2010). Other businesses include two local manufacturing plants, and the home base for Stewart's Shops. Saratoga Springs is also called 'the city in the country' due to its interesting dynamic of a bustling city center with high end shops and restaurants located within a landscape of rural farmlands (City of Saratoga Springs, 2010).

2.2.1 Division Street Elementary

We piloted an environmentally based curriculum at Division Street Elementary to increase awareness concerning watershed function and ways to decrease pollution levels, specifically HHW. Division Street Elementary is a K-5 school that is responsible for approximately 370 students. The school is part of the Saratoga Springs City school district. The school relies on skilled instructors to utilize innovative instructional strategies and provide students with personalized attention. At Division Elementary, this goal is accomplished with the aid of 26 teachers, making the student to teacher ratio approximately 3:41. The sub-mission of Division Street Elementary School is to provide a quality educational program, which challenges, nurtures, and supports students to do their best in all developmental areas. Division Street instills in students a love of learning, pride in their accomplishments, a sense of responsibility for their own learning, and good citizenship (saratogaschools.org).

In 2006, Division Street Elementary implemented a voluntary before-school program called the Green Team. The club, which was implemented by the principal after concerns from teachers about the waste levels in the school, meets once a week on Mondays from 8:35-9:10 a.m. The club began with a simple collection of paper recyclables and eventually, in 2009, added plastics deposit/returns to their activities. Currently, this group focuses on monitoring the school's paper waste levels, where kids discuss ways to decrease paper waste as well as collect and measure the amount of waste created by the school. This club is open to students in grades 3-5 and currently consists of ten members.

2.3 Sampling

Data for this study was collected through 132 online digital surveys (Survey Monkey), we distributed surveys using convenience and snowball sampling to residents of Saratoga Springs through social media (see Appendix A for survey instrument) (Creswell, 2003). The

survey focused on overall knowledge of Saratoga Springs' HHW program, general HHW knowledge, and questions on best methods for program improvement. Information from the survey was analyzed and coded. Due to the high response rate for our survey, we are able to extrapolate our findings to the rest of the Saratoga Springs population with a 90% confidence interval.

2.4 Interviews

We conducted five semi-structured interviews and two archival investigations with New York State municipal HHW collection programs at the city and county level. Although the Saratoga Springs HHW collection program is currently run at the city, rather than county, level, we decided to contact counties in order to examine the best practices of collection programs. Furthermore, after an initial overview of city programs operating either in close proximity to Saratoga Springs or in cities of similar size, it was discovered that the cities either completely lacked HHW programs or ran one day collection events, such as the one currently held in Saratoga Springs. Because of these factors, we decided to proceed with county programs in order to obtain the maximum amount of information on alternative practices and solutions for Saratoga Springs. Nevertheless, due to the disparity in resources between the city and county level, these programs cannot be compared perfectly.

Municipalities were chosen based on having a well-established HHW program, receiving grant money through the DEC, and of similar relative size to Saratoga County (Table 2). During interviews (which lasted approximately 30-40 minutes), questions focused on the overall nature of the program, implementation costs, and method of advertisement. We also met regularly with our stakeholder contact within the Saratoga Springs Public Works Department to ensure best

representation of the city throughout the study and to take into consideration stakeholder needs and concerns as the research developed.

Schenectady County, New York	154727	62886
Rensselaer County, New York	159429	64702
Ulster County, New York	182493	71049
Broome County, New York	200600	82167
Saratoga County, New York	**219607**	**88296**
Niagara County, New York	216469	90556
Oneida County, New York	234878	93028
Rockland County, New York	311687	99242
Dutchess County, New York	297488	107965
Orange County, New York	372813	125925
Albany County, New York	304204	126251
Richmond County, New York	468730	165516
Onondaga County, New York	467026	187686
Monroe County, New York	744344	300422

Table 2. List of counties in ascending household order in New York State. The left column is overall population; the right column is number of households. The counties in blue are the counties studied (US Census Bureau). [1]

3. Results and Discussion

3.1 Survey Results

After surveying 132 residents of Saratoga Springs, we discovered that of those surveyed, only 27.48% (36/132) reported having been aware of the HHW collection services offered by Saratoga Springs, with only 22.73% (30/132) stating that they had ever used these services previously (Figure 1).

[1] All following estimates for 2012 populations of cities and counties were taken from the United States Census Bureau.

