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Institute *for the* Built Environment
Colorado State University
COLLEGE OF APPLIED HUMAN SCIENCES

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TABLE OF CONTENTS

TABLE OF APPENDICES

Overview

With approximately 3 million annual visitors to Rocky Mountain National Park (ROMO), sustainably managing ROMO's facilities and infrastructure, while protecting its natural beauty, proves to be a difficult challenge. Jointly emerging from the nationally recognized Climate Friendly Parks Initiative and an internal push to encourage greater recycling, solid waste management has become a central aspect of facilities management at ROMO. In 2009, ROMO produced 3,815 cubic yards of solid waste, while diverting 1,115 cubic yards (29.2%) to recycling. In 2010, the park improved its efforts by diverting 1,927 cubic yards (40.53%) to recycling. Even though these sustainability initiatives are commendable, park management believes that they can achieve better landfill diversion rates still. In order to accomplish these goals and enhance their landfill diversion rates, ROMO received a National Park Foundation grant and a small research grant by the management team to perform a waste stream analysis. The goal of this waste stream analysis is to explore the composition of their current waste stream destined for the landfill, and use this information to better inform facilities management about further waste diversion efforts.

In the summer of 2011, volunteers and NPS staff conducted a waste audit in collaboration with the Institute for the Built Environment (IBE) to identify waste types and locations with the greatest opportunity for diversion. The initial results of the waste audit informed the development of new strategies and recommendations aimed at changing waste disposal behaviors toward increasing waste diversion rates. The results were somewhat surprising. For example, 40% of the waste stream consisted of recyclables. Furthermore, 12% of the trash volume consisted of paper products, however, site visits to audit locations revealed that paperboard, cardboard, or general paper recycling receptacles did not exist at any of the audit locations.

At the end of the summer in 2012, IBE collaborated with the National Park Service (NPS) to conduct a second waste audit in order to evaluate the effectiveness of waste diversion strategies implemented and to identify further waste diversion opportunities. A full comparison of the results from 2011 and 2012 is located in Appendix J. The results show that annual analysis of the waste stream is imperative to meet the waste diversion goals in ROMO.

Methodology

The *ROMO Waste Audit Protocol* informed the 2012 Rocky Mountain National Park Waste Audit. Developed exclusively for ROMO by the Institute for the Built Environment, the protocol provides techniques for future Waste Stream Analysis at ROMO. The 2012 audit included nine separate locations, representing seven distinct location types and amounting for 16 cubic yards of waste. The six waste categories sorted by location type are Recyclables, Compost, Plastic Water Bottles, Paperboard/Cardboard, Trash, and Hazardous Materials. See Appendix K for complete data from the 2012 ROMO waste audit. In the 2011 audit, the Institute for the Built Environment made site visits to the audit locations in order to qualify the data with true observations of site layout and recycling access. Due to limited changes in the layout of the sites since then, these observations remain true for the purposes of this analysis.

Results

The division of the 2012 ROMO Waste Audit results follows in two sections: Quantitative Data and Qualitative Data. The resulting data set is for the use of developing waste diversion strategies.

Overall Quantitative Results

Below is an evaluation of the quantitative data of the 2012 Waste Audit. The table and charts highlight the weight and volume percentages of the overall audited waste. During the audit, volunteers recorded the weight and volume in an effort to document the waste stream systematically. Some waste has substantial

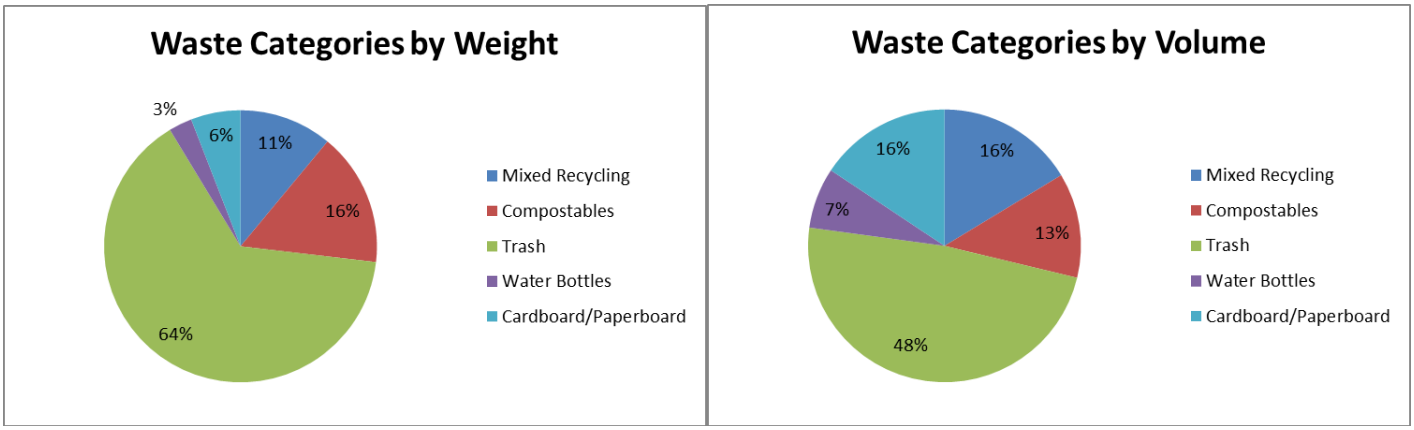
weight but a relatively small volume, as in the case of food scraps, while other items have a comparatively large volume, but are lightweight, such as empty plastic water bottles. Large volume/low weight items are important to note because ROMO employees empty the bins when they are noticeably full and weight is not a factor. Decreasing the amount of high volume/low weight items, such as recyclables, from the waste stream will make a significant impact on park tipping fees.

Non-divertible waste, referred to as "Trash" dominates the weight and volume percentages, accounting for 64% by weight and 48% by volume to the total waste stream. Compostable items represent a smaller portion of the waste stream, measuring 16% by weight and 12% by volume. The rest of the waste stream consists of recyclable items, divided into the categories: Mixed Recycling, Cardboard/Paperboard, and Plastic Bottles. All combined, these waste categories account for 20% by weight and 39% by volume.

