Journal of Sustainability Education
Vol. 16, December 2017
ISSN: 2151-7452

City of Aspen Single Use Bag Study

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Abstract: Five years after the City of Aspen Waste Ordinance went into effect, this study examines its effectiveness and current shopper behavior. The ordinance banned single use plastic bags from supermarkets and placed a $0.20 fee on single use paper bags. The policy was supported by outreach measures such as distributing reusable bags and education. Results show that single use paper bag sales per $100 of supermarket revenue ranged from a low of 0.59 bags/$100 revenue in 2012 to high of 0.78 bags/$100 revenue in 2014. This rate remained relatively constant between 2014-2016. These low values, combined with the observation that only 15% of shoppers leaving supermarkets were observed using single use bags, indicates that a substantial number of customers choose reusable bags or no bags at all. In contrast, observations made at a nearby supermarket with no bag policy in place indicated that 77% of shoppers left with single use bags. Surveys and interviews indicated that while some people initially opposed Aspen's bag policy, the community has now generally adapted to and accepted it. These results suggest a level of success in using a policy lever, such as Aspen's Waste Reduction Ordinance, to advance sustainable behavior.

Keywords: Waste Education, Behavioral Change, Local Policy, Sustainability, Informal Education, Single-use Plastic Bag

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Background and History

Waste Reduction Ordinance

In May of 2012, the City of Aspen implemented a Waste Reduction Ordinance to eliminate waste and raise awareness around excessive resource consumption. This ordinance bans the use of single use plastic check out bags at Aspen supermarkets and instates a $0.20 fee for single use paper bags. This action was directed by Aspen City Council as a means to reduce single use plastic bag waste and was informed by single use bag policies in other municipalities across the United States, principally in San Francisco, CA. Additional direction and research was garnered from a study conducted by the Community Office for Resource Efficiency (CORE), which emphasized the adverse impacts of plastic and paper bags on natural and urban environments, energy consumption, waste management, and climate change (CORE, 2009). Previously, City of Aspen and CORE staff also piloted a variety of outreach initiatives to reduce disposable bag use and encourage reusables, ultimately determining that voluntary programs alone were not effective at reducing consumption in Aspen.

Supportive Programming and Outreach

Since the implementation of the plastic bag ban and paper bag fee in May 2012, City of Aspen staff have undertaken innovative outreach programs to support residents and visitors. These efforts include the implementation of a bag bank program, which provides free reusable bags at fourteen locations (see Appendix A for a map of bag bank locations). At most bag banks, users are encouraged to both take a bag and/or drop off clean bags (Fig. 1).

Figure 1. A City of Aspen Bag Bank.

The reusable bags that the City of Aspen purchases to stock the bag banks are sourced from GarCo Sewing Works in Rifle, Colorado, which teaches industrial sewing to help women participating in the federal government's Temporary Assistance for Needy Families program gain self-sufficiency. The bags are a third-generation recycled product originating from plastic bottles that were recycled into a fabric used in medical facilities and then sterilized and recycled to make reusable bags (GarCo Sewing Works, 2017).

Additional outreach efforts include annual trainings for grocery store staff about the Waste Reduction Ordinance and strategies for communicating about it with customers. Environmental Health and Sustainability staff incorporate reusable bags into ongoing educational strategies aimed at various sectors of the Aspen community (Appendix B). These efforts include outreach at community events, as well as providing bags to the Aspen Chamber and Resort Association and to Aspen Skiing Company staff.

Introduction

Purpose of Report

In April 2016, City of Aspen Environmental Health and Sustainability staff approached City Council with the observation that the number of paper bags being purchased at Aspen's grocery stores in 2014 and 2015 exceeded 2013 levels (Fig. 2). Additionally, the total number of paper bags purchased during the peak month of bag sales (December) had also increased each year (Fig. 3). No data was available about the number of reusable bags sold from each grocer.

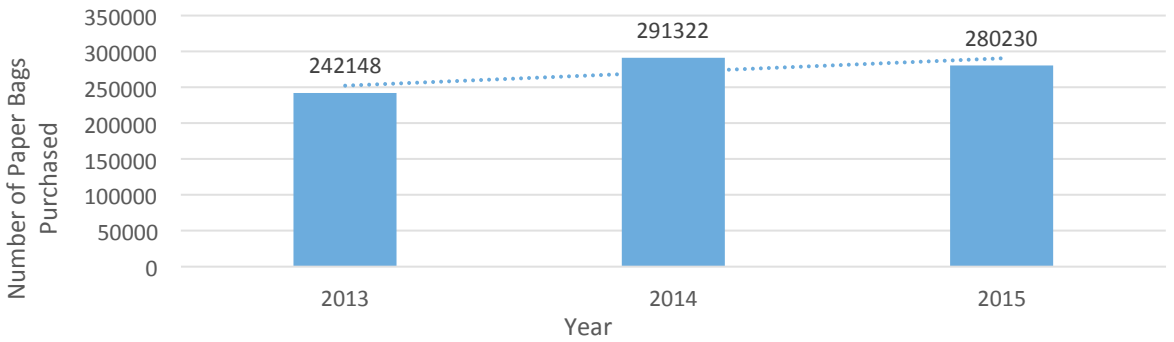

Figure 2. Annual Paper Bags Purchased in Aspen Supermarkets

Note: 2012 data was omitted here because data collection began mid-year.

