
State of Disposal in California



California Department of Resources Recycling and Recovery

March 2015

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S T A T E O F C A L I F O R N I A

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Executive Summary

Since 1989, the California Department of Resources Recycling and Recovery (CalRecycle) has been tasked with monitoring municipal solid waste and promoting recycling in California. The amount of waste disposed has been the key metric in California's efforts to reduce landfilling and other disposal, minimize the generation of waste, and maximize source reduction, recycling, and composting as the state strives for the 75 percent statewide recycling goal by 2020 under Assembly Bill 341 (AB 341, Chesbro, Chapter 476, Statutes of 2011). This report discusses the disposal of solid waste in California, including the amounts and types of materials that are disposed, the facilities that handle disposed waste, the flow of disposed material into, out of, and within California, and how disposal is tracked. In addition, this report is paired with a report titled "State of Recycling in California," which focuses on the state's recycling and composting infrastructure.

This report will look at the following key issues related to disposal in California:

- Amount of statewide disposal and how it is tracked
- Composition of disposed materials statewide
- Waste disposal by the commercial and residential sectors
- Flow of disposed material into, out of, and within California
- Disposal facilities, including number of facilities, locations, and capacities
- Disposal-related materials under AB 341
- Disposal fees and long-term funding for CalRecycle

In each area, this report discusses the available data, how the data is collected and limitations on the available data, and conclusions that can be drawn based on the data.

CalRecycle tracks the amount of waste disposed and the jurisdictions in which the waste was produced using its Disposal Reporting System. This tool is critical for evaluating local and statewide waste management, but there are substantial limitations to the quality of the information CalRecycle receives. Incomplete or late data, coupled with a lack of enforcement tools to ensure timely and accurate reporting, make it challenging to ensure compliance with statewide waste management goals.

In order to determine the types of materials that enter the waste stream, CalRecycle periodically conducts waste characterization studies. The studies provide insight as to the types of waste generated by different business types and by the residential sector. The composition of disposed waste is important for policy development, program planning, market development, and program assessment. Future waste characterization studies will allow CalRecycle to determine the level of success of mandatory commercial recycling and mandatory commercial organics recycling as well as other laws, policies, and programs.

In most areas of California, hauling companies (private haulers) are the predominant mode of transportation of disposed waste from the source of generation to facilities. The collected waste can then be received by transfer stations, material recovery facilities (MRFs), landfills, or transformation facilities. Transfer stations and MRFs sort and process collected waste and remove some recyclables. In 2013, 30.2 million tons of material were landfilled and 0.86 tons of waste were incinerated at the three transformation facilities in California.

Many factors affect landfill capacity; CalRecycle calculates that under a business-as-usual scenario, California has sufficient statewide disposal capacity to handle landfilled waste until 2057. If California achieves its 75 percent statewide recycling goal, then the current amount of landfill capacity is sufficient to last into the 2080s.

Under CalRecycle's implementation of AB 341, several activities that use waste-derived materials that count as diversion at the jurisdiction level now count as disposal-related activity at the state level. These include alternative daily cover (ADC), alternative intermediate cover (AIC), other beneficial reuse at landfills, all transformation, and waste tire-derived fuel. In 2013, these five activities that use waste-derived materials totaled 6.8 million tons of materials. Alternative management strategies will need to be developed for a significant portion of these materials in order to achieve the 75 percent statewide recycling goal.

Many of California's state-level waste and recycling programs are funded by an Integrated Waste Management Fee (IWWMF) of \$1.40 per ton collected on waste disposed at landfills. As CalRecycle promotes and expands new source reduction, composting, and recycling programs, the amount of material entering landfills should decrease; this means that there will be less revenue to support the Department's operations overall. If California meets its 75 percent statewide recycling goal in 2020, the reduced IWWMF revenue will result in a \$29 million gap even if there is no increase in operations costs. As a result, it is critical to consider long-term solutions for funding California's waste management programs.

The landscape of solid waste management has evolved substantially over the last 25 years. Without any changes in policy, California's growing population will lead to higher amounts of overall disposal. Recycling policies, such as the 75 percent statewide recycling goal, will likely have significant impacts on how much waste is disposed. Current projections suggest that in order to meet the recycling goal, the amount of per capita disposal will need to be cut in half. As CalRecycle implements its waste management programs, accurate information on the amount and type of waste and how that waste moves through the solid waste infrastructure is critical for the long-term success of managing California's solid waste.

History of Disposal in California

Overview

Californians generate solid waste at their homes and workplaces every day. Currently, about half of this material is source-reduced, recycled, or composted, and half is disposed at landfills (buried), disposed at transformation facilities (burned to produce energy), or handled in another disposal-related activity. While almost all of this material could and should be source-reduced, recycled, or composted, it is likely there will always be some remaining material that needs to be disposed or managed by alternative methods. In the 25 years since people became concerned about landfill capacity in the late 1980s, the management of solid waste has changed tremendously, with much more emphasis on saving resources and reducing disposal. The solid waste collection, handling, and disposal infrastructure has also evolved. From initial generation to final disposition, California still has about 37 million tons of material that goes to disposal, or activities closely related to disposal, each year. That is nearly 1 ton (2,000 pounds) of solid waste for every resident every year.

Solid Waste Legislation, Mandates, and Goals

California adopted its first comprehensive solid waste management program in 1989. The California Integrated Waste Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989) established a full-time California Integrated Waste Management Board (CIWMB, now the Department of Resources Recycling and Recovery, or CalRecycle). The Act also created a comprehensive statewide system for permitting, inspecting, and enforcement requirements for solid waste facilities to ensure public and environmental health and safety. Finally, the Act required jurisdictions to implement programs to achieve 25 percent diversion of all solid waste from disposal by January 1, 1995, and 50 percent diversion by January 1, 2000. AB 939 has shaped the solid waste management landscape in California for the last 20 years with an emphasis on implementing local government (jurisdiction) diversion programs.

Disposal under AB 939

For the initial round of measurement under AB 939, jurisdictions used a variety of methods to determine how much waste they generated, diverted, and disposed. This information was used to set the base for measuring progress toward the diversion mandates. With the passage of AB 2494 (Sher, Chapter 1292, Statutes of 1992), the system used to measure annual progress became disposal-based, and since 1995 CalRecycle has used the Disposal Reporting System (California Code of Regulations sections 18809.6, 18810.6, and 18811.6) to track solid waste disposal amounts and jurisdiction of origin. Prior to 2008, diversion rates were calculated using an adjustment method that relied on a complicated formula involving the amount of disposed waste and taxable sales adjusted for inflation, employment, and population. With the passage of SB 1016 (Wiggins, Chapter 343, Statutes of 2008), diversion rates are now

calculated using a per capita disposal system that relies on existing reporting systems to determine whether the 50 percent mandate has been met based solely on disposal and population. Under this system, waste generation is set based on the calendar years 2003 to 2006. This period corresponds to the time when California achieved 50 percent diversion statewide and to a boom in the housing market and strong economic activity. This base generation rate is then compared to the disposal rate for a given year. Statewide, the base waste generation level is 12.6 pounds per person per day, so on average California residents must dispose of less than 6.3 pounds per person per day to meet the 50 percent diversion mandate. Because each jurisdiction has its own unique set of waste generators and waste streams, an individual jurisdiction's base generation rate and targets cannot be compared to other jurisdictions or to the statewide numbers.

Under AB 939, disposal includes landfilling, exported waste sent for disposal, and transformation (waste to energy), while diversion includes source reduction, recycling, composting, alternative daily cover (ADC), alternative intermediate cover (AIC), beneficial reuse at solid waste landfills, transformation diversion credit, and related activities. In addition, material management practices such as approved land application or inert debris fill do not count as disposal. However, because they reduce the amount disposed at landfills and transformation facilities, these activities count as de facto diversion for jurisdictions.

Disposal and Disposal-Related Amounts under AB 341

In 2011, the Legislature implemented a new approach to the management of solid waste. AB 341 (Chesbro, Chapter 476, Statutes of 2011) requires that CalRecycle adopt regulations for mandatory commercial recycling and establishes a new statewide goal of 75 percent recycling through source reduction, recycling, and composting by 2020. This paradigm adds to the policies in AB 939 in several significant ways.

First, AB 341 established a statewide policy goal, rather than a jurisdictional mandate. This places the onus for achieving the goal on the state rather than on the cities and counties that are directly responsible for waste disposal and recycling. Under the law, jurisdictions are not required to meet the new policy goal.

Second, CalRecycle uses different metrics to calculate the statewide recycling rate. Under the 75 percent recycling goal, a base generation level is calculated using the average per resident generation from 1990 to 2010 (10.7 pounds per person per day). This period includes all years for which data exists, so it is the most representative of California generation. Because of the different base period used and definition of recycling, the estimated waste generation and disposal targets under AB 341 are different than under AB 939. In 2020, residents must dispose less than 2.7 pounds per person per day on average statewide to meet the 75 percent recycling goal. More information about recycling rate calculations can be found here:

www.calrecycle.ca.gov/75Percent/Sept2012Wksp/WhyHowMeasur.pdf

Finally, for the new statewide goal, CalRecycle uses a definition of recycling that differs from the AB 939 definition of diversion. The statewide 75 percent goal uses a non-technical definition of “recycling” as an umbrella term for just those activities that count toward the goal, which is limited to source reduction, composting, and recycling programs. Several activities that count toward diversion under AB 939 do not count toward recycling under AB 341, including ADC, AIC, other beneficial reuse at landfills, transformation credit, and waste tire-derived fuel. These five activities are instead defined as “disposal-related activities.” Table 1 compares the definitions and disposal reduction goals under AB 939 and AB 341. Biomass conversion has not been part of the waste stream for goal measurement purposes, so it is not included in either column.

Table 1. Comparison of disposal definitions and goals under AB 939 and AB 341.

| | AB 939 | AB 341 |
|--|---|--|
| Goal | 50 Percent Diversion (Jurisdictional Mandate) | 75 Percent Recycling (Statewide Goal) |
| Statewide Disposal Target in pounds per person per day (ppd) | 6.3 ppd | 2.7 ppd |
| Baseline Waste Generation and Base Years in pounds per person per day (ppd) | 12.6 ppd (2003-2006) | 10.7 ppd (1990-2010) |
| Activities that Count Toward Goal | <u>Diversion:</u> Source Reduction Composting Recycling ADC AIC Other Beneficial Reuse Transformation Credit | <u>Recycling:</u> Source Reduction Composting Recycling |
| Activities that Do Not Count Toward Goal | <u>Disposal:</u> Landfilling Exported Waste Disposal Some Transformation Engineered Municipal Solid Waste (EMSW) | <u>Disposal:</u> Landfilling Exported Disposal All Transformation Engineered Municipal Solid Waste (EMSW) <u>Disposal-Related:</u> ADC AIC Other Beneficial Reuse Waste-Derived Fuel |

Amount of Statewide Disposal

The amount of disposal from within the state, or a jurisdiction, is a key metric for determining progress toward diversion, recycling, and disposal reduction mandates and goals. At the state level, California does not currently require ongoing systematic reporting of throughput from recycling and composting facilities. Facilities are required to keep records, and local enforcement agencies review them, but that information is not transmitted to CalRecycle. While source reduction is at the top of the hierarchy and source reduction programs are the most effective at eliminating waste disposal, it is very hard to quantify it in a meaningful way, especially at a macro level. As a result, disposal is the only part of the California waste stream that is systematically tracked and measured.

Disposal Amount Data

Disposal Amounts under AB 939

Using AB 939 definitions, California generated about 87 million tons waste in 2013. Of this, approximately 30.2 million tons were disposed in landfills in California or exported to out-of-state landfills. With a population of about 38 million residents, California had a per capita disposal rate of 4.4 pounds per resident per day. This puts California well below the statewide target of 6.3 pounds per person per day needed to meet the 50 percent diversion mandate. Figure 1 shows that approximately 35 percent of all material generated statewide was landfilled, which results in a statewide diversion rate of 65 percent. However, 2013 was the first year since 2005 to show an increase in the total amount landfilled (Figure 2). Before 2013, statewide disposal had declined from 42.5 million tons in 2005 to 29.3 million tons in 2012. Most of this decline was likely due to the recent recession, but continuing diversion program implementation and improvement undoubtedly contributed as well.

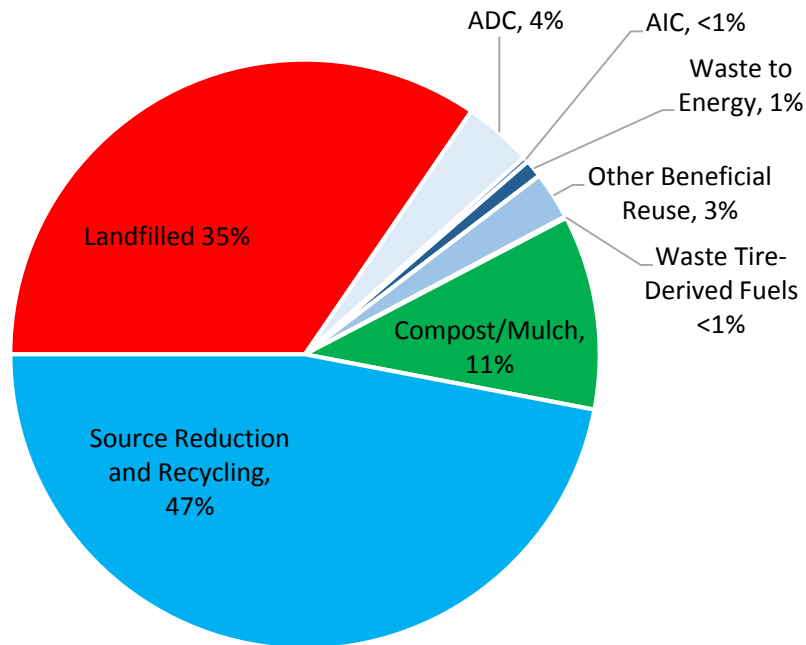


Figure 1. Estimated destination of 87 million tons of waste generated in California in 2013 based on AB 939 definitions. The total generation is determined from the 2003-2006 per person baseline and the 2013 population in California. Quantities of disposal, waste to energy, ADC, AIC, and other beneficial reuse are derived from the Disposal Reporting System (DRS). Waste tire-derived fuel is calculated based on numbers reported to CalRecycle. Estimate for amount composted and mulched is based on published reports for chip and grind facilities, and internal calculations for composting facilities. Source reduction and recycling accounts for the remaining generated waste. Amounts may not add to 100 percent due to rounding.

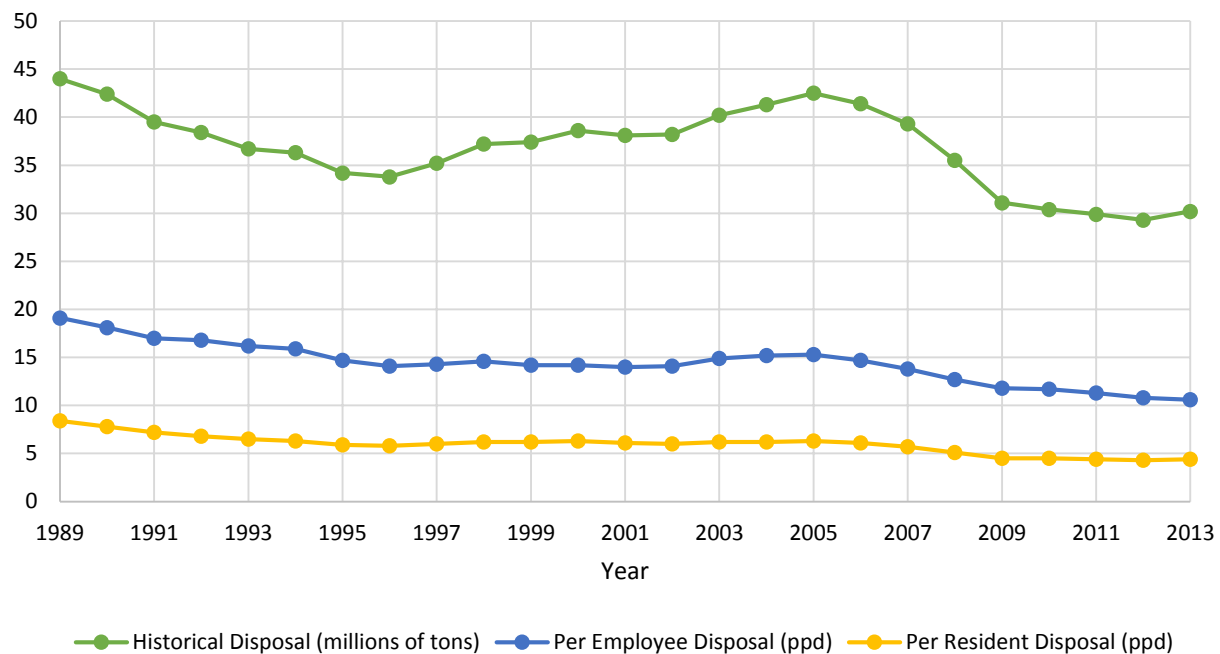


Figure 2. California's statewide per resident, per employee, and total disposal (1989-2013). The Y-axis represents both the number of pounds (per employee per day and per resident per day) and millions of tons disposed for historical annual disposal. Data from DRS.

Disposal and Disposal-Related Amounts under AB 341

Under AB 341, current disposal and disposal-related activities account for a much larger portion of the total generated waste (Figure 3). Landfill disposal and disposal-related activities now count for 50 percent of the generated waste stream, rather than 35 percent under AB 939.

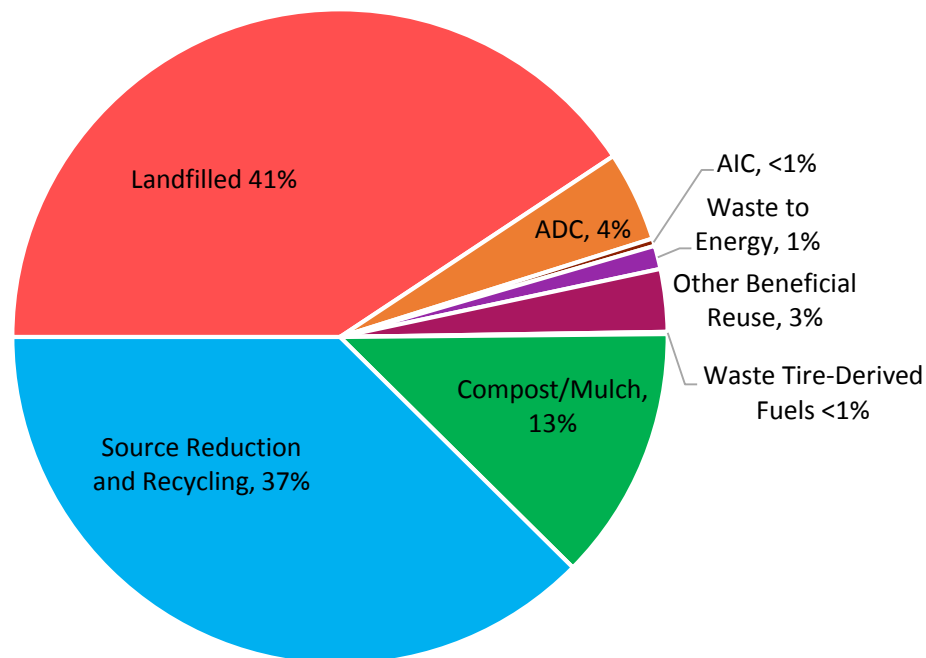


Figure 3. Estimated destination of 74 million tons of waste generated in California in 2013 based on AB 341 definitions. The total generation is determined from the 1990-2010 per person baseline and the current population in California. The remaining values were determined as described for Figure 1. California's recycling rate in 2013 was calculated to be 50 percent. Amounts may not add to 100 percent due to rounding.

Disposal does not remain static. As California's population increases and economic activity picks up after the recession, disposal will rise. Construction activity will increase, and people will buy more things and generate more garbage at their homes and workplaces. In a business-as-usual scenario using a medium-growth projection, California would expect to see a total of 36 million tons of traditional disposal (as defined under AB 939) in 2020 (Figure 4). After adding in the 7 million tons of disposal-related activity, current estimates project about 43 million tons of potential disposal and disposal-related activity in 2020.

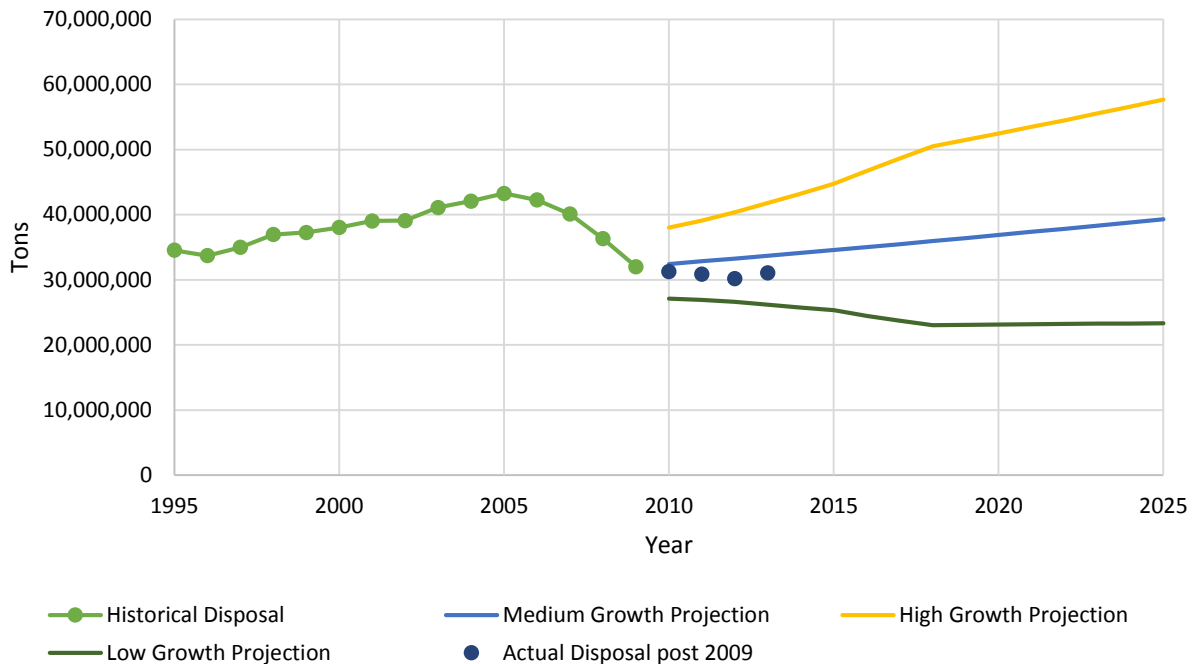


Figure 4. Historical and projected disposal for California, beginning in 2009. 1. Historical 1995-2009 solid waste disposal (landfilled, transformed, or exported for disposal) originating in California as reported to CalRecycle's Disposal Reporting System (connected green dots); 2. projected 2010 to 2025 solid waste disposal using Woods and Poole Inc. econometric data to generate high (yellow line), medium (blue line), and low (green line) growth factors; and 3. actual disposal (dark blue dots) for years after 2009 for comparison purposes (material disposed after 2009 was not used in the projection calculations). Data from FacIT and DRS.

Disposal Amount Findings

If California were treated like a local jurisdiction, the state would easily meet the 50 percent diversion mandate with current disposal amounts. However, to reach a statewide recycling rate of 75 percent, California must reduce disposal and disposal-related amounts by about half; in 2020, out of a projected potential disposal and disposal-related activity of 43 million tons, about 22 million tons of additional material need to be recycled beyond current recycling amounts. As a result, traditional disposal would likely need to drop from the current level of about 30 million tons to between 15 million and 18 million tons (depending on the level of disposal-related activity in 2020).

Disposal Amount Data Collection and Limitations

CalRecycle's Disposal Reporting System (DRS) is the main source of disposal amount data in California. DRS started tracking the amounts and jurisdiction of origin of waste in 1995. While there have been some regulatory revisions and changes to reporting, the

fundamental purposes and requirements of DRS have not changed substantially in the last 20 years.

The primary use of DRS data is to determine disposal amounts for each jurisdiction. This allows the calculation of each jurisdiction's actual annual per capita disposal rate for comparison with its target rate under the requirements of AB 939 (note that this alone does not determine compliance). DRS similarly supports the calculations done to determine California's per capita disposal rate, statewide diversion rate, and statewide recycling rate.

CalRecycle's Disposal Reporting System requires each operator of a permitted solid waste facility (landfills, transfer stations, materials recovery facilities, and transformation facilities) to report disposal data to the county in which the facility is located. The county, in turn, reports these disposal tonnages each quarter to CalRecycle and to the jurisdictions disposing waste within the county's boundaries.

