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# 2015-16 CENTRALIZED STUDY ON AVAILABILITY OF PLASTIC RECYCLING

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# BACKGROUND AND PURPOSE

This study aims to provide an accurate measurement of the availability of recycling programs in the U.S. for different types of plastic. Through the collaboration of multiple packaging stakeholders, this study shares a common methodology with measurements of recycling availability for numerous other materials. It aims to capture the nuances of how recycling services for these materials are provided to residents in the U.S., as well as identifying opportunities for increased material recycling.

This study identifies the prevalence of recycling programs that accept different types of plastic and also characterizes the type of instructions provided to residents on recycling these items. This can be used to substantiate availability of recycling claims by brands and marketers.

The data presented is not intended to represent, in and of itself, any claims regarding the recyclability of items covered in this study. Note that the liability for making a recyclability claim rests on the entity making the claim, as described by the Federal Trade Commission:

Marketers must ensure that all reasonable interpretations of their claims are truthful, not misleading, and supported by a reasonable basis before they make the claims. See FTC Policy Statement Regarding Advertising Substantiation, 104 FTC 839 (1984). In the context of environmental marketing claims, a reasonable basis often requires competent and reliable scientific evidence. Such evidence consists of tests, analyses, research, or studies that have been conducted and evaluated in an objective manner by qualified persons and are generally accepted in the profession to yield accurate and reliable results. Such evidence should be sufficient in quality and quantity based on standards generally accepted in the relevant scientific fields, when considered in light of the entire body of relevant and reliable scientific evidence, to substantiate that each of the marketing claims is true.

— Section 260.2, Guides for the Use of Environmental Marketing Claims (“Green Guides”), Federal Trade Commission, October 11, 2012.

# ACKNOWLEDGEMENTS

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# DEFINITIONS

- **Availability of recycling** for this study is defined by a resident having one or more of the following services, measured separately in this study, at their place of residence:
  - Curbside recycling provided automatically to their home by public or private service providers, or
  - Curbside recycling provided on an opt-in or subscription basis to their home by public or private service providers
  - A publicly or privately operated drop-off recycling location within the municipality where the resident resides. Residents living outside the community where the drop-off is located are considered to have drop-off recycling available if their own municipality, county, or other local government directs them to that drop-off location as the appropriate recycling outlet.

Note that the study measures **availability** of recycling, not recycling rates or recycling participation.

- **Curbside** collection of recycling means that recycling is collected from homes after residents set out materials on the side of the street. In this study it is also used to refer to programs for apartment complexes where collection containers for recycling are located anywhere in the complex.
- **Drop-off** recycling refers to a program where residents bring recyclables to a collection point away from their residence.
- **Bins** are open-top containers typically 14 to 18 gallons in capacity, used to hold recyclables for curbside collection.
- **Carts** are large wheeled containers with lids, ranging in capacity from 30 to 100 gallons. Carts used for recycling collection are most frequently 64 or 96 gallons in capacity.
- **Automatic** - In an automatic program, residents receive recycling services, including bins or carts in programs that use them, by default as part of standard waste collection services. These services may be provided by municipal employees or by a contractor.
- **Opt-in** - An opt-in program, for the purposes of this study, is one provided by a community or its contractor, in which residents must sign up and in some cases pay an additional fee to participate in recycling.
- **Subscription** - In a subscription-based program, residents hire curbside recycling services on an individual basis from their choice of private service provider. These services may be bundled with the cost of regular trash collection, or priced separately.
- **Single Stream** refers to a system in which all recyclables are commingled in one container for collection and sorted after collection at a Material Recovery Facility (MRF).

- **Dual Stream** refers to a system in which recyclables are sorted into two groups (“streams”), typically containers and fiber, for separate collection. Each stream may be further sorted at a MRF.
- **Source-Separated** refers to a system in which recyclables are sorted into three or more streams prior to collection.
- **Mixed Waste** refers to a system in which all recyclables and household trash are commingled into one container for collection. Recyclables are sorted from trash after collection at a specialized mixed waste material recovery facility.
- **Single Family** housing typically refers to a detached dwelling in which one household resides. However, in recycling programs, “single family services” are often offered to residents in buildings with up to 2-8 residential units. See the methodology section below for further discussion of this study’s approach.
- **Multi Family** refers to buildings with more than one residential unit. For recycling program purposes, the definition of multi-family may vary from one community to another. This is discussed in the methodology section below.
- **Uptake Rates** refer to the percentage of the population offered an opt-in or subscription recycling service who chooses to receive that service, by signing up, subscribing, or paying the required fees, depending on the program requirements.

# METHODOLOGY

## OVERVIEW

The team of researchers conducting this study reviewed details on recycling program availability for a group of over 2,000 communities representing over 50 percent of the population of each U.S. state and the U.S. as a whole. The largest communities in each state were identified and included in the sample so that at least 50% of each state’s population was represented. This large community sample included approximately 1,600 communities in the U.S. The remaining population was represented by a random sample of approximately 500 smaller communities. Researchers independently reviewed public-facing recycling program information and materials and evaluated them for details on the program and items accepted. Both curbside and general drop-off recycling programs were evaluated, but the study did not cover some material-specific drop-off programs, such as bottle deposit programs or manufacturer-provided take-back locations. Each program was coded to indicate whether it was available to single-family residents, residents of multi-family housing, or both. Based on the results of the research, the research team calculated the number of residents in each community that had a recycling program available that accepted a particular material or item. The Project Team calculated the rate of availability of recycling for each commodity included in the study from the large comprehensive sample and the small random sample. The results from the small random sample were extrapolated to apply to the remaining half of the population for each state.

For more details on the study methodology, please see the main study report, *Sustainable Packaging Coalition: 2015-16 Centralized Study on Availability of Recycling*.

## “AVAILABILITY OF RECYCLING” DETERMINATION FOR MATERIALS

The methodology included development of a standardized framework for evaluating how a recycling program describes its acceptance of specific materials. Identified materials were coded based on how explicitly that item is included or excluded from the program’s descriptive guidelines. This metric, excerpted below, was used to account for some of the variation in how recyclables are described by public programs and to reduce the variation in individual interpretation by researchers as a factor in the study. The scoring system provided a basis for the assumptions and rules that are used to determine whether recycling is available for a particular category. Note that the language shown in the framework is not all-inclusive but represents examples of descriptive terms used to classify materials. The complete framework for all materials in this study is found in the Appendix.

*Table 1: Acceptance Rating Framework and Examples of Application to Packaging Types*

RATING	RATING SCALE DETAIL EXPLANATION	HDPE BOTTLES/ JUGS & JARS	PP CUPS
		Examples (Categorize based on language similar to examples shown)	
<b>1: Explicitly Accepted (Considered Availability)</b>	A "1" is a specific mention of the item, or a photo of a common example. For plastic refers to product form and doesn't exclude resin	Plastic bottles; #2 bottles; Plastic bottles and containers; Plastic containers; Milk jugs, shampoo and soap bottles	Plastic cups; #5 plastic cups; Plastic containers

RATING	RATING SCALE DETAIL EXPLANATION	HDPE BOTTLES/ JUGS & JARS	PP CUPS
		Examples (Categorize based on language similar to examples shown)	
<b>2: Implicitly Accepted (Considered Availability)</b>	A "2" means that the program accepts a broader category of material that residents would presume the material belongs to.	Plastic; Rigid Plastic; Plastics 1-7	Plastic; Rigid Plastic; Plastics 1-7
<b>3: Neither Accepted nor Prohibited</b>	A "3" is either highly general instructions that rely on resident prior knowledge, or a specific material not being mentioned in any category. Phone follow-up was conducted to attempt to move items out of the "3" category as appropriate.	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"
<b>4: Implicitly Prohibited</b>	A "4" does not call the item out as prohibited, but goes into sufficient detail (e.g. with photos and text) of all the items that are part of the program, that a reasonable consumer could assume that anything not listed is not allowable. An item that is part of a larger category that is prohibited.	Detailed plastic list that does not include plastic bottles	Detailed plastic list that does not include plastic cups
<b>5: Explicitly Prohibited</b>	A "5" means that the material is specifically called out as prohibited in either text or pictures.	No Plastic; no bottles; no #2 plastic	No Plastic; No cups; No Foodservice; no #5 plastic

These individual ratings were then translated to a determination of “availability of recycling”. While some materials can be assumed to be included in recycling programs if broad or implicit statements of acceptance are made, others are not assumed to be included unless the program explicitly lists them. The table below explains how and why these determinations were made for the specific materials in this report. The cut-off points for determining availability of recycling for each material were reviewed and approved by the study stakeholders.

*Table 2: Determination of Availability of Recycling for Items based on Framework*

RATING	CAN BE INCLUDED AS AVAILABILITY OF RECYCLING FOR MATERIAL?	DETERMINATION FOR MATERIALS IN THIS REPORT
<b>Explicitly Accepted</b>	Yes	Included for all materials.

RATING	CAN BE INCLUDED AS AVAILABILITY OF RECYCLING FOR MATERIAL?	DETERMINATION FOR MATERIALS IN THIS REPORT
<p><b>Implicitly Accepted or Broader Category Accepted</b></p>	<p>Yes, if similar in shape and structure to other accepted items of the same material type such that a reasonable consumer would consider them to fall within the category; if broad categories are typically used to describe the inclusion of this item; or if item has been found to be widely accepted in previous studies, and is not known to be problematic in the MRF. No, if unlikely to be considered included in the language.</p>	<p>Included for:</p> <ul style="list-style-type: none"> <li>• HDPE bottles/jugs &amp; jars</li> <li>• PP bottles/jugs &amp; jars</li> <li>• LDPE and LLDPE bottles/jugs &amp; jars</li> <li>• PVC bottles/jugs &amp; jars</li> <li>• Other bottles/jugs</li> <li>• Bottle Caps</li> <li>• PP cups</li> <li>• PP tubs/containers (including &lt;5gal buckets)</li> <li>• PP clamshells</li> <li>• PP lids</li> <li>• LDPE/LLDPE tubs (including &lt;5gal buckets)</li> <li>• LDPE/LLDPE lids</li> <li>• PVC non-bottle rigid packaging (blisters/formed packaging)</li> <li>• PVC clamshells</li> <li>• PS cups</li> <li>• PS containers</li> <li>• PS clamshells</li> <li>• PS lids</li> <li>• Bulky Plastic (e.g. buckets/crates/baskets) without Resin Code</li> <li>• Bulky Plastic with Resin Code</li> <li>• Plastic Buckets 5 gallons and over</li> </ul> <p>This type of instructional language was included for these materials. The broad categories of <i>Rigid Plastic</i> and <i>#1-7 Plastic</i> are commonly used as descriptions in programs accepting these items.</p> <p>Not included for:</p> <ul style="list-style-type: none"> <li>• HDPE tubes</li> <li>• LDPE/LLDPE tubes</li> <li>• PP cutlery</li> <li>• PS cutlery</li> </ul> <p>These materials may present challenges in acceptance or communication such that assuming their inclusion in a broad category such as <i>Rigid Plastic</i> would overstate their actual acceptance in recycling programs at this time.</p>

RATING	CAN BE INCLUDED AS AVAILABILITY OF RECYCLING FOR MATERIAL?	DETERMINATION FOR MATERIALS IN THIS REPORT
<b>Neither Accepted nor Prohibited</b>	No	No
<b>Implicitly Prohibited</b>	No	No
<b>Explicitly Prohibited</b>	No	No

*For the complete framework covering all study materials, please refer to Appendix 1. Note that PET plastic, foam polystyrene (foodservice and EPS block and shape/transport packaging), plastic bags, and film plastic are not included in this report. Foam polystyrene and plastic bags and film plastic are planned to be covered in a separate addendum to this report that will use an adapted version of this methodology, including material-specific drop-offs, to capture the full picture of recycling programs for these items.*



# FINDINGS

## AVAILABILITY OF RECYCLING FOR PLASTIC MATERIALS

Recycling for plastic was found to be widely available for some types, while less available for others, ranging from a high of 92% availability for HDPE Bottles/Jugs and Jars to a low of 1% availability for HDPE and LDPE Tubes. These figures include programs available via curbside, municipal and other general drop-offs, and optional programs that may or may not charge a fee for participation. In-store drop-off programs, such as those available for plastic bags and film, and other material-specific drop-offs not promoted by municipalities are not included in these figures. Note that the study measured **availability**, not recycling rates. Availability of recycling for a given material measures the percent of the population with opportunities to recycle the material.

*Table 3: Availability of Recycling Programs by Material*

AVAILABILITY OF RECYCLING PROGRAMS FOR EACH MATERIAL	ESTIMATED POPULATION, IN THOUSANDS, WITH PROGRAMS AVAILABLE	ESTIMATED POPULATION, IN THOUSANDS, WITH NO PROGRAMS AVAILABLE	PERCENT OF TOTAL U.S. POPULATION WITH PROGRAMS AVAILABLE
HDPE bottles/jugs & jars	284,820	23,925	92%
PP bottles/jugs & jars	250,663	58,082	81%
LDPE and LLDPE bottles/jugs & jars	248,086	60,659	80%
PVC bottles/jugs & jars	242,357	66,389	78%
Other bottles/jugs	244,707	64,039	79%
Bottle Caps	233,546	75,200	76%
HDPE tubes	2,619	306,126	1%
PP cups	187,177	121,568	61%
PP tubs/containers (including <5gal buckets)	217,140	91,605	70%
PP clamshells	190,756	117,990	62%
PP lids	166,451	142,295	54%
PP cutlery	14,880	293,866	5%
LDPE/LLDPE tubs (including <5gal buckets)	214,431	94,315	69%
LDPE/LLDPE lids	166,185	142,561	54%

AVAILABILITY OF RECYCLING PROGRAMS FOR EACH MATERIAL	ESTIMATED POPULATION, IN THOUSANDS, WITH PROGRAMS AVAILABLE	ESTIMATED POPULATION, IN THOUSANDS, WITH NO PROGRAMS AVAILABLE	PERCENT OF TOTAL U.S. POPULATION WITH PROGRAMS AVAILABLE
LDPE/LLDPE tubes	4,526	304,220	1%
PVC non-bottle rigid packaging (blisters/formed packaging)	122,230	186,515	40%
PVC clamshells	180,909	127,836	59%
PS cups	135,344	173,401	44%
PS containers	184,775	123,971	60%
PS clamshells	165,451	143,294	54%
PS lids	137,405	171,340	45%
PS cutlery	16,115	292,630	5%
Bulky Plastic (e.g. buckets/crates/baskets) without Resin Code*	94,630	214,115	31%
Bulky Plastic with Resin Code	132,931	175,814	43%
Plastic Buckets 5 gallons and over	132,939	175,806	43%

Some materials were found to be included in programs generally but with certain specific sizes, forms, types, or colors called out as specific exclusions:

- Programs for 23% of the population in the sample excluded bottles for hazardous liquids such as antifreeze, pesticides, cleaners, etc.
- Programs for 19% of the population in the sample excluded motor oil bottles.
- Programs for 18% of the population in the sample excluded toys.
- Programs for 4% of the population in the sample excluded flower pots.
- Programs for 4% of the population in the sample excluded biodegradable/compostable plastics.
- Programs for 3% of the population in the sample excluded materials based on minimum or maximum size limits.
- Programs for 1% of the population in the sample excluded any black plastic.