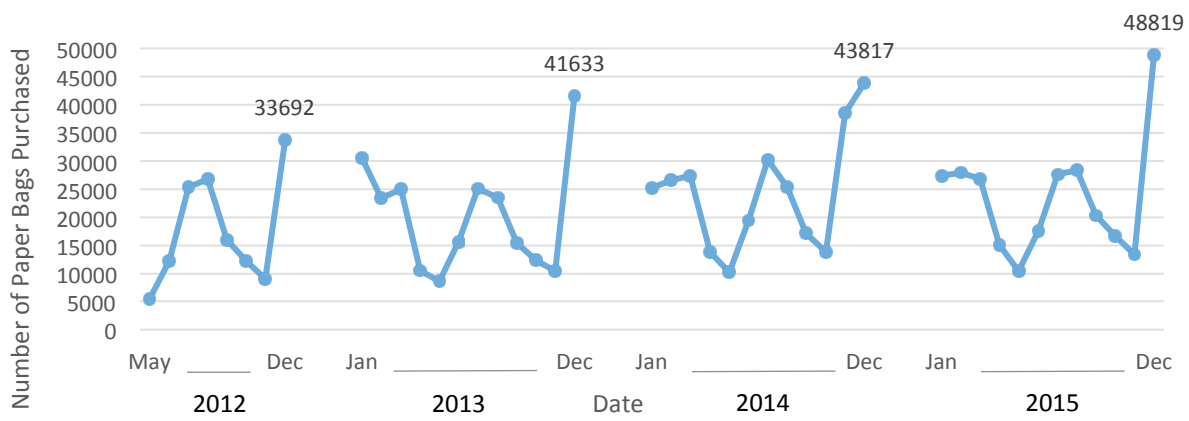

Figure 3. Paper Bags Purchased Monthly: 2012-2015

Following these observations, in the spring of 2016, Aspen City Council approved the staff request for the use of the Waste Reduction Fees collected from disposable paper bag use in Aspen supermarkets (Aspen Municipal Code 13.24) to examine the effectiveness of the current plastic bag ban, paper bag fee, and ongoing outreach efforts.

The goal of the project was to develop a better understanding of the behavior and bag use of Aspen shoppers (visitors and residents), and the attitudes that residents, workers, and visitors

hold toward the ban. This investigation also included research into bag bans in other communities and possible next steps, based on best practices and case studies.

This report seeks to gauge the impact of Aspen's single use bag ordinance and the community's reaction through quantitative figures, qualitative interviews, and surveys. The conclusions and recommendations for further action are given based on the study of best practices, as well as the localized learnings of a small mountain town. We hope that by sharing these findings, other communities can then re-contextualize and apply these learning within their own jurisdictions.

National and International Single Use Bag Policies

Single use bags were once ubiquitous across communities in the United States. The phrase, "paper or plastic?" was a hallmark of supermarket checkouts from coast to coast. While this is still the norm in many places, over 200 jurisdictions in the United States, seven in Colorado, have instated policies to reduce the use of single use bags (Frazier, 2016). Two of the large drivers for these laws are the environmental degradation and economic costs of cleaning up plastic film. Simply put,

> The environmental externalities associated with plastic bag production and disposal, which include CO_2 emissions, water pollution, and solid waste, exemplify a classic tragedy of the commons. Individual consumers benefit from the use of plastic bags because they can easily carry purchased goods without the burden of carrying around reusable bags, while the population as a whole bears the collective cost of the production and disposal of plastic bags. (Akullian, Karp, Austin, and Durbin, 2006, p.1)

US municipalities with bag bans are not alone in their effort. As of 2014, over thirty-seven countries or cities enacted bag ban legislation, including Ireland, China, Italy, Bangladesh, Ethiopia, Mexico City, and Delhi (Romer and Tamminen, 2014).

Where some countries have achieved comprehensive bans, researchers Clapp and Swanston maintain that national legislation on plastic bags in the United States is unlikely due to the opposition of the plastics industry (2009). Several state legislatures, such as those of Florida and Arizona, prohibited municipalities from passing single use bag legislation altogether (Frazier, 2016). Similarly, an ordinance to instate a $0.05 fee for single use paper and plastic bags in New York City was overridden by the State of New York in February of 2017, when the legislature passed a bill banning bag taxes or fees in cities of one million or more people. New York City is the only city in the state that meets the population restriction (Pope-Sussman, 2017). With such opposition, the continued spread of bag ban legislation across the United States is uncertain.

Efforts to reduce single use bags take many forms, including bans, taxes, fees, and voluntary efforts to recycle or take back bags. In 2012, the City of Aspen instituted a plastic bag ban and a paper bag fee of $0.20. Accordingly, this paper focuses on the use and effectiveness of bans and monetary disincentives to curb single use bag consumption, rather than examining

voluntary waste reduction programs. Single use bag fees in the United States range from $0.05 to $1.00 (Romer and Tamminen, 2014).