2012 Waste Audit Result Table

Overall Totals:	Weight (lbs.)	% of Total Weight	Approximate Volume (Cubic Yards)	% of Total Volume
Mixed Recycling	185	11%	14.1	16%
Compostables	266.5	16%	10.7	12%
Trash	1084	64%	41.7	48%
Water Bottles	46.5	3%	6.2	7%
Cardboard/Paperboard	99	6%	13.5	16%
Total Waste Audited:	**1681**		**86.3**	

2012 Waste Audit Result Charts



Overall Qualitative Results

The qualitative data represents general reactions and noteworthy observations found by the volunteers during the waste audit. Organization of impressions is as follows:

Contamination: Materials that are not acceptable for diversion into recycling due to contaminants, such as food or other non-recyclable materials mixed with recyclables
Hazardous Materials: Materials that should not be landfilled
Intent to Recycle: Recyclable materials separated from general trash, but thrown in trash bins
Method of Disposal: The way an individual disposed of their waste in dumpster (e.g. smaller bags inside of larger ones)
Quality Food Waste: Instances of edible food waste found in waste stream
Reoccurring Materials: Materials found commonly within one of the waste categories
Uncommon Waste: Waste that is traditionally not found in the audited location (e.g. residential waste found in a trailhead dumpster)

Subsequent appendices represent the detailed results per location. In summary, hazardous materials exist at most location types. There is likely an exaggeration in the trash category totals because the filthiness of the rubbish in some trash bags. A compounding factor was the number of recyclable items contaminated with trash. Therefore, there may be greater potential for improving waste stream diversion rates than shown in the data.
The majority of these hazardous materials are batteries and propane fuel canisters found in the campgrounds, but uncommon hazardous waste existed in a variety of locations. For example, auditors found a used paint can and brush at the Picnic Area and a camping lamp at the Family Campground location. The majority of contaminated waste found during the waste audit appeared as trash stuffed into recyclable materials (such as water bottles) and mixed with non-recyclable materials. Many sites also observed large amounts of uneaten (and in many cases unopened) food waste in the waste stream. This was especially the case in all employee housing locations as well as the Group Campground and Picnic Area. Unusual waste included many durable household goods at the Residential areas such as an X-Box, clothing, kitchen electronics, tents, work boots and lawn sculptures. This waste, while notable, did not make up a significant amount of the waste stream. Common waste that was found park-wide across all location types were water bottles, paper plates, compostable food waste, individual packed lunch boxes and pre-purchased food, and plastic bags. Plastic bags dominated as the most common method of waste disposal at most location types.

DISCUSSION OF THE RESULTS

Implemented Recommendations from 2011 Report

As a part of the 2011 report, IBE made recommendations related to signage for recycling procedures, paper recycling, recycling receptacles, food waste, waste diversion awareness, and disposal bin locations and site re-configuration options, as well as recommendations for composting and reusable water bottles. IBE presented the 2011 results and recommendations to the ROMO facilities management directors and staff. ROMO staff implemented some of the suggested strategies throughout the year. It is likely that these changes contributed to the overall difference in totals between 2011 and 2012.

Elliot Dale, a Colorado State University Master's Candidate, handed out recycling bags at the Moraine Park Campground (MPCG) entrance as a part of his thesis research and requested that MPCG gate employees discuss the initiative to increase recycling and hand out a free, reusable bag with a message "Rocky Recycles" printed on the side. An unquantifiable, and thereby unmeasured, number of these conversations occurred. Also included in the bag was a flyer further explaining recycling and listing recyclable items. The back of the flyer had an exit survey asking for the effectiveness of the different strategies that visitors dropped off at the

end of their stay. Mr. Dale gleaned valuable information from the process. Park interpretation created two separate programs around recycling. The first was an evening program and the second was a Jr. Ranger program. Little feedback came from the programs aside from implementation and a notation of the success, but with no specific details. As a part of the programs, the Rangers also handed out stickers intended to go on reusable water bottles advertising filling up bottles from the tap instead of using disposable bottles. Kathy Brown, along with her staff, discussed the importance of recycling at the end of each of their interpretive talks in MPCG. Recycling signage reminders were in two places: the Beaver Meadows Visitor Center and Park shuttle busses. At the Visitor Center, they were on flat screen TVs that revolve between different announcements, including bear safety, elevation safety, weather, lightening, and among others. Additionally, staff added two recycling stations to Loop E.

Comparison of 2011 to 2012 Waste Audit Results

See Appendix J for quantified charts of the comparative data. In 2012, trash dominated the weight and volume percentages, accounting for 64% by weight and 48% by volume to the total waste stream. This is a notable increase from the 43% by weight and 42% by volume from the 2011 results. Mixed recycling decreased from 19% by weight and 22% by volume in 2011 to 11% and 16% in 2012. These are positive changes, likely indicating that the recycling bins at the noted locations were useful for waste diversion. However, water bottles and cardboard/paperboard found in trash did not see a remarkable change. Between 2011 and 2012 there was no change in the % of weight for water bottles and a 2% increase by volume. cardboard/paperboard" saw a 1% increase by weight and a 4% increase by volume between the two years. This evidence demonstrates an area of opportunity for ROMO. Please refer to the *Waste Diversion Recommendations* for a list of strategies regarding this topic. The tables below demonstrate the remarkable results that the percentages indicate between the two years.

	2011 Overal Weight	2012 Overall Weight	% Change
Mixed Recycling	19%	11%	57% decrease
Compostables	30%	16%	53% decrease
Trash	43%	64%	67% increase
Plastic Bottles	3%	3%	0% change
Cardboard/ paperboard	5%	6%	83% increase

	2011 Overal Volume	2012 Overall Volume	% Change
Mixed Recycling	22%	16%	72% decrease
Compostables	18%	12%	67% decrease
Trash	42%	87%	67% increase
Water Bottles	5%	7%	71% increase
Cardboard/ paperboard	12%	16%	75% increase

Lessons Learned For Future Waste Audits

1. Trailhead information is not consistent because single sites produced only an inconsequential amount of trash. Furthermore, the bin used to dispose of trash after weighing during the audit was nearly full upon the arrival of volunteers. Communication with all staff prior to the waste audit regarding expectations and the importance of the audit is critical to the success and efficiency of the audit.

2. Total volume of waste from each location was inconsistent because of varying load capacities in the collection trucks. Use of matching trucks for each location type would bring consistency to the approximate volumes of collected waste.
3. Total volume/weight does not include weight of hazardous waste (e.g. batteries, propane tanks) and uncommon goods (e.g. durable goods, household items)
4. Consider developing mitigation techniques for loose and blowing trash disturbed by the afternoon winds during the waste audit.
5. The results suggest a gross over-estimation of the recorded volumes due to the subjective nature of estimating the volumes. A more consistent and rigorous process for recording the volumes should be considered.
6. Developing a comprehensive program for changing the disposal behavior for waste requires a more in-depth analysis of people's conduct, in addition to waste stream analyses.
7. Recommendations for source reduction are contingent upon a recycling stream analysis in order to understand the complete waste stream.