The process for reporting disposal information involves many steps (Figure 5). Haulers report the origin of waste to the landfill, transfer station, or transformation facility. Landfills and transformation facilities track the amount of waste accepted from the hauler and disposed at their facility and record the waste origin for every load. Transfer stations and material recovery facilities record the origin of each load of waste brought to their facilities from a hauler and report it to the landfill or transformation facility where the waste was sent. Landfills and transformation facilities compile the disposal origin information for the quarter and report quarterly disposal information to the county in which the facility is located. Waste exported for disposal is also tracked by haulers, transfer stations, and material recovery facilities and reported to the county on a quarterly basis.

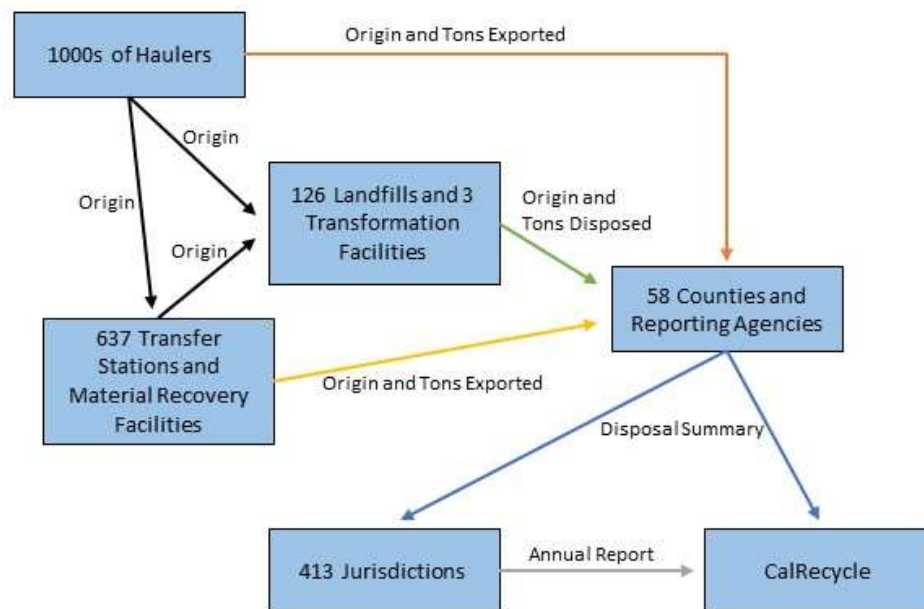


Figure 5. Who Reports in DRS? Flowchart showing how disposal data is reported and tracked by jurisdictions, haulers, facilities, counties, and CalRecycle and the total number of entities for each group that has to report. The jurisdiction total is based on the number of jurisdictions required to report in the 2013 Electronic Annual Report. Transfer station, material recovery facility, landfill, and transformation facility counts are based on 2015 data in FacIT. County counts are based on the number of reporting counties in DRS for 2014. Hauler counts are estimated by research and surveys done by CalRecycle in 2014. Data from DRS, FacIT, the hauler database, and SWIS.

The county then compiles the disposal information and sends it to CalRecycle on a quarterly basis. Twenty-two California counties (representing 36 percent of the state's population and 43 percent of the data records in DRS) use CalRecycle's online electronic [Disposal Reporting System \(eDRS\)](#) to submit their quarterly reports.

In addition to traditional disposal, disposal facilities must also report on other activities in DRS reports, such as alternative daily cover (ADC), alternative intermediate cover (AIC), beneficial reuse (such as road base or erosion control materials used at landfills), and materials sent from landfills for off-site recycling. DRS also tracks waste disposed at California facilities from other states, countries, or tribal lands; however, this waste does not count as disposal generated from within California.

CalRecycle staff reviews the data, compares landfill disposal amounts to those reported in relation to the Integrated Waste Management Fee (IWMF), checks for anomalies, and compiles the four quarters of disposal information submitted into a comprehensive disposal data set for the entire state as well as all counties and jurisdictions.

Late, Incomplete, or Incorrect Quarterly Jurisdiction Allocation Reports

For jurisdiction diversion mandate measurement, DRS information must be timely and accurate. However, facilities and counties frequently submit late disposal reports to CalRecycle, fail to report, provide incomplete or incorrect information, and intentionally misreport information (see discussion below). In addition, some facilities have refused to help jurisdictions verify disposal allocation errors. These issues prevent CalRecycle staff and jurisdictions from reviewing their disposal information in a timely manner to address any inconsistencies. These issues also limit the reliability and usefulness of DRS data for other purposes.

DRS reporting due dates for counties to submit quarterly disposal reports to CalRecycle are set in regulation (California Code of Regulations section 18812.10). CalRecycle disposal report submittal records for 2012 and 2013 show that many counties do not submit disposal reports by the regulatory deadlines and some counties submit incomplete disposal reports. In 2013, 65 percent of mandated 2013 quarterly disposal reports were late, incomplete, or inaccurate (requiring revision or modification after submittal). Figure 6 shows that DRS compliance issues were a statewide problem with counties in all regions having compliance issues in 2013.

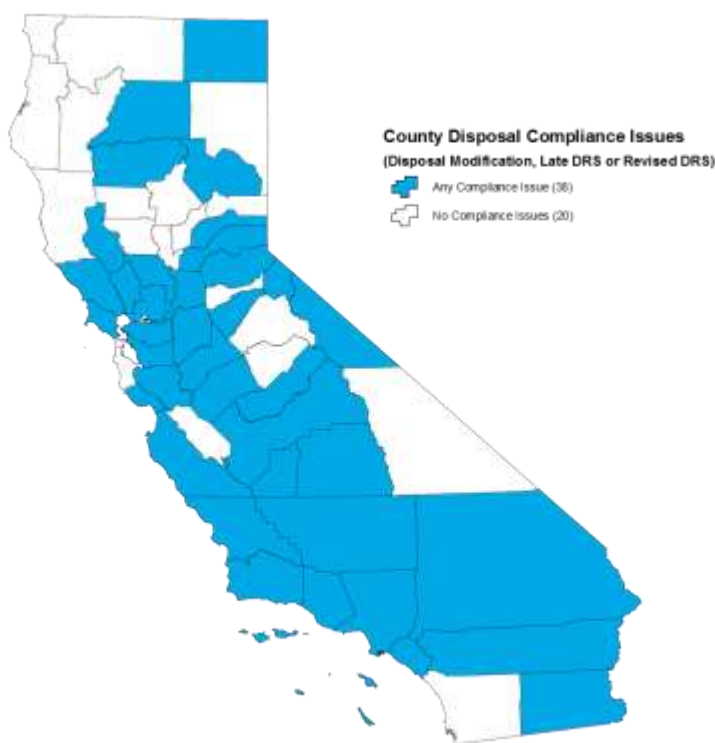


Figure 6. County disposal compliance issues 2013. Map showing counties with a compliance issue in 2013 (blue) and counties without any issues (white). Compliance issues include late, incomplete, or revised quarterly disposal reports, or disposal modifications. Data from DRS and the Electronic Annual Report (EAR).

For one or more quarters in 2012, 35 counties submitted a late report. For one or more quarters in 2013, 13 counties submitted a late quarterly disposal report. Of those reports that were late in 2013, 33 reports were received more than two weeks late. Of those reports that were late in 2012, 11 reports were received more than two weeks late (Table 2). Some counties were late due to oversight, while others submitted late due to late reports they received from landfills. Under the current DRS compliance requirements, CalRecycle's options are limited for getting facilities or counties to submit the reports on time (or at all). If a report was not received by the due date, a letter was sent out asking the late reporter to submit. Late reporting counties were also identified at CalRecycle's monthly public meetings.

In 2013, six incomplete reports were submitted by two counties. Incomplete information prevents CalRecycle and local government staff from being able to investigate allocation issues. In addition, significant staff time is spent determining why reports are incomplete and reminding counties to submit complete, on time reports.

Table 2. Number of counties submitting late or incomplete quarterly disposal reports from 2012-14. Counties may be counted multiple times in the "Number of Late Quarterly Reports" and the "Quarterly Reports More than Two Weeks Late" columns if a county submitted reports late for more than one quarter. Data from DRS.

| Report Year | Number of Late Counties | Number of Late Quarterly Reports | Quarterly Reports More than Two Weeks Late | Incomplete Quarterly Reports by Submittal Date |
|--------------------|--------------------------------|---|---|---|
| 2012 | 35 | 60 | 33 | Not available |
| 2013 | 13 | 26 | 11 | 6 |
| 2014 Q1 | 10 | 10 | 6 | 1 |

Late reports have slowly been declining due to substantially increased CalRecycle staff efforts. However, reports continue to be submitted late, and there have been instances in which inaccurate or incomplete reports were submitted just to meet the due date. Receiving timely reports affords both CalRecycle staff and the jurisdictions the opportunity to review the information and to contact report filers to correct any errors in the disposal information.

Submitting disposal reports on time allows facilities to amend their disposal reports prior to the annual reporting process. This is especially important for the fourth-quarter disposal reports, since they are due April 15, and immediately following this deadline is the formal revision period from April 15 until May 15. All revisions for the year must be submitted by this deadline so disposal information can be finalized by mid-June to accommodate the release of the Electronic Annual Report filing tools to jurisdictions. Receiving timely reports ensures that CalRecycle can meet its deadlines and that jurisdiction disposal data is available for the annual report.

Disposal Modifications to Correct Misallocation Errors

When errors in jurisdiction allocations are discovered after the May 15 DRS revision deadline, the data cannot be corrected prior to jurisdiction annual report submittals. Jurisdictions must then submit a request to CalRecycle to modify their disposal tonnages and disposal rates. Table 3 shows that from 2011 to 2013, numerous jurisdictions requested to change their disposal amounts using disposal modifications for a total of more than 700,000 tons. While the annual amount is not significant at the statewide level, it can significantly impact the diversion rates of individual jurisdictions.

Table 3. Number of disposal modifications 2011-2013. Table showing the number of disposal modifications requested by jurisdictions and approved by CalRecycle for 2011 to 2013 and the total amount of disposal change each year due to disposal modifications. From Electronic Annual Report System.

| Report Year | Number of Disposal Modifications (Due to Misallocations) | Total Change in Tonnage |
|-------------|--|-------------------------|
| 2011 | 41 | 421,630 |
| 2012 | 39 | 219,160 |
| 2013 | 30 | 93,117 |

As Figure 7 shows, from 2011 to 2013, 110 disposal modifications were requested throughout the state. Twenty-five jurisdictions corrected their disposal more than once from 2011 to 2013. Many jurisdictions do not have the time or resources to track disposal amounts, so it is unknown how many other misallocations were not found and corrected.

Disposal Misallocation Modifications, Total Years Per Jurisdiction

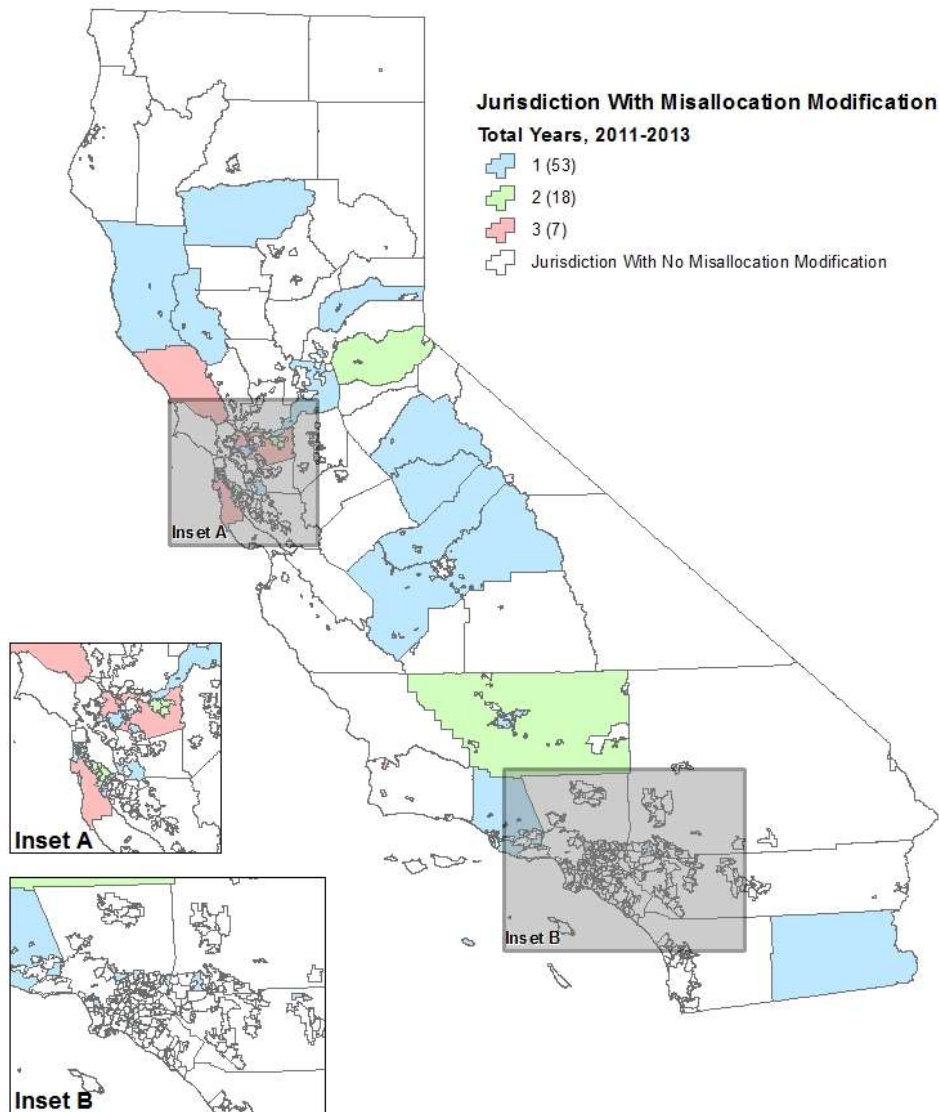


Figure 7. Disposal misallocation modifications, total years per jurisdiction. Map showing jurisdictions with approved disposal modifications from 2011 through 2013. Green and red colors indicate jurisdictions with more than one disposal modification. The number of jurisdictions requesting a disposal modification for one year, for two years, or for all three years from 2011 to 2013 is shown in the map legend. Data from the Electronic Annual Report.

Late and Missing Annual Facility Methods Reports

Facilities also submit late reports or fail to report entirely. As mentioned above, late quarterly reports by facilities are routinely the stated reason for late county reports. In addition to the quarterly reports, disposal reporting regulations require that all permitted disposal facilities submit an Annual Facility Methods Report. Table 4 shows the submittal status for these reports in 2013. CalRecycle received about 70 percent of the reports by the due date. After the initial receipt of reports, CalRecycle staff emailed and contacted the counties with the list of outstanding reports for facilities located in each county. When this report was written, CalRecycle had received an additional 126 reports, which increased the submittal rate to 94 percent. There are still 29 outstanding reports, and CalRecycle staff continue to follow up with counties and facilities.

Table 4. Total number of facilities submitting late or missing annual facility method reports for 2013 report year. Data from DRS.

| Report Year | Total Facilities that Must Report | Late Reports Not Received at the Deadline | Missing Reports as of February 2015 |
|-------------|-----------------------------------|---|-------------------------------------|
| 2013 | 427 | 126 | 29 |

Lack of Facility Cooperation with Jurisdictions on Disposal Accuracy

An important part of disposal reporting is making disposal data available to jurisdictions and allowing them to check the accuracy of disposal allocated to them by facilities. To help jurisdictions review disposal accuracy, disposal data received by CalRecycle is entered in a database, which jurisdictions can access to view their disposal amounts for each quarter and year.

Disposal allocation faces several challenges, including similar or confusing place names, confusion over jurisdiction boundaries, inadvertent misreporting by haulers, or data entry mistakes by a facility that may result in disposal data being unintentionally misallocated to the wrong jurisdiction.

Not allowing jurisdictions the opportunity to identify disposal data collected at the facility prevents a jurisdiction from fully investigating whether disposal allocations were made correctly. In some cases, jurisdictions may dispute the disposal tonnages allocated to their city in a disposal modification request, but with no supporting documentation it is difficult to prove which jurisdiction generated the waste.

In late 2014 and early 2015, two disposal facilities denied jurisdiction requests to review disposal records at two landfills to verify disposal tonnage allocations. Although facilities have the right to claim that the disposal records requested by a jurisdiction are proprietary information, such a claim must be approved by CalRecycle. In these cases, the information was not provided despite CalRecycle's determination that the

information was not protected from disclosure for purposes of DRS verification. This left the jurisdictions unable to review the information or verify its accuracy.

As discussed above, jurisdictions use reported disposal information to calculate their per capita disposal rate. If a jurisdiction's data is misreported or not reported, it could result in a jurisdiction failing to meet the 50 percent disposal reduction mandate. A jurisdiction that fails to meet its numerical goal and fails to adequately implement diversion programs could be put on a compliance schedule and potentially be penalized up to \$10,000 per day.

Issues Impacting Disposal Reporting Accuracy

The four cases below are criminal cases in which a participant in DRS intentionally misreported or failed to report disposal data to a facility, county, and/or CalRecycle. The indirect effects on the disposal reporting system included disposal data not being reported, the origin of waste being incorrectly allocated to jurisdictions, or disposal being classified as other activities. These cases were initiated by whistle-blowers or others reporting the incident to the state or local authorities for investigation, uncovered during investigations of alleged criminal activity or through a company's internal investigations. It is likely that similar instances go undetected. If CalRecycle had comprehensive to investigate or enforce DRS reporting requirements, the increased scrutiny and systematic monitoring could help deter, or more readily identify, these types of activities.

- In 2015, four suspects who worked at the Ox Mountain Landfill as weigh house operators were accused by the San Mateo County District Attorney's Office of underreporting truck weights and misclassifying waste in order to overcharge customers and defraud Republic Services. Prosecutors have charged the men with grand theft, computer fraud, and committing a pattern of fraud and embezzlement.¹ Jurisdictions may have benefitted indirectly by having disposal materials classified as green waste and/or not having materials allocated to them as disposal. Prosecutors claim the defendants defrauded Republic Services of \$1.4 million by misclassifying waste.² The case is pending.
- A 10-month investigation by the San Jose Police Department revealed a bribery scheme that occurred at the Kirby Canyon Landfill in South San Jose. A trucking brokerage bribed Waste Management workers to allow its trucks to circumvent the scales and the gatehouse and pay less in fees, and sometimes was charged no fees to dump its loads.³ This meant that material that was hauled to the facility was not tracked by the facility, county, or CalRecycle. Investigators believe this bribery scheme had been going on for 10 years before it was discovered by a city worker who alerted investigators.⁴ Six people, including the general manager and operation manager, were arrested on felony charges including bribery and embezzlement.⁵ The County of Santa Clara filed a lawsuit against Waste Management of California in order to recover lost revenue, which resulted in a \$2.7 million settlement agreement between the County of Santa Clara and Waste Management of California.⁶ Indirect effects to the disposal reporting system

include material not being tracked as disposal at a facility and material that was hauled to the facility by the waste hauler not being allocated to the jurisdiction of origin.

- According to an attorney general press release, Benz Sanitation was found to have illegally dumped Los Angeles County garbage in a Kern County landfill. The press release stated, “Between January 2008 and September 2012, Benz Sanitation had a waste removal services contract with Kern County that allowed it to take Kern County’s residential garbage and deposit it at local landfills at no charge. During this time, Benz Sanitation also contracted with almost 1,500 residents and businesses in Los Angeles County to remove their residential and commercial garbage. The owner of Benz Sanitation (Paul Michael Benz) then manipulated these contracts by fraudulently mislabeling the Los Angeles County garbage as originating in Kern County so that he could dump it free of charge in Kern County’s landfills.”⁷ Paul Michael Benz, 68, owner and operator of Benz Sanitation, pled guilty in Kern County Superior Court to one felony charge of presenting a fraudulent claim for payment to the government.⁸ Benz was found to have defrauded the county of approximately \$2 million and was required to leave the company and pay \$2,375,000 in restitution.⁹ The indirect effect on disposal reporting included inaccurately inflating Kern County disposal and decreasing Los Angeles County disposal.
- A jury found that the waste management company Recology submitted a false claim to the City of San Francisco for payment under a diversion incentive agreement, after a former employee had alleged that the company committed fraud for CRV and diversion reporting to the city. The diversion incentive agreement was an agreement by the city of San Francisco to financially reward Recology if it achieved certain five-year goals in diverting refuse from disposal in landfills through recycling and reuse.¹⁰ The jury found that in 2008 Recology inflated diversion numbers reported to San Francisco and falsified reports to the city regarding the actual diversion amounts that originated in San Francisco and as a result received the incentive bonus.¹¹ It is unclear if any disposal was intentionally misreported to DRS as a result. Recology was required to pay back the incentive bonus of \$1.3 million to the City of San Francisco.¹² At the time this report was written, the case was being appealed.

Statutes and the DRS regulations lack enforcement provisions. The regulations only have very limited options for encouraging compliance with these rules. If a report is late or not submitted, CalRecycle can report this at a public meeting and publish the names of non-submitters on CalRecycle’s website. Currently, there are no penalties or other enforcement options. The instances and long-term patterns of misreporting in DRS highlight the lack of any effective deterrent mechanisms. Authority for investigations, enforcement actions, and monetary penalties would require legislative action.

Materials Exported for Recycling but Subsequently Disposed

In addition to the export of solid waste to landfills outside of California, an undetermined amount of solid waste is included in exports of recyclable materials. Recyclables that are exported through the port system are primarily distributed to China, Taiwan, and South Korea, where the ultimate fate of the material is unknown. Some clean recyclable materials sent overseas are recycled into new feedstocks or products. It is likely that others are not, instead going to pyrolysis or other thermal technologies. Once potentially recyclable materials leave California, end-uses, greenhouse gas emissions, other environmental impacts, and health concerns are not tracked or quantifiable. Recyclable material from California is also exported to Mexico, Canada, and other states by rail and truck, although there is no data detailing the quantity or composition of material that exits the state in this manner.

When exported, some bales of “recyclable” materials contain trash, other non-recyclable items, or incompatible recyclable items; some bales shipped to China prior to 2013 reportedly had up to 40 percent non-recyclable trash included in a “recyclable” bale. Bales contaminated with trash are difficult to process at recycling facilities and can result in entire bales of mostly recyclable materials being sent to disposal. In order to stem the tide of substandard recyclable bales, China launched “Operation Green Fence” in February 2013. The goal of the 10-month initiative was to prevent the importation of solid waste-contaminated shipments by setting a maximum contamination level of 1.5 percent in each bale. Although the Green Fence officially ended in November 2013, the initiative resulted in significant changes to processing of bales, higher-quality bales of recyclables, and the expansion of domestic markets.

Sending carpet overseas does not count as recycling under CalRecycle’s Extended Producer Responsibility program. For other recyclable materials, exporting counts as recycling even if the material is eventually disposed. This could serve as an incentive to export material rather than send it to facilities located in California, potentially resulting in a loss of green jobs and green energy in California and a net increase in transportation-related GHG emissions and other impacts.

Waste Flows

Knowing how waste flows in California helps paint the picture of the overall solid waste disposal system. Waste flow data helps CalRecycle to identify where waste is generated and how far that waste travels to get to its final destination. Disposal allocation and facility information reported in DRS shows that California's waste stream is very dynamic. Waste generated in one county often flows to landfills located in many counties throughout California. Many factors impact waste flows.

County Waste Flow Patterns

In 2013, no county landfilled all the solid waste created within its borders. Only five counties transported less than 1 percent of their solid waste to a neighboring county's facility. Of those five counties, four of them are considered rural counties by CalRecycle's definition. Most counties sent a significant amount of their solid waste to landfills located in other counties (Figure 8). Thirty eight counties (65 percent of all counties) sent at least 6 percent of their waste to one or more landfills in counties outside their border. Thirteen counties have no landfills and therefore transported all of the waste they generated to facilities in other counties and/or states. Inflow/outflow maps provide detailed information on disposal flows for each county or jurisdiction in California, and can be found on CalRecycle's website at <http://www.calrecycle.ca.gov/LGCentral/Reports/maps/inflowoutflow.aspx>.

Generators vs. Disposers

Some counties generate more waste than they accept, while other counties accept more waste than they generate. As expected, the largest counties by population tend to dispose the most waste in California. In 2013, the top 10 counties (by amount landfilled) created about 22.4 million tons (74 percent) of California's total landfilled waste. Los Angeles, the largest county in the state by population, created about 8.2 million tons (27 percent) of California's landfilled waste. The 19 million tons of disposal from the Southern region represented 61 percent of the states total landfilled waste. Most of the top 10 counties for total disposal had percentages that were similarly proportional to their total population (Table 5).