## DETAIL OF RECYCLING PROGRAM TYPES AVAILABLE BY MATERIAL

The following table shows the types of recycling programs, such as curbside and drop-off, available for each plastic item and the percent of the U.S. population with that program type available. Residents with both a curbside and a drop-off program available to them are included in the curbside total. A majority of residents with recycling programs have curbside recycling available; of curbside programs, a sizeable majority are provided on an automatic basis, with fewer being opt-in or subscription. (Note that percentages may not add due to rounding.)

Table 4: Recycling Program Types Available by Material

	ALL PROGRAMS	CURBSIDE RECYCLING PROGRAMS				DROP OFF PROGRAMS ONLY
		ALL CURBSIDE	AUTOMATIC/ UNIVERSAL	OPT IN PROGRAMS	SUBSCRIPTION PROGRAMS	
(Population, in thousands, with programs available/Percent of U.S. population)						
HDPE bottles/jugs & jars	284,820 92%	209,478 68%	165,941 54%	18,178 6%	25,359 8%	75,342 24%
PP bottles/jugs & jars	250,663 81%	192,852 62%	154,273 50%	13,645 4%	24,934 8%	57,811 19%
LDPE and LLDPE bottles/jugs & jars	248,086 80%	191,371 62%	152,917 50%	13,621 4%	24,833 8%	56,715 18%
PVC bottles/jugs & jars	242,357 78%	184,988 60%	146,850 48%	13,688 4%	24,450 8%	57,369 19%
Other bottles/jugs	244,707 79%	188,851 61%	150,615 49%	13,469 4%	24,767 8%	55,856 18%
Bottle Caps	233,546 76%	168,564 55%	133,383 43%	12,607 4%	22,574 7%	64,982 21%
HDPE tubes	2,619 1%	1,667 1%	1,604 1%	63 0%	0 0%	952 0%
PP cups	187,177 61%	141,064 46%	117,466 38%	10,556 3%	13,042 4%	46,114 15%
PP tubs/containers (including <5gal buckets)	217,140 70%	172,351 56%	136,243 44%	12,221 4%	23,887 8%	44,789 15%
PP clamshells	190,756 62%	145,529 47%	117,679 38%	9,985 3%	17,864 6%	45,227 15%
PP lids	166,451 54%	128,498 42%	101,942 33%	8,331 3%	18,225 6%	37,953 12%
PP cutlery	14,880 5%	13,612 4%	13,256 4%	356 0%	0 0%	1,268 0%

	ALL PROGRAMS	CURBSIDE RECYCLING PROGRAMS				DROP OFF PROGRAMS ONLY
		ALL CURBSIDE	AUTOMATIC/ UNIVERSAL	OPT IN PROGRAMS	SUBSCRIPTION PROGRAMS	
(Population, in thousands, with programs available/Percent of U.S. population)						
LDPE/LLDPE tubs (including <5gal buckets)	214,431 69%	170,785 55%	134,755 44%	12,221 4%	23,809 8%	43,646 14%
LDPE/LLDPE lids	166,185 54%	129,534 42%	102,772 33%	8,436 3%	18,326 6%	36,651 12%
LDPE/LLDPE tubes	4,526 1%	2,337 1%	2,276 1%	62 0%	0 0%	2,188 1%
PVC non-bottle rigid packaging (blisters/formed packaging)	122,230 40%	91,099 30%	70,615 23%	5,515 2%	14,969 5%	31,131 10%
PVC clamshells	180,909 59%	137,586 45%	107,566 35%	10,495 3%	19,525 6%	43,323 14%
PS cups	135,344 44%	120,505 39%	99,543 32%	9,543 3%	11,419 4%	14,839 5%
PS containers	184,775 60%	143,577 47%	111,383 36%	10,214 3%	21,980 7%	41,198 13%
PS clamshells	165,451 54%	125,135 41%	97,310 32%	9,299 3%	18,526 6%	40,317 13%
PS lids	137,405 45%	104,006 34%	79,357 26%	7,676 2%	16,972 5%	33,400 11%
PS cutlery	16,115 5%	14,492 5%	14,147 5%	345 0%	0 0%	1,623 1%
Bulky Plastic (e.g. buckets/ crates/ baskets) without Resin Code	94,630 31%	71,758 23%	59,069 19%	5,813 2%	6,876 2%	22,872 7%
Bulky Plastic with Resin Code	132,931 43%	97,673 32%	82,389 27%	7,004 2%	8,281 3%	35,258 11%
Plastic Buckets 5 gallons and over	132,939 43%	97,697 32%	81,929 27%	7,630 2%	8,139 3%	35,242 11%

Opt-in and subscription curbside recycling programs present barriers to program participation compared to automatically provided curbside recycling services. The study found that 37% of residents provided an opt-in program and 30% of residents offered a subscription program opt to receive these services, on average across all programs. For example, that means that of the over 43

million residents with these optional programs available for HDPE bottles/jugs and jars, as few as 14 million opt to receive these services. The following table shows the estimate of uptake on optional recycling programs for each of the study materials.

Table 5: Uptake Estimates for Optional Services

UPTAKE ESTIMATES FOR OPTIONAL SERVICES	ESTIMATED POPULATION, IN THOUSANDS, WITH OPTIONAL PROGRAMS AVAILABLE			ESTIMATED POPULATION, IN THOUSANDS, OPTING TO RECEIVE SERVICES			ESTIMATED PERCENT OPTING TO RECEIVE SERVICES <sup>1</sup>		
	TOTAL	OPT IN	SUBSCRIPTION	TOTAL	OPT IN	SUBSCRIPTION	TOTAL	OPT IN	SUBSCRIPTION
HDPE bottles/jugs & jars	43,537	18,178	25,359	14,411	6,804	7,608	33%	37%	30%
PP bottles/jugs & jars	38,579	13,645	24,934	12,587	5,107	7,480	33%	37%	30%
LDPE and LLDPE bottles/jugs & jars	38,455	13,621	24,833	12,548	5,098	7,450	33%	37%	30%
PVC bottles/jugs & jars	38,138	13,688	24,450	12,458	5,123	7,335	33%	37%	30%
Other bottles/jugs	38,236	13,469	24,767	12,471	5,041	7,430	33%	37%	30%
Bottle Caps	35,181	12,607	22,574	11,491	4,718	6,772	33%	37%	30%
HDPE tubes	63	63	-	24	24	-	37%	37%	30%
PP cups	23,598	10,556	13,042	7,863	3,951	3,913	33%	37%	30%
PP tubs/ containers (including <5gal buckets)	36,108	12,221	23,887	11,740	4,574	7,166	33%	37%	30%
PP clamshells	27,850	9,985	17,864	9,097	3,737	5,359	33%	37%	30%
PP lids	26,556	8,331	18,225	8,586	3,118	5,468	32%	37%	30%
PP cutlery	356	356	-	133	133	-	37%	37%	30%
LDPE/LLDPE tubs (including <5gal buckets)	36,030	12,221	23,809	11,717	4,574	7,143	33%	37%	30%
LDPE/LLDPE lids	26,762	8,436	18,326	8,655	3,157	5,498	32%	37%	30%
LDPE/LLDPE tubes	62	62	-	23	23	-	37%	37%	30%
PVC non-bottle rigid packaging (blisters/formed packaging)	20,484	5,515	14,969	6,555	2,064	4,491	32%	37%	30%
PVC clamshells	30,020	10,495	19,525	9,786	3,928	5,858	33%	37%	30%
PS cups	20,962	9,543	11,419	6,997	3,572	3,426	33%	37%	30%
PS containers	32,194	10,214	21,980	10,417	3,823	6,594	32%	37%	30%

<sup>1</sup> Percent opting to receive services is a national average across all programs.

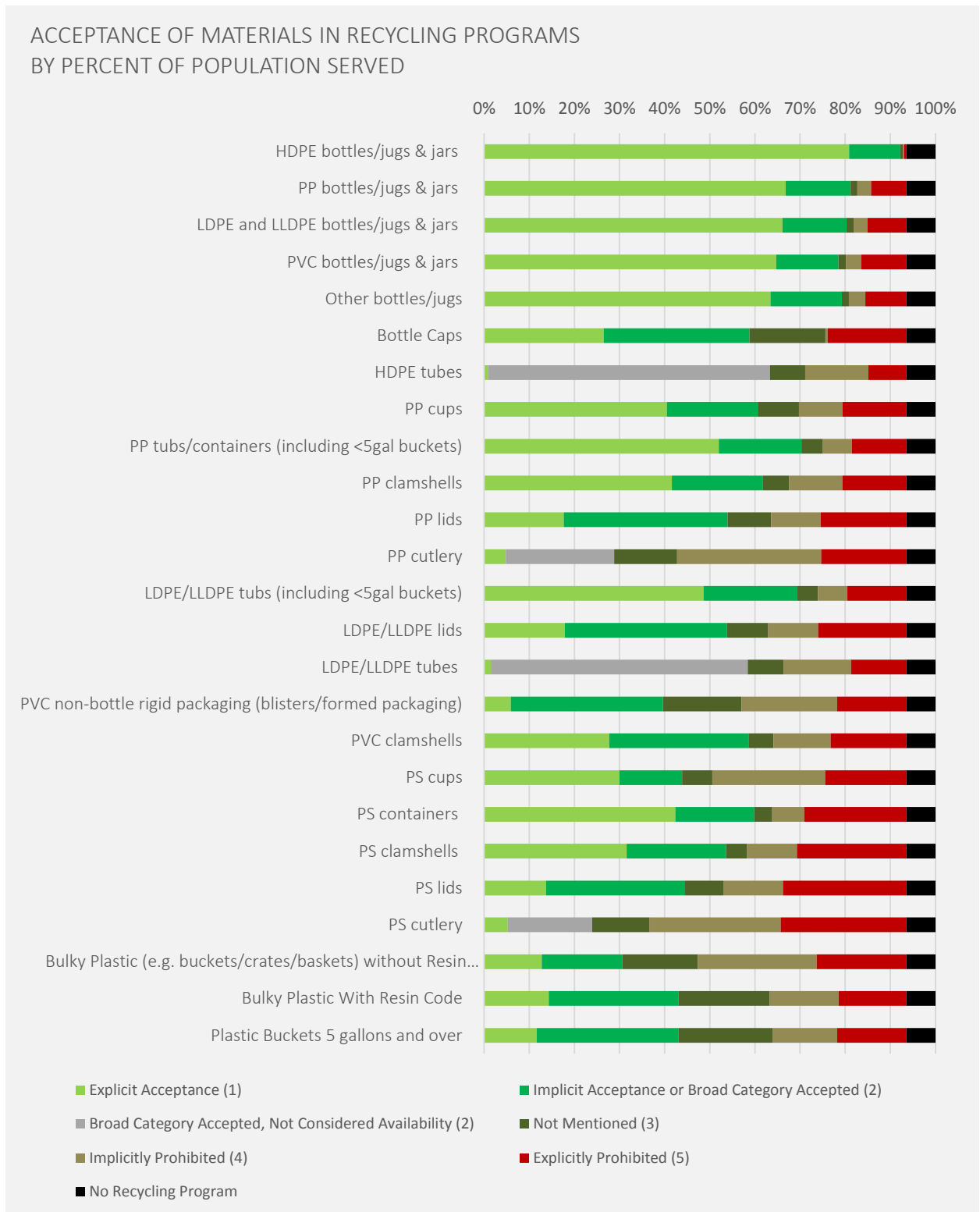
UPTAKE ESTIMATES FOR OPTIONAL SERVICES	ESTIMATED POPULATION, IN THOUSANDS, WITH OPTIONAL PROGRAMS AVAILABLE			ESTIMATED POPULATION, IN THOUSANDS, OPTING TO RECEIVE SERVICES			ESTIMATED PERCENT OPTING TO RECEIVE SERVICES <sup>1</sup>		
	TOTAL	OPT IN	SUBSCRIPTION	TOTAL	OPT IN	SUBSCRIPTION	TOTAL	OPT IN	SUBSCRIPTION
PS clamshells	27,825	9,299	18,526	9,038	3,480	5,558	32%	37%	30%
PS lids	24,649	7,676	16,972	7,965	2,873	5,092	32%	37%	30%
PS cutlery	345	345	-	129	129	-	37%	37%	30%
Bulky Plastic (e.g. buckets/crates/baskets) without Resin Code	12,689	5,813	6,876	4,239	2,176	2,063	33%	37%	30%
Bulky Plastic with Resin Code	15,285	7,004	8,281	5,106	2,621	2,484	33%	37%	30%
Plastic Buckets 5 gallons and over	15,768	7,630	8,139	5,297	2,856	2,442	34%	37%	30%

## ACCEPTANCE OF PLASTIC MATERIALS IN RECYCLING PROGRAM GUIDELINES

The following chart shows the acceptance of plastic materials in recycling programs according to how the program guidelines describe these items. Different types of plastic vary widely in terms of their acceptance and the way recycling programs describe them. In this study, the larger rigid plastic such as plastic bottles, tubs, cups, clamshells, etc. were assumed to be included in programs using general terminology such as “1-7 Plastics” or “All Rigid Plastics.” Among these materials, the most common category to be explicitly accepted in the program guidelines was HDPE Bottles/Jugs and Jars, which was explicitly accepted in programs serving over 80% of the U.S. population. Implicit acceptance was most common among non-bottle items such as lids and bulky rigids. Bottle caps were assumed to be included in recycling programs as part of the bottle unless prohibited by the program.

The study also found significant variability in how commonly materials were explicitly prohibited from recycling programs. Both types of tubes and both types of cutlery in the study are also more widely prohibited than accepted in recycling programs.