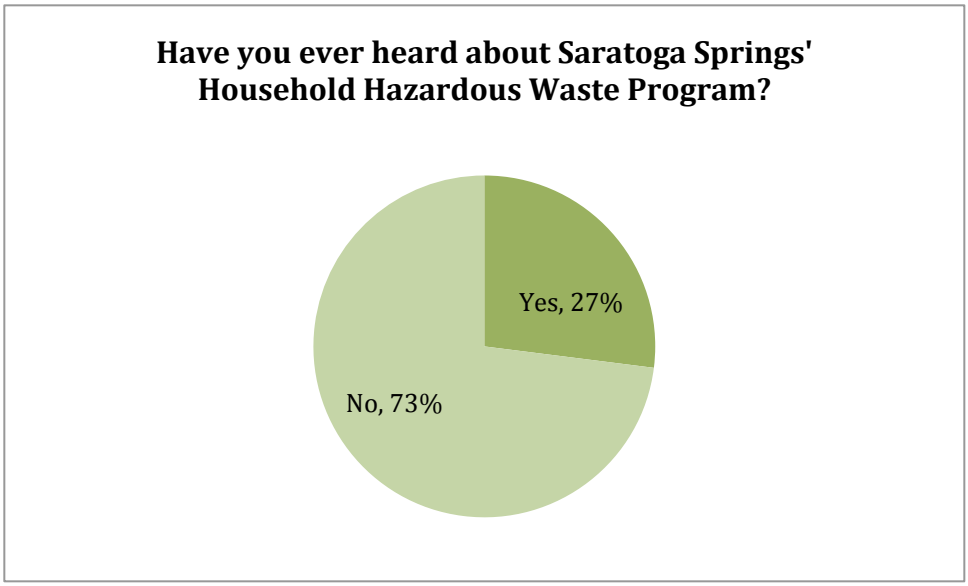

Figure 1. Response to: Have you ever heard of the Saratoga Springs HHW collection program?

This lack of knowledge about the program is most likely due to the fact that 84% (111/132) of respondents had never seen an advertisement for the program. Not only did respondents lack any knowledge about the program, respondents exhibited a lack of knowledge about HHW in general, as only 56.45% (70/124) felt confident in their ability to actually identify which household items constituted as HHW. These results point to major information channel discrepancies between the city and its residents concerning outreach and education.

While trying to identify barriers to participation, 77% (96/124) of respondents listed not knowing where and when the program was running as the major barrier. Transportation was not a barrier as 99% (123/124) of respondents reported having accesses to a car to use for HHW disposal. In a question about what would improve the program, where participants were allowed to choose multiple options, 77.42% (96/124) respondents stated a permanent location program in the community, that operated more frequently, would be more convenient and therefore help make properly disposing of HHW easier and more appealing. Increased education in general about HHW and the program was the second highest cited solution with 63.71% (79/124); and

increased advertising was the third noted solution with 62.1% (77/124) of respondents (Figure 2).

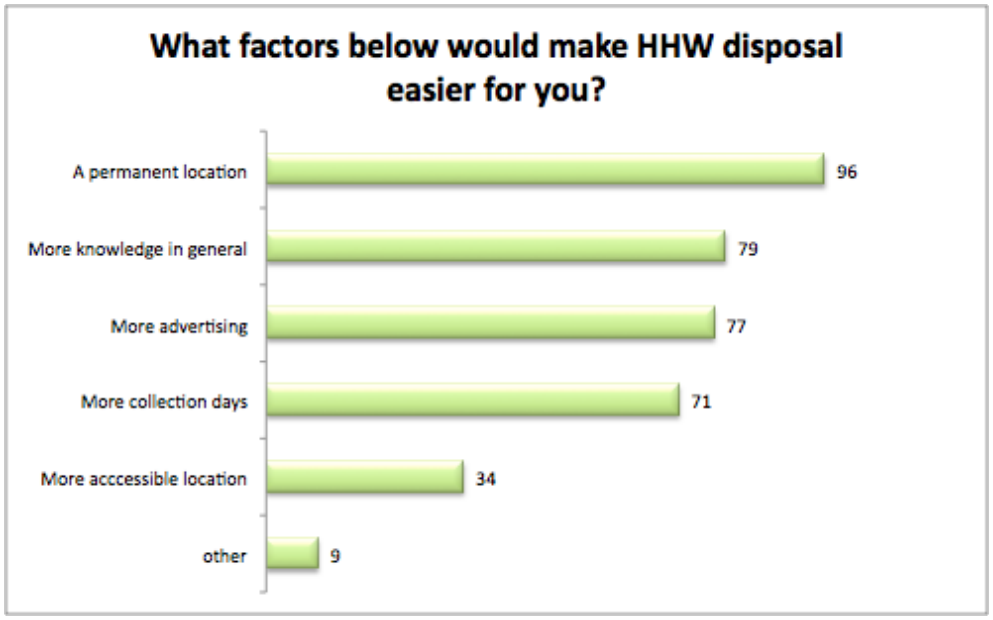

Figure 2. Response to the question: What factors below would make Household Hazardous Waste disposal easier for you? Check all that apply. Numbers at the end of the green bar represent the number of residents who chose that answer.

Focusing specifically on the efficiency of different advertising methods, respondents stated the internet and newspaper were the best advertising avenues, followed by radio, then television (Figure 3). Every question in the survey allowed for optional comments. In the comment section under the most effective place to advertise, 45 respondents gave additional feedback. Those 45 respondents identified direct mailers in a city bill (26%) and posters in frequented locations throughout the city, such as the public library, food mart, gas station, etc., (24%) as the best places to advertise.

