



2021 Campus Race to Zero Waste Case Study Competition

Walkway Bin Waste Audits at North Carolina State University

1. Contact info (name, department, school, email, phone)

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2. Focus of Case study (Summary of Waste Reduction Efforts Category)

Auditing walkway bin systems at NC State University to determine what type of material is collected within the bins, if increased signage reduces contamination, how solar belly walkway bins compare, and if adding a restricted opening to recycling bins changes contamination rates.

This audit study took place over the Fall 2019 - Spring 2020 academic year and the Spring 2021 semester.

3. Detailed description of campaign or effort:

NC State University currently has over 250 paired walkway bins on campus. These units are composed of an open-top waste-to-landfill and recycling bins. Labels encircle each unit with the waste stream type (Landfill / Recycling) and there are also images located on the inner-inserts (of a trash can/ bottles, cans, & paper). The inserts are also color-coded grey for landfill and blue for recycling. The labels and color codes assist users with differentiating between the two streams to help reduce contamination.

NC State also has 9 solar belly self-compacting units on campus. These units are composed of an enclosed waste-to-landfill and recycling compartment, each with a hinged door to access the materials. Labels placed above the hinged doors as well as symbols stamped into the front doors notify users which bin to use (Landfill / Recycling). The doors also use colors on the doors to assist users between differentiating between the two streams: grey for landfill and blue for recycling.

To help NC State reach our 70% waste diversion goals for campus, NC State Waste Reduction & Recycling (WRR) conducted a series of audits that examined the following information while also providing students with experiential service learning opportunities:

1. Determine what's in the bins for each type of unit (Landfill + Recycling) of standard walkway units and enclosed solar belly units
2. Determine if larger/color-coded signs decrease contamination
3. Determine if large blue- bonnets w/ restricted access openings (holes) on the recycling units decrease contamination

Here is the breakdown of each type of audit conducted:

- Fall 2019: 15 baseline audits of the contents of standard walkway bin pairs (Landfill + Recycling) of 8 locations on Main Campus followed by adding large 11x17 signage to each walkway bin then conducting 12 post-signage audits of each unit to calculate any changes
- Spring 2020: 12 audits of the contents of solar belly walkway bin pairs (Landfill + Recycling) of 6 locations across campus

- Spring 2021: 24 baseline audits of the contents of standard walkway bin pairs (Landfill + Recycling) of 8 locations on Centennial Campus On the Oval followed by adding blue bonnets with restricted openings to 5 of the 8 recycling bins then conducting 24 post-bonnet audits of each unit (Landfill + Recycling) to calculate any changes

The data collected from each of these audits will guide future infrastructure changes our office makes to walkway bin units. This data also helps guide our education efforts based on the most common contaminants found in each type of bin (especially the recycling bins). The data also was granular to each of the locations chosen in order to customize messaging according to the location in the future.

For full details reports, check out:

- [Fall 2019 Walkway Bins Audit Report](#)
- [Spring 2020 Solar Belly Audit Report](#)
- [Spring 2021 The Oval Walkway Bins Audit Report](#)
- [One Page Summary \(Infographic\) of Walkway Audits](#)

4. Planning steps & timeline to implement:

- September 2019: Coordinate with NC State's Living & Learning Village: ECO Village, a residence hall that hosts students dedicated to learning about the environment and participating in environmental service activities
- September 2019: WRR develops the first google-form for students to use doing the waste audits (allows students to do audits according to their schedules and provides data directly to WRR to analyze)
- September 2019: WRR develops signs that will eventually be added to each walkway unit
- September 2019: WRR hosts a training session discussing waste & recycling and how to conduct the audit
- October – November 2019: EcoVillage students conduct 15 baseline audits at 8 locations on NC State's Main Campus
- October – November 2019: After last baseline audit, EcoVillage students place large signs on walkway units using double-sided tape
- November 2019: EcoVillage students conduct 12 post-signage audits at the same 8 locations
- December 2019: Attend presentations where students discussed the walkway audit project and their learning outcomes
- January 2020: WRR expands the initial waste audit to examine the contents of solar belly units and compare contamination rates
- February – March 2020: WRR student interns conduct 12 audits of solar belly units across campus
- COVID-19!
- February 2021: Expand the waste audits to units on NC State's Centennial Campus, focusing On the Oval (a central place); this activity was delayed until the Spring due to Covid-19
- February – March 2021: WRR student intern trained 2 community volunteers to conduct 24 baseline audits at 7 locations On the Oval
- March 2021: WRR installs bonnets on locations with the highest contamination rates based off of initial data (note bonnets only placed on the recycling unit)
- April 2021: Volunteers conduct 24 post-intervention audits at the same 7 locations plus one additional location (total of 8)