Figure 1: Acceptance of Materials In Recycling Programs



## STATISTICAL VALIDITY

The study combined a census approach for approximately half the U.S. population with a stratified random sample approach for the other half. For the combined total population, the following procedure was used to calculate a margin of error for the study's findings. The standard error of

proportion was calculated for the random sample using the equation  $Std. error of prop. = \sqrt{\frac{p(1-p)}{n}}$

where  $p$  is the sample proportion and  $n$  is the sample size. Next, a z-score was calculated to correspond to a 95% confidence interval (CI), meaning that there is a 95% probability that repeated random samples would result in findings within the margin of error identified. The margin of error for the small random sample is equal to:  $z\text{-score} * \text{standard error of proportion}$ . This margin of error was applied to the population group extrapolated from the random sample, thus identifying an upper and lower bound of the population in this group with availability of recycling programs. Finally, the ratio of this band of uncertainty compared to the total population was calculated to determine a margin of error for the entire U.S. population for each of the study variables below.

Table 6: Margin of Error

VARIABLE	MARGIN OF ERROR CI=95%
Population with programs available for HDPE bottles/jugs & jars	1%
Population with programs available for PP bottles/jugs & jars	2%
Population with programs available for LDPE and LLDPE bottles/jugs & jars	2%
Population with programs available for PVC bottles/jugs & jars	2%
Population with programs available for Other bottles/jugs	2%
Population with programs available for Bottle Caps	2%
Population with programs available for HDPE tubes	0.2%
Population with programs available for PP cups	2%
Population with programs available for PP tubs/containers (including <5gal buckets)	2%
Population with programs available for PP clamshells	2%
Population with programs available for PP lids	2%
Population with programs available for PP cutlery	0%
Population with programs available for LDPE/LLDPE tubs (including <5gal buckets)	2%
Population with programs available for LDPE/LLDPE lids	2%



VARIABLE	MARGIN OF ERROR CI=95%
Population with programs available for LDPE/LLDPE tubes	0.2%
Population with programs available for PVC non-bottle rigid packaging (blisters/formed packaging)	2%
Population with programs available for PVC clamshells	2%
Population with programs available for PS cups	2%
Population with programs available for PS containers	2%
Population with programs available for PS clamshells	2%
Population with programs available for PS lids	2%
Population with programs available for PS cutlery	0.3%
Population with programs available for Bulky Plastic (e.g. buckets/crates/baskets) without Resin Code*	2%
Population with programs available for Bulky Plastic With Resin Code	2%
Population with programs available for Plastic Buckets 5 gallons and over	2%

# ACCEPTANCE OF PLASTIC IN RECYCLING PROGRAMS IN THE U.S.

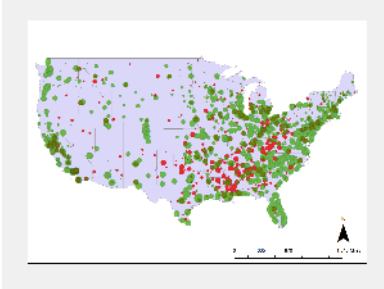
The following maps show where community programs that accept each type of plastic are located in the U.S. based on the direct survey results in 2015 and 2016. The maps also show the locations of communities not accepting the particular plastic in their program or not offering a program to recycle these items. The survey represents just over 50% of the U.S. population and thus the maps do not show recycling availability for all communities in the U.S. Enlarged versions of each map are available as an appendix to this report.

**LEGEND – ACCEPTANCE MAPS**

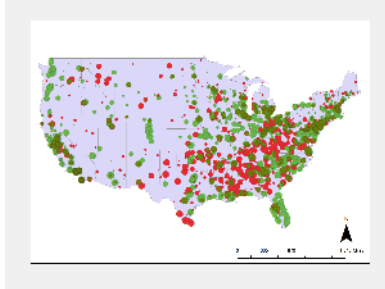
- Program accepting specified material
- Program not accepting material

*Symbols are scaled to represent community population*

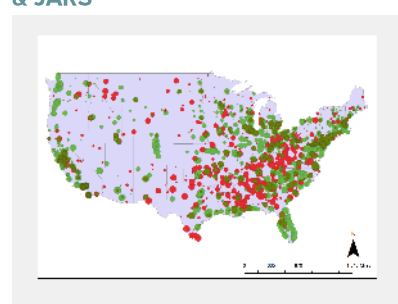
**HDPE BOTTLES/JUGS & JARS**



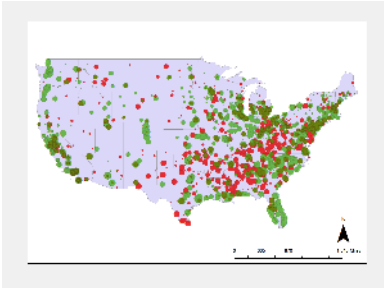
**PP BOTTLES/JUGS & JARS**



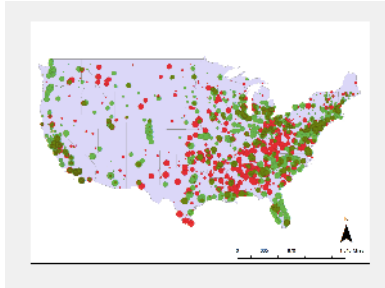
**LDPE AND LLDPE BOTTLES/ JUGS & JARS**



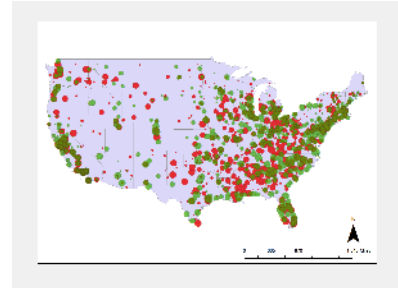
**PVC BOTTLES/JUGS & JARS**



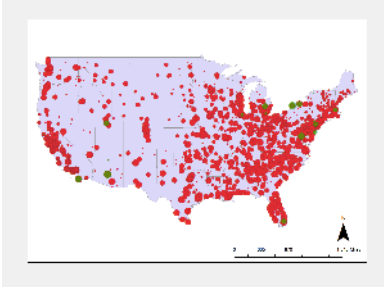
**OTHER BOTTLES/JUGS**



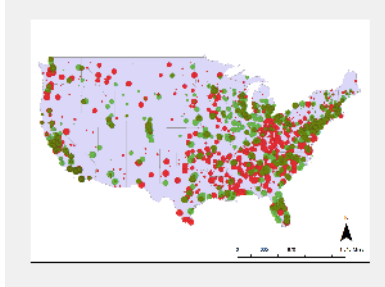
**BOTTLE CAPS**



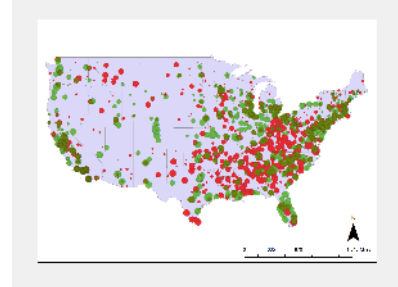
**HDPE TUBES**



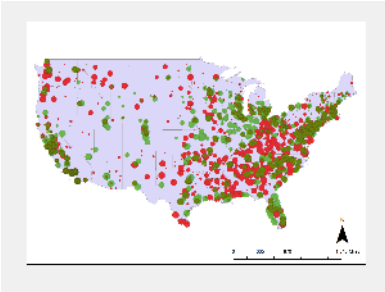
**PP CUPS**



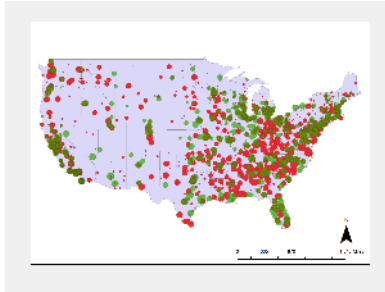
**PP TUBS/CONTAINERS**



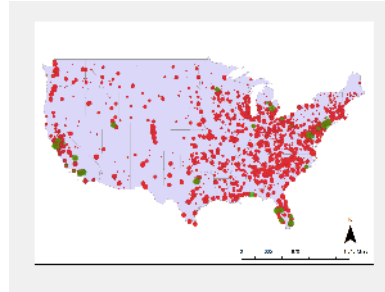
**PP CLAMSHELLS**



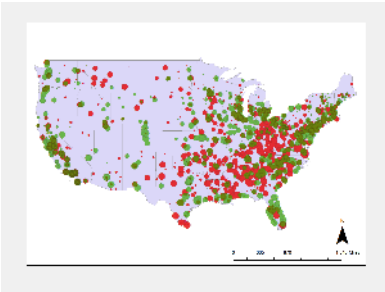
**PP LIDS**



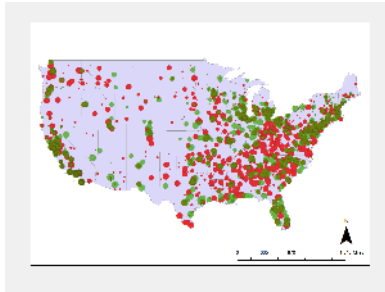
**PP CUTLERY**



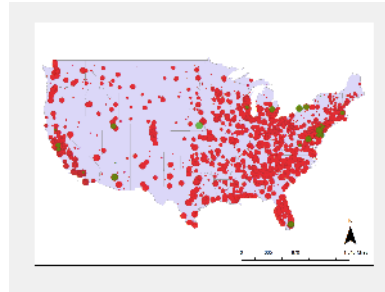
**LDPE/LLDPE TUBS**



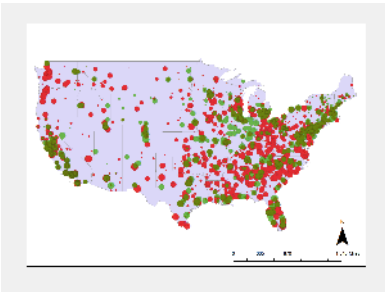
**LDPE/LLDPE LIDS**



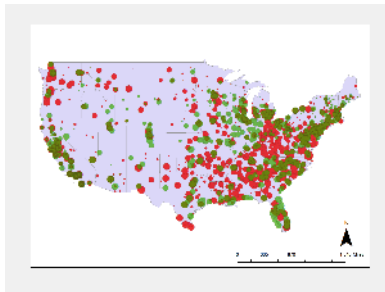
**LDPE/LLDPE TUBES**



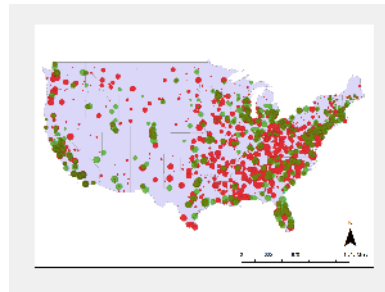
**PVC NON-BOTTLE RIGID PACKAGING**



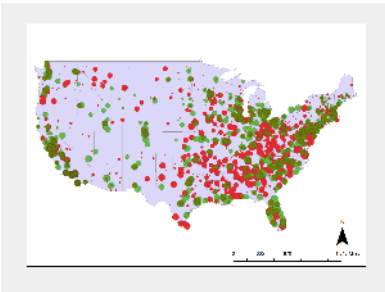
**PVC CLAMSHELLS**



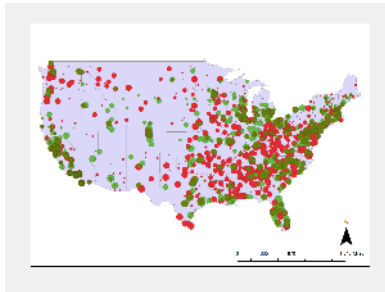
**PS CUPS**



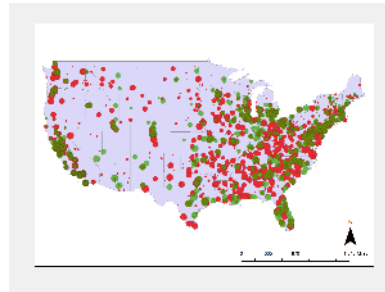
**PS CONTAINERS**



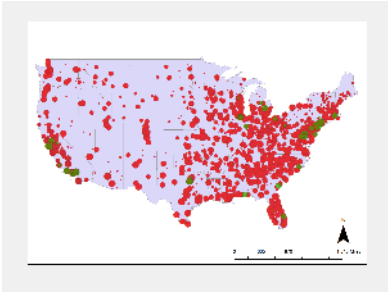
**PS CLAMSHELLS**



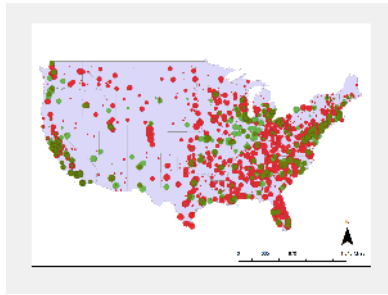
**PS LIDS**



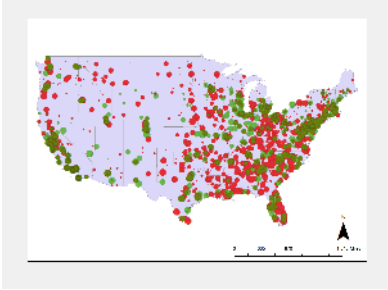
**PS CUTLERY**



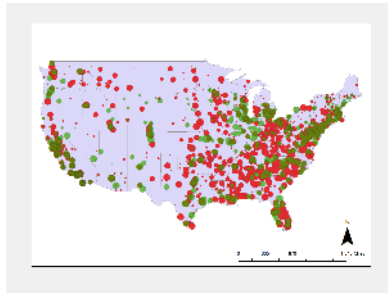
**BULKY PLASTIC WITHOUT RESIN CODE**



**PLASTIC BUCKETS 5+ GALLONS**



**BULKY PLASTIC WITH RESIN CODE**



## APPENDIX 1: FRAMEWORK FOR RATING ACCEPTANCE

RATING	1: EXPLICITLY ACCEPTED (ALL CONSIDERED ACCEPTANCE)	2: IMPLICITLY ACCEPTED (HIGHLIGHTED CONSIDERED ACCEPTANCE)	3: NEITHER ACCEPTED NOR PROHIBITED	4: IMPLICITLY PROHIBITED	5: EXPLICITLY PROHIBITED
	<i>A "1" is a specific mention of the item, or a photo of a common example. For plastic refers to product form and doesn't exclude resin</i>	<i>A "2" means that the program accepts a broader category of material that residents would presume the material belongs to</i>	<i>A "3" is either highly general instructions that rely on resident prior knowledge, or a specific material not being mentioned in any category. Phone follow-up will be conducted to attempt to move items out of the "3" category as appropriate.</i>	<i>A "4" does not call the item out as prohibited, but goes into sufficient detail (e.g. with photos and text) of all the items that are part of the program, that a reasonable consumer could assume that anything not listed is not allowable.</i>	<i>A "5" means that the material is specifically called out as prohibited in either text or pictures.</i>
	Examples (Categorize based on language similar to examples shown)				
HDPE bottles/ jugs & jars	Plastic bottles; #2 bottles; Plastic bottles and containers; Plastic containers; Milk jugs, shampoo and soap bottles	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic bottles	No Plastic; no bottles; no #2 plastic
PP bottles/ jugs & jars	Plastic bottles; #5 bottles; Plastic bottles and containers; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic bottles	No Plastic; no bottles; no #5 plastic
LDPE and LLDPE bottles/ jugs & jars	Plastic bottles; #4 bottles; Plastic bottles and containers; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic bottles	No Plastic; no bottles; no #4 plastic
PVC bottles/ jugs & jars	Plastic bottles; #3 bottles; Plastic bottles and containers; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic bottles	No Plastic; no bottles; no #3 plastic