Recommendations & Next Steps

Based on the results of the waste audit, consideration and implementation of the following list of recommendations could improve ROMO's waste diversion rates. It is imperative that a champion (or champions) exist from within the leadership of the park to deal holistically with the necessary changes, including but not limited to, the execution of recommendations and to encourage a shift in the culture surrounding waste management at ROMO. As discussed previously, implementation of a limited number of the strategies suggested after the 2011 presentation occurred throughout the year between the two audits. This included increased recycling bins in some locations, education-based trainings for staff and discussions with visitors, as well as signage in the Visitor's Center. The list below contains recommendations from 2011 with additions made based on findings from the 2012 Waste Audit.

Waste Diversion Recommendations		
Immediate		
Category	**Recommendation**	**Applicable Location Area**
Recycling Procedure Signage	Provide signage on trashcans and dumpsters informing visitors of the recycling options. This signage could be as simple as “Recycling is just around the corner.”	Campgrounds, Picnic Areas, Employee Housing, Auto Shop
	Change recycling receptacle signage from "#1-2 plastics" to "#1-7 plastics."	All Locations
	Increase signage at key visitor locations in an effort to educate visitors on the park's commitment to landfill diversion.	Park entrance, Campground entrances, major trailheads
	Begin to focus signage in problem areas, such as “Water Bottles” and “Cardboard/Paperboard”	Picnic Areas, Campgrounds, Auto Shop, Employee Housing
	Provide illustrative examples of acceptable materials on the recycling dumpster or on a sign nearby the bin.	All locations
Paper Recycling	Provide paper recycling receptacles to accept paperboard, cardboard, magazines, and newspaper.	All locations
Recycling Receptacles	Provide recycling receptacles directly adjacent to the trash dumpsters.	Auto Shop, Year-round Residential, and Seasonal Residential
	Increase size of recycling receptacles to create a closer 1:1 ratio between trash and recycling sizes.	Campgrounds, Picnic Areas, Employee Housing, Auto Shop
	Include recycling and propane disposal sites on campground maps.	Campgrounds
	Provide receptacle for goods to donate.	Seasonal residential, Year-round Residential, Family/Individual Campground
	Provide dedicated receptacles for Cardboard/Paperboard	All locations
	Provide receptacle for recycling NPS handouts and maps with sufficient signage.	Roadside
Food Waste	Increase size and number of recycling receptacles to foster recycling ease and visibility.	Campgrounds, Picnic Areas, Employee Housing, Auto Shop
	Develop signage and information to encourage food waste reduction.	Park website, Picnic Areas, Trailheads, Campgrounds
Waste Diversion Awareness	Develop recycling and waste reduction brochure for online and Ranger dissemination.	Park website and informational brochure
	Develop Ranger script to educate visitor awareness as to park's commitment to recycling and landfill reduction.	All locations

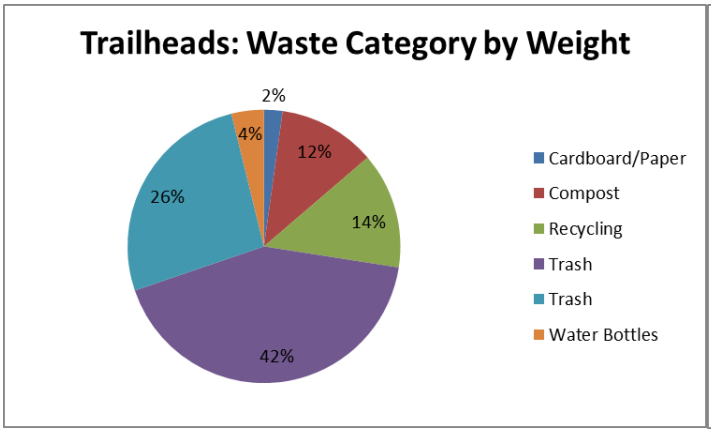
	Develop a culture of waste diversion among employees through increased recycling communication and opportunity.	Employee training
	Develop procedures for visitors to sort trash at the campsite/picnic area, i.e. the source of waste generation, before arriving at dumpsters.	All locations
Site Re-configuration	Reconfigure waste disposal areas to cause visitors to walk directly in front of the recycling receptacles before disposing of waste in the trashcans or dumpsters. Bring recycling receptacles closer to the road or walking path, where appropriate, to increase recycling visibility.	Model Sprague Lake at: Campgrounds, Trailheads, Employee Housing, Auto Shop
Leadership	Encourage internal champion(s) for waste diversion.	All locations
Hazardous Waste Diversion	Develop clear signage of known hazardous waste materials such as propane tanks, batteries, etc.	Campgrounds, Residential
Future		
Category	**Recommendation**	**Applicable Location Area**
Composting	Investigate the feasibility of composting in the park to remove food and other compostable waste from the waste stream.	All locations
Reusable Water Bottles	Work with park vendors to provide reusable water bottles. Advertise this opportunity on the park website.	Visitor gift shop, Campgrounds
Leadership	Investigate the feasibility of employing full time waste diversion champion.	All locations
Hazardous Waste Diversion	Research and implement methods of disposal for hubcaps and other maintenance waste.	Auto Shop/Utility Road
Waste Diversion Awareness	Work with Estes Park vendors to develop an understanding of visitor activities and educate outside sources on goals and efforts of waste management inside ROMO.	Estes Park

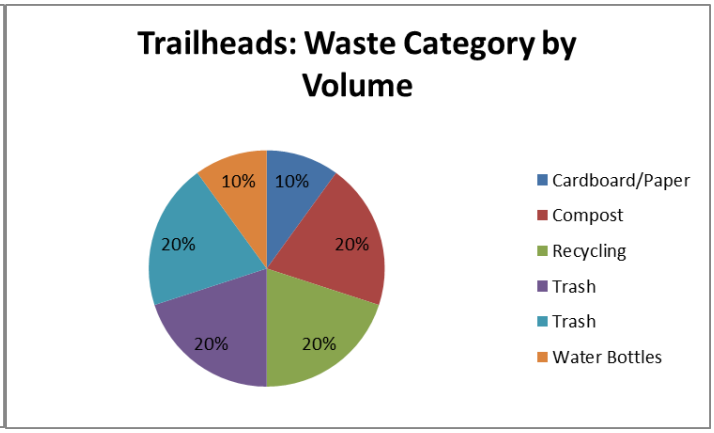
A presentation of the results from this report to ROMO facilities management will occur in the fall of 2012. Park management will use these results, in conjunction with findings from the comparison of the 2011 to 2012 audits, to aid the development of further waste reduction and diversion strategies.