Table 5. Ten counties that created the most disposed waste. Table showing the top 10 counties in California in terms of percent of total waste they created that was disposed at landfills in 2013 and the percent of population for each county. From DRS and the Department of Finance.

| County | Landfill Disposal Tons | Percent of Statewide Landfilled Waste | Percent of State Population |
|----------------|------------------------|---------------------------------------|-----------------------------|
| Los Angeles | 8,266,415 | 27.4% | 26.2% |
| San Diego | 3,007,351 | 10.0% | 8.3% |
| Orange | 2,757,703 | 9.1% | 8.1% |
| Riverside | 1,843,028 | 6.1% | 5.9% |
| San Bernardino | 1,576,995 | 5.2% | 5.4% |
| Alameda | 1,143,318 | 3.8% | 4.1% |
| Santa Clara | 1,133,189 | 3.7% | 4.9% |
| Sacramento | 1,112,929 | 3.7% | 3.8% |
| Ventura | 793,454 | 2.6% | 2.2% |
| Kern | 759,117 | 2.5% | 2.3% |

Of the 58 counties in California, 45 of them have at least one landfill that accepts some amount of waste. The largest counties by population tended to also be the ones to accept the most waste at their facilities. Table 6 shows the 10 counties that received and landfilled the most solid waste. Those 10 counties landfilled about 75 percent of the total waste landfilled in California. Los Angeles landfilled 6.3 million tons (21 percent) of the state's waste. The next county was Orange, which landfilled 3.6 million tons (12 percent) of the state's waste. The Southern region as a whole accepted and landfilled 18.2 million tons (more than 60 percent) of the state's waste.

Table 6. Top 10 counties that received solid waste for landfilling for 2013. Landfilled tons, percent of waste landfilled, and percent of state population are shown. These amounts represent the top 10 counties and do not add to 100 percent. From DRS and the Department of Finance.

| County | Landfilled Tons | Percent of Statewide Landfilled Waste | Percent of State Population |
|----------------|-----------------|---------------------------------------|-----------------------------|
| Los Angeles | 6,335,810 | 21.1% | 26.2% |
| Orange | 3,604,575 | 12.0% | 8.1% |
| Riverside | 3,201,826 | 10.7% | 5.9% |
| San Diego | 2,938,443 | 9.8% | 8.3% |
| Alameda | 1,403,299 | 4.7% | 4.1% |
| San Joaquin | 1,146,315 | 3.8% | 1.8% |
| San Bernardino | 1,135,422 | 3.8% | 5.4% |
| Ventura | 1,030,894 | 3.4% | 2.2% |
| Santa Clara | 840,086 | 2.8% | 4.9% |
| Kern | 817,935 | 2.7% | 2.3% |

Why Waste Flows Around California

There are many reasons why waste flows between counties in California, including daily limits on facility throughput, geography, local ordinances, hauler contracts, vertical integration, material types accepted, and costs. Limits on how much material disposal facilities can receive are based on the design, operation, and environmental protection concerns at the facilities. Facilities located in dense urban areas can reach these limits before the end of the operational day, causing material to be redirected to facilities farther away from where the waste was generated and collected. Geography can also play a role in waste flows, such as mountain roads that may close due to severe weather or landslides and force haulers to take waste to alternate landfills.

Another reason why waste flows is local waste ordinances. Alameda County and Orange County both have ordinances that direct county waste to local landfills in the county. Hauler agreements with jurisdictions can specify the destination of waste collected. Haulers may also preferentially haul waste to facilities that they operate. In some cases, certain waste types are only accepted at certain landfills. Lastly, the cost for disposal can impact disposal location decisions. Different landfill tipping fees, travel times and distances, and fuel costs can all impact flows.

The average distance waste traveled from jurisdiction to landfill is about 21 miles. The greatest distance traveled for waste in California was from Fort Bragg in Mendocino

County to a landfill 130 miles away in Solano County. Mendocino County has no active landfills. Four of the five counties that transport waste the longest distances are considered by CalRecycle to be rural. Haulers for these counties may travel from 64 miles to 130 miles to landfill waste. In comparing average distance traveled for haulers in a region, waste from the Bay Area on average travels the farthest at 35 miles to landfill, while waste from the Southern region travels only 14 miles.

Another waste flow consideration is the tipping fee that landfill operators charge to accept solid waste. As researched in CalRecycle's tipping fee report, California had a posted self-haul (not negotiated rate) median tipping fee of \$45 per ton or \$13 per cubic yard in 2013.¹³ However it is important to note that prices vary by location. Pebbly Beach landfill, which is located on an island, had the highest tipping fee of \$126, while the lowest tipping fee was at Salton City Landfill in Imperial, with a tipping fee of \$12.49. In addition, there are many landfills that do not charge a fee for certain customers and/or specific materials. The tipping fee report can be accessed on CalRecycle's website at <http://www.calrecycle.ca.gov/Publications/Detail.aspx?PublicationID=1520>.

A topic that has been discussed and considered by some counties due to facility closures or lack of available disposal capacity is rail-haul of solid waste to a landfill. In the early 1990s, Los Angeles County looked at rail-haul to manage its solid waste. The plan was for Los Angeles to transport solid waste to a remote facility for disposal. Recently, Los Angeles built a station to allow for rail-haul of solid waste in anticipation of the closures of its largest solid waste facility, Puente Hills Landfill.¹⁴ However, this plan appears to have been abandoned due to increased costs of rail-haul versus sending waste to facilities located in nearby counties.¹⁵ In the late 1990s, Napa County exported waste to Washington State. At this time, CalRecycle has no knowledge of any rail-haul stations in California outside Los Angeles County.

Export to Other States

Export is the transport of solid waste outside the state of California for disposal. Every year California exports waste to neighboring states, and CalRecycle has tracked this data in the Disposal Reporting System since 1995. Since then, exports have ranged from a low of 0.8 percent of total yearly disposal in 2012 to a high of 2.6 percent in 1999.

In 2013, 273,496 tons of material was exported to landfills in Nevada, Arizona, and Oregon. The exported waste accounted for approximately 1 percent of the landfilled waste in 2013. The two counties that created about half of the amount exported in 2013 were Sacramento and Nevada County, which exported their waste to the state of Nevada. Figure 9 shows the locations of the five out-of-state landfills that accepted California waste in 2013.

Exports occur for various reasons, including cheaper landfilling costs or physical proximity. Of the counties that exported waste out of state, a majority of them are located next to a state border. In some cases, these facilities are the closest facility for a

particular jurisdiction. Convenience of transporting the waste to these facilities appears to be a major factor for exports. Another aspect is the costs for disposal at these facilities. Many counties send their waste across the border to neighboring states because the landfill tipping fee is cheaper. For example, Dry Creek Landfill in Oregon has a tipping fee of \$26, which is well below the median price for California facilities. In some areas, winter road closures may result in the seasonal flow of waste out of the state.



Figure 9. Out-of-state facility exports in 2013. Location of five facilities outside California that received solid waste from California in 2013, and the counties that shipped waste to those facilities. Data from DRS.

Imports

Some waste is imported from outside of California for disposal at California landfills. In 2013, solid waste imports totaled 61,730 tons. Imported waste accounts for less than 1 percent of waste landfilled in California. Most imports come from the 116 federally recognized Native American tribes that are located throughout California. These tribes sent more than 44,000 tons of solid waste to landfills in California. The remaining imports come from a variety of locations such as international waters, neighboring states, and rail-haul. In 2013, Azusa Landfill accepted 9,000 tons of tires from other states for disposal.

Disposal Flow Data Collection and Limitations

Disposal flow data is based on disposal reported in the disposal reporting system. The same issues that affect the accuracy of disposal reporting data may impact disposal flow data. Misallocation or misreporting of disposal data could affect county flow data if disposal data is incorrectly reported at the county level. Most allocation issues are found at the jurisdiction level, so they should not have a great effect on the accuracy of county flow data.

Composition of Statewide Disposal

Different activities and behaviors by individuals and businesses result in the generation of different material types. Knowing the types and amounts of individual materials in the waste stream is useful for many purposes, including policy development, program planning, market development, assessing the effectiveness of strategies meant to reduce or remove target materials from disposal, and charting progress toward reducing landfilled wastes that create greenhouse gases.

Disposal Composition Data

At the material class (category) level, organic materials make up about a third of statewide disposal, another third is inert materials (such as many constituents of construction and demolition debris), and the final third is comprised of a variety of materials including paper and other common recyclables (Figure 10).

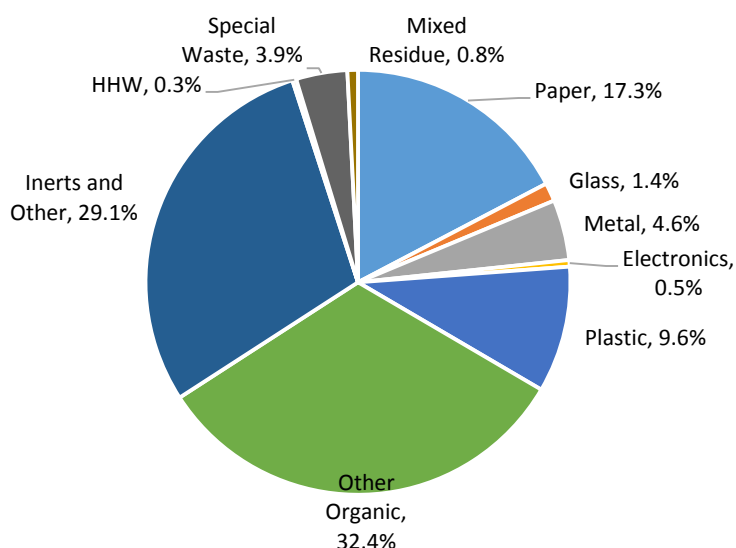


Figure 10. Overall composition of California's waste stream. Amounts may not add to 100 percent due to rounding. From CalRecycle's 2008 waste characterization study.

| Material Class | Estimated Percent |
|------------------|-------------------|
| Other Organic | 32.40% |
| Inerts and Other | 29.10% |
| Paper | 17.30% |
| Plastic | 9.60% |
| Metal | 4.60% |
| Special Waste | 3.90% |
| Glass | 1.40% |
| Mixed Residue | 0.80% |
| Electronics | 0.50% |
| HHW | 0.30% |
| Total | 100% |

At the more detailed material type level, the top 10 most prevalent material types reflect the same relative pattern, with organics (food and green waste), inerts, and common recyclables (cardboard) all contributing to a significant percentage of disposed waste (Table 7).

Table 7. Ten most prevalent material types in California's overall disposed waste stream. Any differences in sums are due to rounding. From CalRecycle's 2008 waste characterization study.

| Material | Estimated Percent | Cumulative Percent | Estimated Tons |
|--------------------------------------|--------------------------|---------------------------|-----------------------|
| Food | 15.5% | 15.5% | 6,145,120 |
| Lumber | 14.5% | 30.0% | 5,765,482 |
| Remainder/Composite Inerts and Other | 5.5% | 35.5% | 2,175,322 |
| Remainder/Composite Paper | 5.2% | 40.7% | 2,056,546 |
| Uncoated Corrugated Cardboard | 4.8% | 45.5% | 1,905,897 |
| Remainder/Composite Organic | 4.3% | 49.8% | 1,719,743 |
| Leaves and Grass | 3.8% | 53.6% | 1,512,832 |
| Bulky Items | 3.5% | 57.1% | 1,393,091 |
| Carpet | 3.2% | 60.3% | 1,285,473 |
| Rock, Soil, and Fines | 3.2% | 63.5% | 1,259,308 |
| Total | 63.5% | | 25,231,814 |

Disposal Composition Findings

In terms of overall material types in the waste stream, many materials are being disposed that can be recycled. Lumber and uncoated corrugated cardboard make up 19 percent of the waste stream and are typically recyclable. Compostable materials, including food, leaves, and grass account for almost 20 percent of the statewide disposed waste stream.

The majority of recyclable materials in the waste stream, such as paper, metal, and plastic, are uncontaminated and could be readily recycled if removed from the waste stream. Based on contamination data collected in the 2008 waste characterization study, recyclables and organics that could be easily diverted account for about 44 percent of what is disposed in California's landfills.

Disposal Composition Data Collection and Limitations

Waste characterization data is usually collected by taking samples of waste from trucks at disposal facilities, sorting it into material types like newspaper and aluminum cans, and weighing each type. CalRecycle's studies estimate the quantity and composition of the commercial, residential, and self-hauled waste streams in California and aggregate the sector data to estimate the overall composition of the waste stream. Samples can

also be taken directly from dumpsters at business sites and sorted to obtain detailed information on waste from the commercial sector.

The 2008 waste characterization study, the most recent study, contains comprehensive information on materials disposed at solid waste facilities throughout the state. More than 750 samples were sorted at 27 disposal facilities around the state over four seasons.

A CalRecycle staff review of other state websites showed nearly half of the states individually track construction and demolition material, while fewer states individually track ash, yard waste, tires, and a variety of other materials. CalRecycle does not require ongoing tracking of the amounts of individual materials in the disposed waste stream; instead, CalRecycle relies on periodic waste characterization studies to determine waste stream composition. One exception to this is the tracking of tires, which are monitored as part of the Waste Tire Manifest System. CalRecycle also tracks the amounts of used oil, household hazardous waste collection activities, and electronic waste handling, but these materials are outside the definition of solid waste.

Characterization studies are designed to provide statistically reliable data on the types and amounts of materials examined. However, they do have some inherent challenges and limitations.

Study Frequency

These studies provide data that represents a snapshot in time. Information can become outdated and misleading over time. This is particularly true when significant demographic or economic changes occur (such as the recent recession), when consumer behavior or product choices change significantly (such as the shift away from glass containers), or when business or manufacturing processes change (such as the rise in e-commerce). Additionally, the 75 percent statewide recycling goal, mandatory commercial recycling, and mandatory commercial organics recycling will have major impacts on the amount and composition of waste as programs expand to meet them. The frequency of these studies is directly related to the accuracy of determining the composition of the waste stream, so it would be beneficial to conduct more studies to keep the data fresh and accurate.

Prior to the 2008 study, CalRecycle conducted statewide waste characterization studies in 1999, 2004, and 2006. CalRecycle conducted a study in 2014, and the results will be available in May 2015. The disposal facility-based portion of the 2014 study followed the method used in 2008 and provides similar comprehensive data on solid waste materials disposed in landfills.

California has endured a major economic downturn and has only recently recovered. In addition, many cities have implemented new programs since 2008 to divert and/or recycle waste. The 2014 waste characterization study will be a good assessment of California's progress toward several 2020 goals.

In order to gather the data necessary to evaluate the state's success in meeting the GHG reduction goals in AB 32, the 75 percent statewide recycling goal and the mandatory commercial recycling goals in AB 341, and the mandatory organics recycling goal in AB 1826 (Chesbro, Chapter 727, Statutes of 2014), CalRecycle will need to conduct another comprehensive statewide waste characterization study in 2020. However, the nature of the waste stream is constantly changing, and new materials may emerge that may be of concern due to toxicity or decreased ability to be recycled. To help evaluate the progress of these laws, it could be useful to conduct a study in 2017 to identify changes of concern and provide data to assess progress that would aid in any mid-stream corrections that may be needed to ensure achievement of the goals in 2020.

Representative Data and Cost

To ensure that the study results are correct, studies must build in rigorous data collection methods. Sampling must be random and representative of the seasons and regions in the state. As a result, statewide characterization studies are costly and time-consuming. However, there is no other way to gather this type or quality of data on the waste stream.

Study Participant Cooperation

In general, many facilities have cooperated and assisted in CalRecycle's studies when asked. However, a lack of cooperation from the facilities involved may result in flawed data or prevent a study from being as representative or useful as possible. In the 2006 study "2006 Characterization and Quantification of Residuals from Material Recovery Facilities," numerous facilities (70 percent) either outright declined to participate in the study or failed to respond to numerous requests for data. As a result of this low level of participation and cooperation, there is insufficient information from the study to significantly impact policy decisions and program planning.

While participant cooperation can be challenging in generator-based sampling, the pool of participants is also much larger than the number of disposal facilities in California. Participation by generators is voluntary, but usually enough businesses agree to participate to meet data collection goals. However, many businesses must be contacted (at least 10 times more than the number of businesses that are needed) in order to recruit enough for the study.

Waste Sectors

Human activity generates waste, whether it is created by a residential family or as the result of a business endeavor. Some of that waste will be recycled or composted, while the rest will be disposed. It is important to know how much of what type of waste is disposed by the residential and commercial sectors in order to best develop policies, target materials for recycling, and promote programs to increase recycling of materials away from landfills. More detailed data on the composition and amounts of waste from different business groups within the commercial sector can make these tasks even more effective.

Disposal Sector Data

In 2008, approximately two-thirds of California's waste stream came from commercial sources. The remaining third came from residential sources. Combining this 2008 source data with 2013 DRS disposal amount data shows commercial sources responsible for 20.1 million tons of disposed waste and residential sources responsible for the remaining 10.1 million tons.

In order to understand the flow of disposed materials, another consideration to take into account is how material is transported to the disposal facility. Approximately 80 percent of solid waste in California is transported from the source of generation through the solid waste infrastructure to a landfill by a solid waste hauler. The other 20 percent is self-hauled by the generator of the waste. This distinction matters because it affects how materials are handled at facilities and how they can be processed or targeted for recycling programs. Therefore, CalRecycle's waste characterization studies distinguish three sectors: the residential sector, in which waste is collected and brought to disposal facilities by haulers; the commercial sector, in which waste is also collected and brought in by haulers; and the self-haul sector, in which waste is brought to facilities by the generator. The self-haul sector is subdivided into residential and commercial sources.

Figure 11, Figure 12 and Figure 13 show the overall waste compositions by individual sector. The waste-hauler commercial sector is the largest disposal sector statewide at nearly 50 percent. The waste-hauler residential sector makes up another 30 percent, and the self-haul sector makes up the remaining 20 percent.

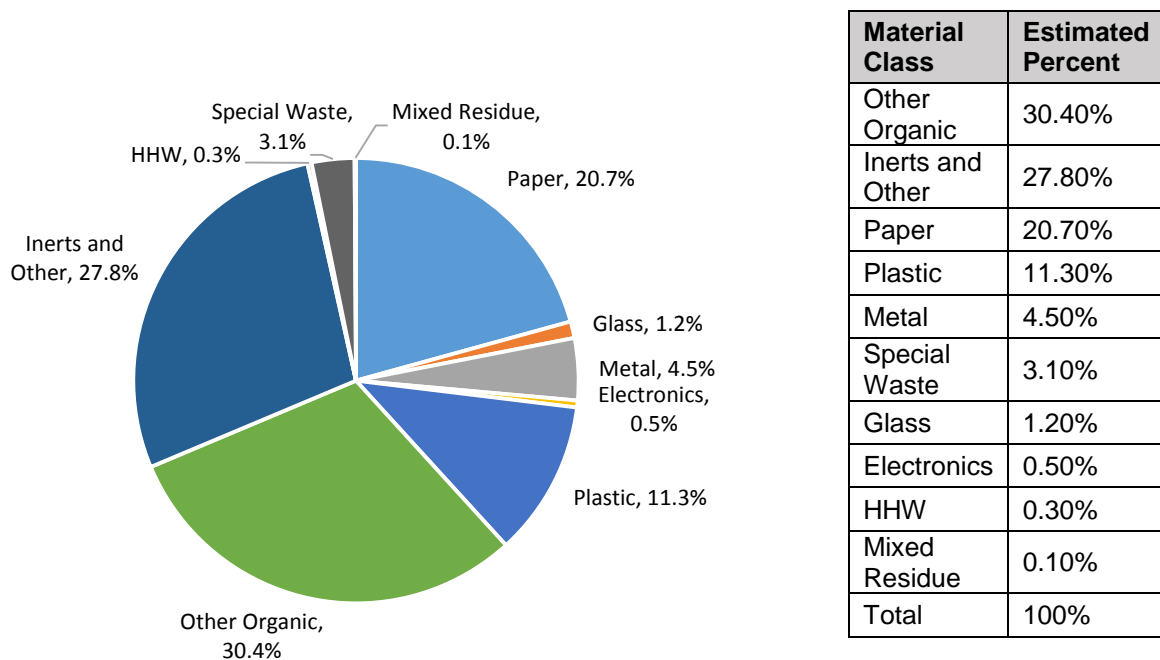


Figure 11. Overview of commercial disposed waste. Chart and table showing the overall waste composition by material class for the commercial sector. Amounts may not add to 100 percent due to rounding. From CalRecycle's 2008 waste characterization study.

Commercial waste is collected by waste haulers from businesses, industries, institutions, and government sites. It includes all waste from these sources that is disposed in municipal solid waste landfills. The United States Environmental Protection Agency (U.S. EPA) does not include industrial waste or construction and demolition debris as part of the municipal solid waste stream, but California does include these with the commercial waste sector. Therefore, overall waste amounts, per capita amounts, and amounts of inerts disposed may appear higher in California than in other states or the nation as a whole.

As mentioned above, commercial sector disposal estimates can be made for individual business groups. Within the commercial sector, CalRecycle has disposal composition data for 29 business groups (e.g. restaurants, retail stores, and medical facilities). This information can be found on the CalRecycle website (<http://www.calrecycle.ca.gov/WasteChar/JurisSel.asp>) and is based on a compilation of data from the 1990s. The 2014 waste characterization study will be used to update and

improve this data set by examining the materials that businesses place in both disposal and recycling bins.

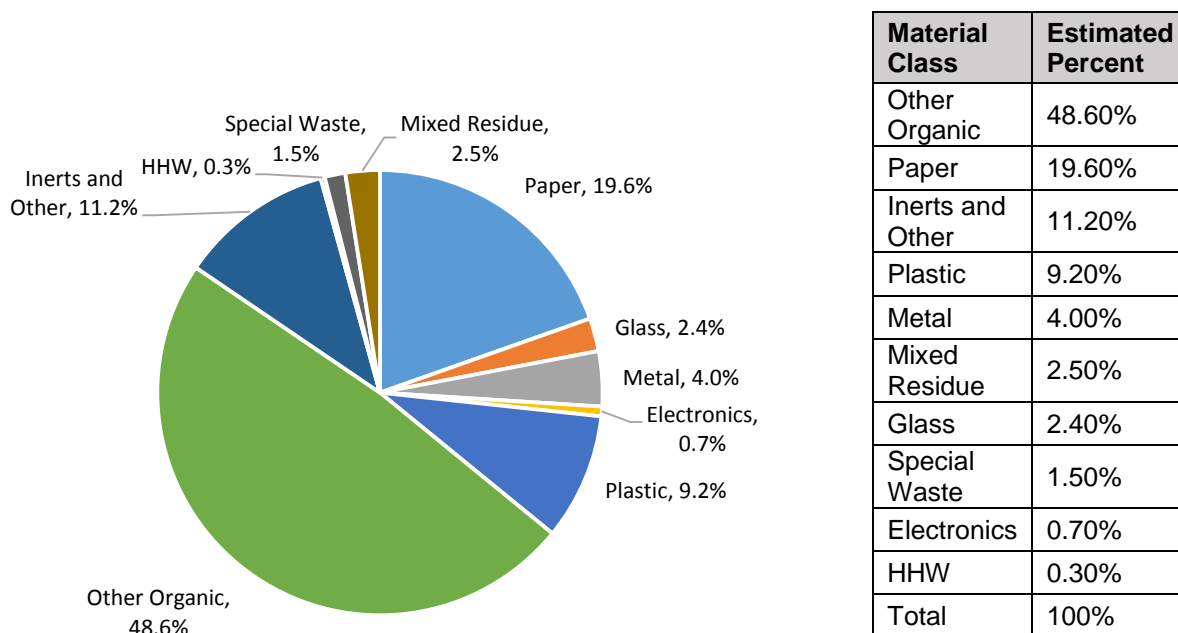


Figure 12. Overview of overall residential disposed waste. Chart and table showing the overall waste composition by material class for the residential sector. Amounts may not add to 100 percent due to rounding. From CalRecycle's 2008 waste characterization study.

The residential sector can be further divided into the subsectors of single-family residential, which consists of 8,811,100 housing units and makes up 21.6 percent of California's disposal, and multi-family residential, which consists of 4,692,734 housing units and makes up 8.4 percent of California's disposal.