- April – May 2021: WRR processes all data for reporting, creates a NO CUPS campaign, plans for future interventions (reducing amount of walkway units on campus, purchasing more bonnets, looking at if signs + bonnets will decrease contamination)

5. Resources and stakeholders involved

This project encompassed three different academic semesters, Fall 2019, Spring 2020, and Spring 2021. Primary costs were time/labor by staff and students, the purchase costs of bonnets, and in-house printing & laminating costs.

- Fall 2019: Primary stakeholders involved were NC State Waste Reduction & Recycling (WRR) and University Housing Village Director and students within the ECO Village Living and Learning Village.
 - a. Resources: time by WRR Outreach Coordinator (Lani St. Hill) to coordinate project timeline and goals with Housing Village Director (Meghan Teten), develop the google form, and train students involved with the audits *estimated total costs: 8 hours*
 - b. Resources: printing, laminating, double-sided tape for the signs developed by WRR Outreach Coordinator *estimated total costs: 2 hours + \$20 in supplies (in-house costs)*
 - c. Resources: time by 12 students of ECO Village who conducted all audits *estimated total costs: 5 hours*
 - d. Resources: time by students on a learning outcome presentation, coordinated by Housing Village Director (Meghan Teten) and presented to larger audience (including WRR) *estimated total costs: unknown*
- Spring 2020: Primary stakeholder involved was NC State Waste Reduction & Recycling staff & student interns
 - a. Resources: time by WRR Outreach Coordinator (Lani St. Hill) to train student interns *estimated total costs: 1 hour*
 - b. Resources: time by student interns (Logan Mossbarger and Jaeleen Mendoza) to conduct the audits *estimated total costs: 6 hours*
- Spring 2021: Primary stakeholder involved was NC State Waste Reduction & Recycling staff, student intern, and community volunteers
 - a. Resources: time by WRR student intern (Logan Mossbarger) to train 2 community volunteers *estimated total costs: 2 hours*
 - b. Resources: time by volunteers (Xavier St. Hill & Emily Berg) to conduct the audits *estimated total costs: 10 hours*
 - c. Resources: cost of 5 bonnet style lids (\$225 per bonnet, total: \$1125.00)

6. Describe the Results of this campaign component

- General results
 - a. Provide service learning project to 14 NC State students and 2 community students to better understand waste, waste education, and social behaviors
 - b. The EcoVillage Students were featured in the [2020 Annual Sustainability Report \(see p. 10\)](#) as an example of how NC State engages students in initiatives that promote leadership and service in sustainability
 - c. Created an electronic campaign about “No Cups” to be hosted across campus
 - d. Focus on messaging for students about cups, napkins and other top contaminants (single-use utensils, plastic wrap, and food waste)

- Specific measurable impact figures
 - a. Learned what's in the bins:
 - Landfill bins contain only 3.8-7.7% contamination (contamination = recyclables)
 - Recycling bins contain 60-68% contamination (contamination = landfill + compostables)
 - That most common contaminants in recycling bins are to-go cups for both cold & hot drinks followed by napkins/paper towels.
 - b. Learned that large signs with images on bins only decrease contamination slightly (.64%) in 5 of 7 locations / other 2 locations saw an increase of contamination in recycling units (5.2%)
 - c. Learned that restricted openings have lowest contamination rates overall
 - Adding bonnets to walkway bin recycling units decreased contamination by 25%
 - However, landfill bins showed an increase in contamination when bonnets were added
 - Solar belly units and walkway bonnet units have similar contamination rates
- For full details reports, check out:
 - [Fall 2019 Walkway Bins Audit Report](#)
 - [Spring 2020 Solar Belly Audit Report](#)
 - [Spring 2021 The Oval Walkway Bins Audit Report](#)
 - [One Page Summary \(Infographic\) of Walkway Audits](#)

