



Recyclable Materials in North Carolina's Disposed Waste Stream

FACT SHEET

Commonly recycled materials are still present in large volumes in solid waste disposed by households across the state. Municipal and county recycling programs can potentially recover much more of these commodities than is currently achieved. Many of these same commodities are also present—sometimes in even larger quantities—in the commercial waste stream, characterized together with residential waste as municipal solid waste, or MSW.

This fact sheet provides information on the presence of recoverable commodities in North Carolina's residential waste stream. This fact sheet first estimates the total tonnage of residential waste disposed each year, then uses existing waste composition studies to calculate the presence of readily recyclable materials in disposed household waste. Additional comments are made about other potentially recyclable and relatively non-recyclable discards in household wastes. The potential to encourage greater recycling of commercial wastes is also examined. Finally, recommendations are provided to encourage increased recycling rates of specific commodities.

ESTIMATE OF DISPOSED HOUSEHOLD WASTES IN NORTH CAROLINA

The draft 2003 North Carolina Solid Waste Management Plan estimates residential waste to be approximately 28 percent of disposed waste. Multiplied by the disposed waste total for the state of 10,003,070 tons in FY 2002, total approximate residential disposal was 2.8 million tons.

Annual local government reports to the state provide additional information that can be used to estimate the volume of residential waste. Data on residential solid waste collection programs puts the average disposal per household at .92 tons per year. Multiplying this tonnage by the U.S. Census figure of 3,132,013 households in North Carolina produces an overall annual residential estimate of 2,891,783 tons per year, which is fairly close (within about 3 percent) of the calculation in the paragraph above.

For purposes of the remaining analysis, the more conservative figure of 2.8 million tons will be used to estimate the presence of certain recoverable commodities in the residential waste stream. Cities and counties in North Carolina can also use both the 2.8 million ton figure and the commodity analysis below to extrapolate their approximate level of residential waste and the amount of specific recyclables still disposed in their communities.

ESTIMATE OF PRESENCE OF RECOVERABLE COMMODITIES IN DISPOSED RESIDENTIAL WASTES

Waste stream composition studies were examined for three North Carolina communities: Winston-Salem (2000), Orange County (1995 and 2000), and Wake County (1999). This analysis was supplemented by review of waste composition studies completed in four states – Iowa (1998), Wisconsin (2002), Minnesota (2000) and Pennsylvania (2002).

As a group, these communities and states have relatively mature public recycling programs and some have policies in place that help them achieve high recycling rates (e.g., Iowa's bottle bill). As such, using their data may actually produce an underestimate of commodities in the waste stream, since most

N.C. DIVISION
OF POLLUTION
PREVENTION AND
ENVIRONMENTAL
ASSISTANCE

1639 Mail Service Center
Raleigh, NC 27699-1639

(919) 715-6500
(800) 763-0136

communities in North Carolina have not reached their level of recovery. In general, it can be assumed that the residential waste stream is very similar across North Carolina and the United States. And as shown in the table below, a remarkable consistency exists in the commodity estimates across this sample group.

Table 1: Specific Commodities as a Percentage of Disposed Residential Waste

	Winston-Salem (2000)	Orange County (2000)	Orange County (1995)	Wake County (1999)	Iowa 1998	Wis. 2002	Minn. 2000	Penn. 2002	Straight Average
Newspaper	5.25%	4.80%	5.30%	7.30%	4.20%	3.80%	5.00%	5.20%	5.11%
Cardboard	4.66%	4.70%	4.50%	3.70%	4.10%	2.40%	3.20%	5.30%	4.07%
Office papers	0.64%	6.50%	1.70%	2.30%	1.80%	1.60%	1.40%	2.20%	2.27%
Magazines	N/A	4.40%	6.10%	3.20%	3.20%	1.90%	2.40%	2.90%	3.44%
Paperboard	N/A	5.10%	N/A	2.50%	N/A	1.40%	3.10%	N/A	3.03%
Mixed paper	21.99%	N/A	N/A*	5.30%	6.10%	6.70%	6.20%	4.80%	8.51%**
<i>Subtotal for Papers</i>	<i>32.53%</i>	<i>25.5%</i>	<i>17.6%</i>	<i>24.3%</i>	<i>19.4%</i>	<i>17.8%</i>	<i>21.3%</i>	<i>20.4%</i>	<i>26.43</i>
Glass (all colors)	6.12%	4.20%	5.80%	3.60%	2.10%	1.50%	2.40%	3.20%	3.61%
Steel cans	1.75%	1.80%	2.70%	1.10%	1.30%	0.90%	0.90%	1.40%	1.48%
Aluminum cans	0.71%	N/A	N/A	0.50%	0.30%	0.50%	0.70%	0.60%	0.55%
PETE	1.66%	1.60%	1.30%	1.00%	0.50%	0.60%	0.90%	1.00%	1.07%
HDPE	1.88%	1.30%	1.30%	1.00%	0.90%	0.70%	0.60%	0.90%	1.07%
<i>Subtotal for Containers</i>	<i>12.12%</i>	<i>8.9%</i>	<i>11.1%</i>	<i>7.2%</i>	<i>5.1%</i>	<i>4.2%</i>	<i>5.5%</i>	<i>7.9%</i>	<i>7.78%</i>
Food wastes	28.93%	17.80%	11.20%	11.60%	10.80%	13.40%	12.00%	12.20%	14.74%
Textiles/leather	3.01%	5.40%	3.30%	4.70%	5.50%	3.60%	3.50%	4.40%	4.18%