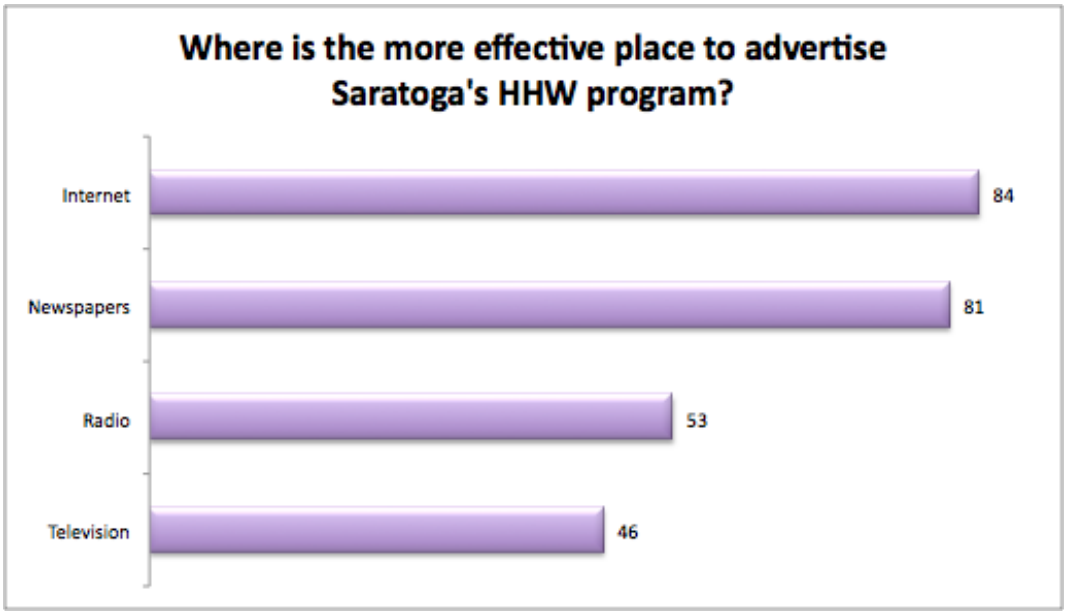

Figure 3. Response to question: Where is the most effective place to advertise? Numbers at the end of the purple bar represent the number of residents who chose that answer.

In an open-ended question about the strengths and weaknesses of the program, the overwhelming conclusion was that nobody knows about the program. One respondent said "I've been waiting for YEARS to find a place to safely dispose of old paint that I inherited when I bought my house in 2007." The 59.8% (79/132) of people said they knew so little about the program they could not give constructive feedback on the strengths and weaknesses. Respondents who were more familiar with the program cited the infrequency of the collections and inconsistency in time of year 20.5% (27/132), as major problems. Two respondents stated that even when there was a collection, there are not enough appointment slots. In terms of improving program weaknesses, 16.6% (22/132) of respondents thought greater advertising and outreach would build a stronger program. The listed strengths of the program were the benefits it does for the waste stream, and the fact that it exists at all.

3.2 Case Studies of Relevant HHW Collection Programs

The following archival data and semi-structured interviews allowed us to gain insight into the common barriers, challenges, and motives behind upgrading a HHW collection program. This data was gathered with the intention of aiding our stakeholder in the implementation of an improved HHW collection program.

3.2.1 Monroe County

Monroe County (2012 population: 744,344), upstate-New York's first HHW permanent facility, provides free services to all residents with an appointment, though it accepts out-of-county waste at a charge (Monroe, 2014). The county has also held scheduled collection days. Facilitated by the Department of Environmental Services, the program operates under a contracted waste disposal company (Monroe, 2014). Monroe County is exemplary for its online explanation and advertisement of their HHW collection program. The website clearly explains the consequences of improperly disposing of HHW, how to and where to dispose of it, proper packaging and handling of HHW, and a historical timeline of the HHW collection program's presence in the county (Monroe, 2014).

3.2.2 City of Clifton Park

The HHW program of the city of Clifton Park (2012 population: 36,705) is relatively similar to that of Saratoga Springs. The city also holds special collection days. In order to participate, residents must register and submit a form identifying the waste that will be disposed of (Clifton Park, 2012). Nearby Malta, Ballston, and Halfmoon may also register for participation in this event. This collection event is well-attended by residents and is even quoted to be "just like hitting the easy button" (Griffith, 2013).

3.2.3 The Counties of Oneida and Herkimer

The counties of Oneida and Herkimer (2012 combined population: 298,375) have a joint facility to collect HHW. The facility, open 6 days a week all year, serves 8,000-9,000 residents yearly at no charge. The program currently services 2.7-3% of its population. HHW, such as latex paints, pesticides, pool chemicals and cleaning solvents, are only collected from April to September, though the facility collects wastes such as antifreeze, motor oil, and other common HHW items year-round (Oneida-Herkimer, 2013).