7. What would you do differently in the future?

- Instead of just using our interns and 2 community volunteers for the Spring 2020 and 2021 audits, it would have been great to continue to use student organizations moving forward so more students could have participated. Unfortunately, due to the timing and then to COVID-19, this was not possible
- WRR is setting up meetings with our Grounds teams who empty and manage the walkway bins. As contamination is so high in these units, we are looking to see if reducing the amount of bins outside is possible. This may lead to people to using interior bins which currently have much lower contamination rates (as of now)
- WRR is also investigating adding larger labels onto units with restricted openings (solar belly bins and bins with the bonnet) would decrease contamination. We are particularly interested if adding labels such as "NO CUPS" onto the recycling units would decrease contamination

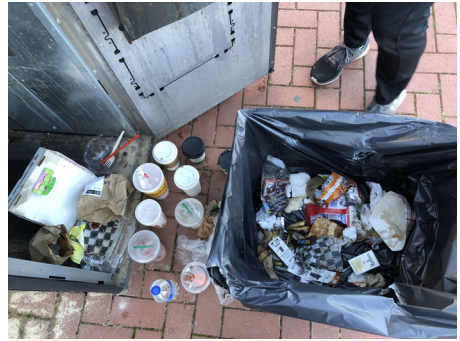
8. What advice would you give to another college that wanted to do a similar effort?

- Do it! Just having students involved in waste audits helps them to understand the impact of waste sorting done right and gone wrong. Actively going through waste is eye-opening, and all auditors involved were amazed at what was tossed into both the landfill and the recycling bin. It really improved their understanding that not everyone thinks about what container is correct and not everyone knows which container they should be using. (During the training, many auditors learned that cups were NOT recyclable—they themselves were contaminating the units!)
- Performing waste audits also provides students with hands-on experiences on how to collect data that educational and physical (infrastructure) interventions are based on.
- I also highly recommend doing interventions as a "pilot". Our office WRR consistently gets asked to add large signs to the outdoor bins—which previously, our hesitation in doing so was because of the cost. But after this project, we see that it makes more sense to invest in restricted access units if we are looking to decrease contamination...and because solar bellies and walkway units with bonnets have the same contamination rates, then cost wise, our focus will be on purchasing bonnets for current walkway bins.