RATING	1: EXPLICITLY ACCEPTED (ALL CONSIDERED ACCEPTANCE)	2: IMPLICITLY ACCEPTED (HIGHLIGHTED CONSIDERED ACCEPTANCE)	3: NEITHER ACCEPTED NOR PROHIBITED	4: IMPLICITLY PROHIBITED	5: EXPLICITLY PROHIBITED
Other bottles/ jugs	Plastic bottles; Plastic bottles and containers; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic bottles	No Plastic; no bottles
Bottle Caps	Include caps on bottles; picture of bottles with caps on; Caps on for Recycling	Plastic; Rigid Plastic; Plastics 1-7 ; plastic bottles, Plastic bottles and containers	No mention of caps - if not mentioned assumed part of the bottle		No Plastic; no caps
HDPE tubes	Plastic tubes; #2 plastic tubes	Plastic; Rigid Plastic; Plastic 1-7; Plastic bottles and containers; Plastic containers	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic tubes	No Plastic; no plastic tubes; no #2 plastic
PP cups	Plastic cups; #5 plastic cups; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic cups	No Plastic; No cups; No Foodservice; no #5 plastic
PP tubs/ containers (including <5gal buckets)	#5 plastic containers; Plastic containers; Plastic tubs, trays, containers; plastic takeout/ to-go containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic containers	No Plastic; No plastic containers; No #5 plastic
PP clamshells	#5 plastic containers; Plastic containers; Plastic clamshells; Plastic takeout/ to-go containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic containers	No Plastic; No plastic containers; No #5 plastic; No clamshells
PP lids	#5 lids; yogurt container lids; tub lids	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include lids	No Plastic; No plastic lids; No #5 plastic

RATING	1: EXPLICITLY ACCEPTED (ALL CONSIDERED ACCEPTANCE)	2: IMPLICITLY ACCEPTED (HIGHLIGHTED CONSIDERED ACCEPTANCE)	3: NEITHER ACCEPTED NOR PROHIBITED	4: IMPLICITLY PROHIBITED	5: EXPLICITLY PROHIBITED
PP cutlery	Plastic utensils; plastic cutlery	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include cutlery; Plastic marked 1-7	No Plastic; No plastic utensils; No #5 plastic
LDPE/LLDPE tubs (including <5gal buckets)	Plastic trays, cups, containers; #4 plastic containers; Plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic containers	No Plastic; No plastic containers; No #4 plastic
LDPE/LLDPE lids	#4 lids; butter/margarine lids; tub lids	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include lids	No Plastic; No plastic lids; No #4 plastic
LDPE/LLDPE tubes	Plastic tubes; #4 plastic tubes	Plastic; Rigid Plastic; Plastic 1-7; Plastic bottles and containers; Plastic containers	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic tubes	No Plastic; no plastic tubes; no plastic containers; No #4 plastic
PVC non-bottle rigid packaging (blisters/formed packaging)	Plastic product packaging; plastic blisterpack	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include non-bottle rigids	No Plastic; No #3 plastic; no blister packs
PVC clamshells	Plastic clamshells	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include non-bottle rigids	No Plastic; No #3 plastic; no plastic containers; no clamshells
PS cups	Plastic cups; #6 plastic cups; plastic containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic cups	No Plastic; No cups; No Foodservice; No #6 plastic

RATING	1: EXPLICITLY ACCEPTED (ALL CONSIDERED ACCEPTANCE)	2: IMPLICITLY ACCEPTED (HIGHLIGHTED CONSIDERED ACCEPTANCE)	3: NEITHER ACCEPTED NOR PROHIBITED	4: IMPLICITLY PROHIBITED	5: EXPLICITLY PROHIBITED
PS containers	Plastic containers; #6 plastic containers; yogurt containers; plastic takeout/ to-go containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic containers	No Plastic; No plastic containers; No #6 plastic
PS clamshells	Plastic clamshells; #6 plastic containers; plastic takeout/ to-go containers	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include plastic containers	No Plastic; No clamshells; No #6 plastic
PS lids	Plastic Lids; #6 lids; drink lids	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include lids	No Plastic; No plastic lids; No #6 plastic
PS cutlery	Plastic utensils; plastic cutlery	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include cutlery; Plastic marked 1-7	No Plastic; No plastic utensils; No #6 plastic
Bulky Plastic (e.g. buckets/ crates/ baskets) without Resin Code*	Large/bulky plastic items; Plastic crates, laundry baskets, lawn furniture, infant car seats, 5 gallon buckets	Plastic; Rigid Plastic	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include oversized plastic items; Plastics 1-7 (only); Plastics marked 1-7	No Plastic; No items larger than a 5-gallon container; ...3-gallon container
Bulky Plastic with Resin Code	Large/bulky plastic items; Plastic crates, laundry baskets, lawn furniture, infant car seats, 5 gallon buckets	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include oversized plastic items	No Plastic; No items larger than a 5-gallon container; ...3-gallon container
Plastic Buckets 5 gallons and over	Large/bulky plastic items; Plastic buckets	Plastic; Rigid Plastic; Plastics 1-7	Not mentioned; All recyclables; non-specific lists like "paper, cardboard, and other recyclables"	Detailed plastic list that does not include oversized plastic items	No Plastic; No buckets



## APPENDIX 2: MAPS OF MATERIAL ACCEPTANCE

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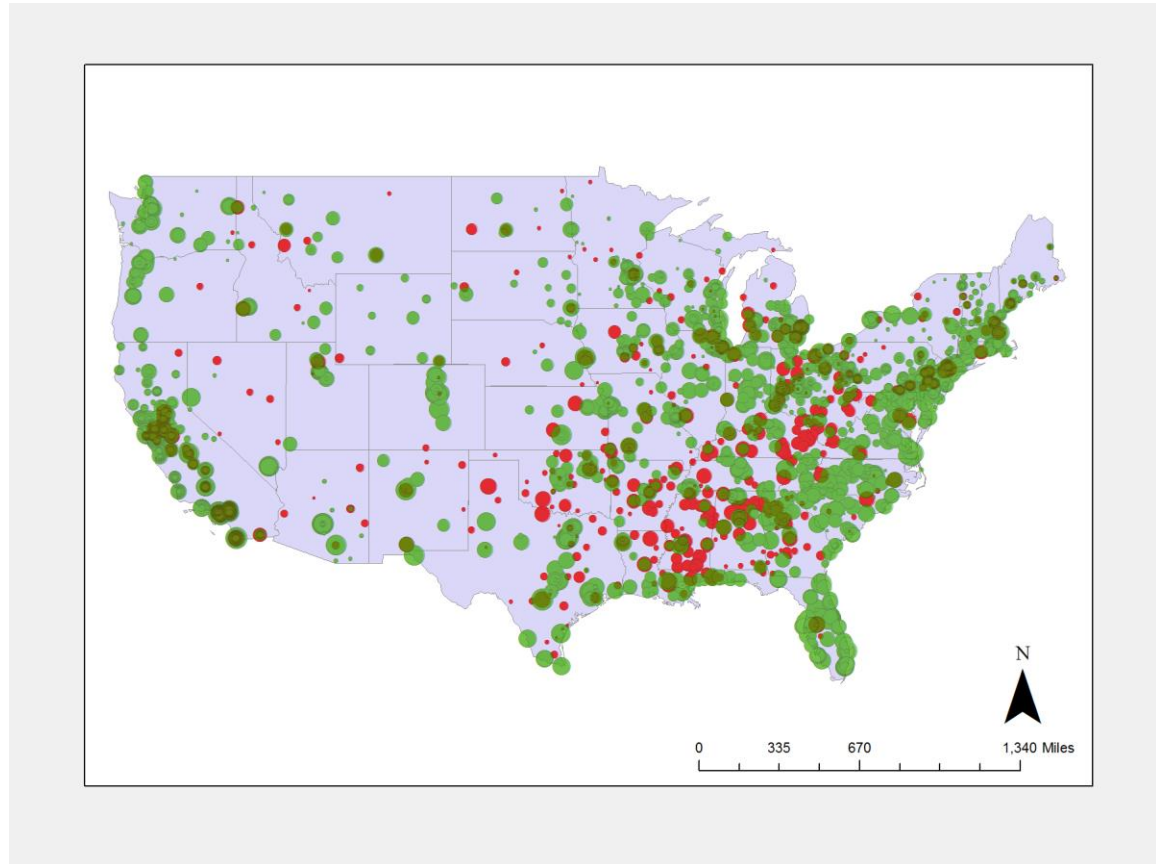
### LEGEND – ACCEPTANCE MAPS