Oneida County originally began its collection program in 1989 with one-day collection events. David Lupinski of the Solid Waste Authority calls these one-day events "disastrous," as residents waited three hours in line and many cars overheated (personal communication, 2014). When the Solid Waste Authority found the most commonly disposed wastes were motor oil and paint and that the one-day events were exceedingly expensive, the county decided to establish a permanent collection site. Trained employees operate the site and pre-sort materials, while a contracted company lab-packs and transports the materials every two weeks. The cost of paying employees and for disposal of the material is on average $300,000 a year. The Solid Waste Authority pays for these services through landfill tipping fees, DEC grants, and profits from selling recycling facility material.

The facility advertises in a yearly press release, distributing brochures, and through its website. Lupinski says the aim of the website is to be a "two-click" site, i.e. "easily maneuverable" ((personal communication, April 3, 2014). The thorough site provides links to brochures in multiple languages, information on HHW alternatives, and separate pages for commonly disposed of items. According to Lupinski, the counties are concerned with looking at the whole waste stream and how to detoxify it at all points. Oneida County operates its own landfill, which accounts for their higher concern with reducing illegal dumping and preventing

toxic leaching from HHW in the landfill. Lupinski acknowledges the high cost of the collection program, but states it is "the cost of doing business" (personal communication, 2014). The environmental benefits outweigh the economic costs for the Oneida-Herkimer program.

3.2.4 Rockland County

Similarly, Kathleen Smith of the Rockland County (2012 population: 311,687) HHW Drop-off Facility cites an interest in reducing environmental impacts as the motivating factor behind the creation of the program (personal communication, 2014). Concerns from local environmental groups and for the protection of emergency responders stimulated the creation of one-day collection events. Like Oneida-Herkimer, Rockland County also found these events too expensive, and established a permanent facility in 1994. Operated by a contracted company, the facility services an average of 40 people weekly during low-participation months, and as many as 2,500 people weekly in high-participation months, for a yearly average of 17,000-18,000 cars. The program reaches 5.4-5.7% of the county's population.

Once relying on advertisements in the local newspapers, Rockland County now spends $20,000 to create a brochure that is distributed annually through the postmaster. The County also provides relevant information on its easily navigable website. Smith states the program relies on residents' demand and interest level; she believes the county is comprised of a very environmentally conscious population and that this motivation explains why the use of the facility has increased over time.

3.2.5 Schenectady County

Schenectady County (2012 population: 154,727) began its HHW collection program as annual one-day events, servicing 800-1400 cars at each event. The County found that many residents had nowhere to dispose of HHW during the moving process, and so established a

monthly collection program in 2002. Residents pre-register for the events online and the facility services about 100 people at each event, for a total of 825 cars in 2013, or 0.5% of the county's total population. The program costs $80,000 a year, with half of the funds covered by DEC grants. Additionally, the County initially relied on contractors to meet the facility requirements; in the first bid contract, the County required the contractor to provide a storage shed, which would then become county property after the contractor's termination of service. The County advertises through newspaper ads, its website, its Facebook page, local organizations' newsletters, and would like to expand its advertising to radio, television spots, and billboards.

The facility is operated by a contracted company, along with a full-time employee from the county. The program has also developed a base of volunteers, and there are always at least two volunteers present at collection days for directing traffic. The facility charges residents $20 for a yearly permit to dispose of HHW. Jeff Edwards of Schenectady's Department of Economic Development and Planning explained that in a survey on the HHW program, many residents expressed complaints about the cost and waiting on crowded days, but that the majority of residents see the program as a benefit to the community (personal communication, 2014). According to Edwards, the County's philosophy is to only take what people cannot dispose of elsewhere in the community, such as batteries and CFLs at Home Depot and Lowe's.

3.2.6 Broome and Tioga Counties

The HHW collection program of Broome (2012 population: 200,600) and Tioga (2012 population: 52,337) Counties is conveniently located in the former maintenance garage at the local landfill; not only is the facility in a prominent and easily accessible location, but the garage doors at either end of the building allow for easy flow of traffic in and out of the facility. The program conducts three collections each month and uses a contractor for assistance at collections

and to pick up shipments. The facility has trained staff, which reduces costs, resulting in the elimination of HHW disposal charges for residents. At the beginning of each year, the program advertises in the local newspaper and keeps information on its website year-round. The cost of the program in 2013 was $198,236 without DEC grants (Donnelley, personal communication, 2014). In 2013, 3,528 residents participated in the program or 1.4% of the two counties' total population; the program collected 222,400 pounds of HHW.