* The 1995 Orange County study included 23.9 percent for “other paper” which would presumably include office and mixed papers included in the other studies.

** The mixed paper tonnage may be skewed high in terms of representing what is recoverable – e.g., Winston-Salem’s high percentage may include some unrecyclable fibers.

A number of conclusions become apparent in examining Table 1:

- Recoverable paper represents between 20 and 25 percent—or as much as one-fourth—of all waste disposed by households. This fiber includes commonly collected grades such as newspaper and magazines, but also grades that are increasingly accepted by mills and recoverable by materials recovery facilities (MRFs) and other processing centers. It is clear that greater amounts recyclable residential paper could be recovered from North Carolina households.
- Next to paper, food waste is one of the largest remaining “untapped” recoverable materials in the residential waste stream. With a disposal rate that exceeds all remaining newsprint, cardboard and magazines combined,

food represents a considerable opportunity for diverting residential wastes. Unlike paper, however, the residential food diversion infrastructure is very immature. Backyard composting diverts some of this waste, and a few commercial composting facilities can process the material. Still, no community in North Carolina is actively collecting separated residential food waste.

Expanded composting could also open up more markets for traditionally unrecyclable paper grades, which are not included in this fact sheet.

- Containers (bottles and cans) are a relatively smaller percentage of disposed waste, but may still represent as much as one out every 10 pounds that a household throws away. The recycling rate for these materials has not been optimized.
- Textiles/leather is a waste stream that represents additional diversion potential if recycling markets stabilize and community textile recycling programs can be redeveloped. Additional promotion of reuse (through charities such as Goodwill and through community swap shops) may also boost diversion of this material.

Table 2 below shows the diversion potential for some of these key commodities in tons and as a percentage of overall disposed waste in North Carolina. Additional recovery of these basic materials will capture substantial tonnage and will improve the cost efficiency of many community recycling programs. The table assumes a recovery rate of 50 percent of the remaining recyclable materials in the waste stream. Although the percentage impact on the entire disposed waste stream is not large (less than 4 percent), the recovery infrastructure for these materials is much more developed and available than for other much larger waste streams (e.g., construction and demolition wastes).

In general, optimizing the use of the residential recycling infrastructure and maximizing recovery of these common recyclables is a key strategy to converting more “wastes” into “commodities” in North Carolina. For communities where residential waste makes up a heavy portion of disposed waste, the increased diversion of common household recyclables will help assure achievement of waste reduction goals.

Table 2: North Carolina Tonnage Diversion Potential for Disposed Common Household Recyclables

	Estimated percentage of disposed residential waste	Estimated total residential tonnage	Estimated percentage of overall North Carolina waste stream	Reduction in North Carolina waste if half of disposed tons are recovered
Newspaper	5.11%	143,080	1.41%	71,540
Cardboard	4.07%	131,600	1.32%	65,800
Office Papers	2.27%	63,560	.64%	31,780
Magazines	3.44%	96,320	.96%	48,160
Paperboard	3.03%	84,840	.85%	42,420
Glass (all colors)	3.61%	101,080	1.02%	50,540
Steel cans	1.48%	41,440	.41%	20,720
Aluminum Cans	0.55%	15,400	.15%	7,770
PETE	1.07%	29,960	.3%	14,980
HDPE	1.07%	29,960	.3%	14,980
TOTAL	25.70%	737,240	7.37%	368,690 (3.69%)

NOTES ABOUT OTHER COMMODITIES

Table 1 did not present the full range of data available in the waste composition studies cited above. However, the studies do provide other information on other types of discards or commodities that can be targeted in planning residential diversion programs. The following section discusses two general categories of commodities that either hold some promise for recovery or are basically unrecoverable.