Gauging Results and Success

For the most part, a higher cost per single use bag equates to a more significant decrease in bag consumption (Romer and Tamminen, 2014), and some policies have seen noteworthy results and success. Ireland was one of the first places to implement legislation limiting single use bags, imposing a 15 Euro-cent levy on plastic bags. The Irish levy saw tremendous initial results. Estimated annual bag consumption dropped from 328 bags to 21 bags per capita. To discourage bag use, Ireland intentionally set the cost of each plastic bag to be much higher than the customer's "willingness to pay" (Convery, McDonnell, and Ferreira, 2007). Despite early success, by 2006, bag use rose back to 31 bags per capita. Consequently, Ireland raised its levy to 22 Euro-cents, and bag usage is now estimated at less than 14 bags per capita (Plastic Bag Levy, 2017). Of note, the Irish seem to be generally invested in and approving of the levy, with scholars contending: "the Irish plastic bags levy has proved so popular with the Irish public that it would be politically damaging to remove it" (Convery, McDonnell, and Ferreira, 2007).

Not all countries have enjoyed such successes. In South Africa, a plastic bag levy was introduced in 2003. Though plastic bag use decreased initially, consumption again increased over time. Economists Dikgang, Leiman, and Visser (2012) suggest that, "the initial sharp fall in use of bags was a result of loss aversion… once consumers became adjusted to paying for bags, demand slowly rose to its historic levels" (p. 3339). Dikgang, Leiman, and Visser also suggest that South Africa's lack of long term reductions in bag use may be related to "the lack of pre-emptive advocacy campaigns aimed at raising consumer awareness," which they contrasted to the success of Ireland's policy and outreach (p. 3341).

In addition to the nation-wide examples, there is also much to learn from the proliferation of municipal-level action being taken in the United States. Many municipalities with single use bag ordinances report positive outcomes. After instating a $0.10 bag charge, San Jose, California saw reductions in the number of plastic bags in its storm drains (an 89% decrease), rivers and streams (60%), and city streets (59%) (Romer and Tamminen, 2014). The quantity of single use bags being carried out per customer also dropped from 3 bags to 0.3 bags (Romer, 2016). After instituting a plastic bag ban, Portland, Oregon cited a 300% increase in reusable bag use (McLaughlin, 2016). One of the largest supermarket chains in Portland, ME reported a 350% increase in reusable bag sales after a fee of $0.05 was instituted for both plastic and paper shopping bags (McLaughlin, 2016). Across a variety of metrics, these communities realized success in reducing single use bag consumption and its associated environmental impact.

In some instances, policy results are less clear. For example, after instating a $0.05 tax on plastic bags in 2009, Washington, DC saw increasing tax revenues over the first four years (McLaughlin, 2016). At the same time, a household survey conducted in DC found that 60% of people reported reducing use of plastic bags since the tax was put in place (Government of the District of Columbia, 2013). Increasing revenues suggests that perhaps the impact of the tax is decreasing, and yet household surveys point to significant behavioral change.

A recent examination of the Toronto plastic bag levy also called into question the extent of the levy's impact. This study found that the influence of the policy varied significantly across

behavioral and demographic groups. The levy seemed to have a positive effect on those who were already likely to use reusable bags and little to no impact on those that seldom use reusable bags (Rivers, Shenstone-Harris, and Young, 2016). What is more, many bag ban policies are put into place at the same time as cultural thinking is shifting for certain groups around the social tolerability of single bag use (Rivers, Shenstone-Harris, and Young, 2016). This might result in inflated estimates of policy impact.

Single use bag policies, in concert with other societal factors, seem to have notable impacts on waste reduction; still, extrapolating the extent of that impact across communities, or the root cause of said impact, remains enigmatic. There are challenges associated with comparing the success of one ordinance to another. As is seen in the comparison of Ireland with South Africa, beyond differences in policy, the programs and education that support implementation are critical to the success of waste reduction. What is more, each location is subject to a unique set of social and cultural norms regarding single use bags. Communities track results in different ways and for disparate spans of time. The authors of the Toronto study stress that, "overstating the impacts of policy interventions can lead to unintended consequences, such as overconfidence in 'silver bullet' approaches to complex problems" (Rivers, Shenstone-Harris, and Young, 2016, p.161). This is all to say that single use bag policy is an important tool to promote waste reduction, and the context in which the policy is enacted, the programs that support it, the cultural norms of the community subject to it, are also critical to success.

Methods

Paper Bags Purchased in Aspen Grocery Stores

To comply with Aspen's Waste Reduction Ordinance, grocers report the quantity of paper bags purchased at their stores monthly to the City of Aspen.[1] Grocer report data was then compared with the annual aggregated revenue of Aspen supermarkets to gauge the change in bag sales per fixed quantity of revenue changed over time.

Supermarket Observations of Bag Use

To assess the effectiveness of Aspen's bag ban in deterring the consumption of single use bags, staff observed and analyzed shopper behavior at Aspen's two grocery stores. Data was gathered by an observer stationed at supermarkets to note the apparent sex, approximate age, and type of bag (paper, reusable, or none) carried by the shoppers exiting the store. These observations took place at Aspen, Colorado's two supermarkets in the morning (9am-11:30am), lunchtime (11:30am-1:30pm), afternoon (1:30pm-4:30pm), and evening (4:30pm-6:30pm). A total of 928 shopper observations were conducted from August through September 2016 to capture summertime behavior, and 704 more observations were taken from January through February 2017 for a wintertime sample. For a point of comparison to a community that does not contain a bag ban, 1241 shopper observations were also taken at a supermarket in El Jebel, Colorado, approximately 22 miles from Aspen. The El Jebel observations were taken during

[1] Throughout the course of this report, paper bags provided without a fee to shoppers on federal assistance programs are also included in these figures or where "quantity of paper bags purchased" is referenced.

lunchtime and dinnertime in January and February 2017, and took note of the quantity of bags with which each customer left the store.