Appendices

APPENDIX A: SIX TRAILHEADS

Trailheads Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	2	2%	0.5	10%
Compost	10.5	12%	1	20%
Recycling	12.5	14%	1	20%
Trash	62.5	69%	2	40%
Water	3.5	4%	0.5	10%
Total Waste Audited	91		5	





Qualitative Observations

* The collection of trash from six trailheads occurred because of the limited amount of trash found at the initial two sites selected for the audit (Lawn Lake and Alluvial Fan).

Contamination

- Trash waste stuffed into water bottles

Hazardous Waste

- Batteries

Reoccurring Waste

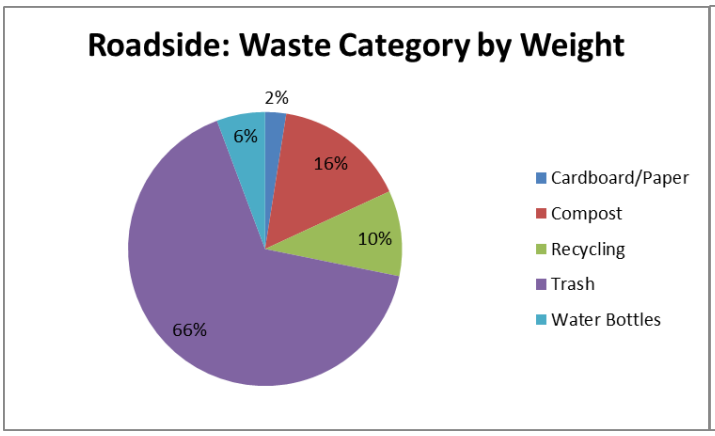
- Many small plastic bags with wrappers inside – assumed large groups
- Many individually packed lunches
- Trash inside water bottles
- Soda bottles
- Many plastic disposable lunchables

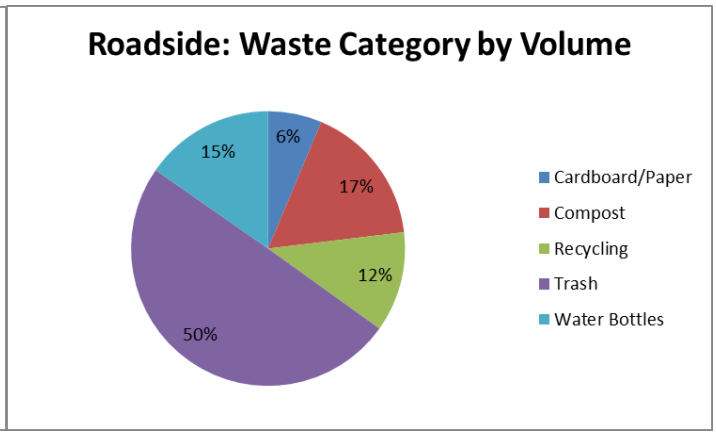
Uncommon Waste

- Full vacuum bag
- Party supplies

APPENDIX B: ROADSIDE

Roadside Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	6.5	2%	0.85	6%
Compost	41	16%	2.24	17%
Recycling	26.5	10%	1.58	12%
Trash	173.5	66%	6.66	50%
Water Bottles	15	6%	2.05	15%
Total Waste Audited	262.5		13.38	





Qualitative Observations

Contamination

- Lunchboxes – paperboard, full and contaminated
- Trash stuffed into water bottles

Hazardous Waste

- Batteries

Method of Disposal

- Many small trash bags put into one large bag
- Trash stuffed into water bottles
- Little bags of food

Quality Food Waste

- Unopened food

Reoccurring Waste

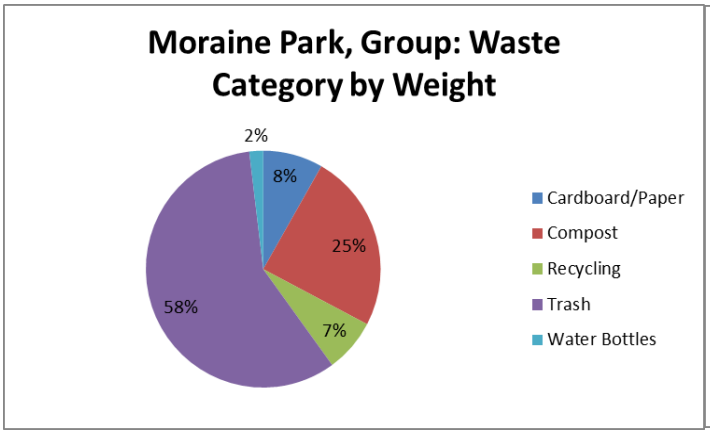
- Lunchboxes or bags
- Compostable food waste
- Recyclables placed in other mixed trash bags
- NPS maps, products, handouts

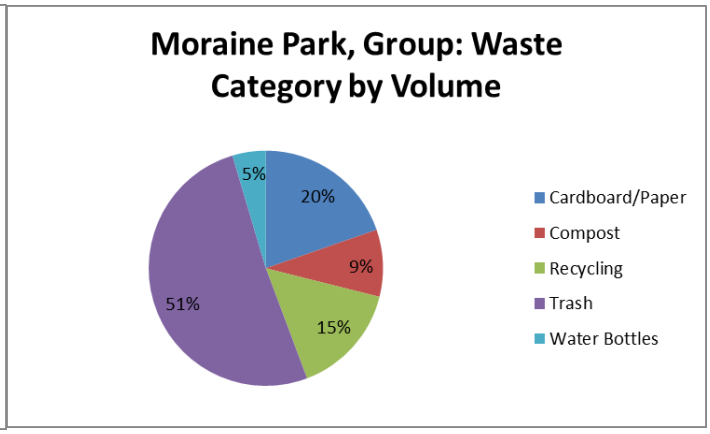
Uncommon Waste

- Tripod, camera

APPENDIX C: MORAINE PARK, GROUP

Morainne Park, Group Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	13	8%	1.41	20%
Compost	38.5	24%	0.66	9%
Recycling	11.5	7%	1.1	15%
Trash	91.5	58%	3.66	51%
Water Bottles	3	2%	0.33	5%
Total Waste Audited	157.5		7.16	