● Program accepting specified material

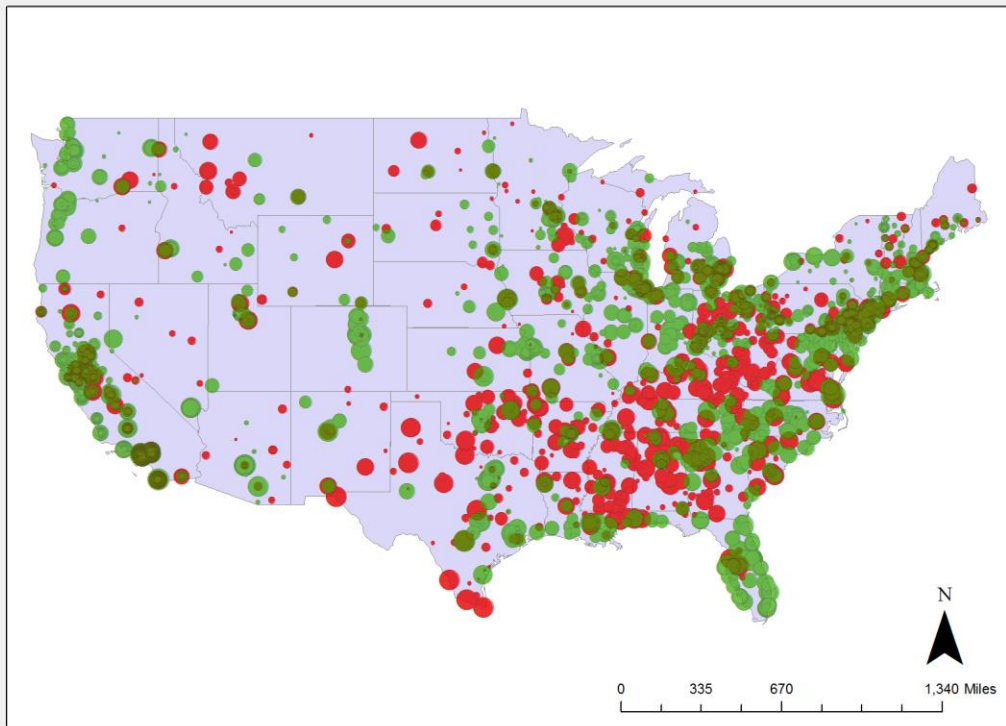
● Program not accepting material

*Symbols are scaled to represent community population*

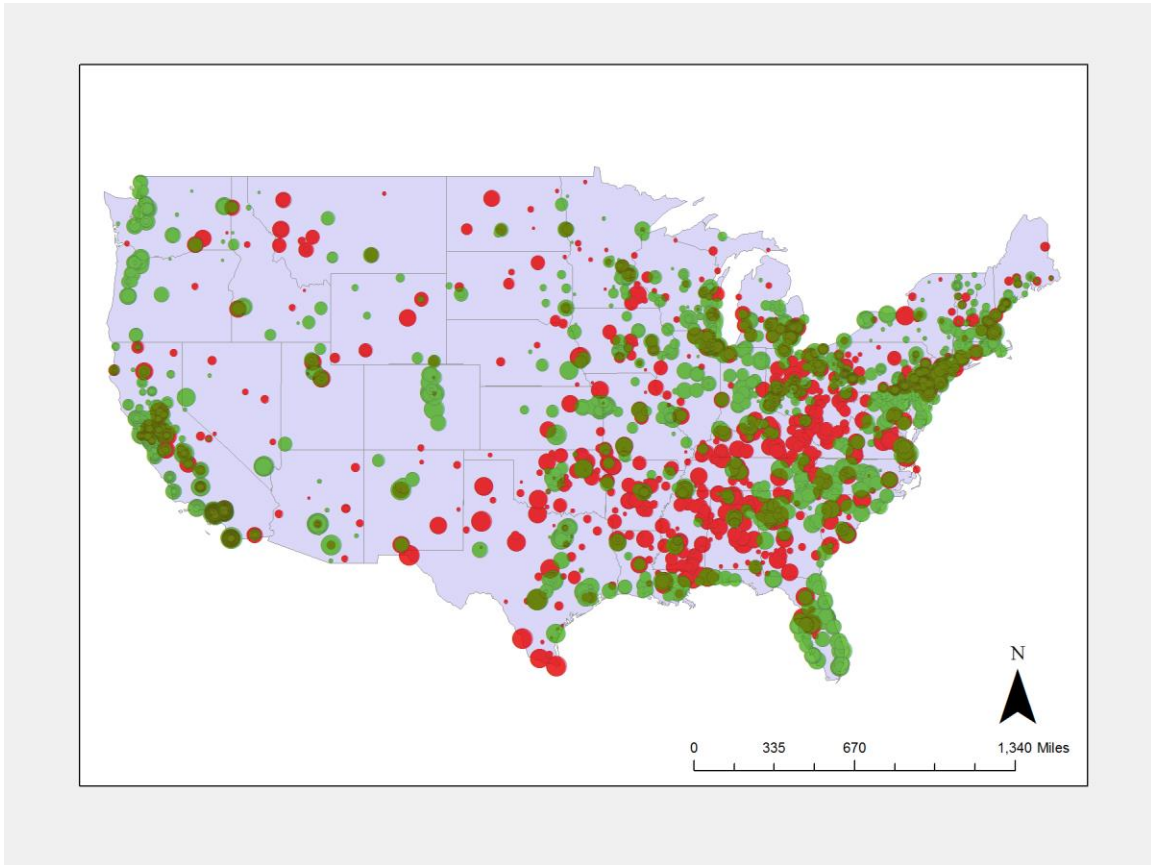
### HDPE BOTTLES/JUGS & JARS



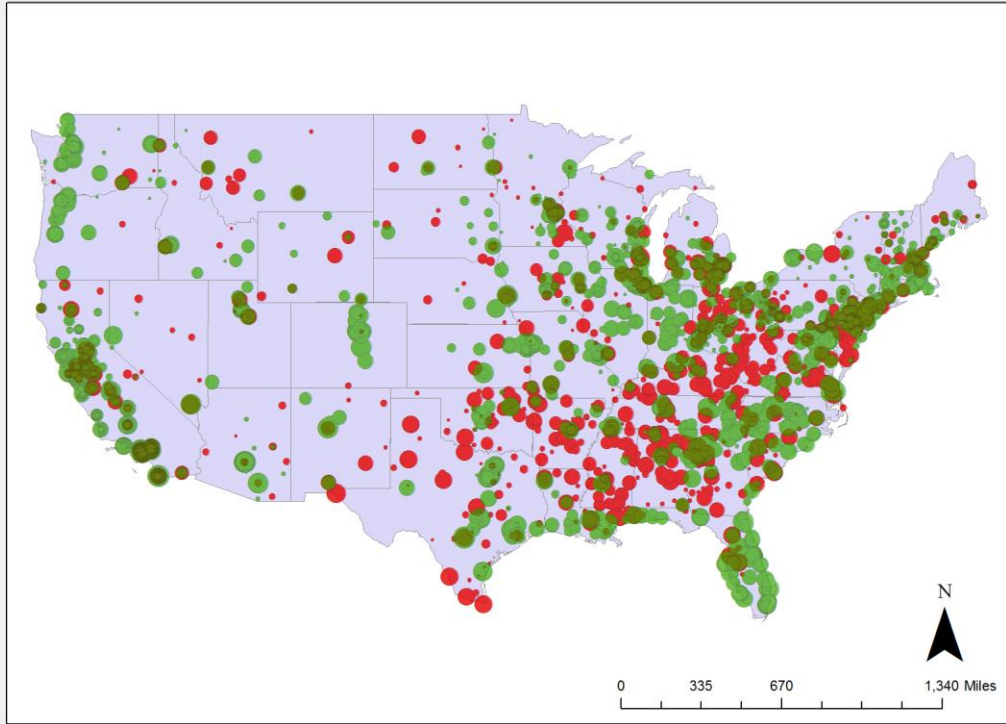
PP BOTTLES/JUGS & JARS



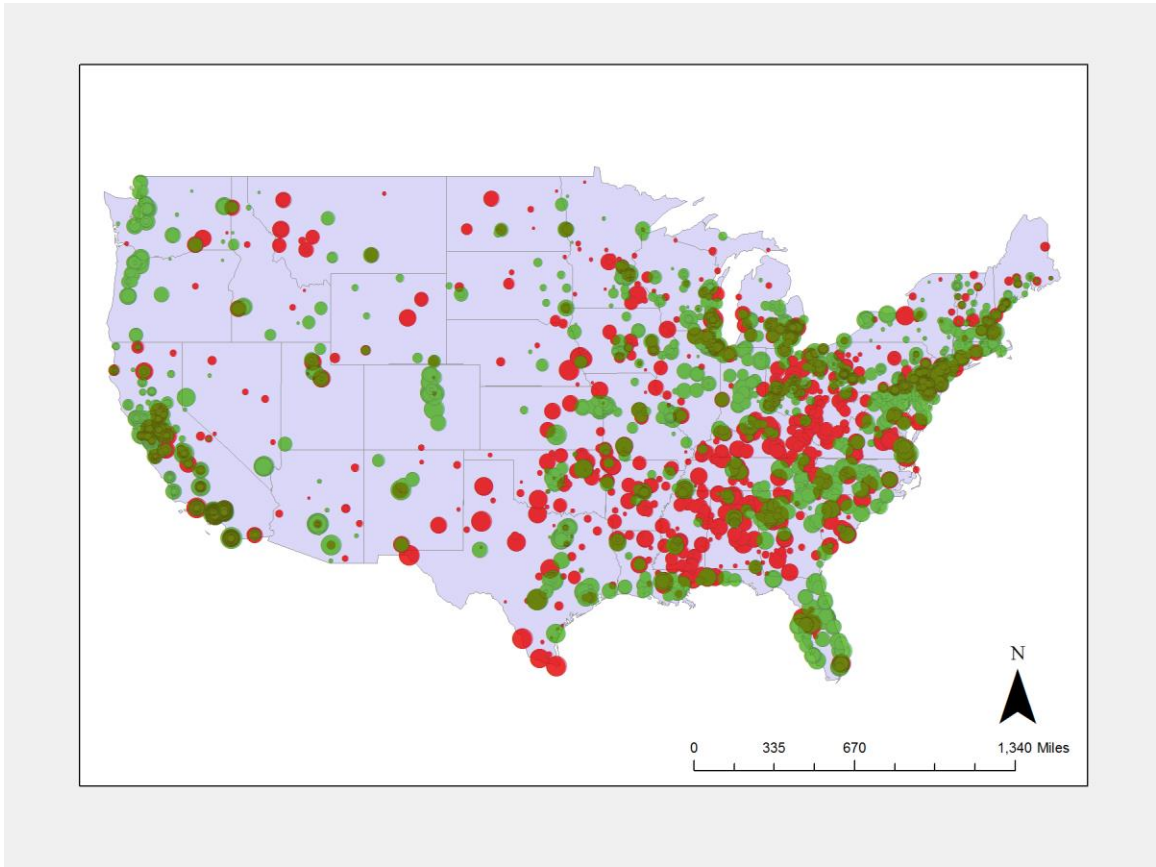