3.2.7 Dutchess County

Dutchess County (2012 population: 297,488) began operation about 12-13 years ago and currently holds collection dates eight times a year at four locations throughout the county. These locations are not permanent facilities. They currently spend about $70,000 on their program and garner a participation of 1,000 residents (0.3% of the county population). The program is mainly spread by word of mouth, but they also advertise in the local paper, hand our flyers, and have large laminated posters in the Fire Department and the Public Works Department. The reason we wanted to interview Dutchess County was due to an online press release stating the program had a 10% increase between 2006 to 2007. Bill Calogero, Executive Director of their Resource Recovery Agency, accredited this improvement to increased societal push to recycle electronics. Since electronics are not included in HHW collection and HHW outreach has not changed, this growth in participation point to increased resident awareness.

3.2.8 Case Study Conclusions

Overall, the interviewed county programs evolved from one-day collection events to permanent collection centers, open year-round or part-time. All programs advertise well online, as well as conduct outreach through other avenues throughout the county. Additionally, officials from Rockland and Oneida-Herkimer counties implied their programs exist in response to

residents' high concern for the environment. These programs have a significantly higher operating cost than that of the Saratoga Springs program, but seem to consider this high price necessary in promoting environmental health.

Residents of Saratoga Springs identified establishing a permanent location and the provision of more educational material as the main ways that Saratoga Springs' HHW program could be improved. Incidentally, the best practices of our case study municipalities reflected the desires of Saratoga Springs residents. The five out of seven programs have permanent facilities for HHW storage and far surpass Saratoga Springs' education program and online informational material. Given all the data collected during this research, we attempted to create an education curriculum to overcome the education barrier identified by residents.

3.3 Curriculum Implementation

When designing the curriculum, it was important to keep the lesson in line with the club's age group as well as the school's mission and teaching styles. Although the Green Team's main focus up until this point has been on the school's waste stream, our curriculum helped bridge the gap between environmental consciousness at school and at home. By creating a solution-based curriculum, we kept in line with the pedagogy of the Green Team, which seeks to empower students to take on more environmentally friendly behaviors (See Appendix C).

To achieve this, we utilized models in which students could simulate how pollutants can enter a watershed system and contaminate both resources and the overall environment. Students were first asked to try and define a watershed, working together to construct a comprehensive definition. Next, the class marked the watershed to establish its boundaries to demonstrate the principles that had just been discussed. In this way, the kids were able to construct their own understanding of the concept through experience.

After establishing how watersheds function, we moved on to discussing the different types of activities that occur in a watershed and how these activities could, in turn, affect the ecological system. Students brainstormed different human developments that were present in a watershed, each taking turns placing a representation of that entity into the model (for example, a barn to represent farming, a house for residential areas, a sand trap for golf courses, etc.). Students then sprinkled different colored powders around these entities to represent the pollution they created. The model was then sprayed down so that the kids could see how these pollutants entered the water supply. We next focused on finding a solution to this problem. Students shared ideas of ways that we could either minimize the amount of pollution or manipulate the landscape to prevent the pollution from entering the watershed. The students then tried out these ideas by implementing their solutions on the model, which was sprayed down again. By comparing the state of the water from the first run to the second, the club members were able to determine which strategies were successful and which weren't.

During the second session with the group, we elaborated on one of the solutions discussed during the watershed model activity. The students were asked to think of some of the items that they had around their house that might be harmful if they were to end up in the environment. Many of them listed items such as light bulbs and various household cleaners, most of which are indeed defined as household hazardous waste. We then introduced the kids to that morning's activity, which consisted of creating substitute household cleaners that were environmentally friendly and could replace the more harmful products found in their homes, thereby decreasing the possibility of pollution of the watershed.

The students were separated into three groups. Each group was presented with a recipe for an environmentally friendly household cleaner. Once the cleaners had been mixed, they were

distributed into different spray bottles and containers that the kids then labeled with their name, product name and recipe so that they could remake it in the future. The kids were also each given a reusable bag to take their products home, which contained a handout outlining the definition of HHW, the guidelines for the HHW program in Saratoga Springs, and which items were acceptable for collection.

Following these sessions, we then presented the Department of Public Works office with the curriculum as well as the handout created to elaborate on the current program. It is our hope that these will become available to other teachers through the Department of Public Works website.

4. Recommendations

We presented our findings in a white paper to the Department of Public Works, as well as at a public city council hearing on May 6, 2014 (See Appendix B). In addition to our survey results, the white paper included a list of possible recommendations for the Saratoga Springs HHW collection program.

A permanent location, with increased operating days, would greatly increase accessibility for residents and divert more HHW from the Saratoga Springs waste stream. Case study counties explained that despite the high initial costs of implementation, permanent locations have a lower cost in the long-term over holding one day collection events for the same period of time, as these facilities are able to store partial barrels of HHW rather than transport them below full capacity. Further, survey respondents identified a permanent collection program in a permanent location as the most likely improvement to increase participation in the HHW program.