Qualitative Observations

Intent to Recycle

- Separated bags of recyclable goods

Method of Disposal

- Bags of recyclable goods
- Uneaten food waste mixed with recyclables

Quality Food Waste

- Uneaten food waste

Reoccurring Waste

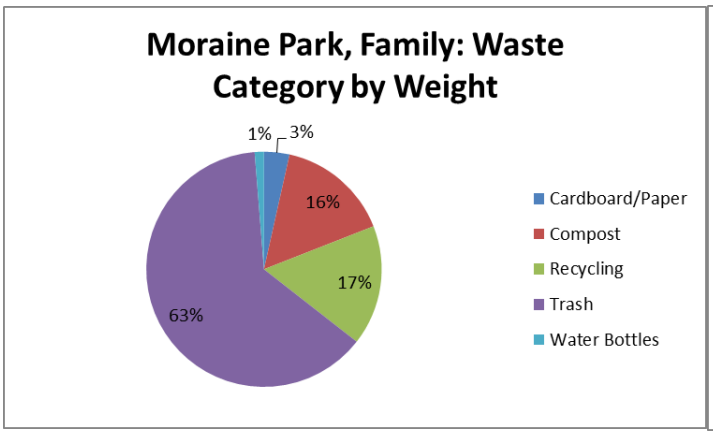
- Food waste
- Candy wrappers
- Bags of recyclable goods
- SOLO cups
- Trash indicated large group cooking

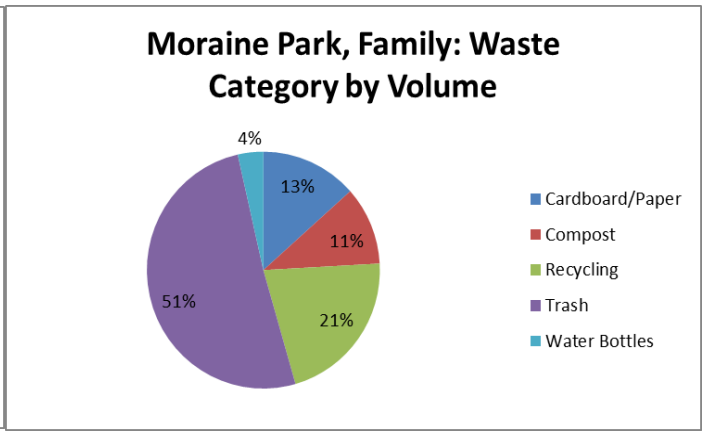
Uncommon Waste

- Large tarp

APPENDIX D: MORAINE PARK, FAMILY

Morainne Park, Family Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	5.5	3%	1.25	13%
Compost	24.5	16%	1	11%
Recycling	26	17%	2	21%
Trash	99.5	63%	4.75	51%
Water Bottles	2	1%	0.33	4%
Total Waste Audited	157.5		9.33	





Qualitative Observations

Hazardous Waste

- Camping lamp
- Batteries
- Propane cylinders

Intent to Recycle

- Separated water bottles

Method of Disposal

- Separated water bottles

Reoccurring Waste

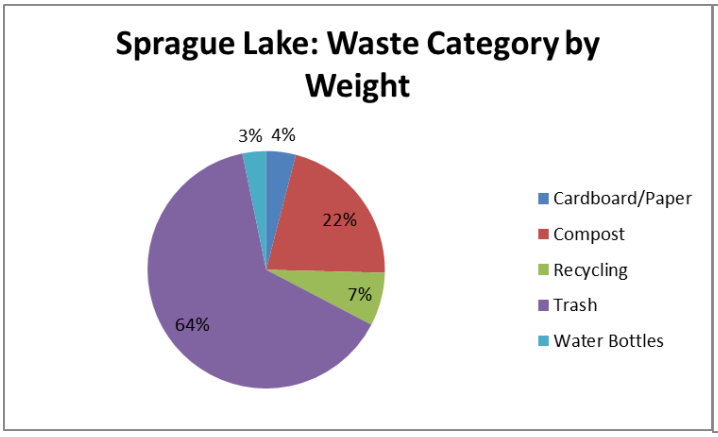
- Many plastic “Safeway” bags
- Cardboard food containers
- Separated water bottles in bag

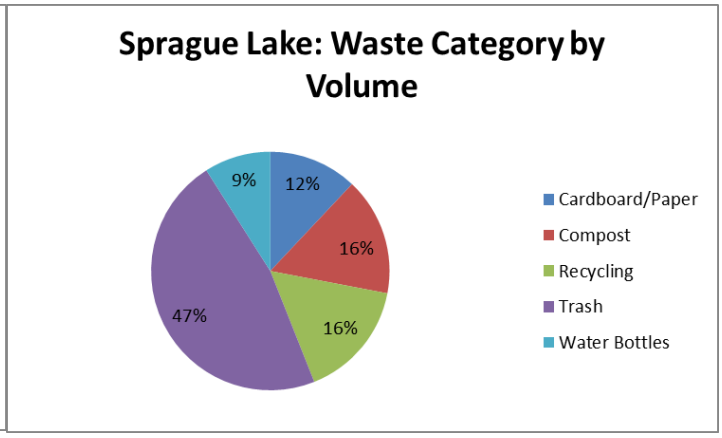
Uncommon Waste

- Camping lamp

APPENDIX E: SPRAGUE LAKE

Sprague Lake Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	5	4%	1	12%
Compost	26.5	21%	1.33	16%
Recycling	9	7%	1.33	16%
Trash	79.5	64%	3.91	47%
Water Bottles	4	3%	0.75	9%
Total Waste Audited	124		8.32	





Qualitative Observations

Hazardous Waste

- Propane tank
- Batteries
- Used paint brush and can

Intent to Recycle

- Many grocery bags with recyclables only

Method of Disposal

- Grocery bag full of vegetables
- Grocery bag full of unused paper plates
- Multiple instances of grocery bags full of recyclables
- Water bottle box (24pk) with only one empty water bottle