## LDPE AND LLDPE BOTTLES/JUGS & JARS



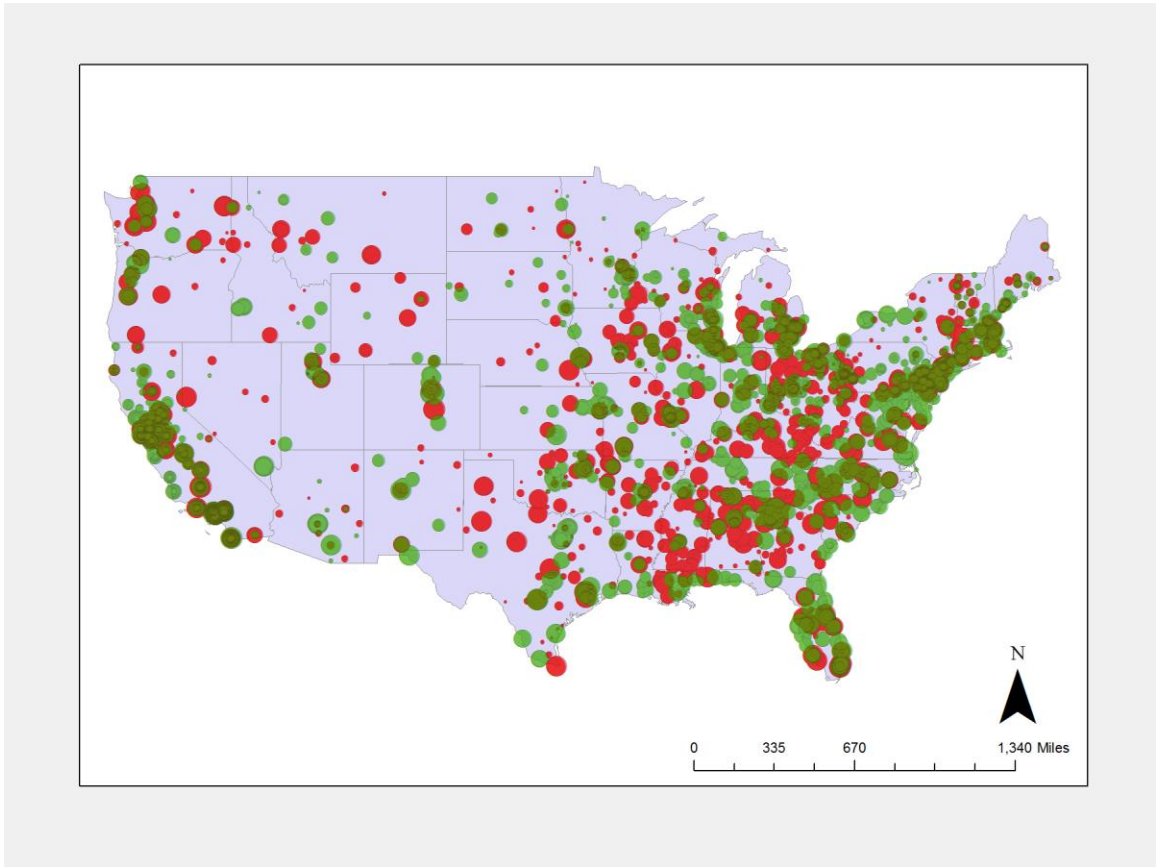
PVC BOTTLES/JUGS & JARS



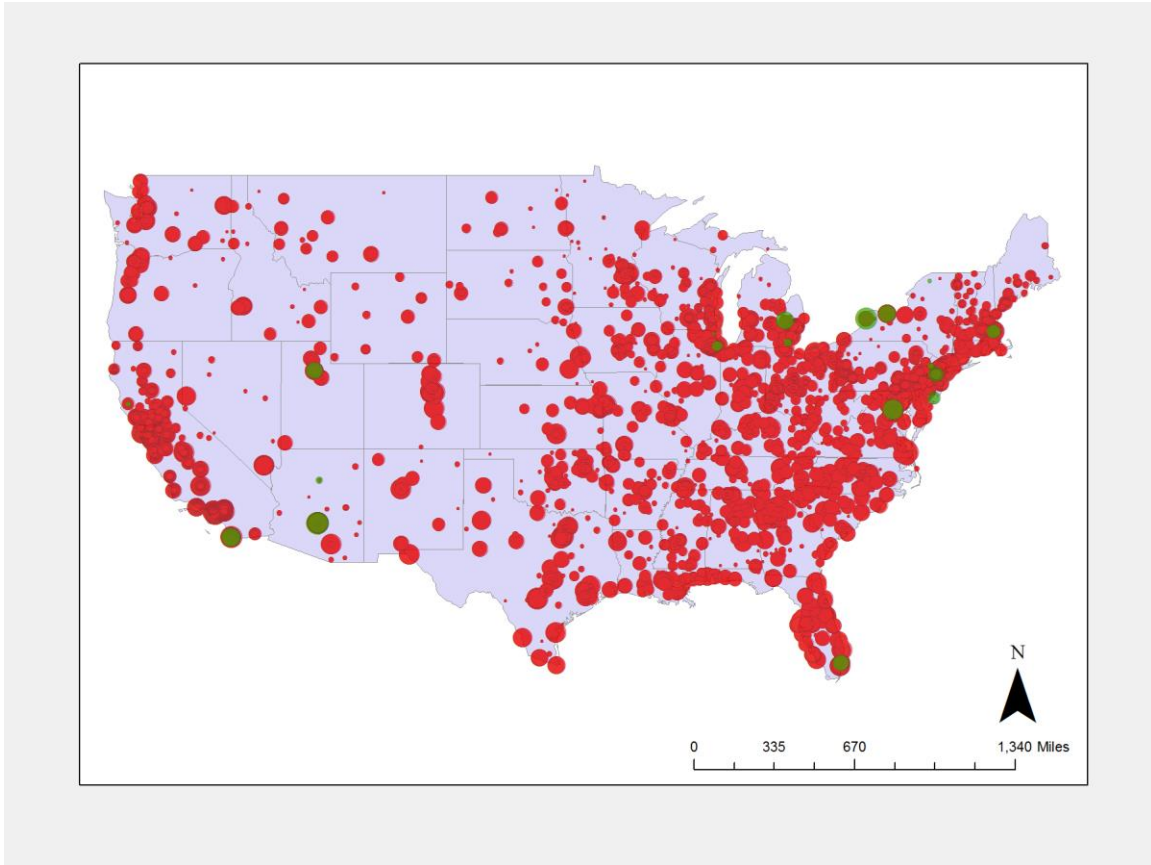
OTHER BOTTLES/JUGS



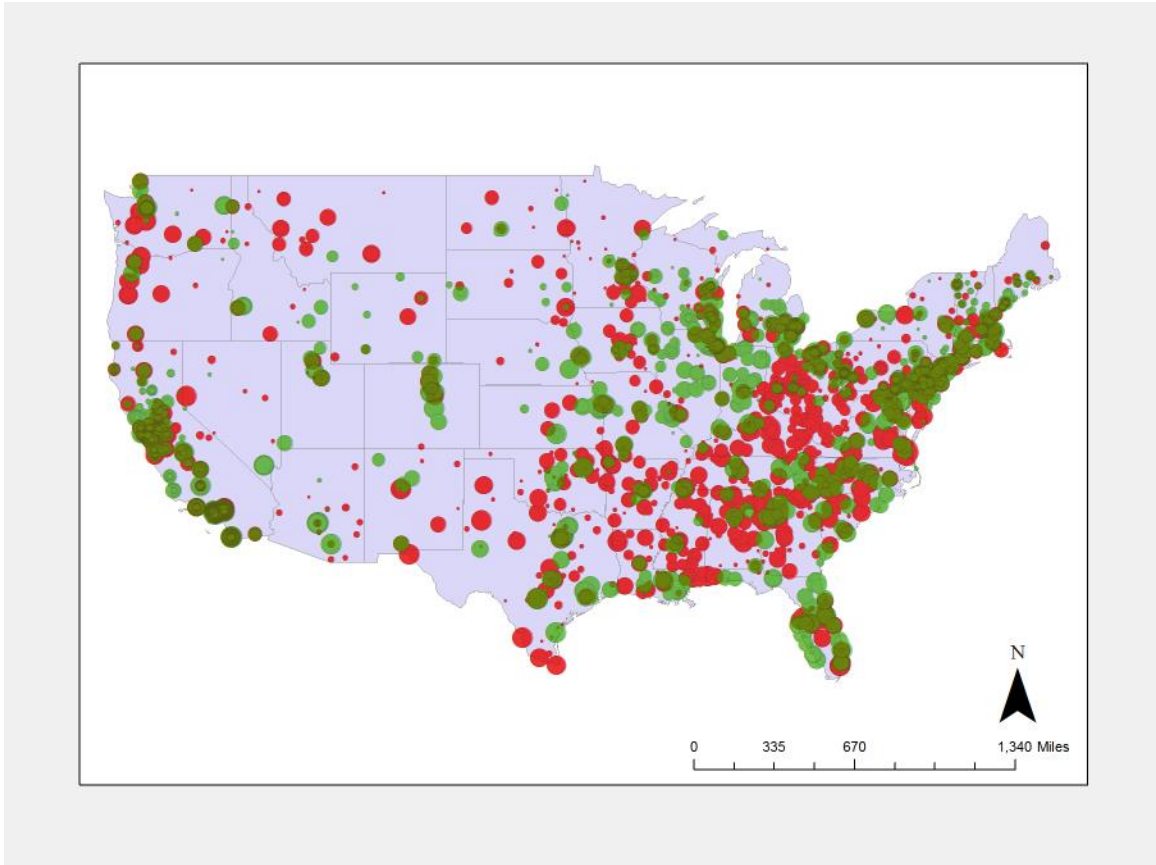
## BOTTLE CAPS



## HDPE TUBES

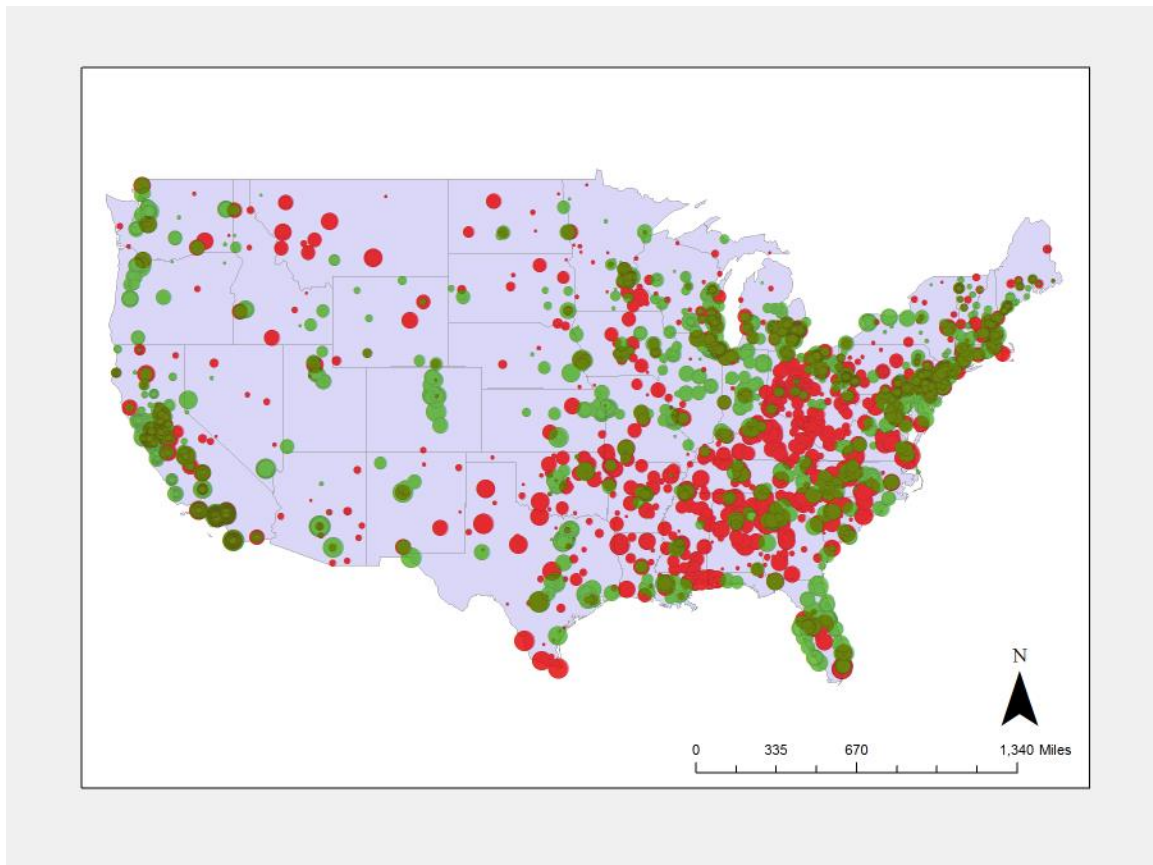


PP CUPS

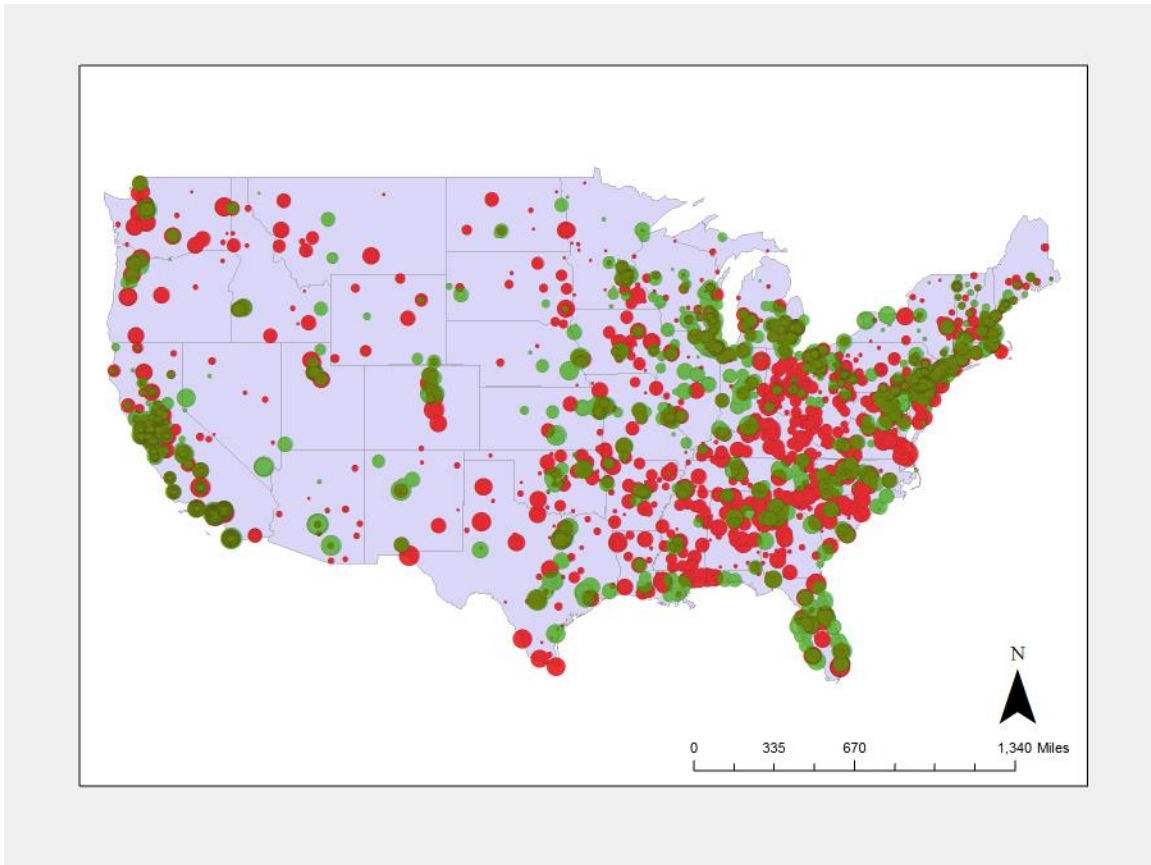




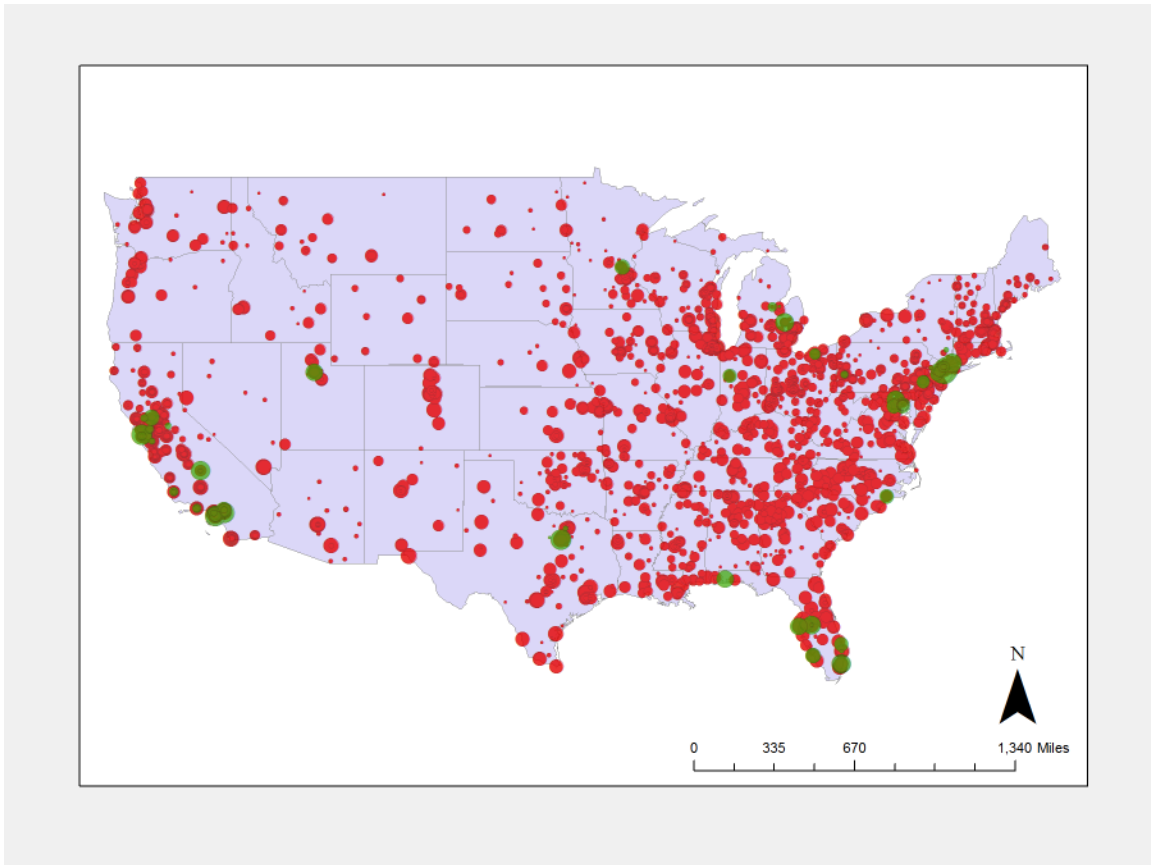
PP TUBS/ CONTAINERS (INCLUDING <5GAL BUCKETS)