Many HHW collection programs throughout the nation also have materials reuse centers, where residents can exchange partially used HHW (Cabaniss, 2008). Such a program would increase a product's time period of use, eliminating it from the waste stream, as well as reducing the need to consume new HHW products. Additionally, such a reuse program could operate year-round with minimal supervision, providing a large benefit to the community at little cost.

Though permanent facilities appear to be the best solution to increasing disposal participation, diverting more HHW from the solid waste stream, and saving costs on disposal programs, these programs can still prove prohibitively expensive. Other counties have found ways of financing their programs in addition to DEC grants, such as charging a low one-time user fee, or a higher yearly user permit. In addition to DEC grants, Oneida-Herkimer County's program is funded entirely by the tipping fees gathered from the Public Authority (a joint operator of the program) and by the revenues from selling recyclables for reuse.

Another example of a creatively funded program is through private-public partnerships. Private companies, especially those in the hazardous waste industry, have an incentive to provide clean, safe HHW disposal for the surrounding community. Similarly, cross-jurisdictional cooperation is another effective way to decrease program costs. Adjacent municipalities or related local governmental agencies can partner to pool resources and save costs, or create a purchasing cooperative, while still providing a benefit to the community.

The program officials of the Rockland and Oneida-Herkimer collection programs cited an interest in maintaining environmental and public health over reducing monetary costs. Under the current paradigm of HHW disposal, it seems disposal will always be costly; the high price is the cost of diverting household pollutants from the overall waste stream, preserving natural ecosystems and the safety of the home.

Nevertheless, the benefits of the population serviced by the permanent facility may not outweigh the high costs of keeping the program running; though permanent programs have higher participation than one-day collection events, even the most active programs in the country still reach only 5-10% of the target population (Cabaniss, 2008). Rather than scaling up programs to reach 100% of a population at an exorbitant monetary cost, the future of HHW disposal lies in restructuring our current program into an innovative sustainable vision.

One of the longest-running programs in the country, the HHW services provided by the Local Hazardous Waste Management Program of King County, Washington rewrote their mission statement and vision in 2007:

> "[R]esidents, businesses and government [will] demand, use and produce products that are the least harmful to the environment and all segments of the county's population. Exposure to toxic or otherwise hazardous chemicals is virtually eliminated, essentially reduced to natural background levels….Products that still present any risk from chemical content are managed in a closed-loop stewardship system, funded by those who make and sell the products, until such time as they can be replaced with safer ingredients." (LHWMP, 2007)

The above mission statement implies a much-needed change in the HHW programs across the nation, not only in Saratoga Springs. Local government programs are often regarded as a stop-gap for federal regulations on the disposal and production of HHW products.

A more environmentally and socially healthy solution to the problem of HHW is to begin at the pre-consumer phase by passing regulations that reduce the toxicity of household products. Alternatively, solutions can also be found in the post-consumer phase. A producer responsibility law, which would require paint manufacturers to establish a statewide collection of post-consumer paint, is currently tabled in New York State (A06930A 2013). According to the Product Stewardship Institute, about 3.1 million gallons of paint go unused each year in New

York and a statewide paint stewardship program would create about $25 million annually (PSI, 2014). California, Connecticut, Rhode Island, and Oregon have all implemented such programs.

Another approach has been to simply reduce the production of HHW through reducing the consumption of household hazardous products. Our main recommendation for the Saratoga Springs collection program is to enhance its outreach and education initiatives, which would increase awareness of not only the city's HHW collection program, but the benefits of avoiding household hazardous products in the first place. Though the Saratoga Springs program currently advertises and receives press coverage in the local newspapers, they do not utilize social media. The avenues of Facebook and Twitter proved helpful in distributing our surveys to the local community and revealed a lack of awareness in this audience of the HHW program and the definition of HHW. Such social media avenues have the potential to reach larger portions of the Saratoga Springs community and at a very low cost.

Providing additional informative material on the collection program and on HHW in general on the city's website is also an effective way to increase understanding among residents. The Saratoga Springs program's website currently offers information on what constitutes as HHW, when the collection day occurs (though with outdated information), and who to contact to set up an appointment. However, this information is not easily accessible from the city's main site. In addition to creating a link from the city main page to the program's site, we recommend providing educational materials on the importance of HHW proper disposal and alternatives to household hazardous products. We have also offered our lesson plans designed for this capstone to the Department of Public Works for use on it's website.

We would like to emphasize that through our surveys, residents expressed high interest and excitement in the Saratoga Springs HHW collection program. Respondents who had not

heard of the program were eager that it existed; a typical response to what is a strength of the program was "that it exists at all." Increasing public awareness through outreach and education initiatives, as well as offering more HHW collection days, are possible ways to improve on what the Department of Public Works has already created. The city of Saratoga Springs currently provides a beneficial service to the local community; we hope that the program can expand its efforts to include more participants in the future. There has been talk of the city partnering with the county on its HHW collection program, which would bring this service to a larger population.