Quality Food Waste

- Full bags of food and unused hamburger buns

Reoccurring Waste

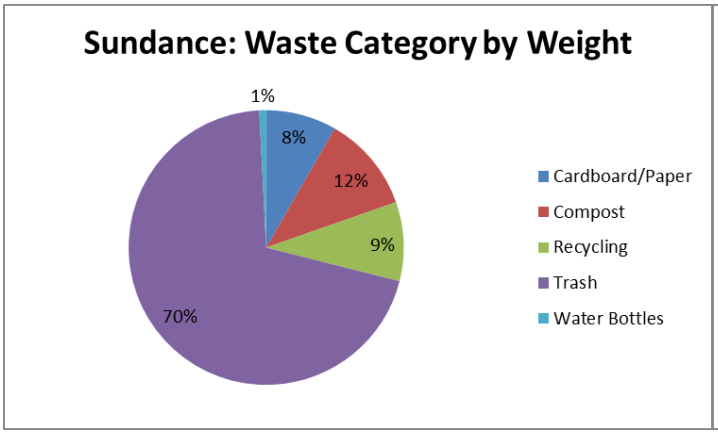
- Bags full of: vegetables; unused plates; recyclables
- Pre-purchased food in grocery bags

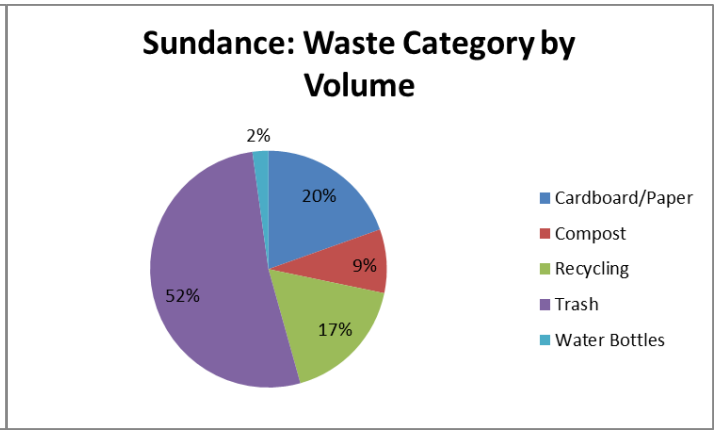
Uncommon Waste

- Duct tape

APPENDIX F: SUNDANCE

Sundance Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	20.5	8%	2.25	20%
Compost	28	11%	1	9%
Recycling	23	9%	2	17%
Trash	173.5	70%	6	52%
Water Bottles	2	1%	0.25	2%
Total Waste Audited	247		11.5	





Qualitative Observations

Reoccurring Waste

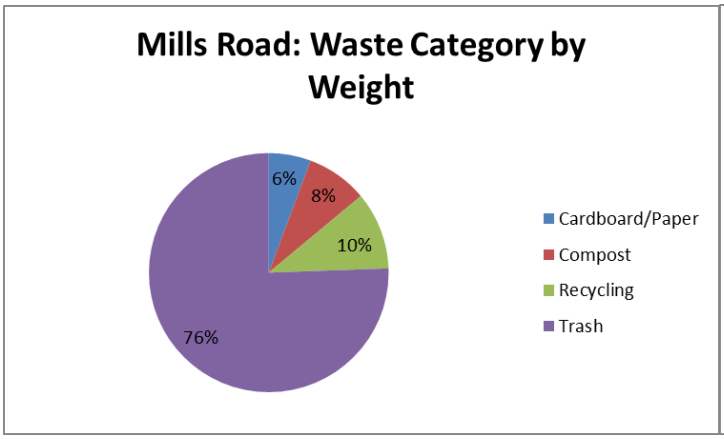
- Whole meals, family meals

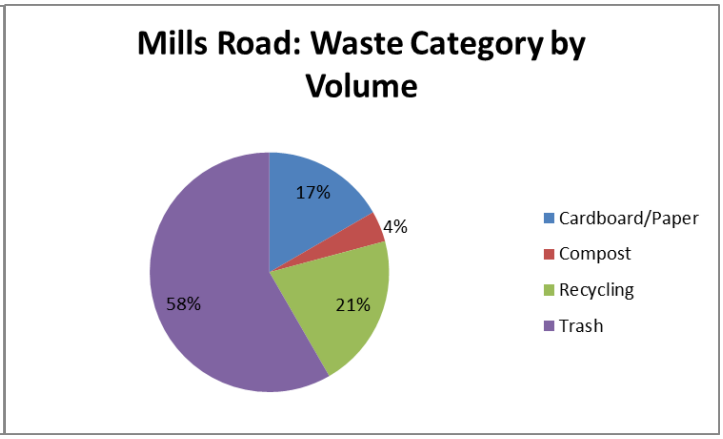
Uncommon Waste

- One tent
- Picture frame
- Work boots

APPENDIX G: MILLS ROAD

Mills Road Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	16.5	6%	2	17%
Compost	24	8%	0.5	4%
Recycling	30.5	10%	2.5	21%
Trash	219.5	76%	7	58%
Total Waste Audited	290.5		12	





Qualitative Observations

Intent to Recycle

- Sorted recyclables in separate bag

Method of Disposal

- Bag full of diapers
- Sorted recyclables in separate bag
- Large amount of household durable goods

Quality Food Waste

- Unopened cans and boxes of food

Reoccurring Waste

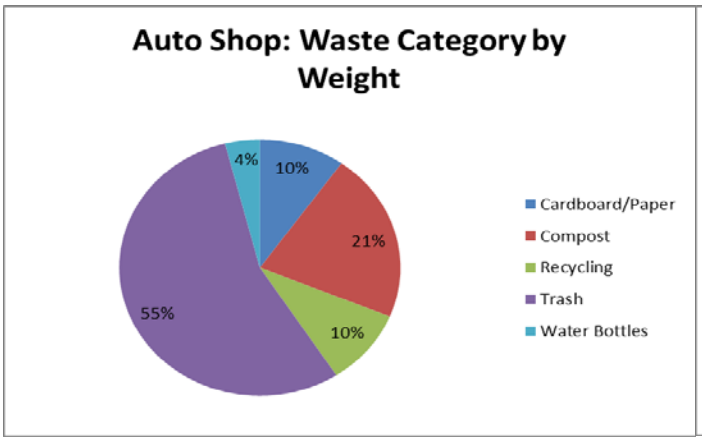
- Bags of diapers
- Sorted recyclables

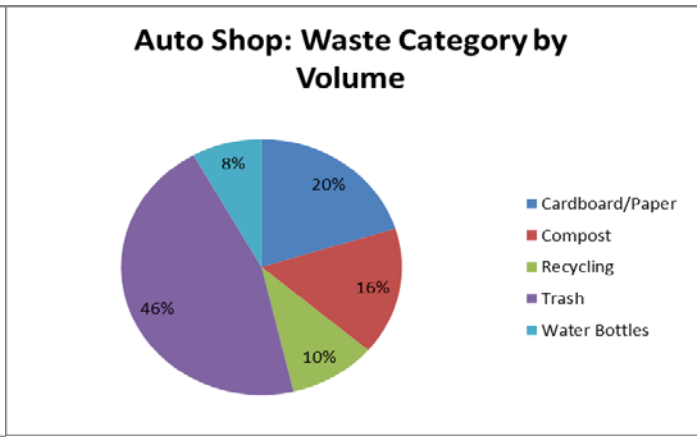
Uncommon Waste

- Durable goods: X-Box, Clothing, Toaster Oven, Bread Machine, Copper Wire, Light Ballasts, Ornamental Lawn Sculptures