Surveys and Interviews

To gauge community and visitor awareness and views on the Waste Reduction Ordinance, as well as general attitude toward waste reduction efforts in Aspen, individuals were surveyed at the entrances to Aspen's two grocery stores. Basic demographic information about each participant was recorded, including apparent sex and approximate age. Eight community members whose work is impacted by the bag ban were sought out for conversations on their opinions about the bag ban, and the attitudes of their customers and employees. Questions were tailored to individuals, depending on their work.

Results

Paper Bags Purchases Relative to Supermarket Revenue

This study originated from concerns that the quantity of paper bags being sold at Aspen's supermarkets was increasing (Fig. 2 and 3). When the quantity of bags purchased each year is compared to the amount of supermarket revenue earned over the same period, an increasing trend emerges between 2012 and 2014. However, since 2014, the number of paper bags purchased per $100 of revenue remained relatively flat (between 0.78 and 0.76 bags) (Fig. 4).

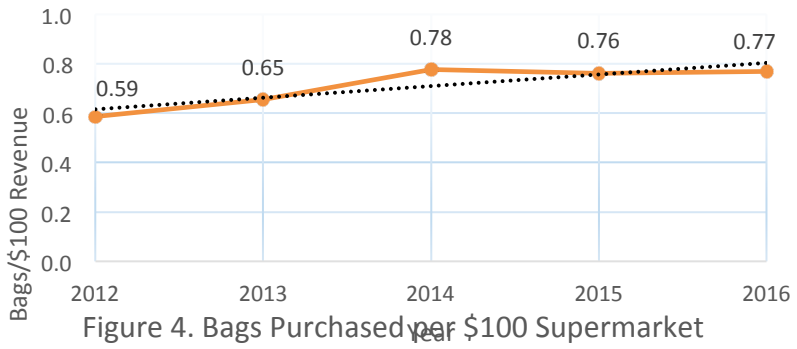

Figure 4. Bags Purchased per $100 Supermarket Revenue

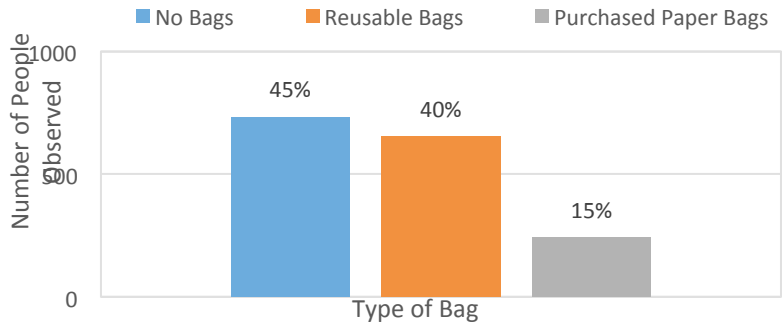

Figure 5. Types of Bags Used in Aspen

Bag Use Observations in Aspen

Of 1632 people observed exiting supermarkets in Aspen, Colorado, 45% used no bag to carry out their groceries, 40% used reusable bags, and 15% purchased a paper bag (Fig. 5).

Adults and millennials were most often observed with no bags, as opposed to seniors, who were more often observed with reusable bags (Fig. 6). Of carrying options, all ages were least likely to walk out of the store with a purchased paper bag (Fig. 6). Of the shoppers observed, 41% were women and 59% were men. Most women observed (53%) used reusable bags to carry out their groceries, whereas majority of men observed (56%) used no bags (Fig. 7).

Aspen's resort economy has two distinct busy seasons, winter and summer. There was a slight increase in the percentage of people leaving with paper bags in the winter (Fig. 8).