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Appendix A

Survey

1. Have you ever heard of Saratoga Springs' household hazardous waste collection day?

_____Yes
_____No

If yes, how did you hear about it?

2. What do you feel are the strengths and weaknesses of the current Household Hazardous Waste collection program?

3. Have you ever seen advertisements for the Household Hazardous Waste program?

_____Yes
_____No

If yes, where?

4. Where do you think would be the most effective place to advertise the Saratoga Springs household Hazardous Waste program?

_____On the internet
_____Newspapers
_____Radio public service announcements
_____Television public service announcements and commercials
_____Other (please specify)

5. Have you ever participated and submitted hazardous materials to Saratoga Springs' Household Hazardous Waste collection program?

_____Yes
_____No

If yes, how many times have you participated?

6. Which Household Hazardous Waste collection sites have you used in Saratoga Springs?

7. Do you have access to a car or other method of transportation for disposing of your Household hazardous Waste?

_____Yes
_____No

8. Do you feel confident in your ability to identify which of the items in your house might constitute as hazardous waste and accepted for collection in the Saratoga Springs Household Hazardous Waste Collection program?

_____Yes
_____No

Why or why not?

9. What factors below would make Household Hazardous Waste disposal easier for you? Check all that apply

_____More advertising
_____A permanent location in the community that operates frequently
_____More collection days in Saratoga Springs
_____More knowledge in general about Household Hazardous Waste
_____Creation of a more accessible location in Saratoga Springs
_____Other (please specify)

10. Which of the following are some of the reasons you may not use the Household Hazardous Waste program in Saratoga Springs? Check all that apply.

_____The disposal sites in Saratoga Springs are inaccessible or difficult-to-reach locations
_____I don't have sufficient knowledge about my waste disposal options
_____I don't have sufficient knowledge about what materials count as Household Hazardous Waste

_____Other (please specify)

Appendix B
White Paper

Saratoga Springs Household Hazardous Waste Collection Program - Survey Results and Suggestions

Survey Results

The Saratoga Springs' household hazardous waste collection program draws about 247 participants each year. Currently, the collection occurs roughly once a year at Weibel Ave and results in mainly the collection of paint materials, pesticides, and bulbs. In order to identify ways to increase residents' use of this event, we distributed surveys to uncover the public's perceived barriers to participation. A total of 132 surveys were collected. Of those surveyed, 73% reported having never heard about the collection program, and 84% replied that they had never seen it advertised. Only 22% claimed to have used the program before. In addition to a lack of advertising, another major barrier preventing disposal appears to be education: only 56% of respondents reported feeling confident in their ability to determine which items in their house constituted as household hazardous waste.

In response to how to increase participation, 78% of respondents preferred a more permanent site for the program, while 63% requested more general information, such as how to handle HHW and what qualifies as HHW. Further, 58% of respondents cited more frequent collection days as a solution to make HHW disposal easier. These findings, in addition to the main barriers to participation, reveal a desire for increasing the program's general existence whether through more collection events or a permanent site, and for increased advertising and outreach about the program.

Recommendations

After assessing the programs of similarly sized and/or nearby municipalities, our group has compiled a host of suggestions to improve the Saratoga Springs current program.

A permanent location would provide the highest accessibility for residents and possibly the lowest long-term cost for the city. However, a permanent facility would have a higher initial cost, unless the city located the facility in a building already owned by the town (as Broome County converted their old garage into a HHW collection facility). If a permanent collection program is prohibitively expensive, increasing the amount of collection events per year to once per month may also be a feasible solution. (Although, to save on costs, this type of program would most likely also be located in a permanent facility.) The city could charge a low user fee per drop-off, or a higher user fee for unlimited yearly access to help offset the costs of expanding the program.

Some possible creative ways to ease the burden of managing and funding an expanded program is to partner with nearby municipalities, other governmental agencies, or a private

company with an incentive to ensure the safe disposal of HHW (i.e. a company that produces hazardous materials).

We also suggest the creation of a materials exchange program, where residents can turn in opened, but still usable, household products for other residents to use. Household products would instead be reused, rather than designated as waste. Additionally, since the collection program already collects mainly paints, pesticides, and bulbs, the Saratoga Springs program could collect only these main wastes. Conversely, the program could work with local hardware stores to increase their collections of paints and bulbs, diverting the bulk of the waste form the city's collection program.

Nevertheless, expanding the program is all with the hopes of increasing public participation. The survey results lead us to strongly suggest increasing the presence of the HHW collection program on the City of Saratoga Springs website, whether through a more accessible link on the site's first page or by providing multiple PDFs with educational material on the program and HHW in general. Further, our group discovered first-hand the power of social media, as the majority of our survey results came from outreach conducted on Twitter and Facebook. These sites are free of charge, and receive more foot traffic than the City of Saratoga Springs website, thereby increasing the chances of reaching the program's target population. Contacting local related groups, such as Sustainable Saratoga and Wilton Wildlife, to post on their walls may be one low cost, high impact way to increase participation in the program.