9. Photos and Graphics
Fall 2019 Walkway Units



Spring 2020 Solar Belly Units



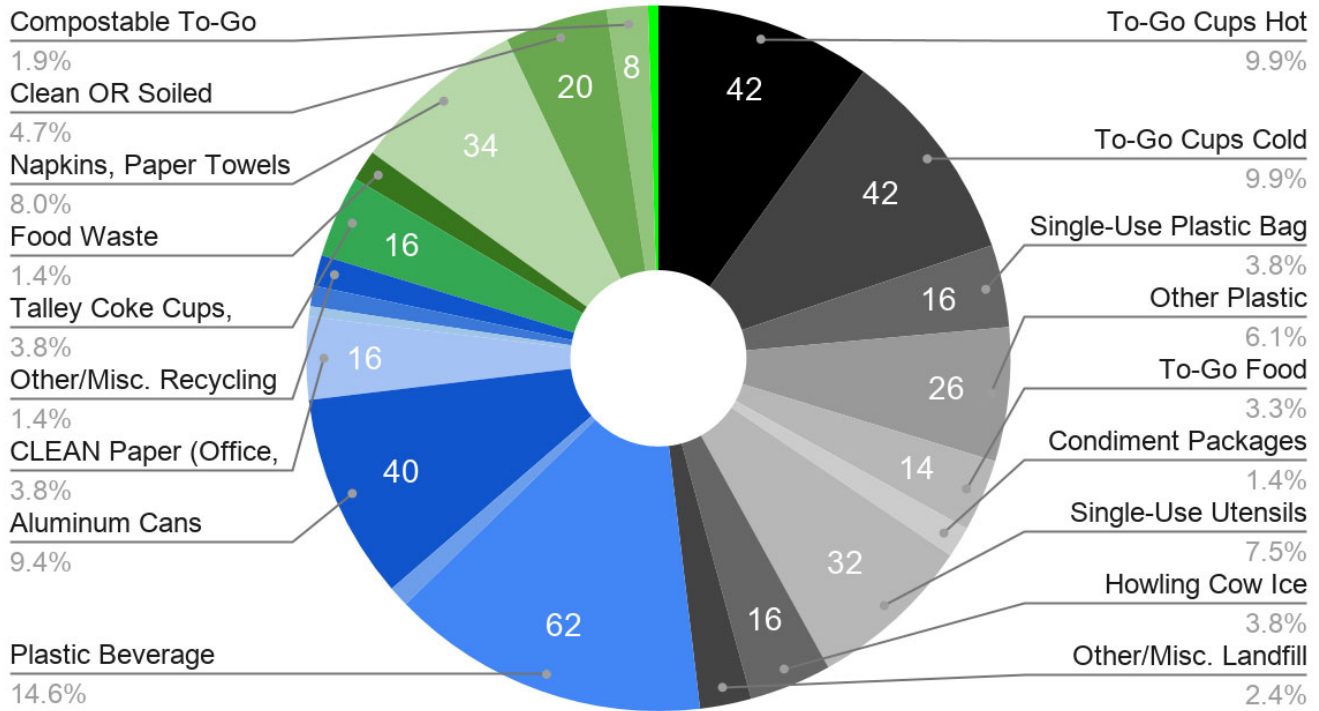
Spring 2021 Oval Walkway Units



DATA ON RECYCLING UNITS ONLY (Access reports for all data points)

Fall 2019, Recycling Data from 12 Post-Signage Audits:

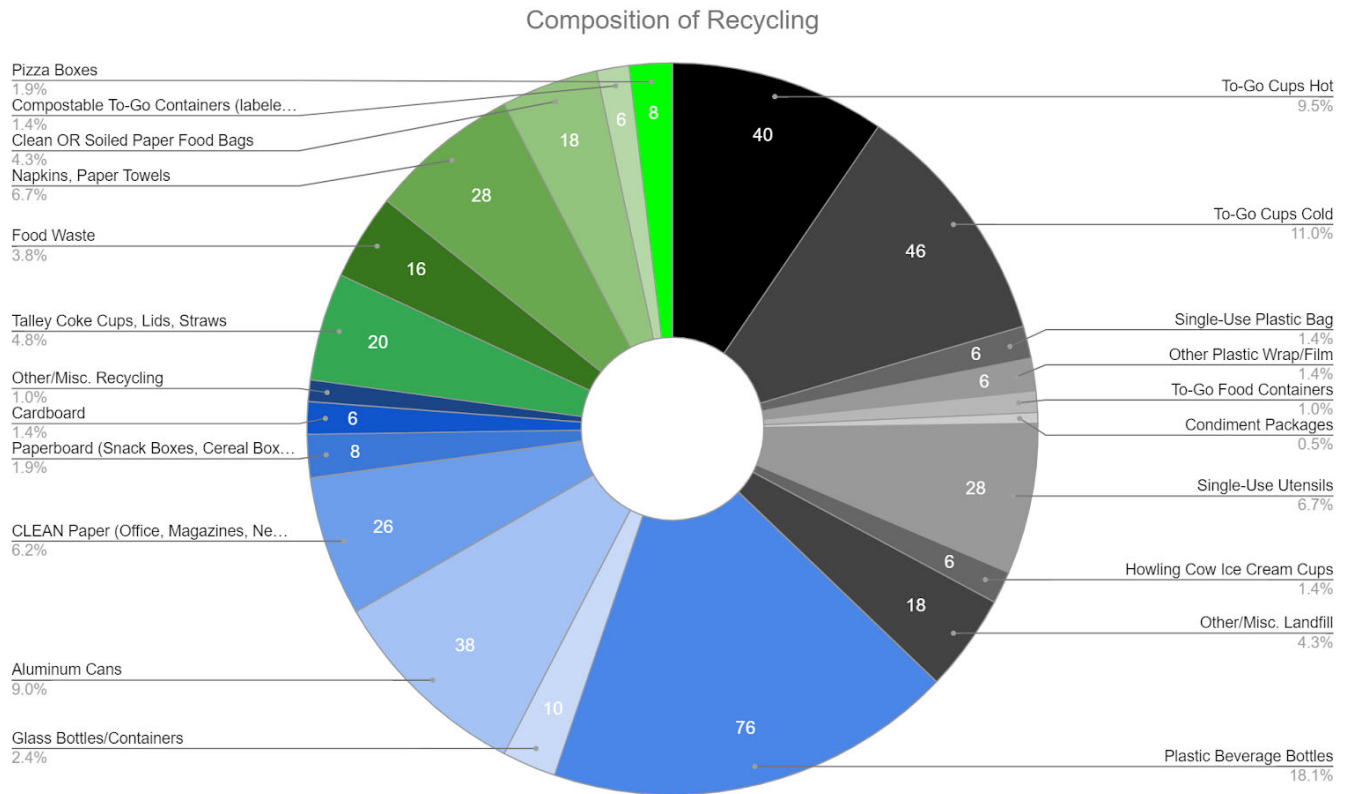
Composition of Recycling Post-Signage



RECYCLING: DO SIGNS WORKS?		
Location	Contamination Rate Baseline	Contamination Rate Post-Signage
Dan Allen Drive #1	50%	↑ 59.3%
Free Expression #3	42.9%	↓ 33.3%
Metcalf Residence Hall #1	77.1%	↓ 71.4%
Talley Student Union #2	87%	↓ 70.6%
Talley Student Starbucks	86.1%	↓ 82.6%
University Plaza "The Brickyard" #6	64.4%	↑ 75%
Witherspoon	60.9%	↓ 37.5%
Wolf Plaza #1	62.5%	↓ 56.7%

DATA ON RECYCLING UNITS ONLY (Access reports for all data points)

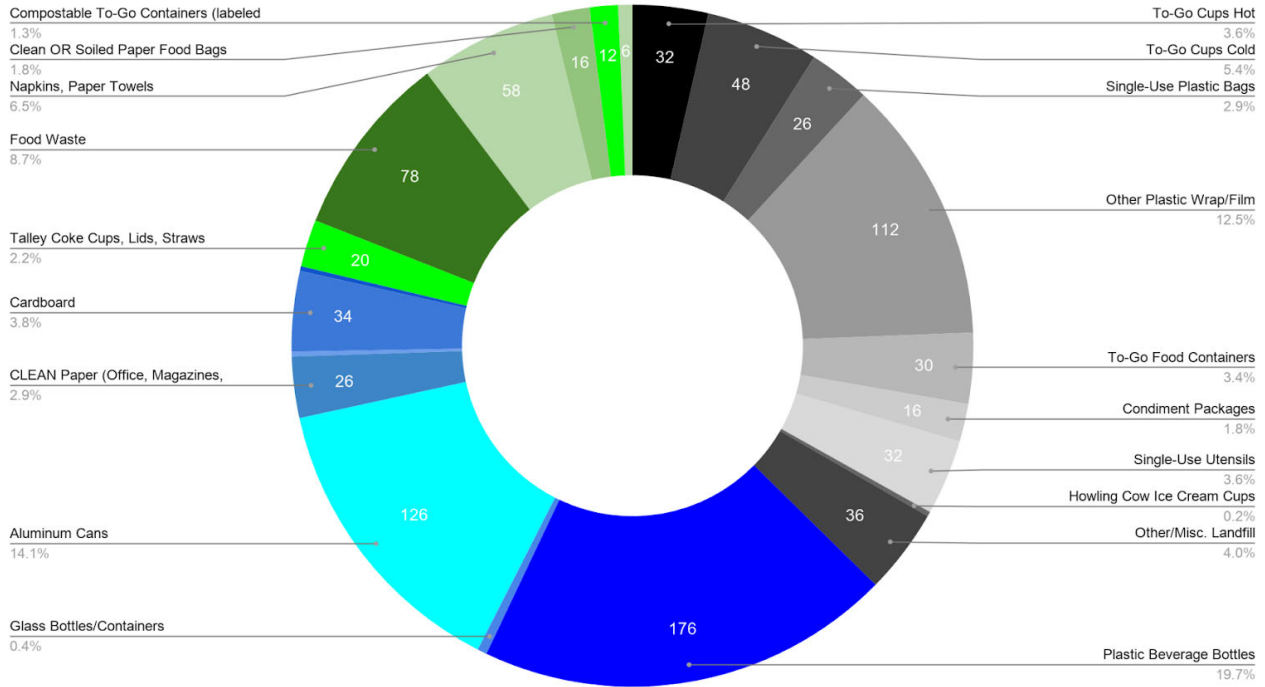
Spring 2020, Recycling Data from 12 Solar Belly Audits:



RECYCLING: SOLAR BELLY UNITS	
Location	Contamination Rate
Stafford Commons Site A	80%
Stafford Commons Site B	65%
Price Music Bike Rack	60.4%
Starbucks Entrance	42.9%
Hunt Library Entrance Site A	38.9%
Hunt Library Site B	38.9%

Spring 2021, Recycling Data from 24 Post-Bonnet Audits:

Composition of Recycling Bin Post-Bonnet (All Locations)



RECYCLING: DO BONNETS WORK?		
	Contamination Rate Baseline (7 locations)	Contamination Rate Post-Bonnet (8 locations)
All Locations	72.2%	↓ 58.6%
Bonnet (5 locations*)	73.6%	↓ 48.9%
Without Bonnet (3 locations)	68.0%	↑ 72.9%

*Note that an additional location was added to the audit post-bonnet

No Cups Campaign (featured on Electronic Billboards through campus)



NC STATE

KEEP OUR RECYCLING CLEAN

RECYCLING walkway bins have a contamination rate of 66%

When signs were added to bins, the contamination increased to 68.4%

RECYCLING.NCSU.EDU



did you know?

CUPS ARE NOT RECYCLABLE

RECYCLE ONLY
CANS & BOTTLES
in outdoor walkway bins



NC STATE

CUPS belong in the LANDFILL

CUPS ARE **NOT** RECYCLABLE

RECYCLING.NCSU.EDU

WHEN POSSIBLE, BRING YOUR OWN REUSABLE BOTTLE.



recycling.ncsu.edu

REFUSE

REFUSE

ncstatercycles

ncstatercycles Plastic and styrofoam cups are NOT recyclable. Even if your drink cup has a "♻️" symbol on it, that does NOT mean that the cup is recyclable. Keep all cups OUT of our recycling. Cups belong in the landfill. Learn more at recycling.ncsu.edu

#byocup #recyclerightNC #zerowaste

10w

95 views

MARCH 5

Add a comment...

KNOW YOUR NO'S

Don't tangle or contaminate. Recycle right for our state!

NO CUPS, STRAWS, LIDS

To-go cups, solo cups, straws and lids can't be sorted by the machines.

ncstatercycles

ncstatercycles New Year No's for Smart Recycling include NOT putting cups, straws, or lids in the recycling bin. To-go and single-use cups belong in the landfill so instead #BringYourOwn #recyclerightNC

17w

Liked by zerowastewolvesncsu and 23 others

JANUARY 15

Add a comment...

ncstatercycles

ncstatercycles Plastic cups are NOT recyclable. Plastic cups belong in the landfill.