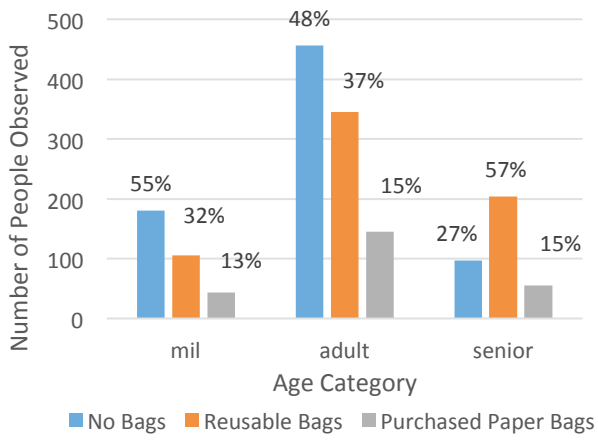

Figure 6. Bag Type by Age

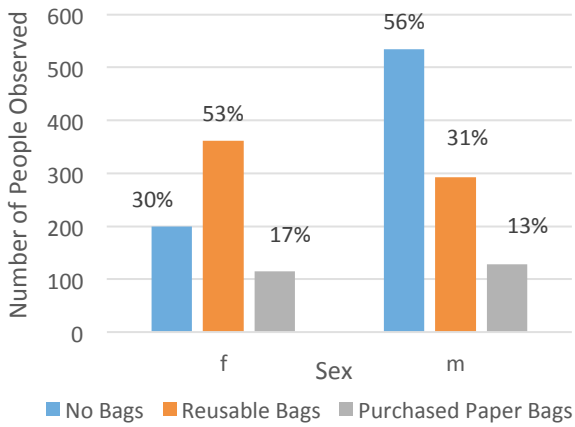

Figure 7. Bag Type by Sex

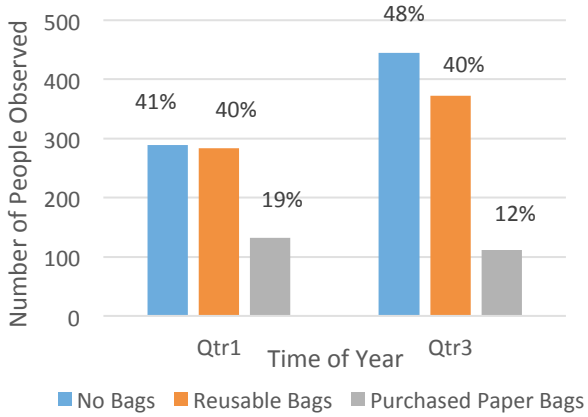

Figure 8. Bag Type by Time of Year

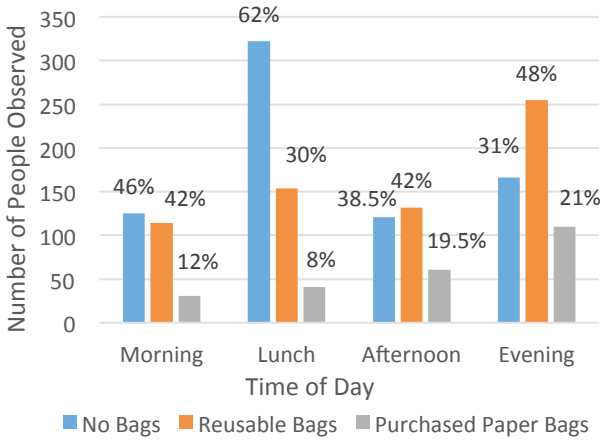

Figure 9. Bag Type by Time of Day

The largest volume of shoppers was observed at lunchtime (11:30am-1:30pm) and during the evening (4:30pm-6:30pm). Lunchtime shoppers were the most likely to use no bags (62% of the people observed) (Fig. 9). In contrast, evening shoppers were more likely to leave the store with reusable bags (Fig. 9).

Bag Use Observations in El Jebel

During observations in El Jebel, Colorado in January and February of 2017, 76.5% of people leaving the supermarket carried single use bags (plastic or paper), 16% carried all their groceries out with reusable bags, and 7.5% carried items out without a bag (Fig. 10).

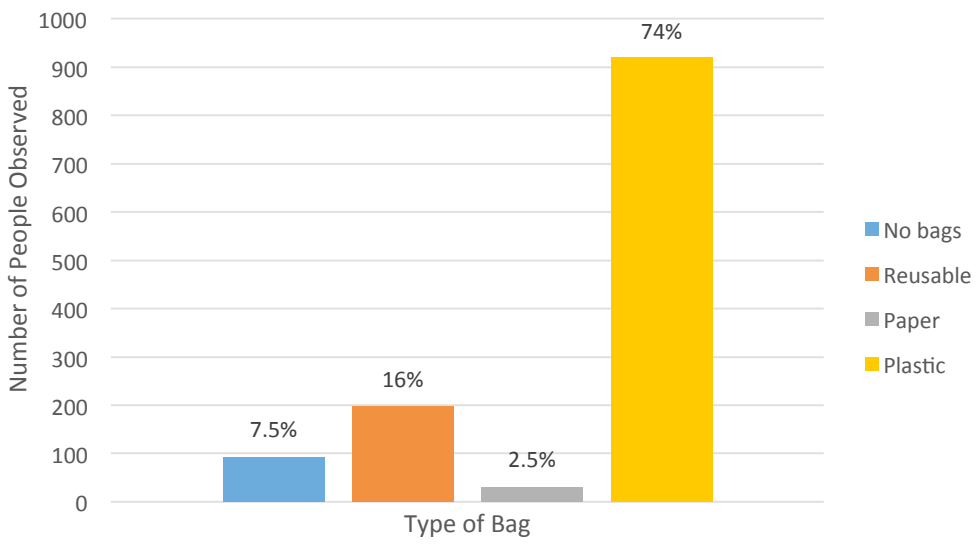

Figure 10. Types of Bags Used in El Jebel

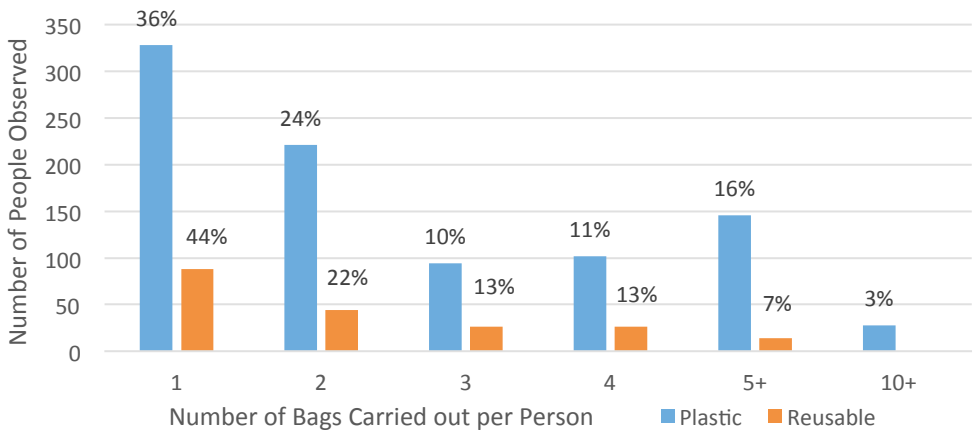

Figure 11. Quantity of Bags Carried out per Person in El Jebel

Of the individuals who used plastic bags in El Jebel, 36% had only one (Fig. 11). The average quantity of plastic bags carried out was 2.9 bags. On the other hand, of shoppers who carried reusable bags in El Jebel, 44% carried only one bag, and the average number of reusable bags carried out was 2.2 bags.