For further information on our project and findings, our final paper will be available to you, as well as attendance at our final presentation.

Appendix C
Informational Handout and Curriculum

Saratoga Springs Household Hazardous Waste

What is HHW?

Many home and garden products contain chemicals that are harmful to both people and the environment. When these products are not disposed of properly, they become hazardous. Saratoga Springs hosts a once a year collection day where you can correctly dispose of your household hazardous waste.

How do I participate?

The collection day is hosted at the Wiebel Avenue Skating Facility Parking Lot. Currently, only residents of the city of Saratoga can participate and must bring a valid New York State driver's licence or current City of Saratoga Springs tax bill as proof of residency. Participants must pre-register for the event by calling the Department of Public Works at (518) 587-3550 ext. 2563. Although collection days occur annually, the date is subject to change so be sure to check the Department of Public Works website!

What materials are accepted?

Acceptable Items

- Cleaning Solvents and Degreasers
- Drain Cleaners
- Fertilizers
- Flourescent Light Tubes
- Furniture Strippers
- Glues/Sealants
- Hair Removers
- Insecticides and Pesticides
- Kerosene
- Oil
- Oven Cleaners
- Paints/Paint Thinners/Lacquers
- Photo Chemicals
- Rat Poison
- Rug & Upholstery Cleaners
- Turpentine
- Wood Polishes/Stain

Unacceptable Items

- Ammunition
- Automotive & Marine Batteries
- Compressed Gas Cylinders
- Electronic Waste
- Explosive & Shock Sensitive Material
- Glass
- Infectious Wastes
- Medicines/Medical Waste
- Radioactive Waste
- Tires
- Items identified and eligible under the County's recycling program
- Normal disposable household trash or plastics

For more information, contact the Department of Public Works office at (518) 587-3550 ext. 2563

Watershed Pollution:

How pollutants enter and impact our water supply

This activity provides a visual demonstration of how watersheds function and how human activities can lead to the contamination of our water supplies. This activity helps increase children's awareness of water pollution as well as what we can do to

Grade Level: 3rd-5th Grade
Prep Time: 1 Hour
Materials:
- Aluminum pan or bin
- Recycleables such as news paper, egg and milk cartons
- Small model houses, barns, industrial buildings and other sources of pollution
- Spray bottle
- Multiple colors of jello powder
- Artificial turf
- Aluminum foil
- Glue gun
- Sponges
- Bucket

Prep work:

1. Begin by constructing your landscape. Cut/crumple your recycleable materials to create hills along the perimeter of your pan. Make sure that all of the slopes in your model will drain into the same water source.

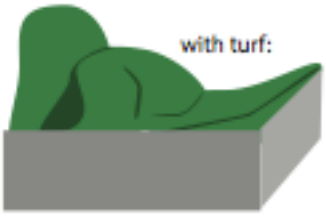
2. Once the scaffolding of your landscape has been glued down, wrap your model in aluminum foil, gently pressing the foil into the hills and valleys you have created. You may then also glue down turf over the foil for a more realistic looking model.

3. Add in pollution sources by gluing down the various models throughout the watershed.

1

2

with turf:



3

Laying the Groundwork:

Start this activity by asking children to try to define a watershed. For this purpose, we can define a watershed as an area of land that drains into a single body of water. This can include streams, lakes and oceans. Hills and ridgelines often make up the perimeter of a watershed while valleys collect the water. Demonstrate this by spraying down your watershed model and showing the kids how the water from the hills runs and collects in your designated body of water. Be sure to sponge up the water afterwards so your model is prepped for the next phase.

Present the Issue:

Next, discuss pollution. For this activity, a pollutant can be defined as a substance that has a harmful effect to the environment and pollution is the introduciton of this substance to the environment. Have the kids brainstorm potential sources of pollution and then allow them to "pollute" the watershed by sprinkling the different colored jellos by the sourrces (example, green jello by a golf course for fertilizer, orange by houses for household hazardous waste, brown by barns for manure). Once the model has been polluted, spray down the watershed so students can see how the different "wastes" are picked up by the water and carried down to the bottom. Sponge off watershed.

Finding Solutions:

Now is a great time to brainstorm solutions to the problem you have just presented. Ask kids how we can help stop this pollution and then adjust the model accordingly. For example, sprinkle less orange jello to represent more people switching to all natural cleaners. Have kids construct a fence or barrier that will stop the manure from being swept away. Glue down turf over fertilizers to represent

Extra Credit!

While brainstorming solutions, discuss the benefits of switching to pesticides and household cleaners that are made with natural ingredients. As a bonus follow up activity, you can have kids make natural cleaners from recipes off of the DEC's website that they can take home to replace their toxic yucky ones. Look up information on your town's household hazardous waste program and be sure to tell your class how they can properly dispose of their HHW. For recipes, visit: www.dec.ny.gov/chemical/8781.html