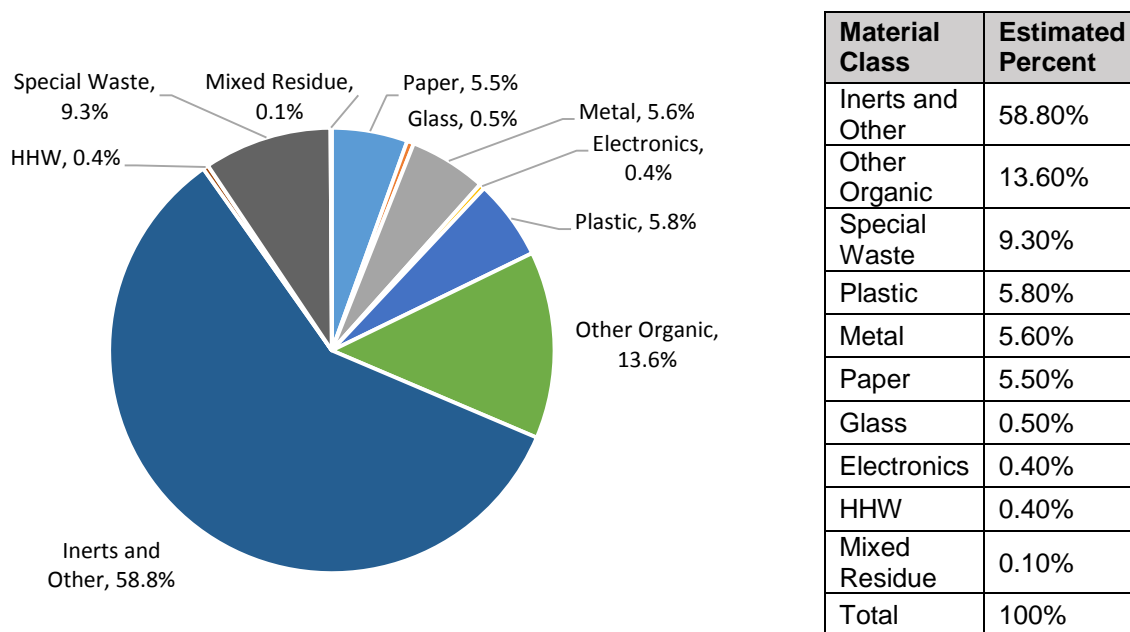


Figure 13. Overview of Overall self-hauled disposed waste. Chart and table showing the overall waste composition by material class for the self-haul sector. Amounts may not add to 100 percent due to rounding. From CalRecycle's 2008 waste characterization study.

The total self-hauled waste can be divided into residential self-haul (3.3 percent) and commercial self-haul (17.2 percent). Residential self-hauled waste appears to come predominantly from property cleanups, home remodeling, and rural homes without regular solid waste collection service. Commercial self-hauled waste appears to come predominantly from construction and demolition projects, roofing, businesses that do not contract for any/all of their disposal collection, and associated services such as landscapers.

Disposal Sector Data Findings

Food was the most prevalent disposed material in the residential sector, at 25 percent of waste disposed in 2008. Lumber accounted for 7 percent of the residential sector, and even with the abundance of yard waste collection programs in California, leaves and grass made up another 6 percent of the residential waste stream. Recyclable paper and cardboard contribute another 7 percent to the waste stream. In total, these divertible materials made up 45 percent of what residences disposed in 2008.

While California businesses have recovered a considerable amount of recyclable material in the past two decades, the amount of easily recycled material still being disposed by the commercial sector shows further opportunities to recycle more. Lumber, food, and cardboard were the top three materials, accounting for 38 percent of commercial disposed waste. Mandatory commercial recycling was implemented statewide starting in July 2012. The 2014 waste characterization study may provide

information to assess the preliminary impacts of this law. Mandatory commercial organics recycling will be implemented statewide starting in 2016. The 2014 study will provide a good base against which to measure the effectiveness of this new program.

The self-haul sector is primarily composed of waste from construction and demolition, including roofing activities. While many local governments have taken steps to deal with construction and demolition debris (such as C&D recycling ordinances), self-haul disposal was still dominated by materials such as lumber (23 percent), rock, soil, and fines (10 percent), and asphalt roofing (9 percent) in 2008.

Disposal Sector Data Collection and Limitations

In CalRecycle's 2008 waste characterization study, of the 750 samples characterized, 250 were done for each of the three sectors. A total of 6,896 vehicles were surveyed at 42 different solid waste facilities around the state. As vehicles entered the facility, the driver was asked whether the source of the load was residential or commercial, and the type of hauler (waste hauler or self-hauler) was recorded for the load.

A CalRecycle staff review of other state websites showed nearly half of the states track the amounts of industrial waste, while fewer states track commercial waste separately. CalRecycle does not require ongoing tracking of amounts of waste from individual sectors in the disposed waste stream; instead, CalRecycle relies on periodic sector surveys to allocate disposal to sectors. Historically, these have been done in conjunction with the previously discussed waste characterization studies.

The 2014 waste characterization study will look in-depth at the commercial sector by studying business disposal directly from the dumpster at the business and business recycling directly at the business. This generator-based (business) study will characterize waste disposed and recycled by specific commercial generators, by characterizing samples taken from both waste containers and recycling containers at individual business sites, and aggregating data to the statewide level. This data will help assess commercial recycling efforts and provide general information on the performance of current commercial recycling programs.

Sector studies are designed to provide statistically reliable data on the types and amounts of materials in each sector and gather data on the hauling methods used. However, they do have some inherent challenges and limitations.

Study Frequency, Representative Data, Cost

The following issues for study frequency, representative data, and cost are key factors in the success of sector studies and tracking sector data:

- Frequent sector studies can keep sector data updated and accurate. In order to track the 75 percent statewide recycling goal and the mandatory commercial recycling goals in AB 341, and the mandatory organics recycling goal in AB 1826 (Chesbro, Chapter 727, Statutes of 2014) , CalRecycle could conduct another

sector study in 2020. An additional sector study could be conducted in 2017 if mid-course data is needed on the interim trends in commercial disposal before 2020.

- Studies must build in rigorous data-collection methods, and sampling must be random and representative of the seasons and regions in the state. Statewide sector studies are costly and time-consuming, but they are one of the best methods of capturing accurate sector data.
- Performing waste sampling and sorting at disposal facilities requires the assistance of those facilities, so facility cooperation is a crucial factor in the success of sector studies. Sector studies are less intrusive and require less of a commitment of facility time and resources than the on-site sorting required for characterization studies, so cooperation may be higher in cases in which sector sampling is done independently.

Disposal Flows and Facilities

Of the 30 million tons of solid waste delivered to disposal annually, an estimated 42 percent is sent to transfer stations and then sent to a landfill, 38 percent is directly hauled to the landfill from the collection company (solid waste haulers) or the generators themselves, and 20 percent is sent from material recovery facilities (materials that could not be recycled) (Figure 14).

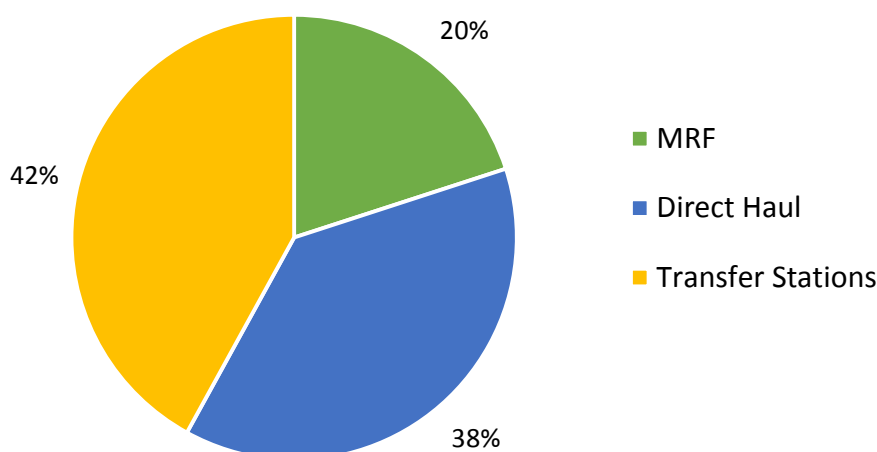


Figure 14. Estimated percentage of waste sent to landfill by source. The chart represents 30 million tons of solid waste delivered to disposal annually, and the sources represent waste sent directly to the landfill (Direct Haul), waste sent to transfer stations and then the landfill (Transfer Stations) and waste from materials that were processed at a material recovery facility that could not be recycled (MRF). Data from DRS, CalRecycle's 2014 waste characterization study, and the 2006 MRF study.

The disposal infrastructure in California is a system of interrelated facilities that perform different functions (Figure 15). Understanding the infrastructure is essential to understanding the flow of waste materials from collection through processing and ultimately to final disposal. The system is dynamic and flows are constantly changing, based on factors such as facility capacities, costs, material markets, local services contracts, solid waste company dynamics (e.g. vertical integration), changes to facilities, and other factors.

Once waste is collected from the generator, it may be taken to a wide array of facility types by the collection company (solid waste hauler). Waste may also be taken to a facility by the generators themselves (self-haulers). Often several types of facilities may be co-located: For example, a MRF and transfer station may be at the same site, and

loads of waste may be directed to one or the other depending on the amount of recoverable materials present in the load.

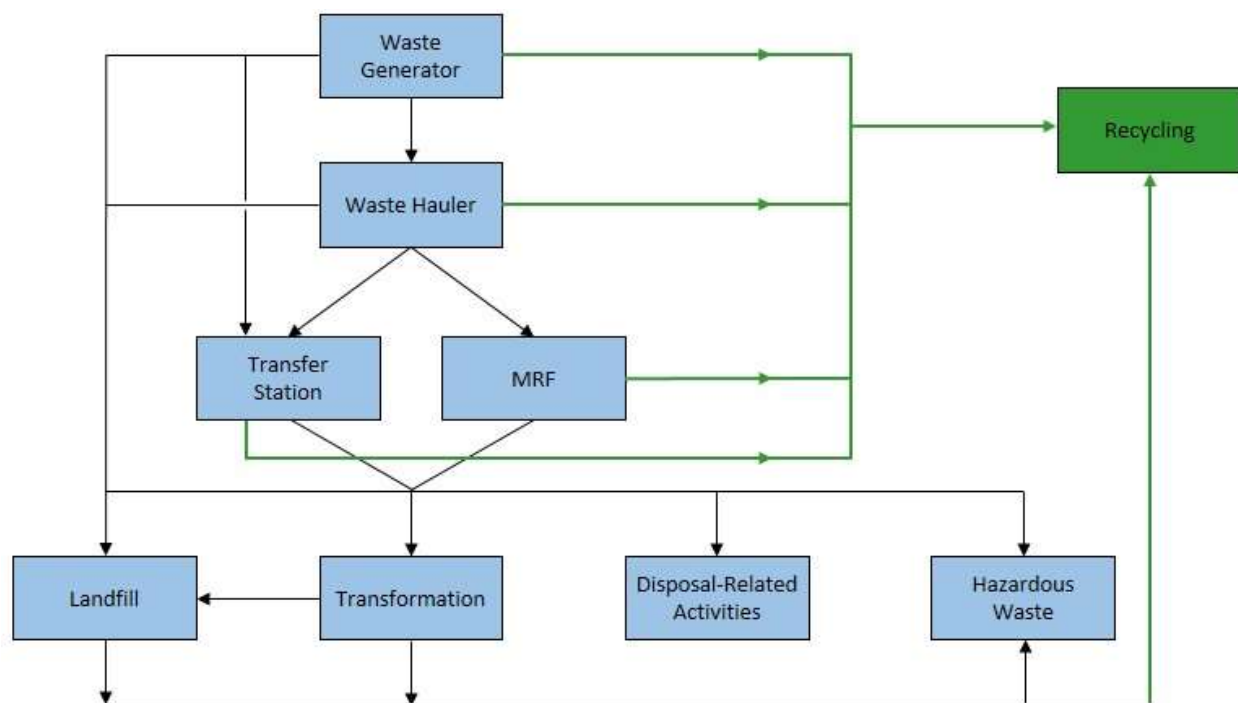


Figure 15. Solid waste system flow chart. Chart describing the many ways waste can flow from the waste generator. Waste can be directly hauled to the landfill from the waste generator. Waste can be transported by a waste hauler and sent directly to a landfill or to transfer stations or material recovery facilities before being sent to a landfill. The final end uses for solid waste include landfiling, incineration at a transformation facility, disposal-related activities such as alternative daily cover, alternative intermediate cover, and beneficial reuse, and disposal at a hazardous waste facility. Generated waste may also be recycled at any point in the process.

Solid Waste Hauling

Consumers are the first component in the solid waste infrastructure because they are the waste generator. Solid waste haulers are typically the second component of California's disposal infrastructure. Much of California's progress in relation to the 50 percent mandate is a result of the cooperative relationships between local governments and their haulers in implementing recycling and composting programs. As discussed in the Disposal Sector section, solid waste haulers are responsible for the movement of more than 80 percent of California's waste from the generators that created it to a processing or disposal facility. Solid waste haulers can be either privately or publicly owned and operated.

Many jurisdictions have exclusive franchise agreements with their haulers. Many of these agreements stipulate where the waste will be disposed and include a guarantee that a certain percentage of the waste collected will be diverted from landfilling or disposal-related activities.

Several of the major haulers also maintain their own disposal facilities. This can impact the flow of waste if haulers preferentially deliver waste to their own facilities (vertically integrate). According to CalRecycle's Solid Waste Information System (SWIS), the four companies that operate the most landfills within California (Recology, Republic Services, Waste Connections, Inc., and Waste Management, Inc.) together own or operate more than 50 disposal, transfer, processing, and composting facilities throughout the state.

Solid Waste Hauling Data

The maps in the two sections below show the distribution of residential and commercial hauling arrangements. Hauler data is based on CalRecycle staff review of jurisdiction websites, solid waste hauler websites, and jurisdiction annual reports. Data may not be complete due to incomplete, missing, or out-of-date data on hauler and jurisdiction websites, especially in the commercial sector, for which some websites did not provide hauler data. For some jurisdictions, it was difficult to determine which haulers operated there. In jurisdictions with multiple haulers, an effort was made to identify the primary hauler, but a primary hauler may not exist. For these reasons, this data is considered preliminary.

Residential Sector Solid Waste Hauling Data

Figure 16 shows which jurisdictions in the state are served by more than one hauler and which are served by a single hauler. Figure 17 further breaks down this information and shows the distribution of private and public residential haulers for each jurisdiction. The map shows jurisdictions that use publicly operated haulers or have agreements with private haulers. For jurisdictions with multiple haulers serving the jurisdiction, only the primary hauling company is shown. There are about 141 haulers serving the residential sector in California; this count includes governmental haulers and parent companies (multiple subsidiary haulers with the same parent company were counted as one hauler). To keep the map readable, the top 10 haulers serving the most jurisdictions are listed, including the number of jurisdictions each hauler serves. Smaller private haulers that have hauling agreements with six or fewer jurisdictions are included under "Other" and serve the 179 remaining jurisdictions.

Jurisdictions With Multiple Residential Haulers

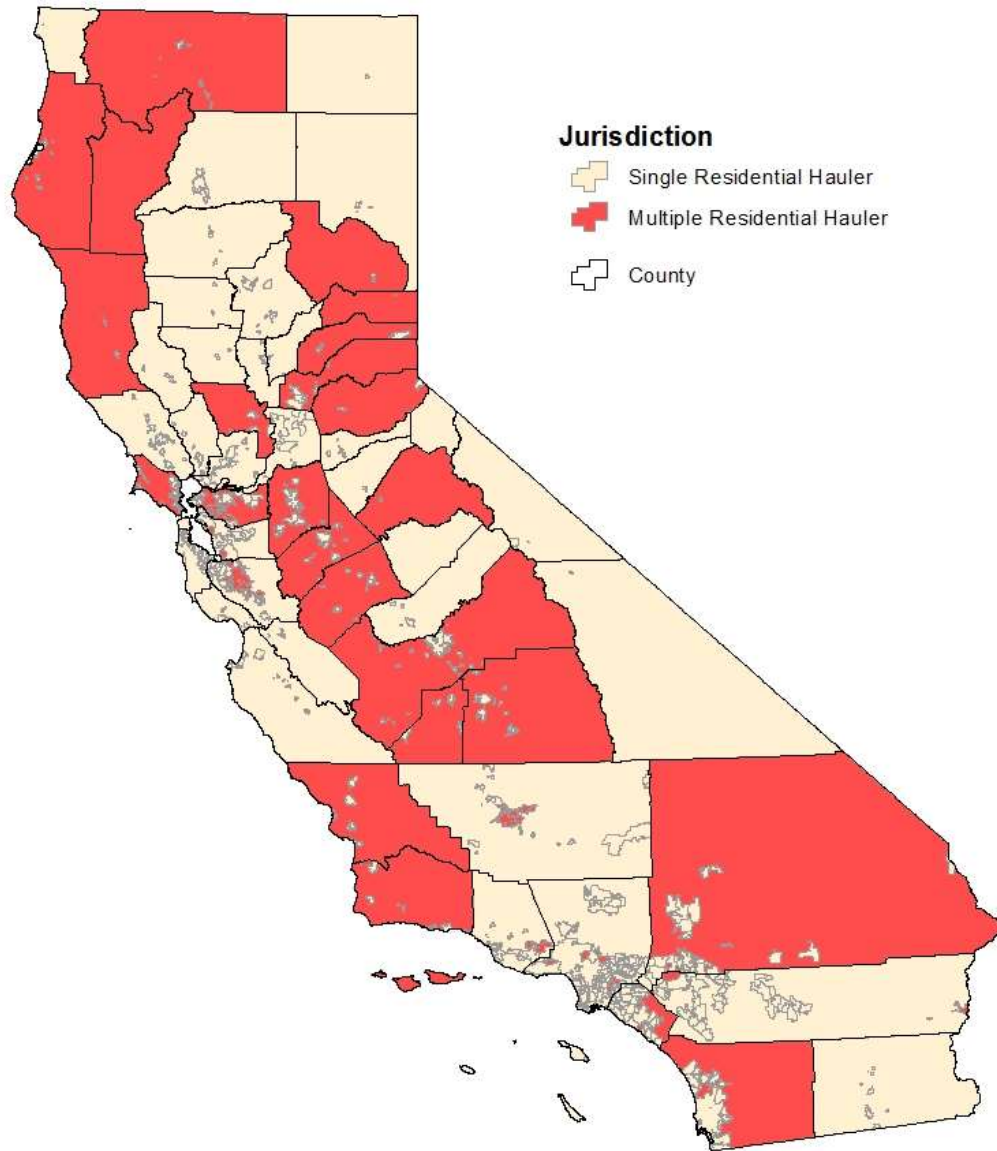


Figure 16. Jurisdictions with multiple residential haulers. Map showing jurisdictions where multiple haulers have residential contracts with the jurisdiction and jurisdictions where a single hauler has a residential contract with the jurisdiction. Data from CalRecycle hauler database, 2015.

Residential Hauling Agreements

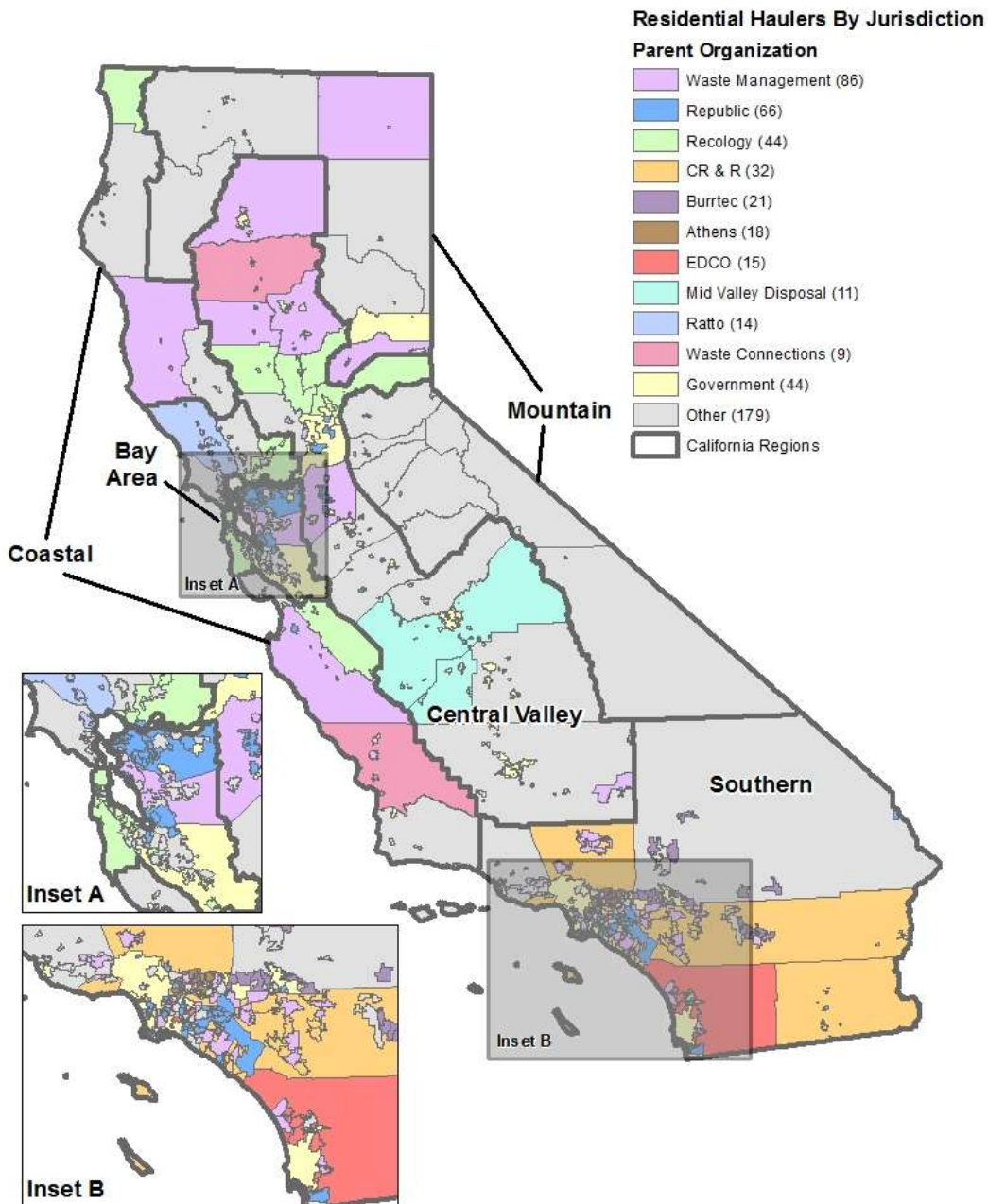


Figure 17. Residential hauling agreements by jurisdiction showing government haulers, large hauling companies, or other independent private haulers. The top 10 haulers in terms of jurisdictions served are shown, while the “Other” category represents smaller hauling companies that serve six or fewer jurisdictions. Data from CalRecycle hauler database, 2015.

In the Mountain region, most jurisdictions handle residential waste through agreements with smaller private haulers that only serve a few jurisdictions (“Other” on map). In the Coastal region, most jurisdictions handle residential waste through a mix of larger haulers and smaller haulers. In the Bay Area region, most jurisdictions handle residential waste through agreements with larger haulers. In the Central Valley region, most jurisdictions handle residential waste through agreements with a mixture of large and smaller haulers. In the Southern region, most jurisdictions handle residential waste through agreements with a mixture of large haulers and smaller haulers.

Commercial Sector Solid Waste Hauling Data

Figure 18 shows jurisdictions in the state that are served by more than one hauler or by a single hauler for the commercial sector. Figure 19 further breaks this down and shows the distribution of private and public commercial haulers for each jurisdiction. The map shows jurisdictions that use publicly operated haulers or have agreements with private haulers. When multiple haulers were found for a jurisdiction, only the primary hauler is included. There are about 142 haulers serving the commercial sector in California; this count includes governmental haulers and parent companies (multiple subsidiary haulers with the same parent company were counted as one hauler). To keep the map readable, the top 10 haulers serving the most jurisdictions are listed, including the number of jurisdictions each hauler serves. Smaller private haulers that have hauling agreements with six or fewer jurisdictions are included under “Other” and serve the remaining 182 jurisdictions.