Survey Responses in Aspen

Comments on what could increase the use of reusable bags

Nearly all respondents (98%) stated that they knew about the plastic bag ban and paper bag fee in Aspen grocery stores. Of respondents who referenced a fee, 87.5% were in favor and 12.5% opposed (Fig. 12). Several respondents described how they had initially been frustrated when plastic bags were banned, but overtime became accustomed to and adapted to the ban. In fact, of those who were in favor of the fee, 64% suggested even more stringent rules and regulations around waste reduction in Aspen.

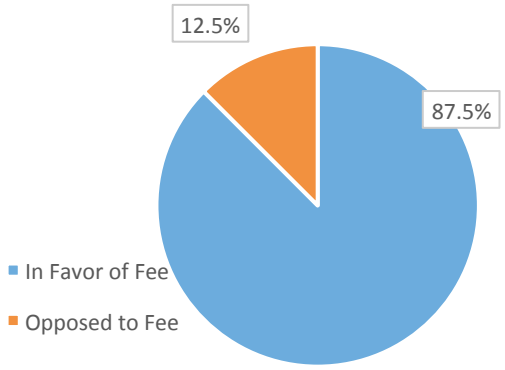

Figure 12. Response to Fee, of those who Referenced it in their Answer

Comments on Aspen's waste reduction efforts

When asked the question, "do you have any comments about Aspen's waste reduction efforts?", 29% of responses reflected the sentiment that Aspen is quite clean and the community is doing good work (Fig. 13). Many said that they use the free public recycling facility or are members of the community composting program. Conversely, 31% of responses referred to Aspen's resort economy and culture of excess (Fig. 13), noting that the Aspen community has lots of room to improve its waste reduction efforts.

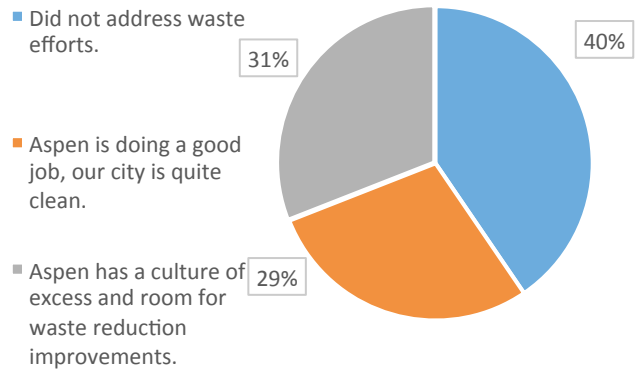

Figure 13. Attitude toward Aspen's Waste Reduction Efforts

Interview Responses

To gain a fuller sense for the bag ban's influence on Aspen's businesses and environment, several community members were interviewed about the ban and its impacts. Below are some excerpts, in direct quote and paraphrased form.

Barrett, an employee at City Market commented that "generally, customers respond well when they learn the reasoning behind the fee" (City of Aspen, 2017, p. 15). He also noted that

"employees are also generally bought in, but sometimes struggle to explain why the City imposes the ban to customers. [Either] they feel ill-prepared to answer or don't have the time to explain" (City of Aspen, 2017, p. 15). David Clark of Clark's Market shared, "Many locals were quite angry at first when the bag ban was passed, [but] they have all become accustomed to it" (City of Aspen, 2017, p. 15). Some visitors, especially those from areas like South America that have fewer local examples of single use bag policies, are sometimes surprised by the fee, but this is less common as tourists from the USA and Europe become used to bag bans at home (City of Aspen, 2017, p. 15). Clark concluded by explaining, "[we] used to hear angry feedback from customers several times a day and now that is only once every couple of weeks" (City of Aspen, 2017, p. 15).

Dan Nelson, City of Aspen Downtown Coordinator explained, "[the ease of cleaning plastic bags out of the parks and ditches around Aspen has] definitely been way better. We are not picking so many [plastic bags] up… In town, there are not as many plastic bags [as before the ban]" (City of Aspen, 2017, p. 16). Dave Radeck, City of Aspen Open Space Project Technician, expressed, "[The bag ban made a] huge difference! Now there is much less plastic trash. [The ban is] the best thing we ever did!" (City of Aspen, 2017, p. 16).

Alyssa Reindel of EverGreen Zero Waste (Aspen's Residential Compost Hauler) shared, "[we] don't see much plastic contamination in residential compost. Most plastic contamination comes from restaurants, which probably does not have much to do with the ban. [More often it is something like] spoiled lettuce in a plastic bag" (City of Aspen, 2017, p. 16). Staff of the Aspen restaurant, the Grateful Deli, commented, "[We chose to not offer plastic bags for takeout orders] to support the City and their efforts once the bag ban was passed. It was also just the right thing to do… [We] have experienced no pushback at all about not having plastic bags" (City of Aspen, 2017, p. 16).