APPENDIX H: AUTO SHOP

Auto Shop Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	21	10%	2.5	20%
Compost	45.5	21%	2	16%
Recycling	20.5	10%	1.25	10%
Trash	117.5	55%	5.66	46%
Water Bottles	8.5	4%	1	8%
Total Waste Audited	213		12.41	





Qualitative Observations

Hazardous Waste

- Many hubcaps

Method of Disposal

- A lot of trash

Reoccurring Waste

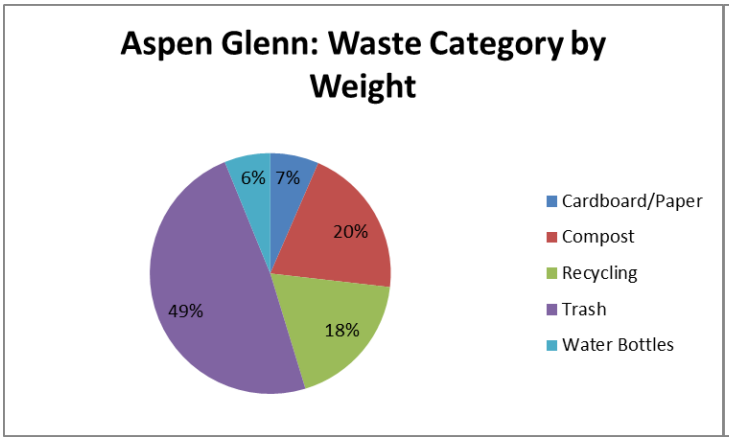
- Hubcaps
- Brown paper towels clumped together
- Beer cans
- Water bottles
- Fast food waste

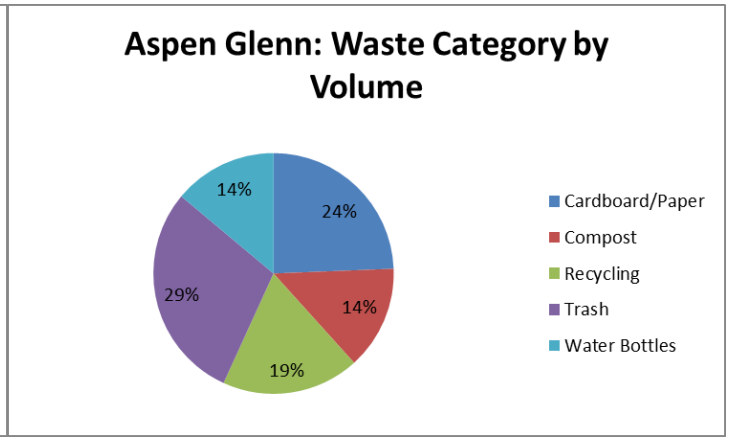
Uncommon Waste

- Plants

APPENDIX I: ASPEN GLENN

Aspen Glenn Totals	Weight (lbs.)	% of Total Weight	Approximate Volume (# of Filled 55-Gallon Bins)	% of Total Volume
Cardboard/ Paper	9	7%	1.75	24%
Compost	28	20%	1	14%
Recycling	25.5	18%	1.33	19%
Trash	67	49%	2.1	29%
Water Bottles	8.5	6%	1	14%
Total Waste Audited	138		7.18	