Jurisdictions With Multiple Commercial Haulers

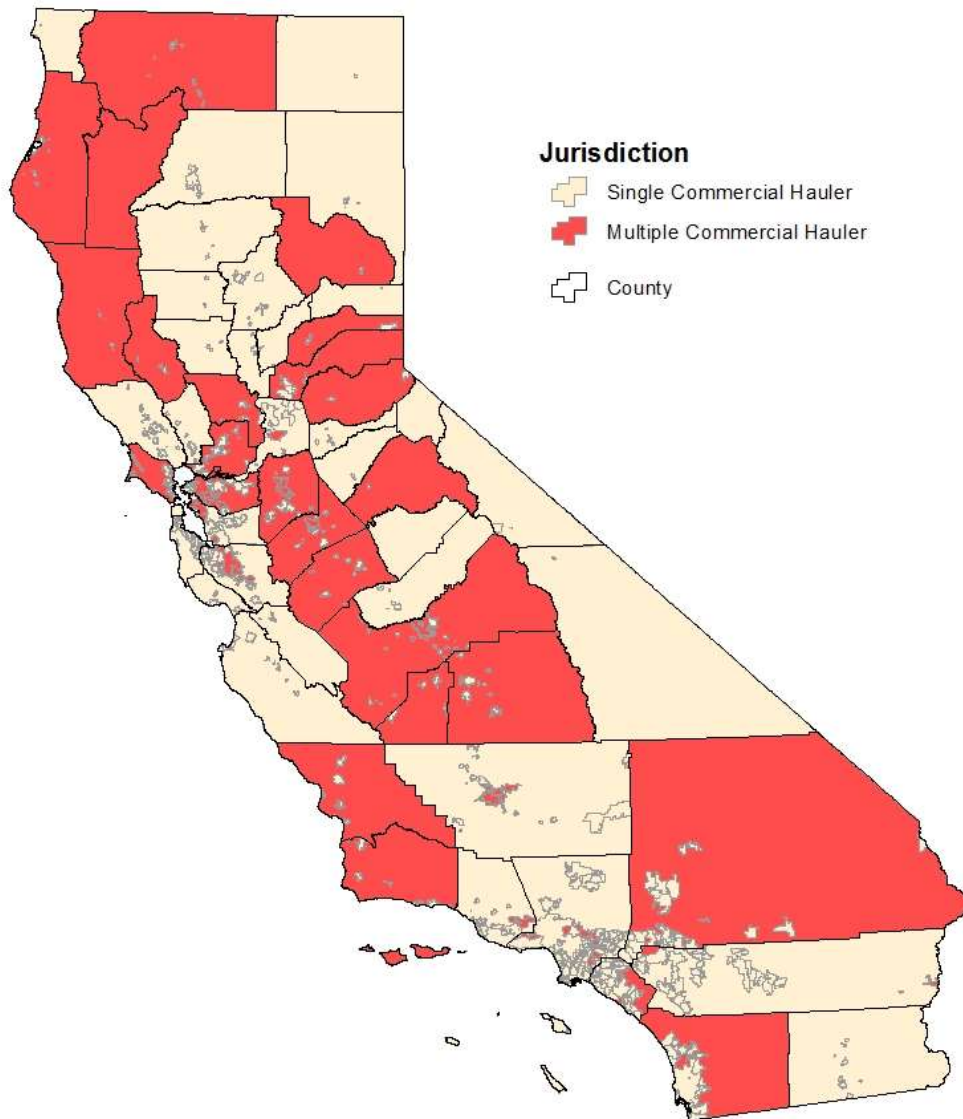


Figure 18. Jurisdictions with multiple commercial haulers: Map shows jurisdictions in which multiple haulers have commercial contracts with the jurisdiction, and jurisdictions in which a single hauler has a commercial contract with the jurisdiction. Data from CalRecycle hauler database, 2015.

Commercial Hauling Agreements

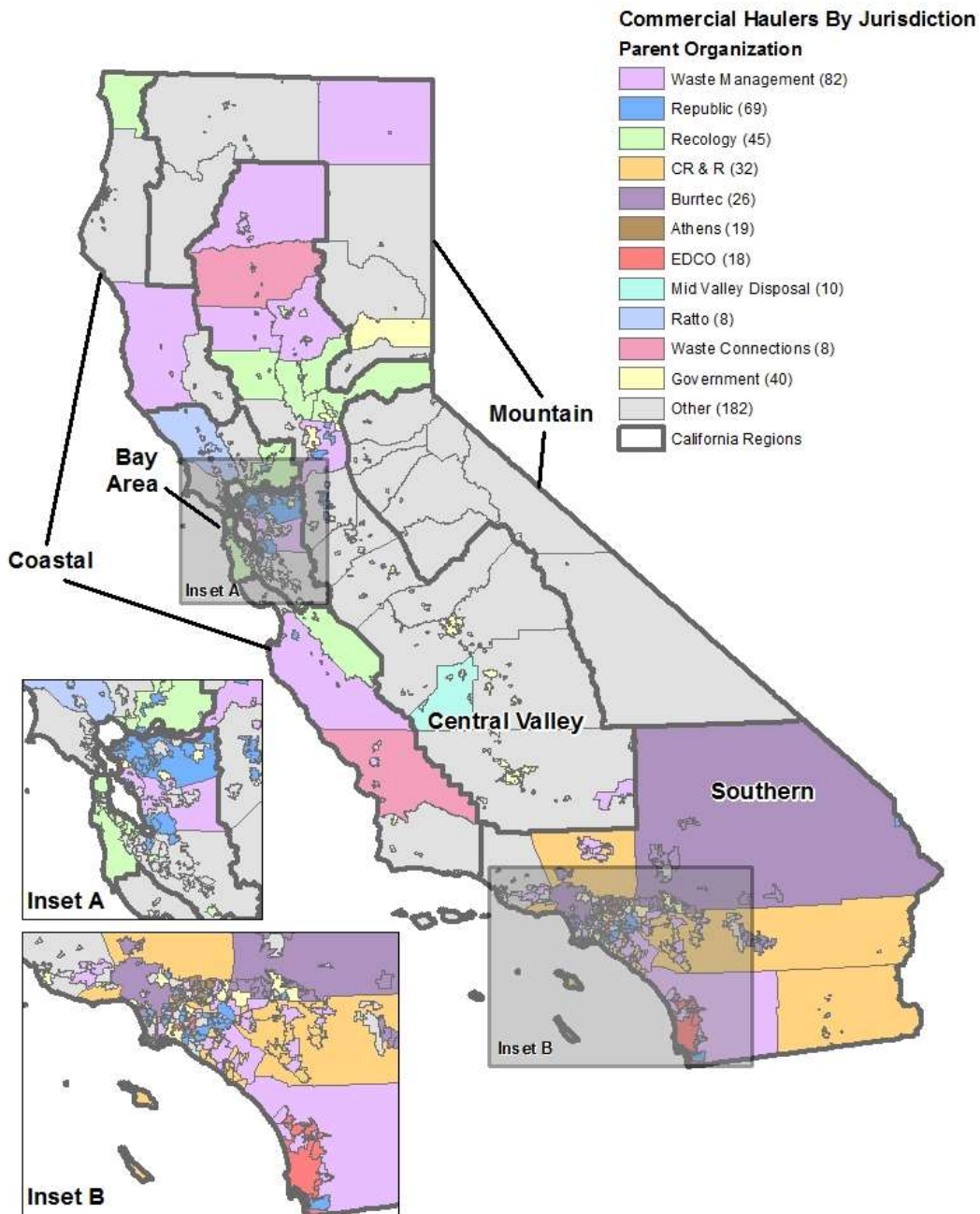


Figure 19. Commercial hauling agreements by jurisdiction showing government haulers, large hauling companies, or other independent private haulers. The top 10 haulers in terms of jurisdictions served are shown, while the “Other” category represents smaller hauling companies that serve six or fewer jurisdictions. Data from CalRecycle hauler database, 2015.

Solid Waste Hauler Data Findings

The majority of jurisdictions in California use private haulers for both residential and commercial solid waste collection. Most (92 percent) jurisdictions in California have exclusive franchise agreements with private haulers for the collection and transport of residential solid waste. Most (93 percent) jurisdictions in California have exclusive franchise agreements with private haulers for the collection and transport of commercial solid waste.

Solid Waste Hauler Data Collection and Limitations

CalRecycle staff reviewed jurisdiction websites, solid waste hauler websites, and jurisdiction annual reports to gather information on solid waste haulers and their agreements with local governments.

Not all jurisdiction and hauler websites provided this information on hauler agreements; this was particularly true for the commercial sector hauling agreements. The wider variety of commercial sector collection systems may be partly responsible for this difference. In addition, it was not always possible to determine the date that the hauler information was last updated, so some of the data may be out of date or incorrect. In jurisdictions with multiple haulers, only a “primary” hauler is identified on the maps. However, this designation is based on prominence on the websites rather than an in-depth analysis of tonnages or service. If additional information is available, this data can be updated and improved.

CalRecycle is in the process of adding this information to the Facility Information Toolbox (FacIT). FacIT is an online, voluntary reporting system that records estimated working capacities and throughputs for those facilities that participate. After the information is added, haulers and jurisdictions will be able to provide online updates to the data set.

Solid Waste Facilities

California’s diverse landscape and large population means there are many solid waste facilities located throughout the state. Waste that is to be disposed may be:

- First processed and aggregated at a transfer station to remove recyclables
- First sorted and processed at a material recovery facility (MRF) to remove recyclables
- Directly buried at a landfill
- Directly burned at a transformation facility or EMSW

The following sections will examine these four types of solid waste facilities.

Transfer Stations and Material Recovery Facilities

Transfer Station Data

In 2014, there were 476 transfer stations in California, according to the FacIT database (Figure 20). The FacIT definition of transfer station results in fewer facilities than the definition of transfer station in SWIS for active facilities with a full permit or notification. FacIT separately lists some types of transfer processing facilities, such as chip and grind, composting, construction and demolition, and some limited-volume transfer operations such as road maintenance and corporation yards, so these facilities are not listed as transfer stations in FacIT. Under the FacIT definition, transfer stations receive, temporarily store, and ship waste to landfills or transformation facilities for disposal. Transfer stations can send waste for processing at other facilities besides landfills, such as MRFs or other transfer stations, before it is sent to a landfill. Increasingly, these facilities are also employing methods to recover materials, such as using sorting lines or pulling recyclable materials directly from recyclable-rich loads. Many also provide opportunities for self-haulers to deposit recyclables in separate areas or bins.

Transfer Stations



Figure 20. Transfer stations in California. Map showing all permitted and active transfer stations in California in 2014. Data from FacIT.

The statewide annual handling capacity of these transfer stations based on permit data is estimated to be 60 million tons, with an estimated annual throughput of up to 25 million tons. Estimates from the 2014 waste characterization study of disposal at transfer stations show that annually, it is likely that about 13 million tons of solid waste flows from transfer stations to solid waste landfills and transformation facilities. It's likely that the FacIT estimates are high compared to the waste characterization estimates because they are based on initial permit estimates of throughput and capacity for a facility. More research is needed to obtain a more accurate estimate of annual facility throughput.

Material Recovery Facility (MRF) Data

There is not a single, definitive definition of “material recovery facility” (MRF) in statute or regulation. As a result, discussions of MRFs can often be somewhat unclear and fragmented due to permit status, activities performed, or other distinctions. This analysis is based on FacIT and includes both active MRFs that process only clean recyclables and MRFs that process either clean recyclables or mixed waste to recover recyclable materials (Figure 21). FacIT includes both permitted and unpermitted MRFs. In 2014, there were 161 active material recovery facilities. There are 32 MRFs known as mixed-waste processing facilities, which sort incoming mixed-waste loads, segregating and salvaging materials by employing sorting lines with manual or automated sorting technologies. There are 129 MRFs that only process clean recyclables that have already been separated from the waste stream. Materials not recovered in the sorting process at either type of MRF are usually sent to disposal, but may go to another facility for further processing.

The statewide handling capacity of MRFs is estimated to be about 36 million tons, with an estimated annual throughput of 15.2 million tons. The most recent MRF study in 2006 showed that it is likely that between 6 million and 7 million tons of solid waste residuals flow annually from MRFs to solid waste landfills and transformation facilities. It appears that only about 20 percent of statewide disposal results from processed residues from MRFs, while about 40 percent comes from transfer stations that likely process the materials less, and the remaining 40 percent flows directly to landfills without any processing or removal of recyclable materials.

Material Recovery Facilities

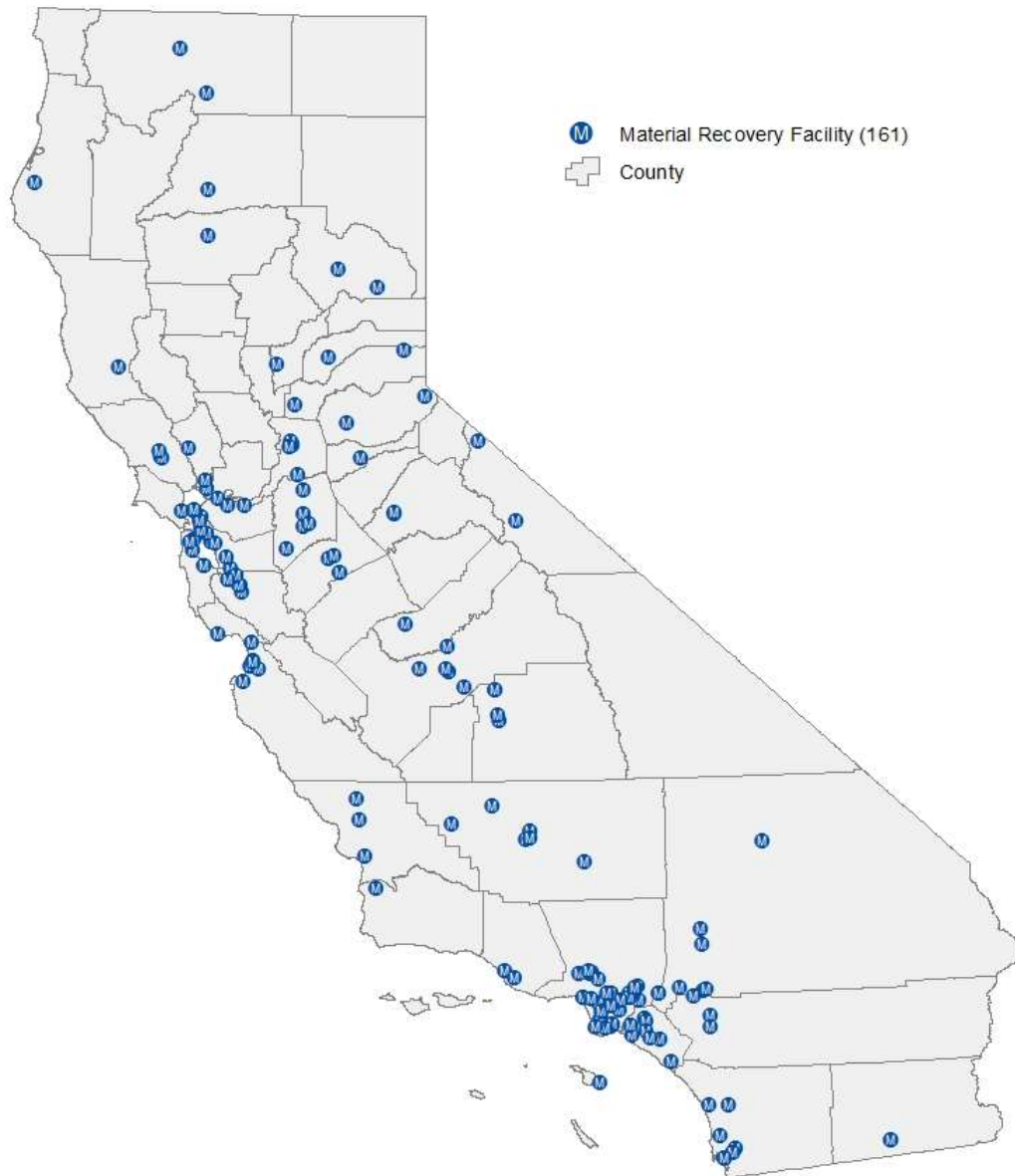


Figure 21. Material recovery facilities in California. Map showing all permitted and active material recovery facilities in California. Data from FacIT and SWIS.

Transfer and Processing Findings

Transfer stations and MSW MRFs are major handlers of solid waste in California. As such, they are critical to the success of the state in reaching 75 percent recycling and to the continued safe and efficient handling of solid waste in California.

Recently, MSW MRFs have had renewed focus as a component in mandatory commercial recycling. Under mandatory commercial recycling, businesses may have a source separation program or utilize the services of a MSW MRF that yields results comparable to a source separation program. That standard is still under discussion and pending further development.

Transfer and Processing Data Collection

CalRecycle used several data sources for these facilities because they are not required to report to CalRecycle on an ongoing basis. Transfer stations and MSW MRFs are required to report to subsequent disposal facilities on the jurisdictions of origin of the waste they send for disposal (CCR section 18809.6). The permits for these facilities list the maximum capacities the facility is allowed to handle.

Transfer and Processing Data Limitations

CalRecycle has recently begun requesting that these facilities provide copies of the quarterly reports they submit to disposal facilities to CalRecycle. Permit data is useful for the maximum values envisioned when the permit was proposed, but it is not useful in understanding current practices or volumes. Limitations also exist in classifying the types of material recovery facilities. Currently, more research is needed to classify the types of MRFs in FacIT and SWIS specifically, whether the facility processes mixed waste loads or only processes clean recyclables. Updated facility information is also limited. For these types of facilities, the participation rate in FacIT is about 10 percent. In cases in which facilities do not participate, CalRecycle can only use industry averages or rough estimates. A prior effort to gather information resulted in a similarly low cooperation rate of 30 percent (2006 MRF study).

Solid Waste Landfills

Landfill Data

Landfills are a key component in the management of municipal solid waste. Although California has adopted several statewide policies aimed at reducing the amount of disposed waste, landfills continue to play an important role in accepting waste that cannot otherwise be reduced, reused, or recycled.

Number and Location of Landfills

Most landfills built after 1988 are subject to the regulations set forth by 40 CFR Part 258 (Subtitle D of RCRA), which are governed by the U.S. EPA to better protect groundwater and air quality. Because of the logistics and cost of this new type of landfill, many smaller publicly owned landfills have closed and larger private landfills have become more common.

In 2013, there were 136 permitted landfills in California. Of those, there are 126 accepting municipal solid waste (Figure 22).

Active Landfills

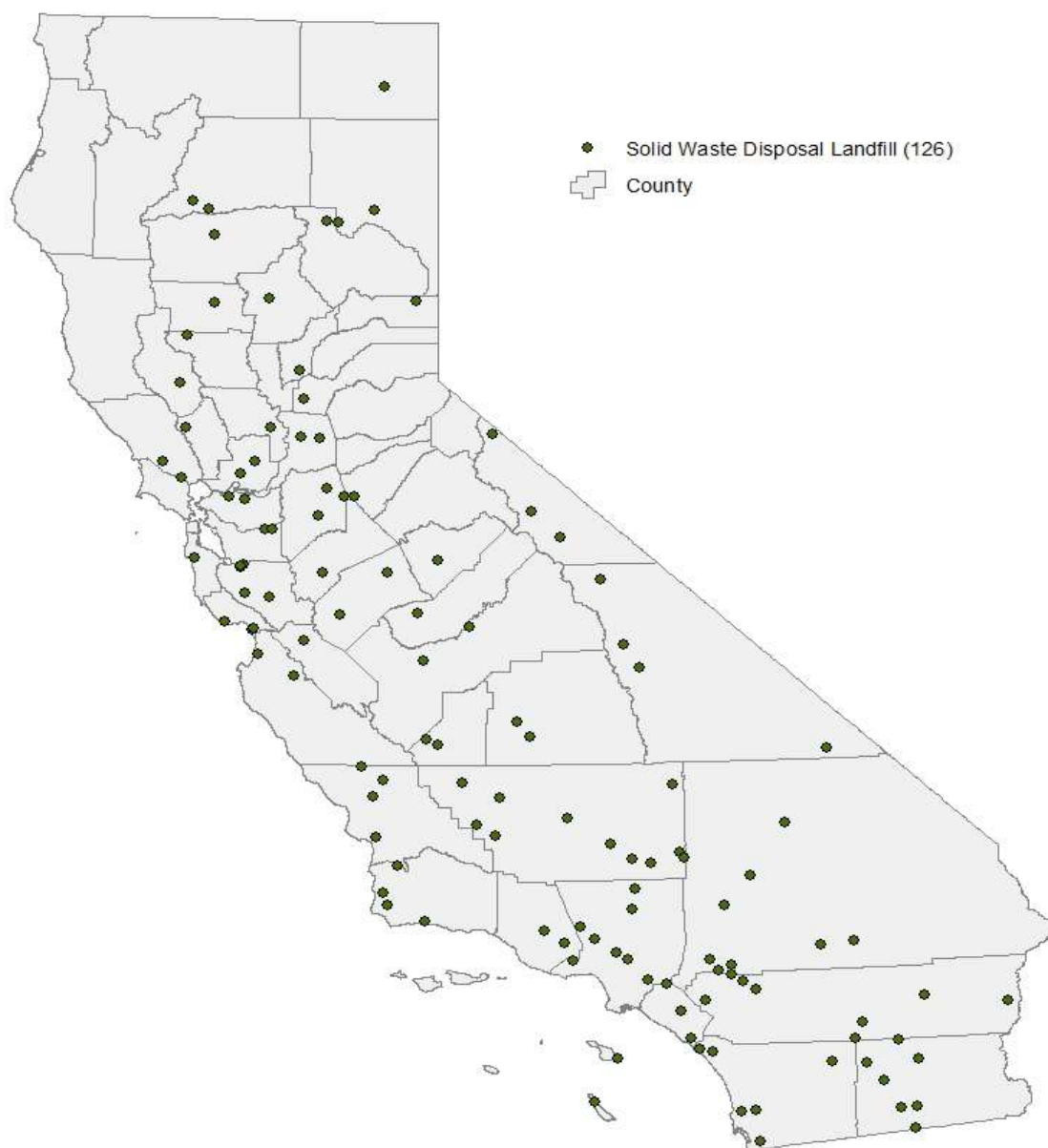


Figure 22. California landfills. Map of permitted and active landfills in California. Data from FacIT and SWIS, 2014.

Ownership of Landfills

Landfills in California may be owned and operated by a public entity or a private entity, but not both. In 2013, there were 88 publicly owned and operated landfills and 38 privately owned and operated landfills (Figure 23). Of the publicly owned and operated landfills, 61 were owned by a county, 15 were owned by a city, 9 were owned by the federal government, and 3 were owned by regional agencies. Private landfills were predominantly owned and operated by four companies: Waste Management (12), Republic (10), Waste Connections (4), and Recology (2).

Active Landfills By Ownership

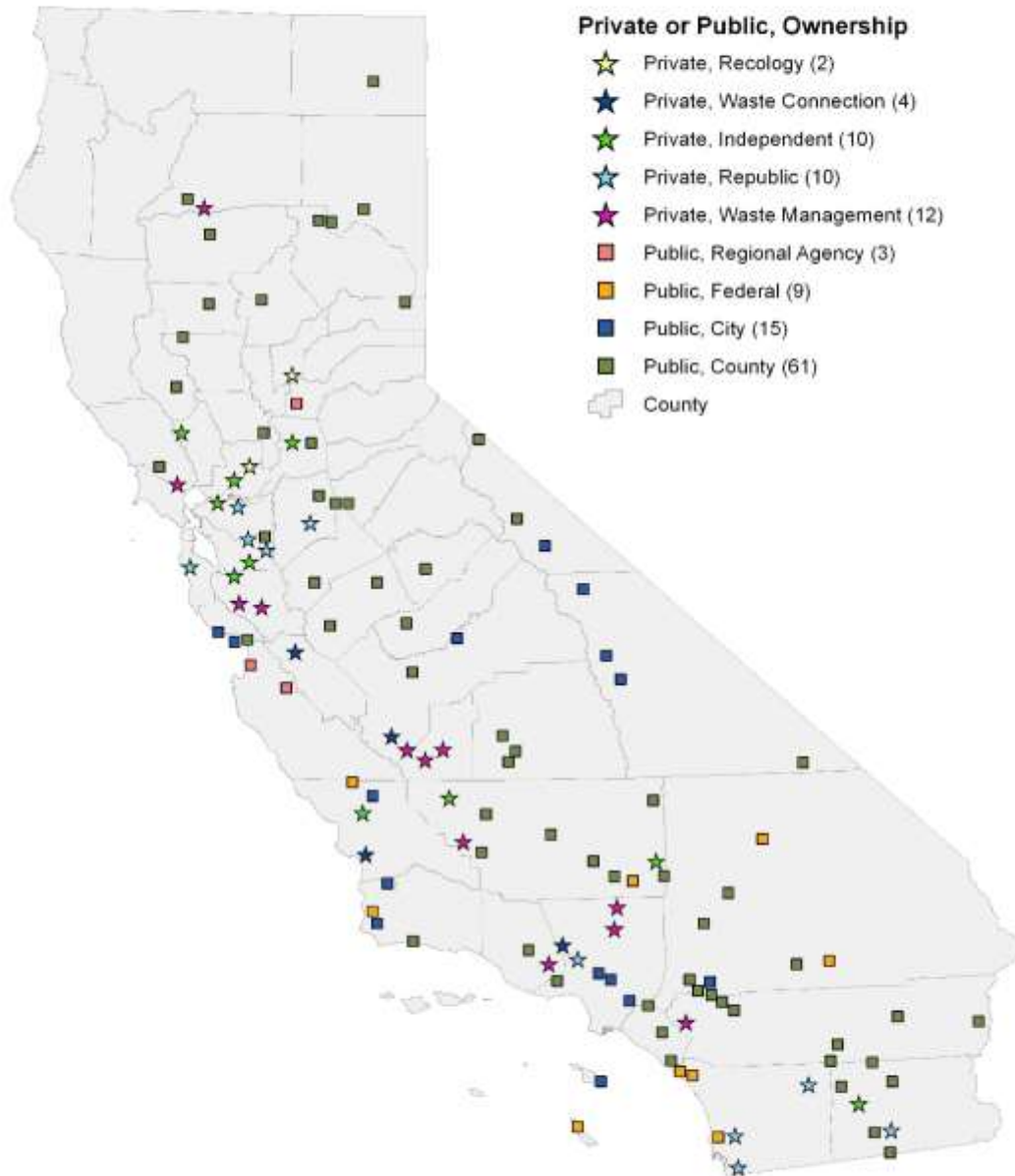


Figure 23. California landfills. Map of permitted and active landfills in California by ownership. Data from FacIT and SWIS, 2014.