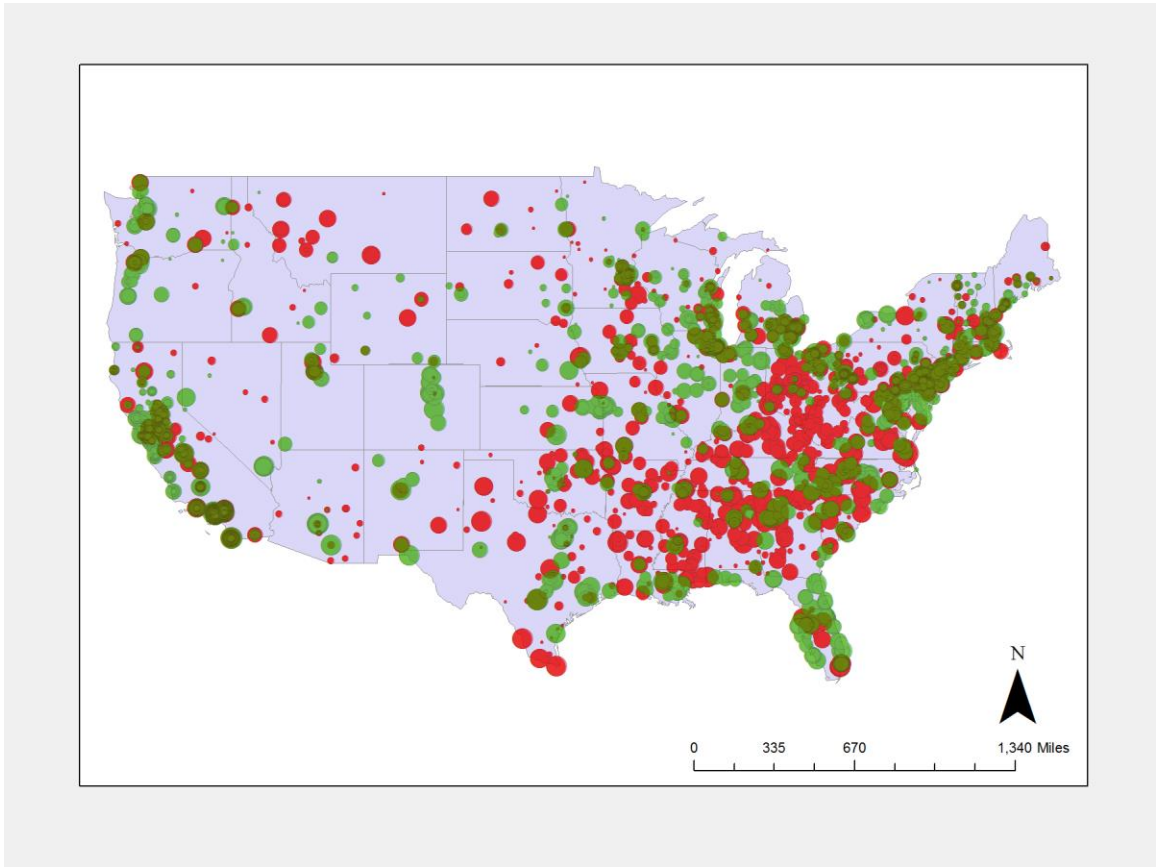
PP LIDS



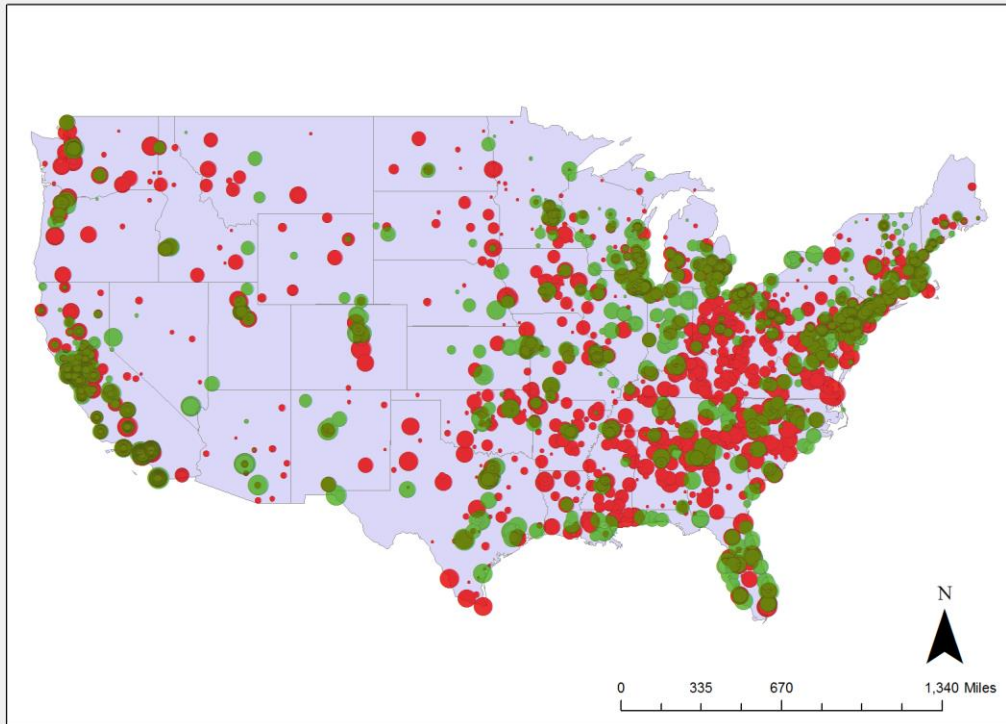
PP CUTLERY



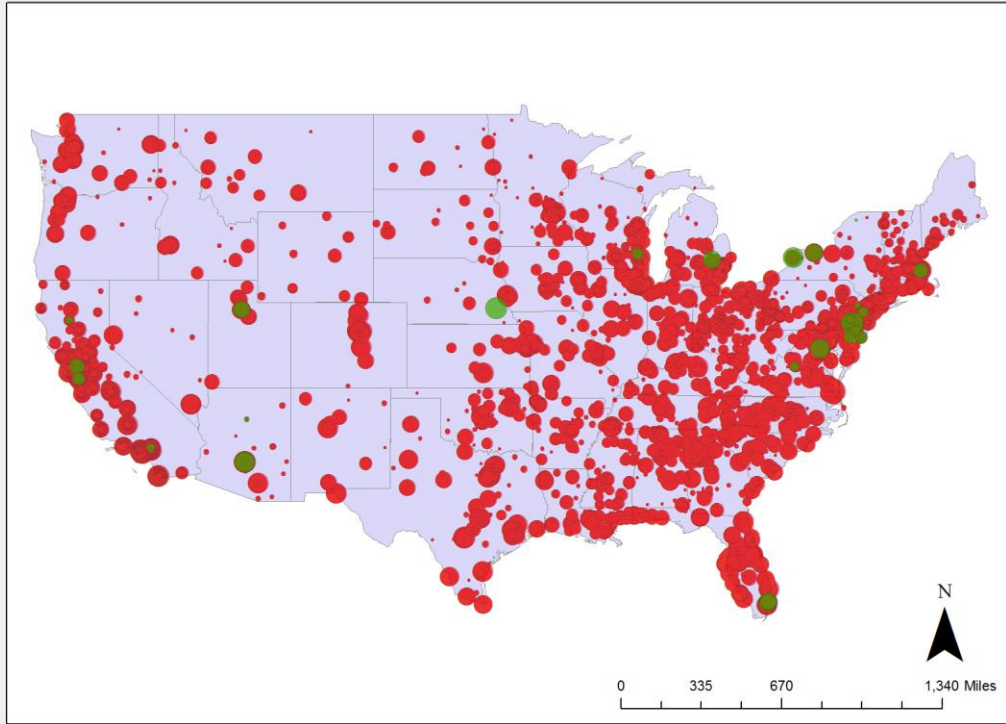
LDPE/LLDPE TUBS (INCLUDING <5GAL BUCKETS)



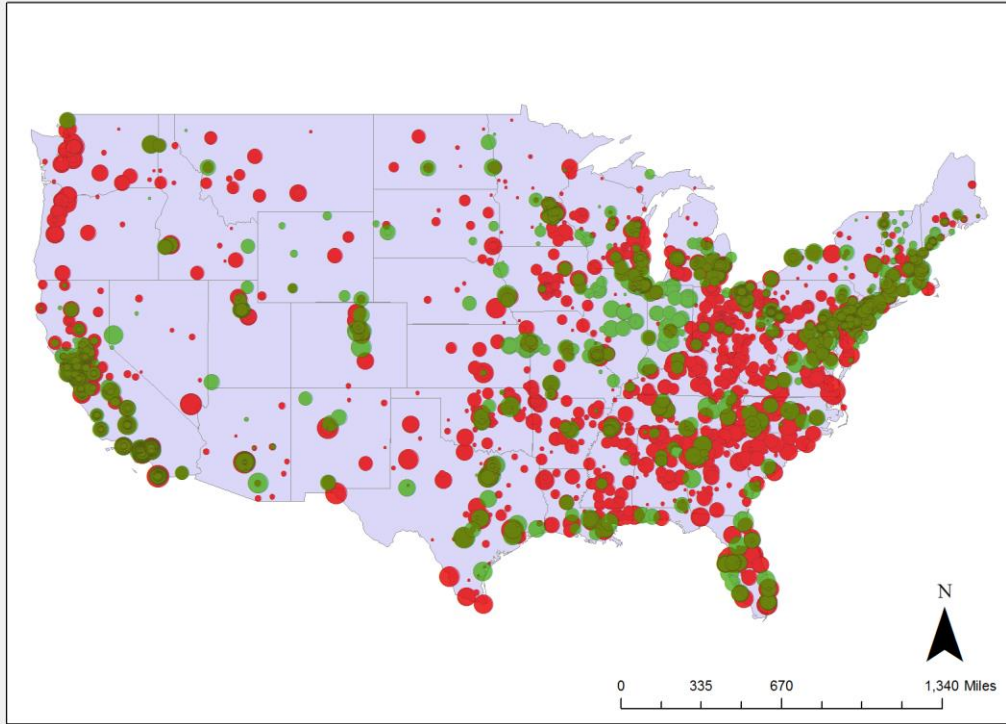
LDPE/LLDPE LIDS



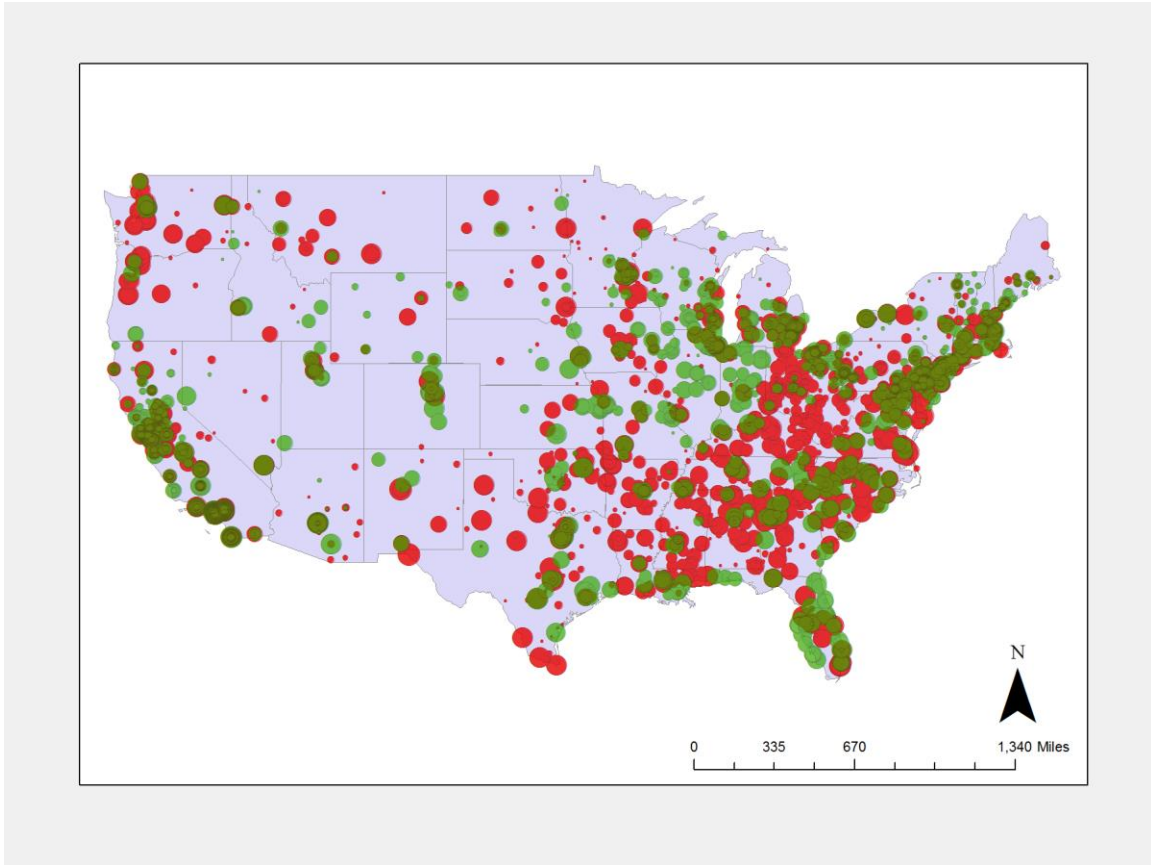
LDPE/LLDPE TUBES



PVC NON-BOTTLE RIGID PACKAGING (BLISTERS/FORMED PACKAGING)