Commodities with Recovery Potential

- **Film Plastics** constitute between four and five percent of disposed residential waste. Some of this material, i.e., plastic shopping bags, is both recoverable and source reducible. Community programs encouraging the use of grocery store collection programs and the use of reusable bags could reduce this waste stream.
- **Electronics and electrical appliances**, depending on how the category is defined, are between 1 and 2.5 percent of the waste stream, but is a growing category as technology and consumer activity turns products over at a faster pace. Well-run recycling programs for these materials can capture between 1.5 and 2.5 pounds per capita per year of these discards, increasing overall diversion. Although collection programs may be expensive to implement, markets and processing capacity for these materials are available to all North Carolina communities. Absent a formal collection program, community swap shops may be able to divert a portion of this material.
- **Household hazardous waste (HHW)** programs operate in about 20 different communities in North Carolina. These services can be costly, but less expensive options such as paint swaps, used oil recycling, and pesticide collection programs (supported by state) can divert some of the larger portions of this material. The waste composition studies put HHW at about .4 percent of residential discards.

Impractical Recoverables

In addition to readily recoverable materials, the residential waste stream contains discards that are highly unlikely to be recyclable at any time in the near future. Some examples include:

- **Disposable diapers** are approximately 3.5 percent of the residential waste stream. Although a number of attempts have been made, most recycling technologies that have been tried have proved untenable. Communities may be able to reduce this waste stream in part by promoting reusable diaper services.
- **Unrecoverable paper** was specifically sorted in a number of the waste composition studies. These analyses suggest that unrecyclable paper may amount to as much as 10 percent of all residential discards. It may be possible to compost some of this material in a collection system that also collects food waste, but no such programs are currently operating.
- **Other/composite plastics**, together with some currently unrecyclable rigid containers (e.g., yogurt cups, butter tubs), constitute as much as five percent or more of disposed waste. The hodgepodge nature of this stream and its lack of markets may keep this material from being recycled for some time to come.

The waste composition studies also show the presence of many other types of materials and products, including rubber, treated and nontreated wood, miscellaneous metals and glass, and other large and durable products (furniture, mattresses, etc.). Some recovery options may be possible for some of these products, but the more likely possibilities for increased diversion are the commodities currently collected in local programs.

POTENTIAL FOR RECOVERY OF COMMERCIAL/INSTITUTIONAL WASTES

Many of the composition studies examined for this fact sheet broke their analyses into three parts: residential waste, commercial waste (or commercial/industrial/institutional – CII), and an overall composite of all wastes. Table 3 (next page) shows the CII results for some of the same residential commodities in Table 1 above.

Table 3: Specific Commodities as a Percentage of Disposed CII Waste

	Winston-Salem (2000)	Orange County (2000)	Orange County (1995)	Wake County (1999)	Wis. 2002	Minn. 2000	Penn. 2002	Straight Average
Newspaper	3.39%	6.10%	4.70%	2.20%	1.60%	2.40%	3.00%	3.34%
Cardboard	19.97%	3.50%	10.70%	8.10%	5.70%	9.90%	11.80%	9.95%
Office Papers	2.90%	5.80%	3.30%	5.40%	1.80%	4.30%	5.20%	4.10%
Magazines	N/A	2.50%	2.80%	1.40%	0.90%	2.50%	2.40%	2.08%
<i>Subtotal for Papers</i>	<i>26.26%</i>	<i>17.9%</i>	<i>21.5%</i>	<i>17.1%</i>	<i>10%</i>	<i>19.1%</i>	<i>22.4%</i>	<i>19.47%</i>
Glass (all colors)	2.13%	3.80%	4.00%	2.00%	0.90%	1.50%	10.00%	3.48%
Steel cans	0.74%	1.20%	1.60%	0.60%	0.50%	0.60%	0.70%	0.85%
Aluminum Cans	0.39%	1.20%	0.70%	0.40%	0.40%	0.50%	0.40%	0.57%
PETE	1.23%	2.00%	1.00%	0.40%	0.50%	0.50%	0.90%	0.93%
HDPE	0.98%	1.40%	1.20%	0.50%	0.40%	0.40%	0.50%	0.77%
<i>Subtotal for Containers</i>	<i>5.47%</i>	<i>9.6%</i>	<i>8.5%</i>	<i>3.9%</i>	<i>2.7%</i>	<i>3.5%</i>	<i>12.5</i>	<i>6.6%</i>
Food wastes	26.24%	20.40%	12.20%	10.00%	13.20%	11.80%	11.80%	15.09%

Just as with Table 1, a number of conclusions become apparent in examining Table 3:

- Recyclable grades of paper are still present in large quantities in the disposed CII waste stream. Cardboard in particular still offers an opportunity for substantial diversion. Office paper is also present at almost twice the level as the residential stream. The data also appears to support the idea that local cardboard disposal ordinances can have a substantial impact with Wake and Orange, two communities with such bans, considerably lower in cardboard disposed than Winston-Salem, a community without a ban.
- Containers are a lower portion of the disposed CII stream than of the residential stream. If a community was seeking to achieve higher levels of CII diversion, the fiber stream is a more promising target than bottles and cans.
- Food waste again stands out as a large portion of disposed waste, even larger in CII than in the residential waste stream. CII food waste is also easier to target for recovery, with smaller numbers of generators producing larger amounts often in concentrated geographic sectors (e.g., restaurants and grocery stores in commercial zones). Recovery programs and private recovery services are few but growing in North Carolina, offering some models for the development of other efforts.