Landfill Capacity

According to the California Integrated Waste Management Board report “Reaching the Limit,” as of January 1, 1990, about half of California counties had less than 15 years of remaining landfill capacity.¹⁶ These counties accounted for 70 percent of the state’s population. The report predicted that the state would face a serious shortage of landfill capacity without expanded waste diversion and development of additional landfill space.¹⁷ AB 939 created a county-level goal of always maintaining at least 15 years of ongoing landfill capacity.

Since that time there has been a trend toward fewer, but larger landfills. In 1989, there were 239 active landfills accepting municipal solid waste. Of those landfills, 134 have since closed or are no longer accepting municipal solid waste. Twenty-one new landfills have become active in the last 25 years. There are now 136 landfills permitted in California, with an average annual landfill capacity of 687,725 tons. This analysis is based on the 126 landfills accepting MSW in 2013.

In this report, landfill capacity is evaluated at a statewide and regional level in order to identify broad trends. As statewide diversion and recycling efforts are expected to impact disposal rates, it is critical to consider how predicted landfill capacity and landfill life will vary based on how well California meets its recycling goals.

Annual Landfill Capacity

Table 8 summarizes the 126 active, permitted landfills by region, as well as their annual capacity and per capita capacity, and for comparison purposes it shows the per capita annual disposal in each region. The per capita annual disposal is based on current disposal rates. Most regions have a greater yearly per capita capacity than their per capita disposal rate and currently have sufficient annual capacity to meet current disposal rates. The Mountain region is the only region that has a lower per capita annual capacity than its annual disposal rate. It is important to note that a large portion of the waste in the Mountain region is sent to other regions or exported.

Table 8. Regional per capita annual facility capacity for active, permitted California landfills and per capita annual disposal in tons. Data from FacIT and Department of Finance.

| Region | Number of Landfills | Annual Capacity (tons) | 2013 Population | Per Capita Capacity in Tons per Year | Per Capita Disposal in Tons per Year |
|------------------|---------------------|------------------------|-------------------|--------------------------------------|--------------------------------------|
| Bay Area | 18 | 15,017,000 | 7,390,000 | 2.03 | 0.78 |
| Central Valley | 38 | 24,761,000 | 6,710,000 | 3.69 | 0.85 |
| Coastal | 12 | 4,231,000 | 1,770,000 | 2.39 | 0.84 |
| Mountain | 14 | 723,000 | 590,000 | 1.23 | 1.28 |
| Southern | 44 | 41,939,000 | 21,700,000 | 1.93 | 1.01 |
| Statewide | 126 | 86,671,000 | 38,160,000 | 2.27 | 0.93 |

Since regional differences are important in determining landfill capacity needs, a per capita annual facility capacity was calculated in order to allow for a comparison across regions. Based on the per capita annual facility capacity, the Central Valley has the most landfill space for its population, or 3.7 tons per person per year. In contrast, the Mountain region has only 1.2 tons per person per year of landfill space. Although this is the lowest regional per capita annual capacity, it corresponds to 6.6 pounds per person per day of landfill space, which is above the statewide average disposal rate. The 126 active landfills in California have sufficient annual capacity to accommodate currently disposed waste.

Closures and Openings Impact Landfill Capacity

Landfill closures or openings can have significant impacts on the capacity of other landfills in the region. For example, when a facility closes, jurisdictions will have to send their waste to other facilities; if a new facility opens, jurisdictions may divert their waste from other landfills to the new facility. The recent closure of the Puente Hills Landfill in Los Angeles County, the pending opening of the Santa Maria Integrated Waste Management Facility in Santa Barbara County, and the planned opening of Gregory Canyon in San Diego County are the most recent examples of landfill closures or openings with major impacts on statewide and regional landfill capacity.

Puente Hills Landfill Closure

Between 2007 and 2013, the Puente Hills landfill accepted an average of 2.4 million tons of waste each year for disposal from more than 100 jurisdictions. When the Puente Hills Landfill closed in October of 2013, waste that would have previously gone to Puente Hills was primarily redirected to three nearby landfills (Frank R. Bowerman

Landfill in Orange County, Olinda Alpha Landfill in Orange County, and Mid Valley Disposal in San Bernardino County) in the first two quarters of 2014.

The Puente Hills Landfill primarily received waste from counties in the Southern region, including Los Angeles, Orange, Riverside, and San Bernardino. Although these counties were likely most affected by the closure of Puente Hills, the advance notice of the closure likely minimized service disruptions. CalRecycle will continue to monitor the impacts of this landfill closure as more disposal data is collected for the region.

Santa Maria Integrated Waste Management Facility

The Santa Maria Integrated Waste Management Facility in Santa Barbara County will likely be the next landfill to become operational. It has been recently permitted and is currently scheduled to start accepting waste in the near future. Although it is difficult to predict which other landfills will be affected by the opening of this landfill, it is likely that the effects will be felt at multiple landfills in the Southern region. Based on the interconnected nature of waste flow in California, CalRecycle anticipates that opening a new landfill will change the amounts of waste disposed at other landfills, particularly in the Southern region. Once this landfill opens, CalRecycle will be able to track the specific impacts of the new facility on nearby landfills.

Gregory Canyon Landfill

Another landfill in the planning stages is the Gregory Canyon Landfill in eastern San Diego County. While this facility has been permitted, it is not clear when it will start accepting waste. This uncertainty serves as a reminder that projecting landfill capacities and lifetimes is not a precise science and that many variables must be considered.

Other Impacts

Changes in landfill permits, such as the planned expansions of the Forward Landfill and Newby Island Landfill, will also impact the available capacity at landfills within a region. CalRecycle updates capacity projections when expansions are approved, but proposals for future expansions are not final so they are not included in this analysis.

Lifetime Landfill Capacity

Annual capacity provides an important picture for California's current disposal needs; however, it is also important to track the available lifetime capacity of landfills. This allows CalRecycle and its stakeholders to evaluate and predict needs for future landfill space.

Lifetime Capacity – Regional Business as Usual

The collective capacity of California landfills to accept municipal solid waste as of January 2014 was more than 1.7 billion tons. This is the equivalent of nearly 2.3 billion cubic yards of available landfill space statewide, using a conversion factor of 0.75 tons per cubic yard. Table 9 shows the remaining landfill capacity for each region.

Table 9. Population, disposal, and remaining landfill capacity in California in 2013, by region. Data from DRS, FacIT, and Department of Finance. Years of landfill space is calculated assuming that the population and amount of disposal remains constant.

| Region | Population | Disposal (million tons) | Total Remaining Capacity (million tons) | Years of Landfill Space |
|------------------|-------------------|----------------------------|--|----------------------------|
| Bay Area | 7,390,000 | 4.9 | 218 | 44 |
| Central Valley | 6,710,000 | 5.0 | 600 | 121 |
| Coastal | 1,770,000 | 1.3 | 106 | 81 |
| Mountain | 590,000 | 0.6 | 11 | 18 |
| Southern | 21,700,000 | 19.4 | 793 | 41 |
| Statewide | 38,160,000 | 31.2 | 1728 | 55 |

At the current rate of disposal, if all waste generated in the region remained in the region, the landfill space in most regions would last at least 40 years. The one notable exception is the Mountain region, where the landfill space would last just over 18 years. However, as only a third of the waste generated in the Mountain region is sent to landfills in that region, the aggregate facility lifetime in practice may be longer.

Figure 24 shows the areas of the state with relatively higher and lower available unused lifetime landfill capacity for the facilities in each region. The Central Valley, Bay Area, and Southern regions all currently have substantial available landfill capacity. Although portions of the Coastal region have ready access to landfills with high total lifetime landfill capacity, the northern portion of the state and the Mountain region have much more limited total landfill capacity.

Available Unused Landfill Capacity

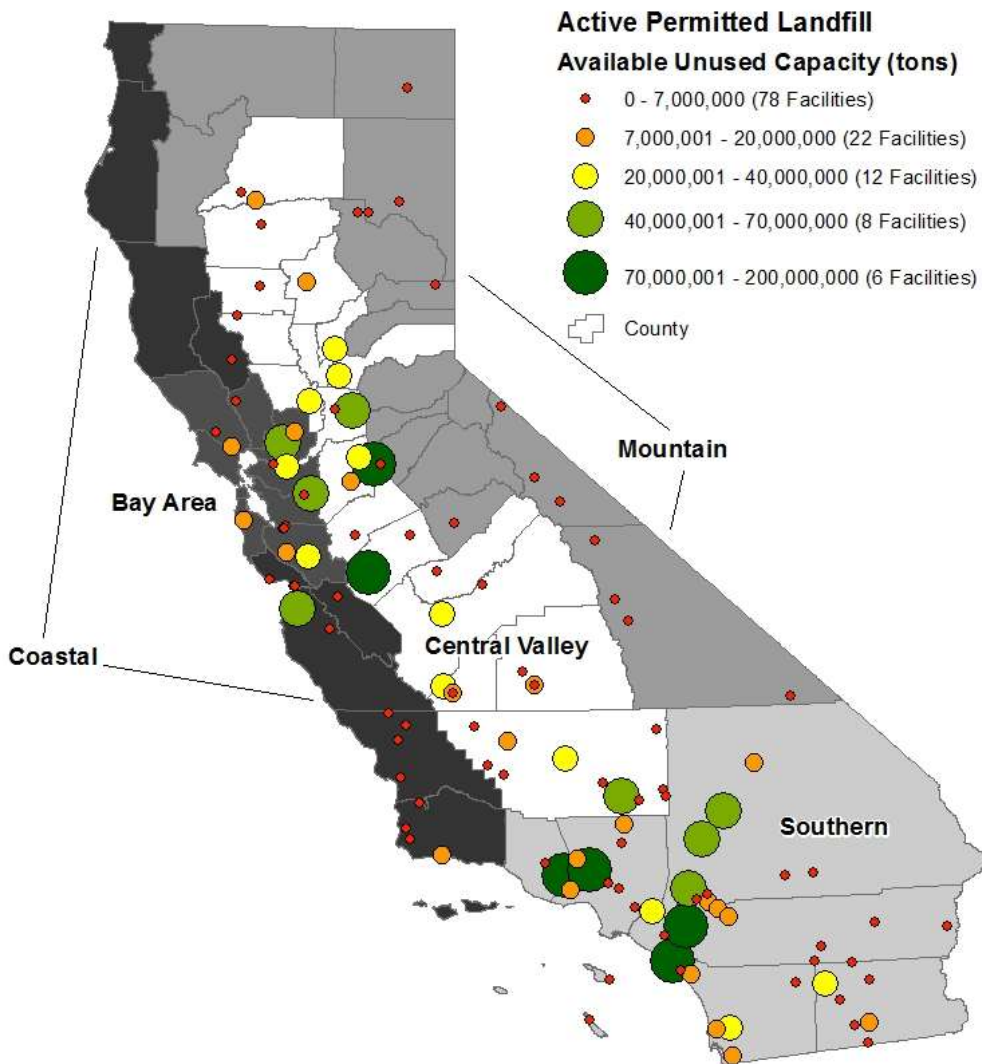


Figure 24. Available lifetime landfill capacity in California. Map showing available unused lifetime landfill capacity for each landfill in a region and the number of landfills that represent that capacity amount in California's five regions. Larger circles represent more available lifetime capacity for a landfill while the color of the circle represents the most lifetime capacity (green) or the lowest amount of lifetime capacity (red) for a landfill. Data from FacIT.

Figure 25 shows that the ownership of landfills with unused lifetime capacity is greater for public landfills, with 1.1 billion tons of lifetime capacity available for public landfills and 635 million tons of lifetime capacity available for private landfills.

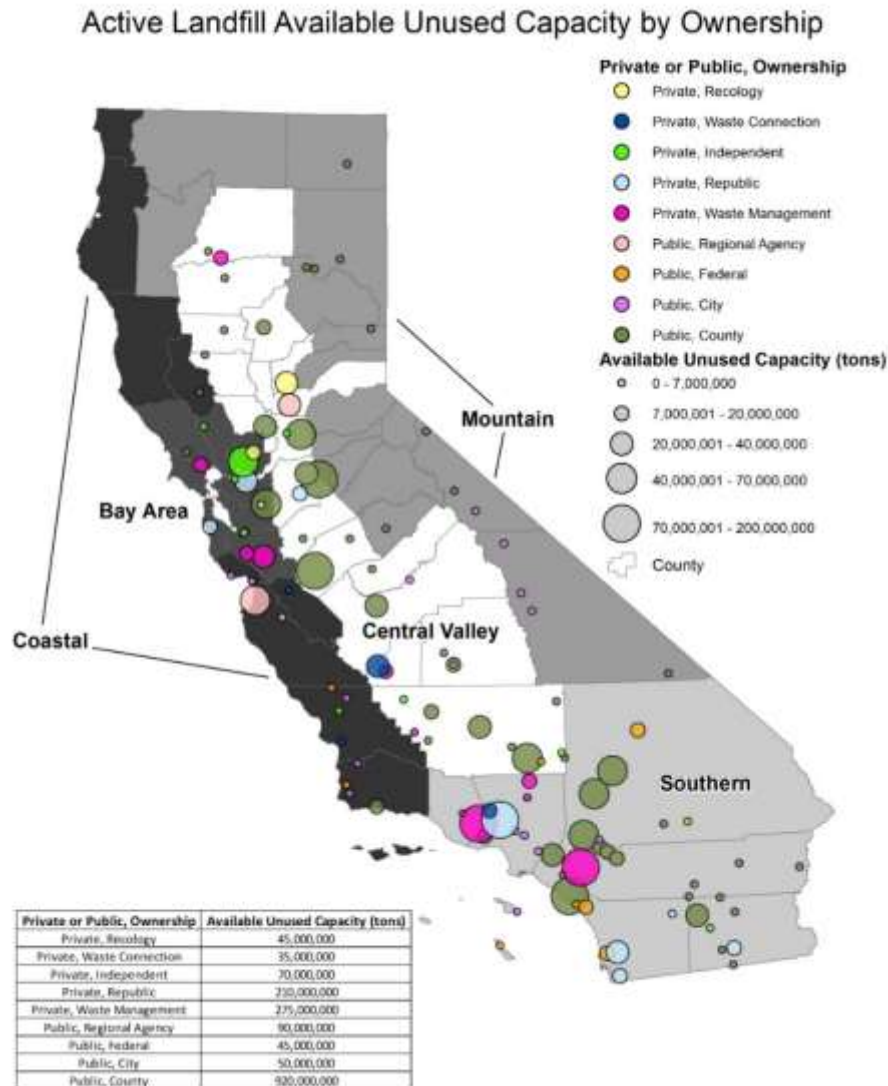


Figure 25. Unused landfill capacity by ownership type. Larger circles represent more available capacity. The color of the circle designates the type of owner (public or private) and company name if it's owned by a private facility. The table shows the amount of unused lifetime capacity by region and owners. Data from FacIT, 2015.

In order to more accurately project the unused lifetime capacity of landfills in California by region, it would be necessary to consider changes in population and disposal rates over time. However, this limited analysis does suggest that there is extensive unused landfill capacity, and that any changes made in state policies to decrease disposal overall should prolong the usable lifetime of these facilities beyond those created using “business as usual” disposal projections.

Lifetime Landfill Capacity – Three Statewide Scenarios

One alternative to the regional-level approach of evaluating total landfill capacity is a statewide analysis. Although this method does not allow for regional variations, a statewide approach does provide two key benefits. First, population changes over the lifetime of the landfill can be considered; for the purposes of this section, Department of Finance statewide population projections were used. Second, factors that influence the total amount of disposed waste in California can be evaluated more easily. These include changing rates in material recovery and recycling over time, as well as economic factors such as the rate of construction and the employment rate.

For this section, three scenarios were projected for disposal:

1. **“Low Disposal Scenario” or “Meets 75 Percent Goal Scenario.”** In this scenario, disposal was predicted to meet the 75 percent statewide recycling goal by 2020. This scenario approximates a linear reduction in disposed waste until 2020, followed by a mild increase in disposal that is tied to increases in California’s population. Beginning in 2020, a disposal rate of 2.7 pounds per person per day was used.
2. **“Medium Disposal Scenario” or “Current Disposal Rates Scenario.”** This scenario uses a business-as-usual approach in which disposal remains roughly the same into the future. For this scenario, an average of the last seven years’ per capita disposal rates was used to define a medium disposal rate. This takes into account the economic downturn and initial recovery. In this scenario, a disposal rate of 4.7 pounds per person per day was used.
3. **“High Disposal Scenario” or “Economic Boom Scenario.”** For this scenario, a high disposal rate was predicted. This scenario is reflective of substantial economic growth, which is generally linked to higher levels of disposal. The total tons of disposed waste is calculated using the Woods and Poole Inc. data described in Figure 26 and corresponds to an average disposal rate of roughly 7.0 pounds per person per day.

The three disposal scenarios were used to model statewide disposal and landfill capacity in California.

Projections of Future Disposal

The projected amount of disposal in 2025 ranges between 20.9 million tons under the Low Disposal Scenario and 57.7 million tons under the High Disposal Scenario (Figure 26). Although the Low Disposal Scenario may be somewhat aggressive in meeting the 75 percent recycling goal by 2020, it is possible that the policies established under that goal may continue to reduce disposal levels past 2020.

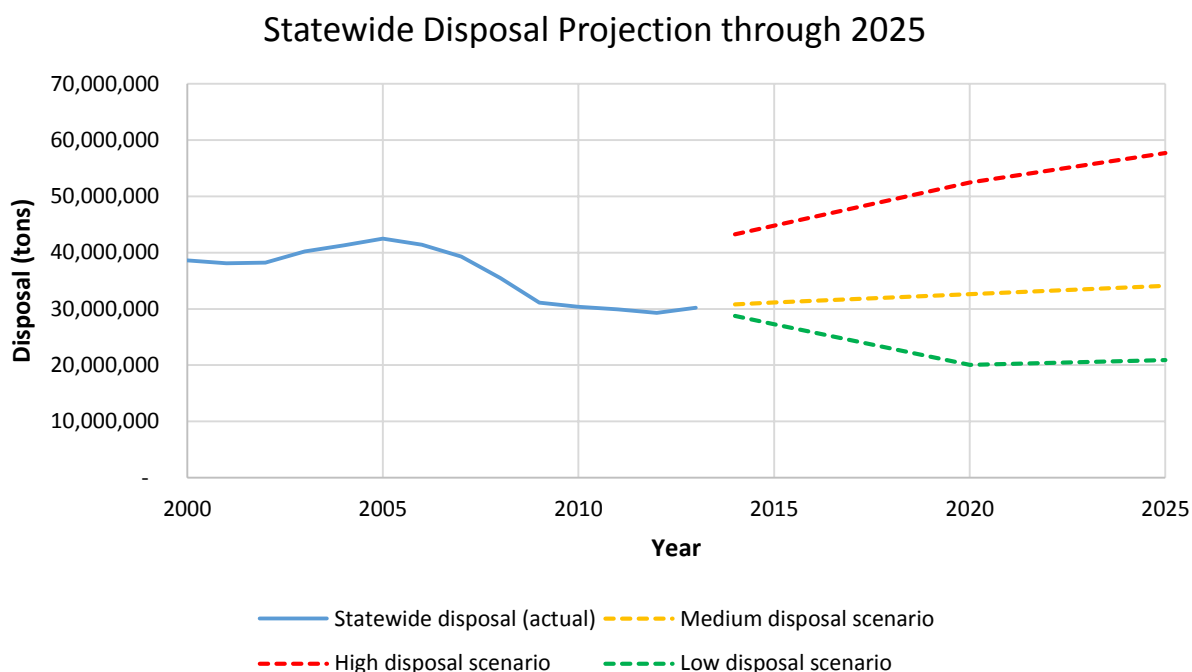


Figure 26. Statewide disposal projected through 2025. Data for current and past disposal from DRS. Future disposal based on a High Disposal Scenario (~7.0 ppd, Woods and Poole Inc.), Medium Disposal Scenario (4.7 ppd), and Low Disposal Scenario (2.7 ppd in 2020, 75 percent recycling goal). Data from FacIT and DRS.

Projections of Lifetime Landfill Capacity

The three disposal scenarios (Meets 75 Percent Recycling Goal, Current Disposal Rates, and Economic Boom) were used to determine remaining statewide disposal capacity, remaining landfill capacity, and the years of available landfill capacity statewide (Figure 27). In all three disposal projections, the future available capacity at landfills statewide decreases steadily but at different rates.

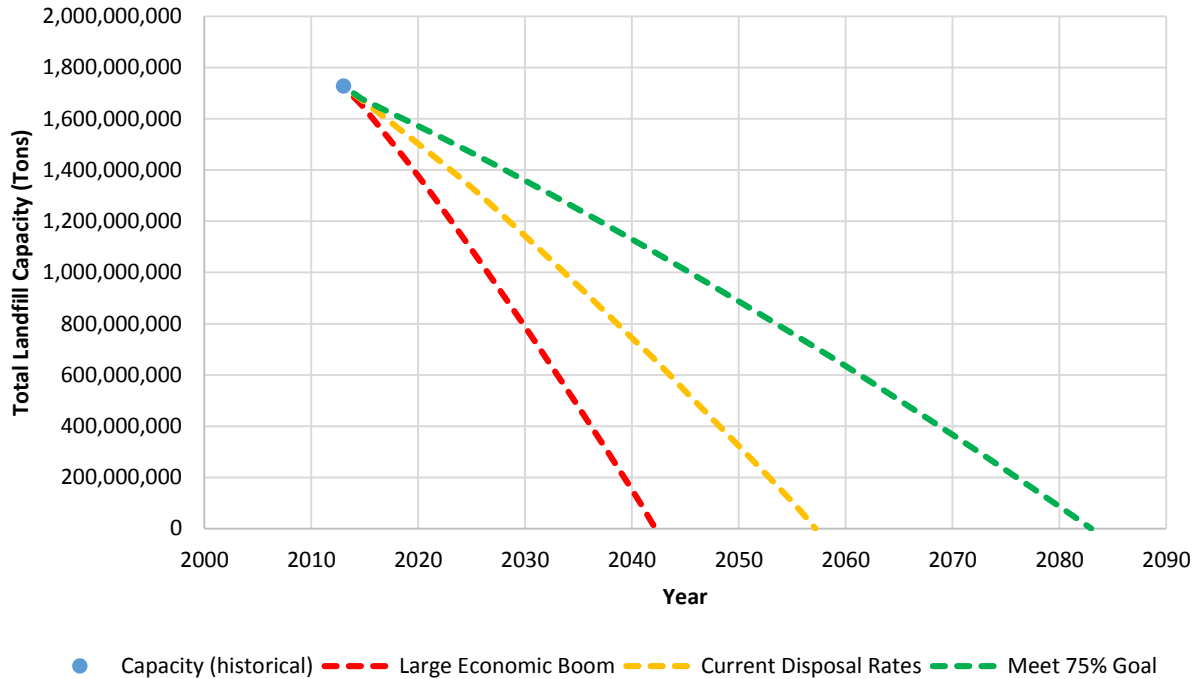


Figure 27. Statewide lifetime landfill capacity projected through 2080. Current and future lifetime landfill capacity. Future capacity is based on an Economic Boom Scenario (~7.0 ppd, Woods and Poole Inc.), Current Disposal Rates Scenario (4.7 ppd), and Meets 75 Percent Goal Scenario (2.7 ppd in 2020, 75 percent recycling goal). Data from FacIT and DRS.