Qualitative Observations

Hazardous Waste

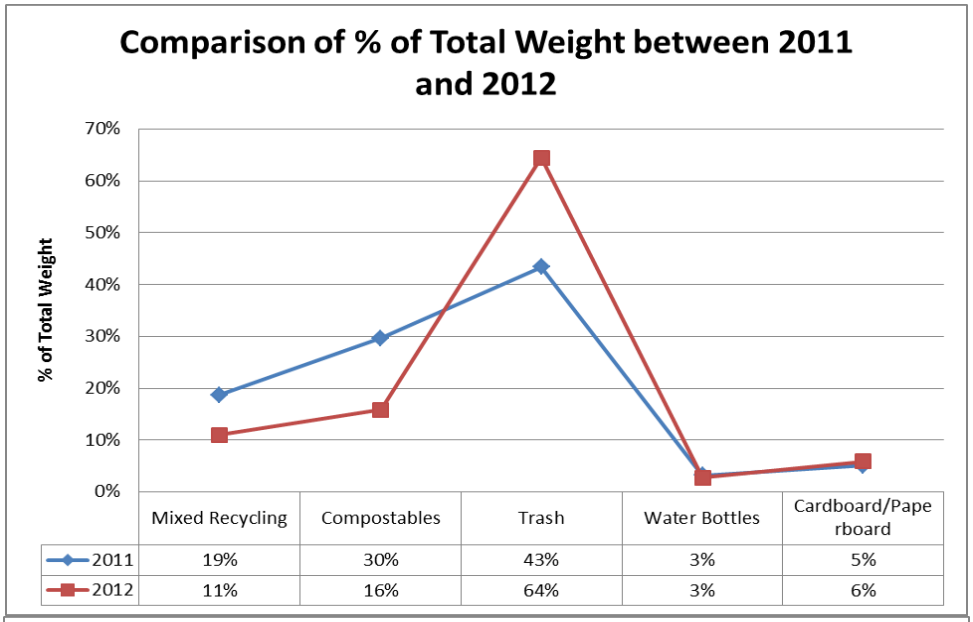
- Batteries
- Propane canisters

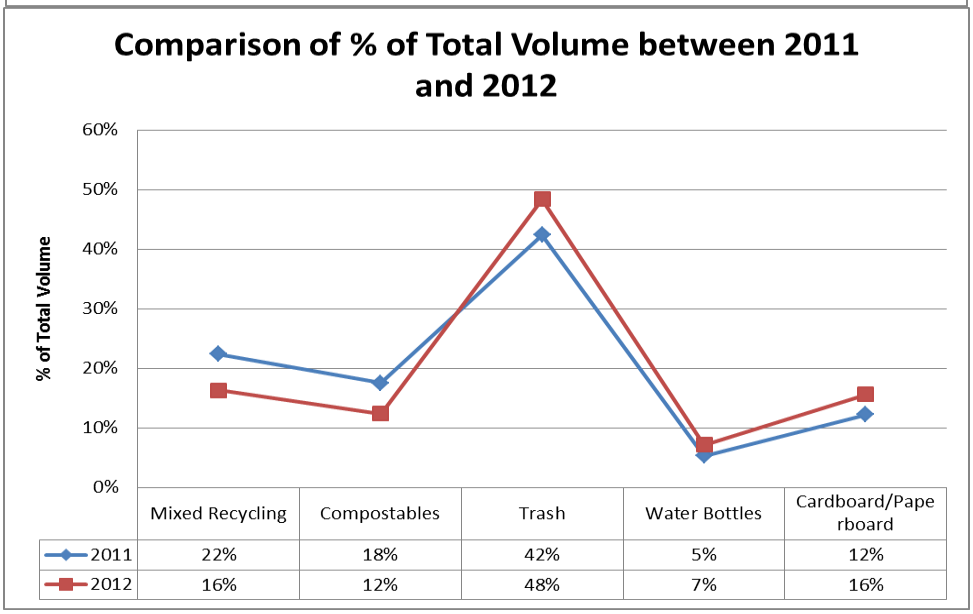
Reoccurring Waste

- Water bottles
- Paper plates

APPENDIX J: COMPARATIVE INFORMATION

2001 Location Name	Location Type	2012 Location Name
Sprague Lake	**Picnic Area**	Sprague Lake
Glacier Basin	**Group Campground**	Moraine Park
Glacier Basin	**Family or Individual Campground**	Moraine Park and Aspen Glenn
Park Roadside	**Roadside**	Park Roadside
Lawn Lake	**Trailhead**	Six Trailheads incl: Lawn Lake and Alluvial Fan
Alluvial Fan	**Trailhead**	Six Trailheads incl: Lawn Lake and Alluvial Fan
Mills Road	**Year-round Residential**	Mills Road
Sundance	**Seasonal Residential**	Sundance
Auto Shop	**Employee Workspace**	Auto Shop





APPENDIX K: BACKGROUND OF FY 2012 WASTE AUDIT

Following the *ROMO Waste Audit Protocol*, the 2012 ROMO waste audit was conducted in a single day and occurred on Sunday, July 15, 2012. The waste audit was conducted in the rear parking lot of the Facilities Administration Building, beginning promptly at 7am. The day was sunny and clear, with gusty winds developing as the day progressed. The waste audit concluded at noon, followed by a catered lunch for all volunteers. Clean-up was completed by 2PM, with a final spray down of the parking lot carried out by the ROMO Fire Department.

Waste Collection Locations and Quantities

Based on the protocol nine location types were selected from various sites throughout the park in order to achieve a comprehensive sampling of ROMO's waste stream. The *ROMO Waste Audit Protocol* established the typical rate a person can sort trash; therefore we recruited 20 volunteer auditors to audit approximately 16 (**attempted to/goal or planned to collect)** cubic yards of waste. Given the interest in collecting waste from various location types, 2 cubic yards of waste per location were collected, with the exception of year-round residential and seasonal residential.

The location name, location types, and volume of waste collected for the audit are listed below.

Location Name	Location Type	Volume Collected (cubic yard(s))
Six Trailheads	Trailhead	2
Park Roadside	Roadside	2
Moraine Park	Group Campground	2
Moraine Park	Family or Individual Campground	2
Sprague Lake	Picnic Area	2
Sundance	Seasonal Residential	1
Mills Road	Year-round Residential	1
Auto Shop	Employee Workspace	2
Aspen Glenn	Family or Individual Campground	2
	Total:	**16**

Waste Type Categories

Six waste type categories were sorted by location type during the 2011 waste audit: Recyclables, Compost, Plastic Water Bottles, Paperboard/Cardboard, Trash, and Hazardous Materials. Except for the "Hazardous Material" category, volunteers collected and recorded weights and approximate volumes of the above categories during the waste audit. The "Hazardous Materials" category amounted to a relatively small amount of waste and recorded from observations.

APPENDIX K: WASTE RECEPTACLE SPECIFICATIONS AND OBSERVATIONS

Four distinct waste collection types resided at all audited locations. Below is a detailed description of the four waste receptacle types. Reference these receptacle types in results, unless otherwise noted.

Recycling Receptacles: The recycling receptacle is approximately 4' wide, 3' tall and 2' deep. It is colored dark green with yellow recycling triangles painted on the side. It has three holes for disposal of recyclables with the two-side holes measure 4" x 4" and the hole in the middle measures 4" x 6". The three holes drop into a 39-gallon plastic waste bin. The three holes all have the same message printed out on white label-making tape: "Cans-Glass-Plastic" below the hole, and "No Trash" above the hole on all three holes. Further above the hole there is an official marking denoting recycling. In a larger font size, this label says "Glass, #1 & #2 Plastics, Cans." This recycling signage is significantly smaller than the signage on the 10 cubic yard Trash Dumpsters and 55-gallon Trash Cans. All three holes have a thick plastic slotted material to allow recyclables to pass through, but remain more or less sealed from the outside. The two-side holes seem to have a ramp or slide meant to allow recyclables to flow down into the recycling bin. The middle hole does not have this ramp. It seems that recycling gets stuck on this ramp, making the recycling bin appear full when there is really just a build-up of recycling at the front of entrance to the recycling hole.

Propane Cylinder Recycling: Propane cylinder recycling receptacles are located only in the campgrounds. They measure approximately 2' wide, 3' tall and 2' deep. The bins are full metal and painted a light green color. They contain a bear proof lid on top of the receptacle.

55-gallon Trash Can: Trashcans are standard 55-gallon metal bins painted dark brown. There is a bear proof lid on them, increasing the height of the bin to about 4 feet tall. The bins include a large "TRASH" demarcation painted white on the front. These bins allow for disposal of small to medium sized trash bags, because there is a 1' x 1' hinge door allowing access to the bins. The "TRASH" label on the front is larger than the recycling label on the recycling bins.

10-cubic yard Trash Dumpster: The ten cubic yard dumpsters are a full metal roll-off style dumpster painted light green and generally positioned in the waste disposal area for ease of access from the road. They have 2-3 bear proof hatch-type doors on either side of the dumpster. The center of the dumpster on both sides announces, "TRASH," in large white lettering, with the lettering measuring approximately 5 inches in height.