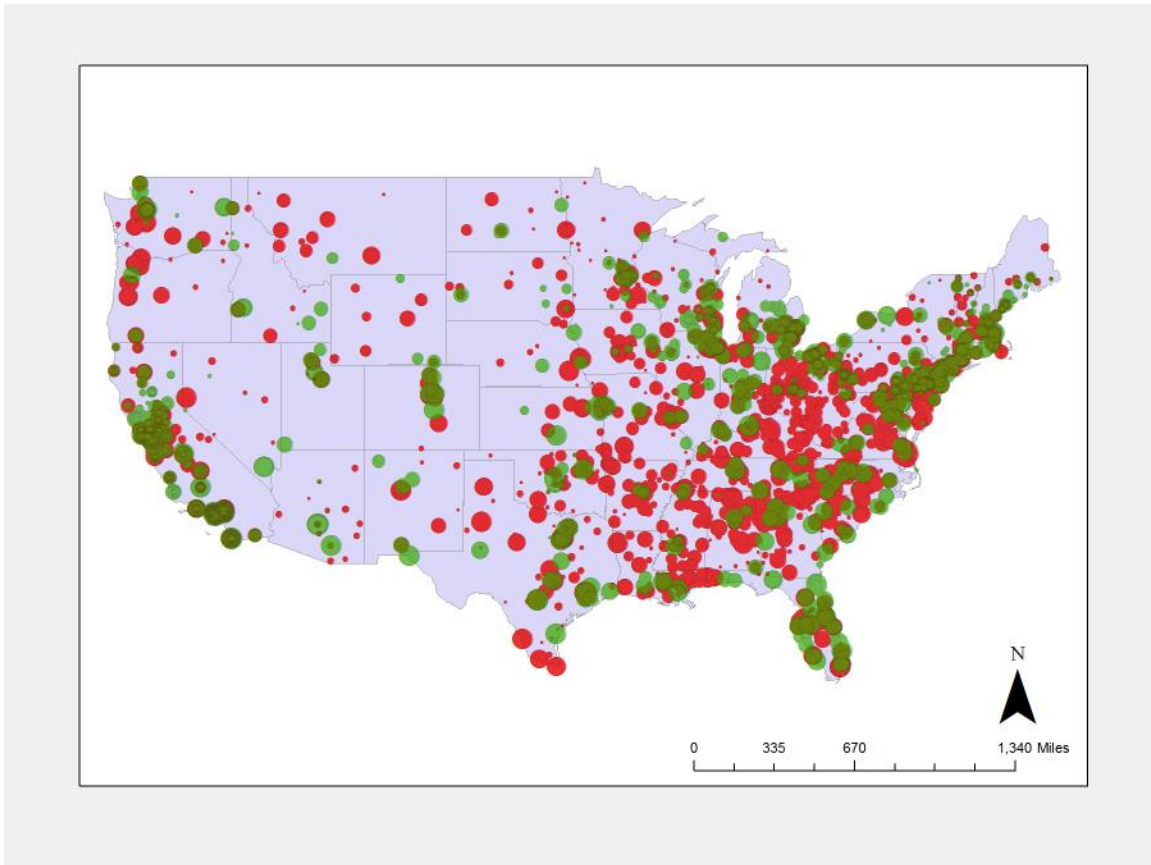


## PVC CLAMSHELLS

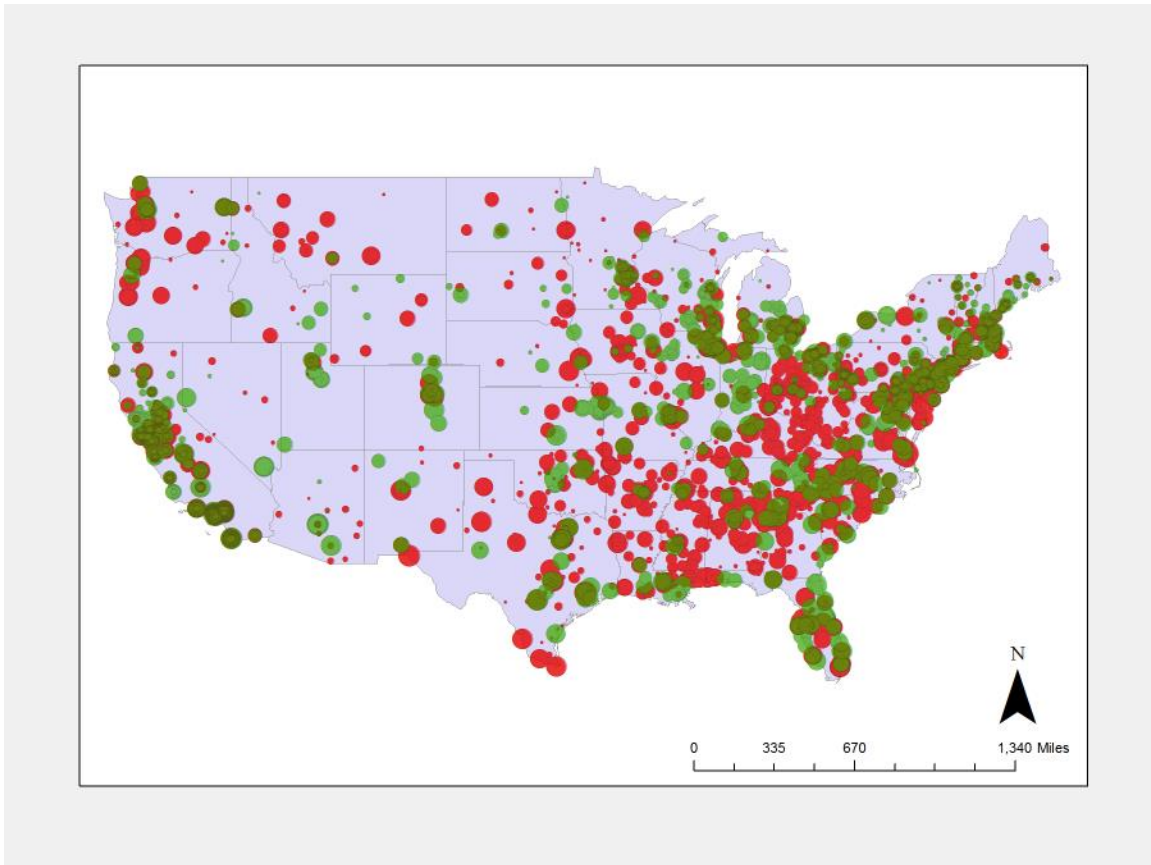




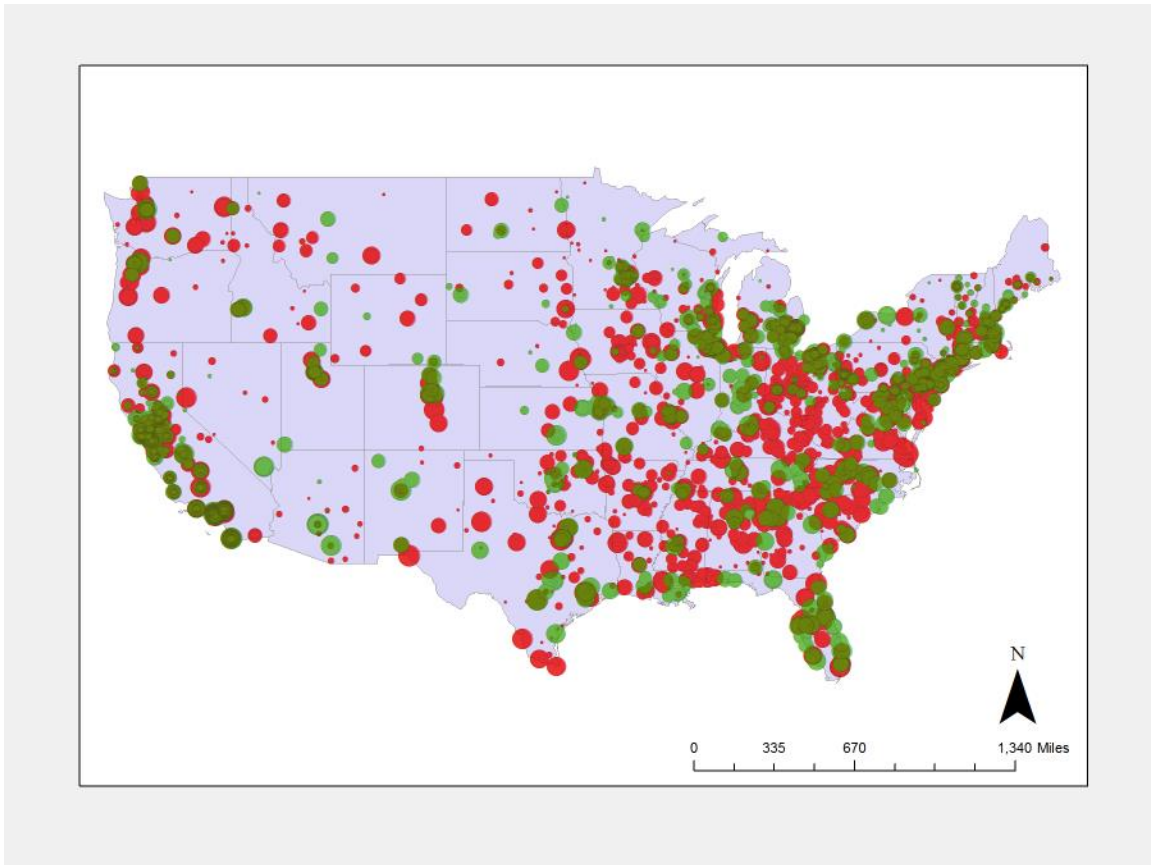
PS CUPS



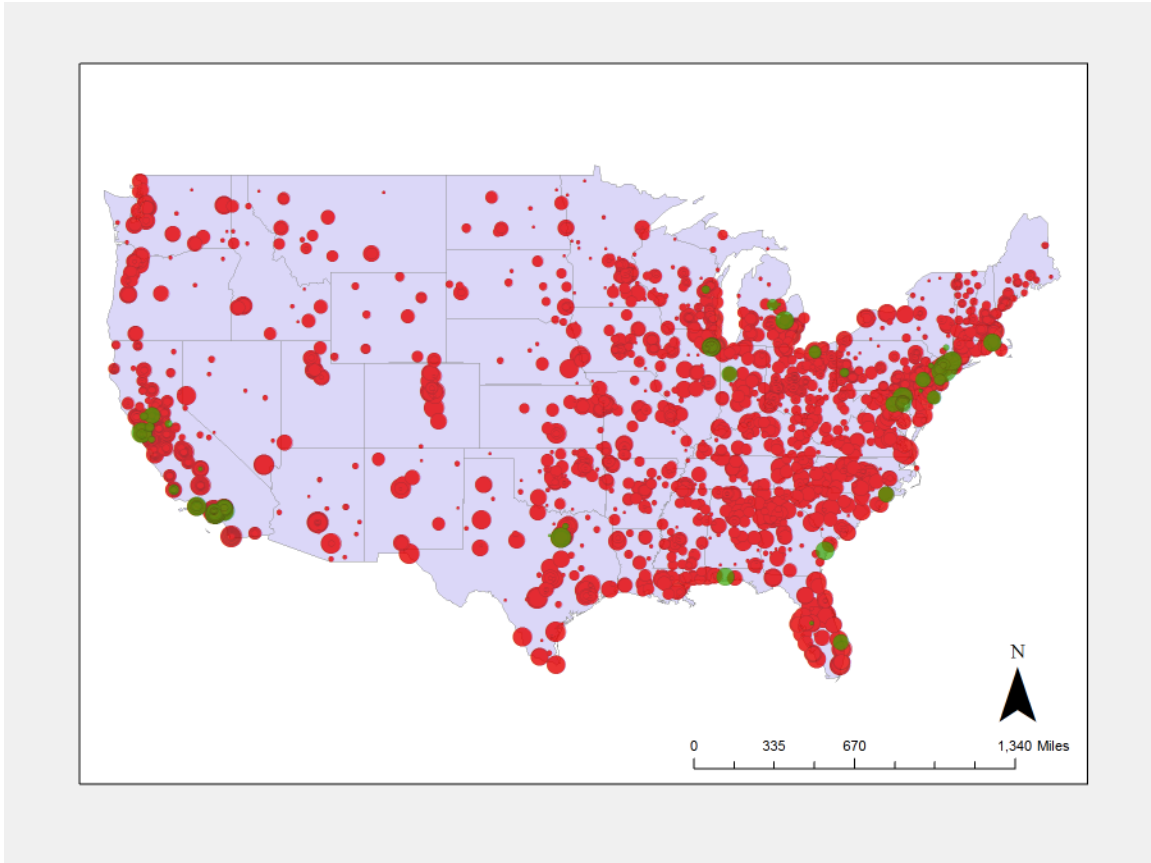
PS CLAMSHELLS/CONTAINERS



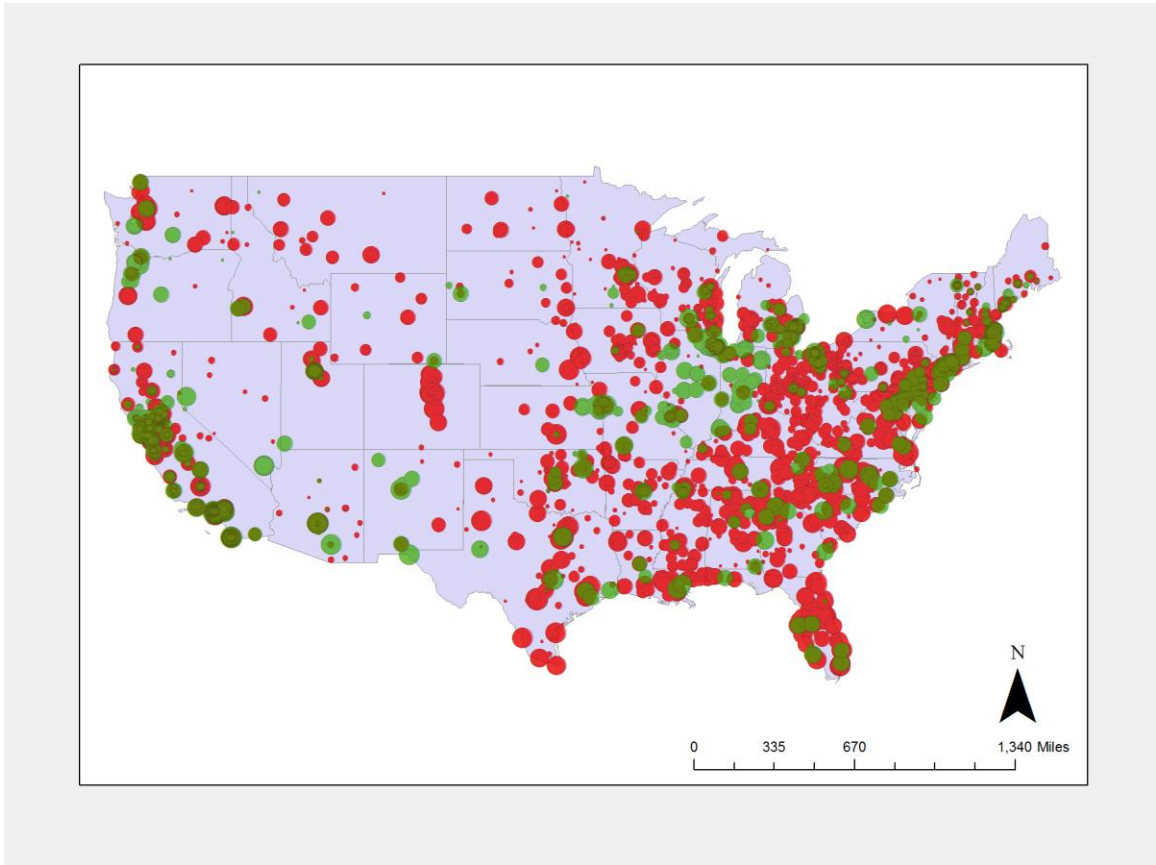
PS LIDS



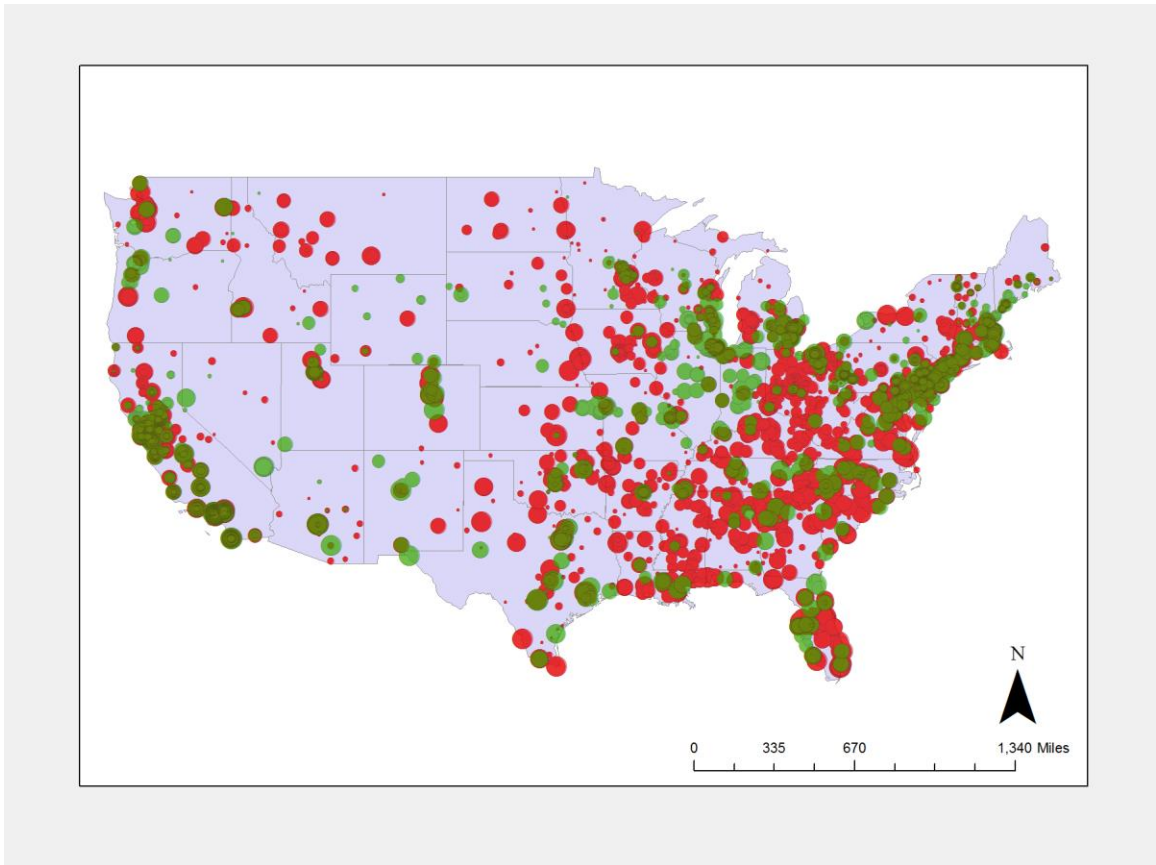
## PS CUTLERY



BULKY PLASTIC WITHOUT RESIN CODE



BULKY PLASTIC WITH RESIN CODE



PLASTIC BUCKETS 5+ GALLONS