Projections of Years of Landfill Capacity

A comparison of the expected years of available landfill capacity in 1992 to today's situation shows a marked increase in years of available landfill capacity statewide. In the 1992 report, landfill capacity was projected to run out by the early 2000s unless changes in disposal or capacity occurred.¹⁸ With the trend toward larger landfills and lower per capita disposal, the projected years of available capacity statewide from 2015 would be between 27 years in the Large Economic Boom Scenario and 68 years in the Meets 75 Percent Goal Scenario. If disposal remains at the current per capita average of 4.7 pounds per person per day, as reflected in the Current Disposal Rates Scenario, there are currently 42 years of landfill capacity remaining in California. This current disposal rates scenario is lower than the 55 years of capacity projected in the regional business-as-usual scenario (Table 9) above because the analysis for Figure 27 takes into account population growth projections for California that are not available for individual regions.

Landfill Findings

The 126 active MSW landfills in California provide about 87 million tons of annual landfill capacity. This annual landfill capacity is enough to provide disposal for all the materials generated annually in California, even if nothing was source-reduced, recycled, or composted.

California has more than sufficient landfill space to accommodate waste at the regional and statewide level for at least 20 years. If California reaches its 75 percent statewide recycling goal in 2020, the state would not run out of landfill space until the 2080s based on current projections of landfill capacity. Even under a conservative business-as-usual scenario, the state has more than 40 years of landfill capacity.

Landfill Data Collection and Limitations

In order to quantify a landfill's ability to accept waste, CalRecycle tracks annual disposal for each landfill. This annual disposal is subtracted from the total unused lifetime landfill capacity each year to yield remaining unused lifetime landfill capacity. Information from SWIS, DRS, and FacIT was used to calculate this capacity and describe the key aspects of current and future landfill capacity in California.

Waste disposal can be characterized by volume and by weight. While yearly disposal totals from jurisdictions are reported to CalRecycle in tonnage, permitted landfill capacity and remaining capacity amounts are recorded in the Solid Waste Information System in cubic yards.¹⁹ Facility operators can measure remaining landfill capacity by determining the amount of space left in the hole. CalRecycle must estimate remaining landfill capacity by using weight-to-volume conversion factors and account for airspace utilization (an estimate of the ratio of waste to cover). These factors vary widely from landfill to landfill. In CalRecycle's FacIT system, a conversion factor of 1,500 pounds, or 0.75 tons, per cubic yard is the default value. For the tables and figures in this section, capacity values in tons are derived from volume measurements based on this factor. Modeling using facility-specific conversion factors would yield more accurate results and will be incorporated into subsequent analyses.

For the purposes of tracking available lifetime landfill capacity and for making statewide predictions about future disposal, regional data is more useful than data from individual counties. This is because most waste disposal takes place in the region where it was generated, rather than the county where it was generated. However, the Mountain Region sends two-thirds of its waste to landfills outside of the region. Modeling using more detailed disposal flows would yield more accurate results.

Regional estimates of future population are difficult to obtain or make. The regional analysis assumed a stable population for the region over time. This oversimplification eliminated the need for complex prediction of future population changes, but if alternative data were available, adjusting for regional growth would yield more accurate results.

A more in-depth analysis of lifetime landfill capacity at the region level would be needed to fully address the complexities including inter-regional flows, exports, imports, closures, possible new facilities, and facility expansions.

Transformation

Transformation is a thermal technology in which conventional combustion systems burn mixed (unprocessed or minimally processed) solid waste in an incinerator to create energy. Three transformation facilities in California accept solid waste and were built in the late 1980s. Transformation plays a small role in California disposal and goal measurement compared to disposal at landfills, representing roughly 1 percent of the waste generated in the state.

Transformation Data

The three transformation facilities in California are Commerce Waste to Energy in the City of Commerce, Covanta Stanislaus Inc. in unincorporated Stanislaus County, and Southeast Resource Recovery in Long Beach. The largest facility is Southeast Resource Recovery, which accepts almost 500,000 tons of waste a year and generates 36 megawatts (MW) of energy output. Collectively, all three facilities have the capacity to process about 2,500 tons per day (TPD) of MSW, producing about 70 MW of electrical power.²⁰

From 1995 to 2012, the amount of waste transformed has consistently been around 1 million tons per year (Figure 28), while disposal at landfills has fluctuated much more. Transformation facilities need a consistent amount of waste to operate, so cities and counties guarantee minimum waste deliveries under “put or pay contracts.” Facilities generally operate in the range between their maximum permitted capacity and the minimum amounts specified in their contracts. As a result, waste continued to flow to transformation facilities with little change even during the recent recession.

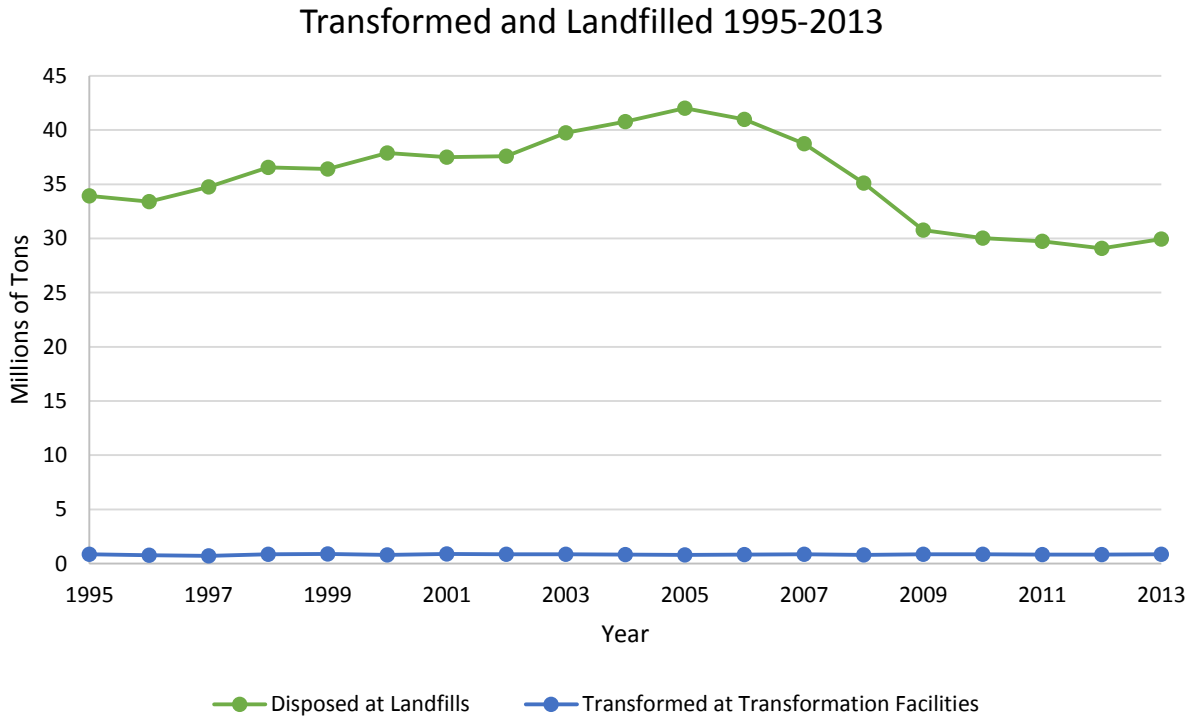


Figure 28. Tons transformed and landfilled 1995–2013. The graph shows the tons of waste disposed at landfills and sent to transformation facilities in California from 1995 to 2013. Data from DRS.

Some jurisdictions rely on transformation more than others; this is most likely due to geographical proximity, contracts between the jurisdiction and the facility, and the diversion credit that jurisdictions can receive for transformed waste. Waste sent to a transformation facility can be counted as a diversion credit but cannot contribute more than 10 of the 50 percentage points needed to meet the diversion mandate. Transformed waste in excess of the credit counts as disposal. Most California counties send some waste to transformation facilities (Figure 29).

Transformation by County, 2013

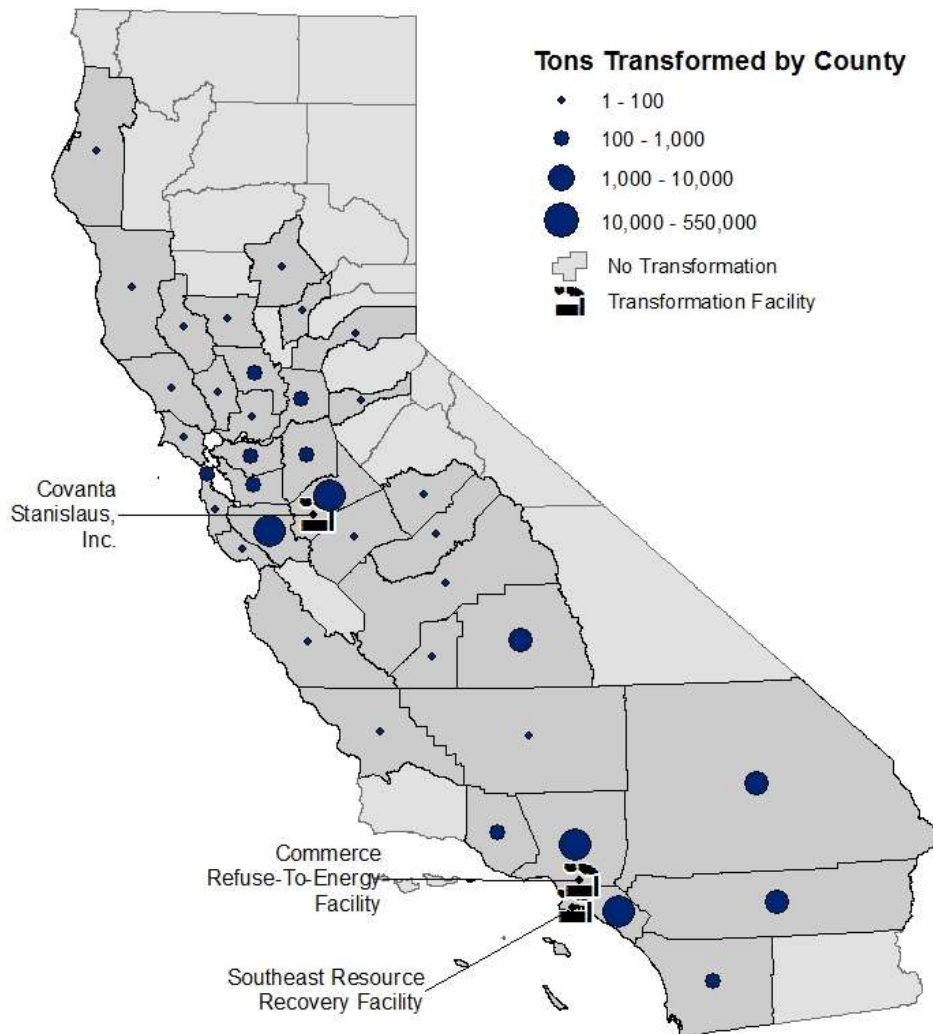


Figure 29. Transformation tonnages, 2013. Map showing the amount of waste sent by counties to transformation facilities in 2013 and location of the three transformation facilities. The largest dot represents more than 10,000 tons of waste sent to transformation facilities. Data from DRS.

Table 10 contains statistics for the three transformation facilities in California, including waste accepted, ash output, energy output, posted tipping fee for the facility, average posted fee at surrounding landfills, and average distance traveled to each facility by haulers.

Table 10. Statistics for California transformation facilities. The posted self-haul tipping fee represents the average posted gate fee for the public at the facility.

| Facility | 2013 Waste Accepted (Tons) | 2012 Ash Output (Tons) | 2012 Energy Output (MW) | Posted Tipping Fee | Average Landfill Fee | Average Distance Hauled (Miles) |
|---|-------------------------------------|---------------------------------|----------------------------------|--------------------------|----------------------------|--|
| Covanta | 281,772 | 71,414 | 22.5 | \$51/Ton | \$38/Ton | 105 |
| Commerce | 104,984 | 29,226 | 11 | \$53/Ton | \$44/Ton | 25 |
| Southeast Resource Recovery Facility (SERRF) | 468,836 | 146,285 | 36 | \$50/Ton | \$44/Ton | 24 |

Jurisdictions that dispose the most at transformation facilities are primarily near the facilities. The following maps (Figure 30, Figure 31, and Figure 32) show the waste-sheds for the three transformation facilities.

Most waste sent to Southeast Recovery and Commerce Waste to Energy comes from Los Angeles County and adjacent counties, whereas Commerce has a more widespread disposal pattern but still receives most of its waste from jurisdictions in the same county or nearby. Covanta, located in Stanislaus County, accepts waste from a more widespread range of counties and jurisdictions but still receives most of its waste from nearby cities.

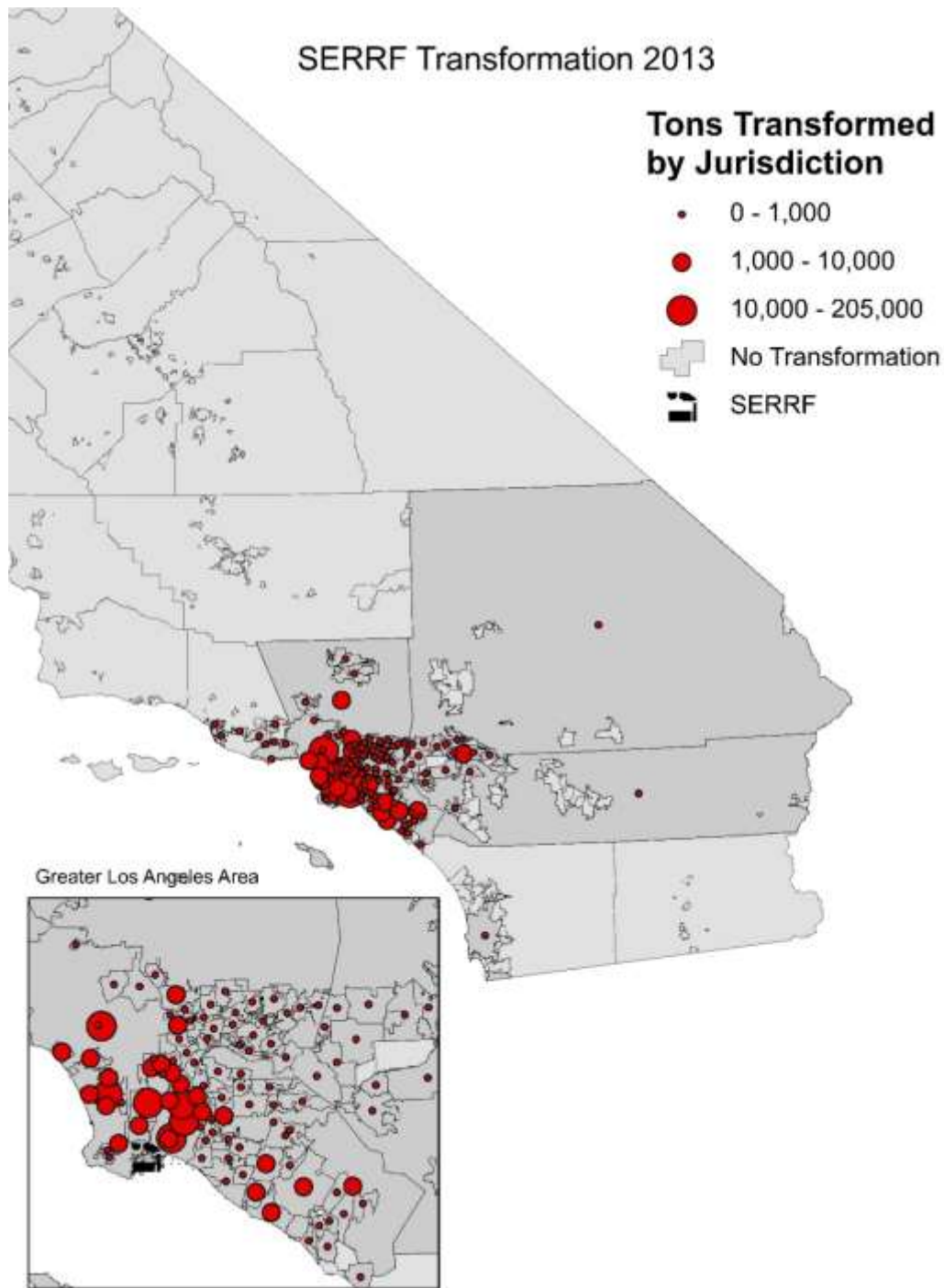


Figure 30. SERRF transformation 2013. Map showing total tons of solid waste sent by jurisdictions to the Southeast Resource Recovery transformation facility in Long Beach in 2013.

Data from DRS.

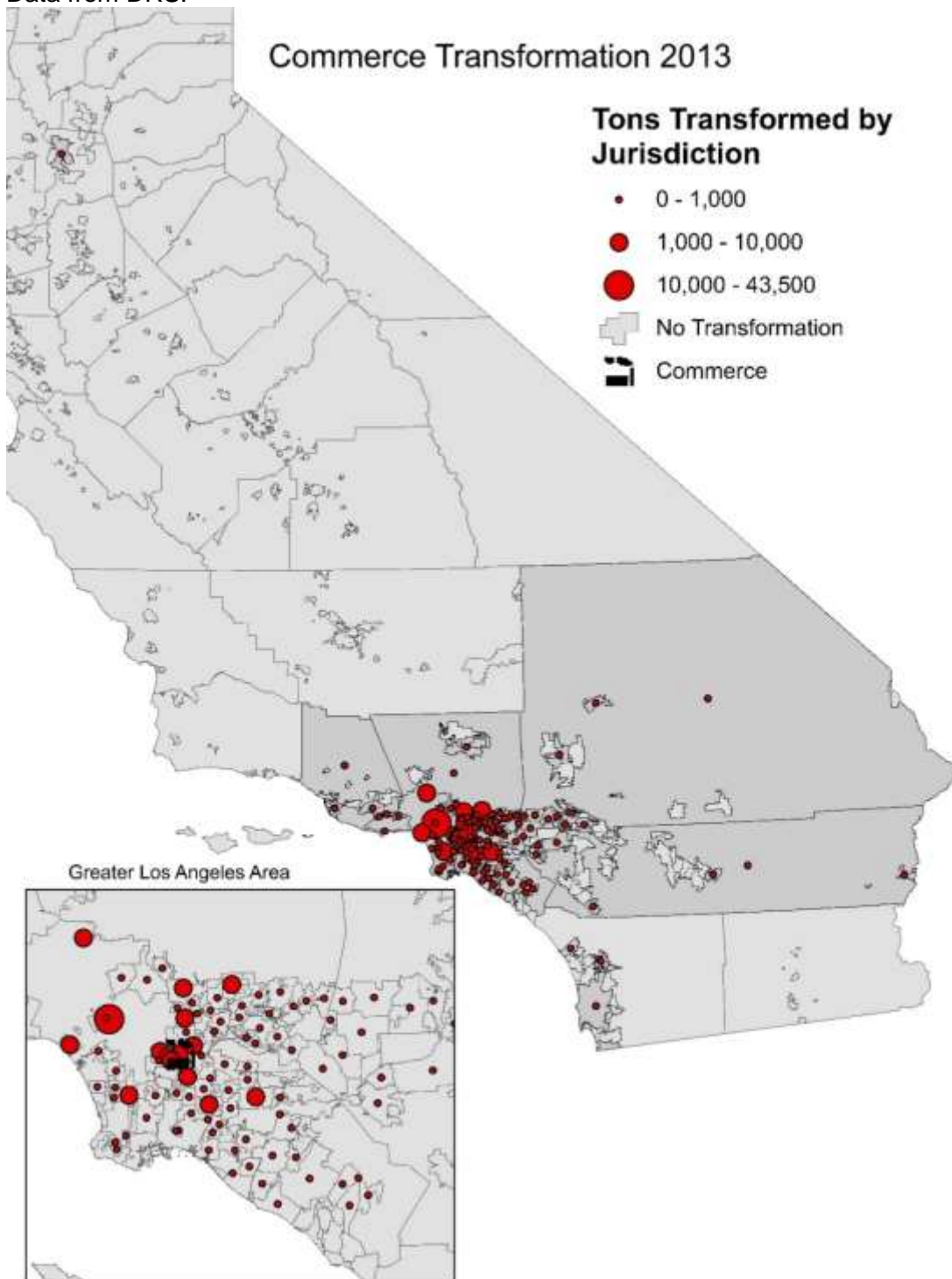


Figure 31. Commerce transformation 2013. Map showing total tons of solid waste sent by jurisdictions to the Commerce transformation facility in Los Angeles in 2013. Data from DRS.

Covanta Transformation 2013

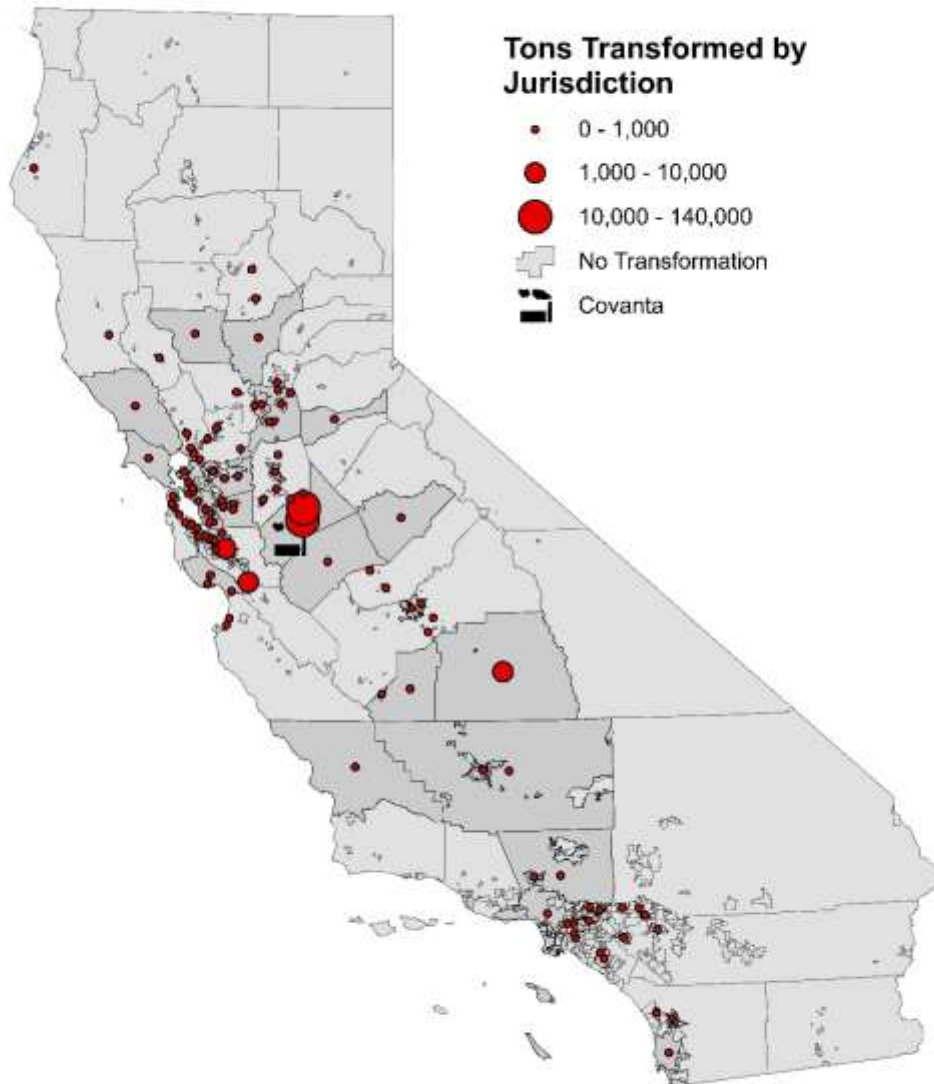


Figure 32. Covanta transformation 2013. Map showing total tons of solid waste sent by jurisdictions to the Covanta transformation facility in the San Joaquin Valley in 2013. Data from DRS.

In 2013, 227 jurisdictions (55 percent) had some transformed waste. No jurisdiction sent more to transformation than to landfill. Even for those jurisdictions using transformation, most jurisdictions send less than 1 percent of their disposal to transformation facilities (Figure 33).