Discussion

Paper Bags Purchased, Relative to Overall Supermarket Revenue

The total quantity of paper bags sold per $100 of revenue at Aspen's supermarkets rose steadily from 2012 through 2014, but was relatively flat between 2014 and 2016. Because of the increase in bag use between 2012 and 2014, the overall trend in bag use since ordinance implementation is positive, meaning that more paper bags were being used to carry out the same amount of revenue.

Ireland (Plastic Bag Levy, 2017), South Africa (Dikgang, Leiman, and Visser, 2012), and Washington, D.C. (McLaughlin, 2016) all observed a gradual increase in single use bag sales, following the initial drop in the purchase of single use bags after bag fee or tax implementation. Though Aspen does not have pre-ban data, the increasing rate of bags sold per $100 in total grocery revenue between 2012 and 2014 seems consistent with what was observed in communities with similar legislation. Aspen should continue to monitor this rate to see if paper bag use increases, remains flat, or decreases in coming years.

Bag Observation Data: Choice of Bag Type

The intent of this study was to better understand the impact of Aspen's plastic bag ban and paper bag fee on the behavior of grocery shoppers. Given that 85% of the shoppers observed

leaving Aspen's supermarkets chose to either carry their goods out by hand (Fig. 15) or use reusable bags, it is a reasonable conclusion that the bag ban was one of the factors discouraging the use of disposable paper bags. One of the most surprising results of the study was the high percentage of shoppers (45%) who left the grocery store with no bags (Fig. 5, Fig. 15), a percentage that increased during lunchtime observations to 62% of shoppers (Fig. 9).

Figure 15. Shoppers choosing to carry out groceries with no bags at all.

Longitudinal data on shopper behavior in Aspen before the ban and prior to the summer of 2016 was not available, and therefore cannot readily be compared to pre-ban figures. However, concurrent observations made at a supermarket in the nearby community of El Jebel, Colorado, where there is no ordinance prohibiting plastic bags or instituting a fee for single use paper bags, recorded markedly different behavior than Aspen stores. This store was chosen for comparison because it is one of the closest supermarkets to Aspen with no plastic bag ban or paper bag fee and is in the same chain as one of the Aspen grocery stores.

While it was not possible to isolate which shopping behaviors are directly attributable to the ban and fee (or lack thereof), the differences in behavior at the two stores was stark. Where only 15% of shoppers in Aspen left with a single use bag (Fig. 5), 76.5% of El Jebel shoppers did (Fig. 10). That is five times the percent of people leaving the store with single use bags at the location without a bag ban. While it is reasonable to assume that the El Jebel store serves many of the commuters who also shop in Aspen, or visitors traveling to or from Aspen, it is important to also note the differences between the Aspen and El Jebel supermarkets. In addition to the bag ban, these differences include, but are not limited to: store size, visitor population served by the store, and limited accessibility by foot or bicycle. El Jebel observations also only took place in the winter. While distinctions between the two locations should not be discounted, the differences in bag use behavior are striking.

Another contrast in shopper behavior at the two sites is that while 45% of Aspen shoppers used no bags at all (Fig. 5), only 7.5% of El Jebel shoppers went without bags (Fig. 10). Interestingly, of all the El Jebel shoppers who carried bags (of any type), 37% used only one bag, and another 24% used two bags (Fig. 11). Perhaps El Jebel customers were carrying more items, or perhaps they took a single use bag due to unconscious habit or prevailing social or cultural norms. We are reasonably confident that the bag ban in Aspen has made shoppers more conscious about their need for a bag, often influencing them not to use one at all; whereas, without the ban there is little incentive or prompt to make that choice.

Bag Observation Data: Temporal Behavior Trends

Another purpose of this study was to develop a more detailed understanding of when most paper bags are bought and who is buying them most frequently. For example, a slightly higher percentage of people left Aspen's stores with purchased bags in wintertime, as opposed to summertime. The reasons behind this are unclear, though some possible contributing factors could be variations in occupancy levels and the ratio of visitors to residents shopping. It is also possible that more people fly to Aspen in the winter than the summer. If traveling by car, summer visitors may be more likely to have reusable bags. Finally, the City of Aspen's reusable bag outreach efforts primarily take place at summer community events.

The highest percentage of people left Aspen stores with purchased paper bags in the afternoon and evening, when they were presumably doing a larger shop than at lunchtime. It is reasonable to surmise that shoppers decline a $0.20 paper bag when purchasing a small quantity of items.

Qualitative Feedback

Shopper surveys, as well as targeted interviews with representatives from grocery stores, suggest that while some community members initially opposed the Waste Reduction Ordinance and found it frustrating, the community has now largely adapted to it and accepted it. When the ban was passed, grocery store employees faced a substantial amount of customer pushback, largely regarding the $0.20 fee. However, as time has passed, these complaints have become seldom and infrequent.

Among interviewees who perform waste removal in public spaces or work for local businesses, there was and continues to be strong support for the Waste Reduction Ordinance. Environmental studies in San Jose, California revealed substantial decreases in plastic bags in storm drains (89%), rivers and streams (60%), and streets (59%) (Romer and Tamminen, 2014). While Aspen does not have data on the reduction of plastic bags in its environment, City of Aspen Parks employees stated that they see and remove markedly fewer plastic bags since the bag ban went into effect.