CONCLUSIONS AND PROGRAM RECOMMENDATIONS FOR LOCAL COMMUNITIES

The waste composition studies reviewed in this fact sheet offer guidance for communities in crafting their waste reduction programs and achieving their waste reduction goals. The recommendations below focus on increasing the recycling of materials, but source reduction programs should also be considered strongly when targeting reduction of particular commodities (e.g., junk mail reduction programs).

Paper

Communities should consider the following steps for recycling more residential and CII-disposed paper:

- Add currently uncollected fiber streams to their material mix: in particular magazines, office papers, cardboard and paperboard; or in general residential mixed paper (RMP).
- Reinvigorate or initiate new local public education and promotion campaigns to increase general public participation and thereby increase the amount of fiber collected in programs.
- Implement incentive programs designed to increase public recycling, including random reward programs and pay-as-you-throw.
- Take advantage of state grant opportunities and free collection services (such as those offered by Raleigh's *The News and Observer* for newsprint and magazines) to increase paper recycling.
- Implement cardboard disposal diversion ordinances to achieve higher levels of CII cardboard recycling.
- Implement a disposal diversion ordinance (similar to the one adopted by Mecklenburg County) that targets CII office paper as well as cardboard.
- Add new types of recycling opportunities for citizens – e.g., cardboard recycling drop-off centers.
- Provide paper recycling services (e.g., collection routes or commercial drop-off sites) to community businesses and industries.
- Promote and implement the greatest possible purchase of recycled content paper to strengthen markets for collected materials.

Containers

Communities should consider the following steps for recycling more residential and CII-disposed containers:

- Reinvigorate or initiate new local public education and promotion campaigns to increase general public participation and thereby increase the amount of containers collected in programs.
- Implement incentive programs designed to increase public recycling, including random reward programs and pay-as-you-throw.
- Implement “all plastic bottle” programs, which have been shown to increase overall recovery of plastic containers.
- Implement a mandatory recycling ordinance similar to the one adopted by the city of Durham that prohibits disposal of certain types of containers and fiber.
- Provide container recycling services (e.g., collection routes or commercial drop-off sites) to community businesses and industries.

Food Waste

Communities should consider the following steps for recycling more residential and CII-disposed food waste:

- Promote backyard composting to households and implement bin distribution programs.

- Implement pilot source-separated residential food waste collection programs to supplement curbside recycling.
- Encourage CII generators to divert food wastes and other discarded organics to commercial composters.
- Implement food waste collection services similar to Orange County's restaurant and grocery store program.
- Promote on-site composting and vermicomposting options for schools and other institutions.
- Take advantage of grant opportunities from the state to implement food waste diversion programs and/or promote these grant opportunities to large food waste generators in the community.

Other Materials

Communities should consider the following steps for recycling or reducing other materials generated by households and businesses:

- Implement source reduction programs targeting difficult-to-recycle materials and products: for example, film plastics (bags) and disposal diapers.
- Promote and implement reuse services for textiles and durable goods. Such services can include publicly popular community swap shops and existing charitable programs run by Goodwill, Salvation Army, churches and other groups.
- Promote repair services for durable goods by providing public education on the availability of such services in the community.
- Implement textile recycling programs if reliable markets can be secured.
- Implement HHW programs, or if these services appear too expensive, implement less costly programs such as latex paint swaps.
- Implement electronics recycling programs, either through periodic or permanent drop-off services.

CONCLUSION

Ample opportunity exists to capture more recyclable commodities from both the residential and commercial waste stream in North Carolina. Markets support the ability to collect more materials, and doing so will increase the efficiency of local government recycling programs. Raising public participation rates in existing programs through education and promotions is a critical strategy, and can be supplemented by techniques proven to boost participation, such as pay-as-you-throw programs. State grants are also available to support increased diversion activities by local governments. Recovering more traditional recyclables from the disposed waste stream in North Carolina is feasible and can deliver many benefits to the state and its communities.



The N.C. Division of Pollution Prevention and Environmental Assistance provides free, non-regulatory technical assistance and training on methods to eliminate, reduce or recycle wastes before they become pollutants or require disposal. Telephone DPPEA at (919) 715-6500 or (800) 763-0136 or e-mail nowaste@p2pays.org for assistance with issues in this fact sheet or any of your waste reduction concerns.

DPPEA-FY03-30