The environmental ethic behind the ordinance seems to be widely understood and generally accepted, which could be due in part to Aspen's efforts, and likely involves a larger societal shift toward environmental consciousness. Many survey respondents asked for more stringent waste reduction measures. Separate from the Waste Reduction Ordinance, locals and visitors expressed frustration at the predominate culture of excess associated with Aspen's luxury resort economy. Very few survey respondents opposed Aspen's waste reduction measures. As Rivers, Shenstone-Harris, and Young (2016) point out, many bag bans went into effect at the same time as norms of environmental stewardship became more widespread. Attributing waste reduction successes to policy alone ignores the other forces at work on society, namely social and cultural pressures to change behavior.

Conclusion

Aspen's Waste Reduction Ordinance aimed to limit the quantity of single use bags distributed at grocery stores and encourage the use of reusable bags. Aspen's shoppers exhibit behavior consistent with the goals of the ordinance. It also appears that a somewhat

unanticipated trend in behavior evolved in the process; namely, many shoppers avoid using bags altogether. It seems that this ordinance served at least in part as an effective tool to limit the consumption of single use bags.

A variety of lessons and ideas for continued waste reduction efforts arose from this study and the examination of a wider body of literature related to bag bans and plastic film recycling efforts. Highlights of these considerations are outlined below.

Data Collection

Communities with interest in strengthening waste reduction policies by regulating the use of single use bags should begin collecting data well in advance of any policy changes, both by establishing a baseline from which to measure progress and by creating a data collection plan to measure effectiveness once a ban goes into place.

Targeted Outreach

Outreach and educational efforts can take a more specific approach when supported by a nuanced understanding of which sectors of the population and at what times single use bags are purchased the most. In Aspen, a resort community with seasonal tourist variation, millennials and adults are frequent paper bag users, most often in the afternoons and evenings. Future outreach efforts should focus on these age groups and times, with fewer resources expended targeting lunchtime shoppers. If seeking reusable bag community champions, our data would suggest municipalities look to senior citizens.

Bag Bank Program

A bag bank is successful when it is dependably stocked, not just by the municipality administering the program, but most importantly by users who both leave and take bags. Based on Aspen's bag bank experience, we recommend choosing locations that are semi-private and serve a specific and returning subset of the community. Examples of successful locations in Aspen include office buildings or employee locker rooms. Bag banks in public areas that feel less personal tend to see primarily a one-way flow of bags, and are therefore not as successful.

Expand the Scope of the Ban

Aspen already has a second-generation bag ban (Romer, 2017), meaning that plastic bags are banned altogether and single use paper bags are discouraged by means of a fee (first generation bag bans do not charge a fee for paper bags). However, one way in which Aspen could further strengthen the impact of its ban would be to amend the Waste Reduction Ordinance so that all single use paper bags sold in supermarkets contain a minimum percentage of post-consumer recycled content. Interestingly, Aspen's two supermarkets already source paper bags with 40% post-consumer recycled content. Adding a recycled content requirement into Aspen's ordinance would ensure responsible purchasing for the future, while not imposing an extra burden on present grocers.

Some communities, such as San Francisco (City of San Francisco, 2012), have an expanded scope of which stores or vendors are impacted by a plastic bag ban. In San Francisco's original ordinance, only supermarkets and chain pharmacies were impacted by the bag ban. The

city later amended that ordinance and expanded it to include retail and food establishment (City of San Francisco, 2012).

Encourage Further Diversion Efforts

The City of Aspen could also explore providing more expansive recycling opportunities through increasing staff and infrastructure devoted to waste diversion. This could include specific diversion programs (plastic film, glass, Styrofoam) or enhancement of existing public recycling facilities.

Final Thoughts

This study was presented to Aspen City Council on May 23, 2017 and sought feedback on how to proceed with continued or different programming and policy. City Council opted to maintain the current ordinance, while focusing greater outreach efforts on working with the hospitality industry to educate visitors on Aspen's bag policies and discourage further consumption of single use bags. There was also interest in further development of the bag bank program, both in adding more locations and increasing awareness of the system, its locations, and how it works. Finally, Aspen City Council asked for staff to continue monitoring the number of bags sold per $100 of supermarket revenue over time to assess shopper behavior and policy success.

Acknowledgements

Two advisors were critical in the development and review of this report: Elizabeth O'Connell Chapman, Senior Environmental Health Specialist for the City of Aspen and CJ Oliver, Director of Environmental Health and Sustainability for the City of Aspen. Their passion for the advancement and continued improvement of waste reduction efforts is an asset to the community they serve.

Thanks to Pete Strecker and the City of Aspen Finance Department for assistance in data collection. Furthermore, many individuals participated in interviews, contributing their time and thoughts to this study. Thank you to Dan Nelson, Alyssa Reindel, Dave Radeck, John Armstrong, David Clark, Dovid Zussman, Sarah Bates, Dan Matsch, Susie Gordon, staff from City Market and Clark's Market, staff of the Grateful Deli, and Megan McClaughlin.

Finally, thanks to all the staff at the City of Aspen and the Community Office for Research Efficiency who were instrumental in passing the original Waste Reduction Ordinance, and lent their perspectives and insight to the creation of this study.

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