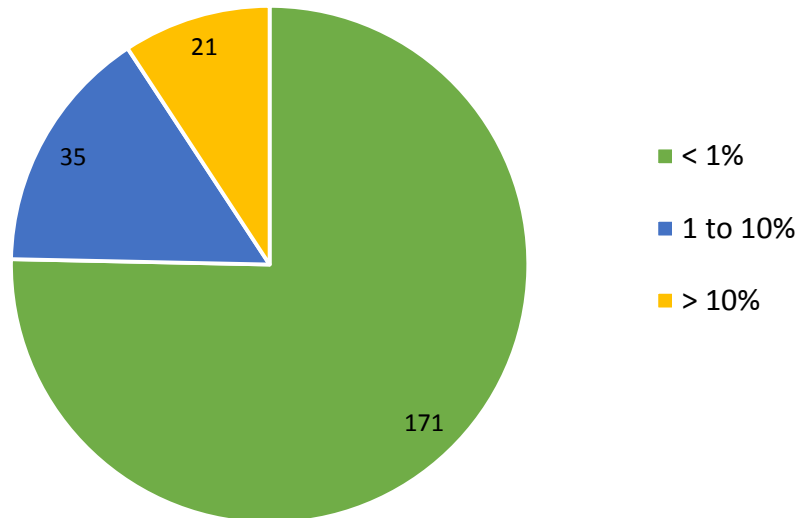


Figure 33. Jurisdictions sending solid waste to transformation facilities (2013 data). Chart shows the number of jurisdictions sending more than 10 percent of their total waste disposal to transformation, 1 to 10 percent to transformation, and less than 1 percent to transformation. From DRS.

The majority of jurisdictions do not get even 1 percent of diversion credit for transformation to meet their 50 percent diversion mandate, but some rely more on transformation. In 2013, 13 percent of jurisdictions earned a transformation credit of 1 percent or more, and for three jurisdictions the credit was necessary for them to reach 50 percent diversion (Figure 34).

Transformation 2013

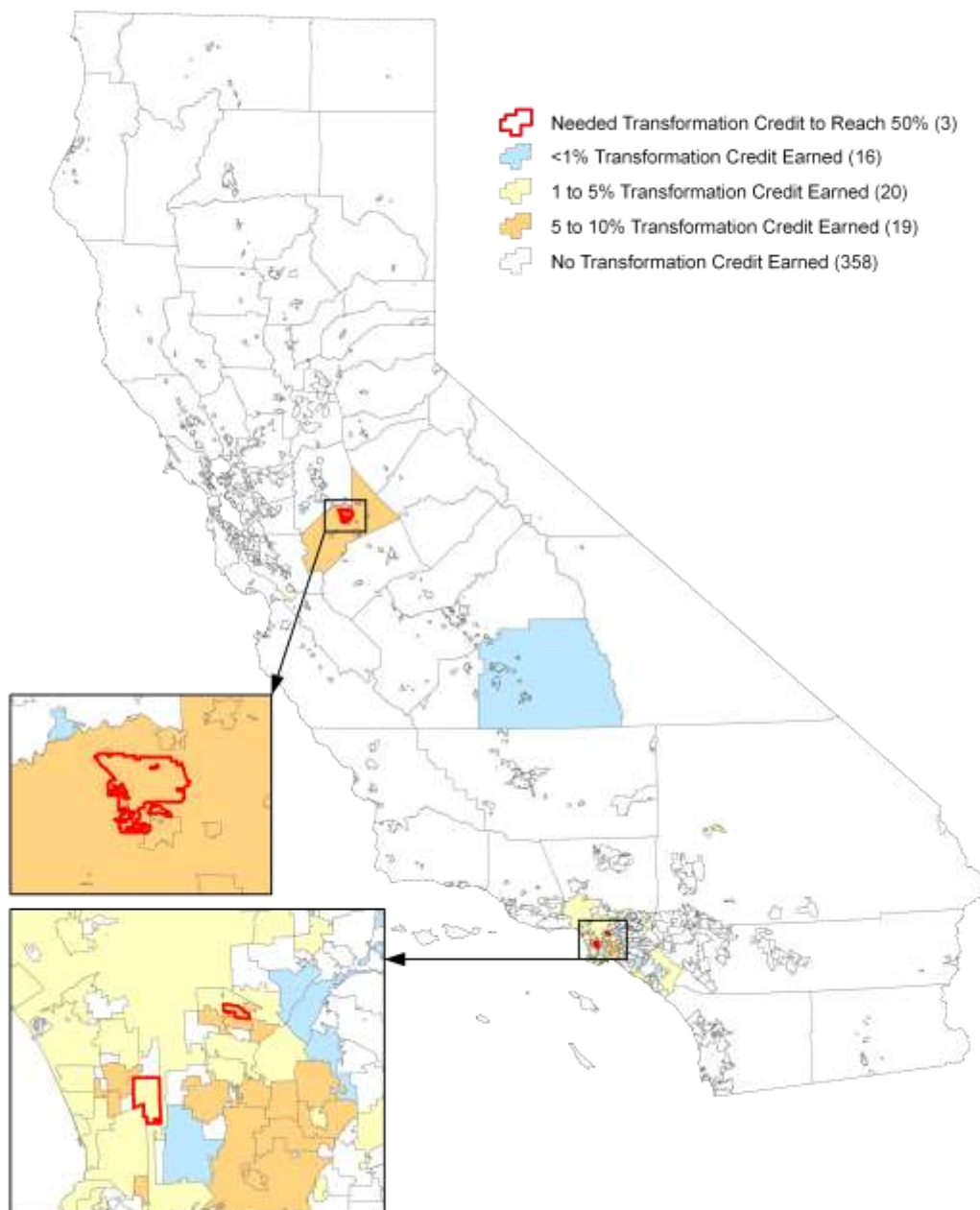


Figure 34. Jurisdiction use of transformation credits in 2013. Map showing the number of jurisdictions that earned 1 to 5 percent diversion credit from transformation toward their 50 percent goal, 5 to 10 percent credit, less than 1 percent credit, and no credit due to little or no transformation use. Jurisdictions with a red border reached 50 percent diversion due to the transformation credit. Data from DRS.

Transformation Data Findings

While the amount of transformation is not significant in the realms of disposal or diversion credit, it does stay relatively constant regardless of external forces.

Transformation use in California will likely stay at the same level it has been at for the last 20 years until one or all of the three existing plants close. No new transformation facilities are planned for the state, and transformation credit is limited to the three existing facilities. The energy contracts for Long Beach SERRF and Commerce Refuse to Energy are set to expire in the next few years. The current contracts provide price “floors” that pay higher prices for the energy the plants produce. If new rates paid for energy fall significantly, these plants will be more expensive to operate and even less competitive with nearby landfills.²¹

Transformation Data Collection and Limitations

Under Title 14 of the California Code of Regulations (CCR section 18811.4), transformation facility operators are required to report the total tons of waste transformed by jurisdiction of origin. No recent reporting issues have been found for the three transformation facilities.

Other MSW Thermal Technologies

MSW thermal technologies are processes that generate energy in the form of electricity, fuel, or heat from thermochemical processes such as combustion or gasification of MSW. MSW thermal technologies refer to a suite of technologies and processes that convert processed solid waste into energy or energy-related products through a range of processes, including gasification and pyrolysis. As discussed above, transformation currently plays a small but consistent role in California’s waste sector, as an alternative to landfilling. In addition to transformation, engineered municipal solid waste (EMSW) is another thermal technology operating in California.

Engineered municipal solid waste conversion was defined last year in AB 1126 (Gordon, Chapter 411, Statutes of 2013), which established a new pathway for more EMSW facilities. EMSW is a special category, separate from transformation, for facilities that use waste materials to create energy under the following conditions:

1. The waste to be converted is beneficial and effective in that it replaces or supplements the use of fossil fuels.
2. The waste to be converted, the resulting ash, and any other products of conversion are not hazardous.
3. The conversion is efficient and maximizes the net calorific value and burn rate of the waste.
4. The waste to be converted contains less than 25 percent moisture and less than 25 percent noncombustible waste.
5. The waste received is handled in compliance with regulatory requirements, and no more than a seven-day supply is stored at the facility at one time.

6. No more than 500 tons per day of waste is converted at the facility where the operation takes place.
7. The waste has an energy content equal to, or greater than, 5,000 BTUs per pound.
8. The waste to be converted is mechanically processed at a transfer or processing station to reduce the fraction of chlorinated plastics and materials.

Materials that can be burned for the EMSW process include MSW and other special materials such as tires or incinerator ash.

MSW Thermal Technologies Data

EMSW Facilities

EMSW facilities were defined as a type of solid waste facility in 2014. Since then, there has been one facility permitted in the state. The permitted facility, the Lehigh Cement Plant near Tehachapi, is permitted to use 350 tons per day of engineered municipal solid waste. The facility also uses biomass and tire-derived fuels. It is anticipated that additional cement kilns will apply for permits to operate as EMSW facilities. These facilities could use waste to power the cement process. Nationwide 0.7 million tons of “engineered fuel” was being used as fuel for cement production in 2011.²² About 1.4 million tons of solid waste was used to make the fuel.

Cement manufacturing plants in California have been using scrap tires as a supplemental fuel. According to data reported in response to the Air Resources Board’s Energy Efficiency and Co-Benefits Assessment of Large Industrial Facilities Regulation (EEA Regulation), reporting cement plants derived about 7 percent of the total energy they consumed in 2009 from scrap tires.²³

Other MSW Thermal Technologies

Pyrolysis and thermal gasification are related conversation technologies not yet in use on a commercial scale in California. These processes perform the thermal decomposition of organic materials at elevated temperatures in the absence of gases or in a limited amount of gases. Hyperion Energy recovery system, operated by the city of Los Angeles, is developing these processes for sewage sludge.

MSW Thermal Technologies Data Findings

It is unclear how many EMSW facilities will become permitted and operational. Given the size constraints, it will likely be several years before a significant amount of material flows through these facilities at the statewide level.

While there are no other full-scale MSW thermal technology facilities in California, AB 1126 established a pathway for EMSW facilities and may serve as an example for other types of facilities that could use waste as fuel.

MSW Thermal Technologies Data Collection and Limitations

EMSW facilities will report in DRS, and the material will count as disposal. CalRecycle will start collecting information on EMSW facilities when they become permitted and start reporting in DRS. When reporting begins, CalRecycle will know more about the impact of these facilities on the disposed waste stream.

Disposal-Related Materials

As discussed previously, CalRecycle's implementation of AB 341 recognizes both disposal and disposal-related activities. These activities are not source reduction, recycling or composting, so they do not count toward the 75 percent statewide recycling goal in 2020. These activities are inextricably tied to disposal and/or disposal facilities:

- Alternative daily cover, alternative intermediate cover, and other beneficial reuse
- Municipal solid waste thermal processes and waste-derived fuels

Alternative Daily Cover, Alternative Intermediate Cover, and Other Beneficial Reuse

Alternative daily cover (ADC) is the use of materials specifically approved by Local Enforcement Agencies to cover solid waste on a daily basis. Alternative intermediate cover (AIC) is the use of approved materials to cover solid waste in areas that will not receive additional waste for 180 days. Other beneficial reuse is the application of other waste-derived materials for other uses at a landfill, such as for road base, winter decks, and erosion control.

ADC, AIC and Other Beneficial Reuse Data

Disposal related activities include ADC, AIC and other beneficial reuse at landfills. ADC fluctuates along with the amount of material disposed over the years. In 2007 the ratio of ADC to disposal was at a low of 10.1 percent of disposal, but climbed to 13.9 percent of disposal in 2011. Overall, the ratio of ADC to disposal has remained consistent over the years despite a drop in disposal due to the economic downturn. The drop in disposal means that although the ratio of ADC to disposal in 2013 was 11 percent of disposal, ADC actually dropped 0.6 million tons when comparing it to 2007, which had the ratio of ADC to disposal at 10.1 percent of disposal. AIC has remained a small portion of disposal-related material, with a ratio of AIC to disposal of less than 1 percent of disposal over the years.

In 2006, CalRecycle began tracking material that was used for other beneficial reuse at landfills. Other beneficial reuse was 1.5 million tons or had a ratio of 3.8 percent other beneficial reuse to disposal in 2006. In 2007, the ratio of other beneficial reuse to disposal jumped to 5.2 percent with an increase of 0.5 million tons of material used at landfills. In the last reporting year, the ratio of other beneficial reuse to disposal was 7.6 percent of disposal, with 2.3 million tons of material. The 2013 ratio of other beneficial reuse to disposal is double the 2006 percentage of disposal. Other beneficial reuse has shown growth over the past few years as more material is being used at the landfills for purposes other than cover (Figure 35).

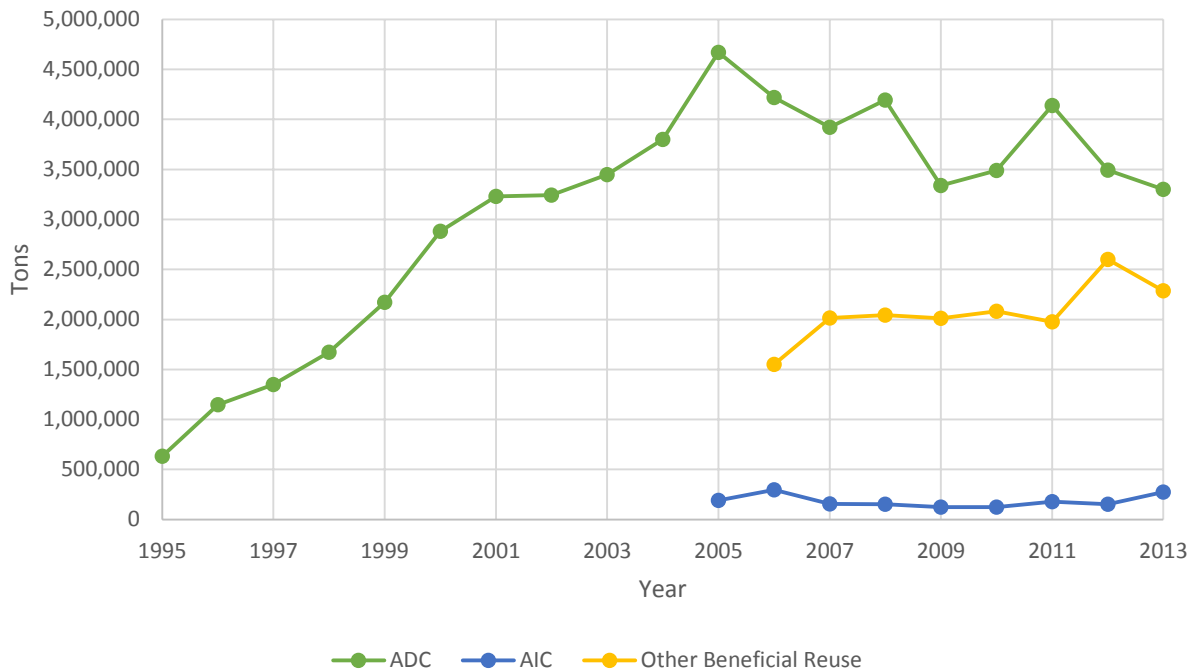


Figure 35. Disposal-related material trends 2006 to 2013. Graph showing the annual tons of use for disposal-related materials including ADC, AIC, and other beneficial reuse from 2006 to 2013. Data from DRS.

Because AIC and Other beneficial reuse constitute a smaller percentage of disposal-related activities, the focus in the remainder of this section will be on ADC (Table 11). However, the increasing percentage ratio of beneficial reuse to disposal (from about 4 percent of disposal in 2006 to about 8 percent in 2013) may warrant additional attention.

Table 11. ADC, AIC and Other beneficial reuse tonnages and ratio to disposal percentages from 2006 to 2013. Data from DRS.

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Disposal Tons | 41,083,735 | 38,939,239 | 35,184,338 | 30,803,263 | 29,590,217 | 29,798,405 | 29,152,195 | 30,016,880 |
| ADC | 4,218,992 | 3,922,060 | 4,192,731 | 3,339,609 | 3,487,779 | 4,137,698 | 3,492,741 | 3,308,011 |
| % of Disposal | 10.3% | 10.1% | 11.9% | 10.8% | 11.8% | 13.9% | 12.0% | 11.0% |
| AIC | 295,665 | 156,770 | 154,097 | 124,633 | 125,331 | 178,424 | 151,440 | 273,386 |
| % of Disposal | 0.7% | 0.4% | 0.4% | 0.4% | 0.4% | 0.6% | 0.5% | 0.9% |
| Other Beneficial Reuse | 1,550,910 | 2,015,166 | 2,044,436 | 2,009,928 | 2,082,567 | 1,976,567 | 2,598,693 | 2,292,612 |
| % of Disposal | 3.8% | 5.2% | 5.8% | 6.5% | 7.0% | 6.6% | 8.9% | 7.6% |

Total ADC

After rapid growth in total ADC use until 2004, ADC usage has declined. This could correspond to a decrease in the need for ADC due to the reduction in disposal during the recent recession; it could also reflect a change in facility practices or jurisdiction preferences, or a change in material availability (such as a downturn in green waste availability due to California's severe drought). Approximately 60 percent of landfills used ADC in 2013, while about 40 percent did not.

Geographically, ADC use is highest in Southern California, and the next-highest use is in the Bay Area. Southern California had five facilities with greater than 100,000 tons of ADC use in 2013 and several facilities with 50,000 to 100,000 tons of ADC use (Figure 36).

The concentration of ADC use in Southern California most likely can be attributed to the greater amounts of waste disposed by the most populated region in the state. In 2013, the five counties in the Southern California region accounted for 61 percent of waste disposed statewide, 58 percent of the population, and 52 percent of the ADC use.

The Bay Area had the next-largest concentration of ADC use for a region, with five facilities using more than 100,000 tons. In 2013, the nine counties in the Bay Area region accounted for 16 percent of the waste disposed statewide, 19 percent of the population, and 32 percent of the ADC use.

Total ADC Tons at Landfills, 2013

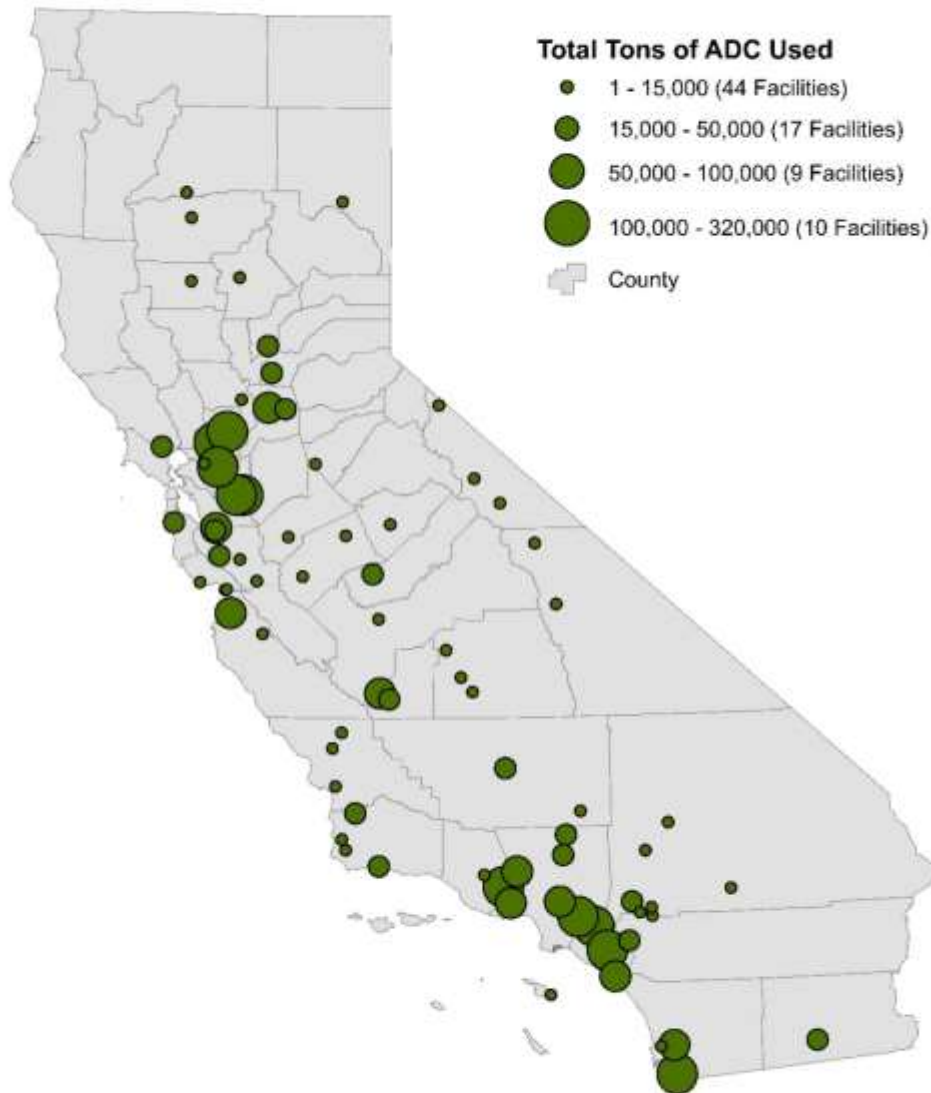


Figure 36. 2013 Total ADC use at landfills in 2013. The largest circles represent facilities that used more than 100,000 tons of ADC. Data from DRS.

Green Waste ADC

In 2013, green waste was the material most used as ADC, comprising 44 percent of total ADC use. Construction and demolition (C&D) waste and auto shredder waste were next, at 17 percent and 14 percent respectively (Figure 37). Overall, these three materials make up more than 75 percent of total ADC use. This has been the case over the last decade, with green waste, C&D, and auto shredder waste being the top three materials used as ADC since 2004. Auto shredder waste is being re-evaluated by the Department of Toxic Substances Control to determine whether it can continue to be used as ADC.

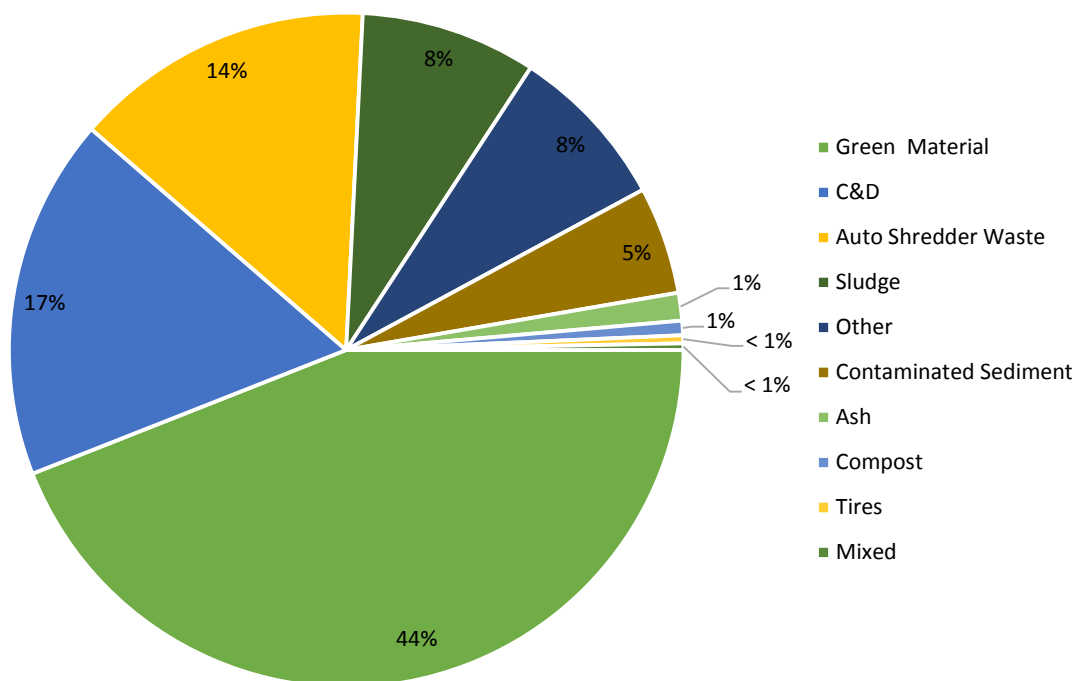


Figure 37. ADC material types used 2013. Chart showing percent of each ADC material type used for total 2013 ADC use. Data from DRS.

Since tracking began for ADC use in California in 1995, green waste ADC has been the top material type used, although it has declined in use since 2005. Since its peak use in 2005 of 3 million tons, green waste ADC use has declined by more than 1.5 million tons to its current 2013 level of less than 1.5 million tons used (Figure 38). The decline in ADC green waste over the last decade is likely due to many factors, including:

- Local ordinances banning green waste from landfills, including use as ADC
- Jurisdictions directing more green material to composting (according to CalRecycle's Diversion Programs System, in 2005 305 jurisdictions reported sending materials to composting facilities while 298 jurisdictions did in 2012)
- The overall 29 percent decline in disposal since 2005 caused by the recent recession, which may have reduced the need for green waste ADC
- Some landfills changing their green waste ADC practices for economic reasons or operational needs
- The severe drought conditions, which may have reduced the availability of green waste

CalRecycle (except in the few cases in which the Department is acting as the Enforcement Agency) does not track the tons of materials sent to composting facilities (or other recycling facilities), so it is not possible to determine whether the decrease in green waste ADC corresponds to an increase in composting.

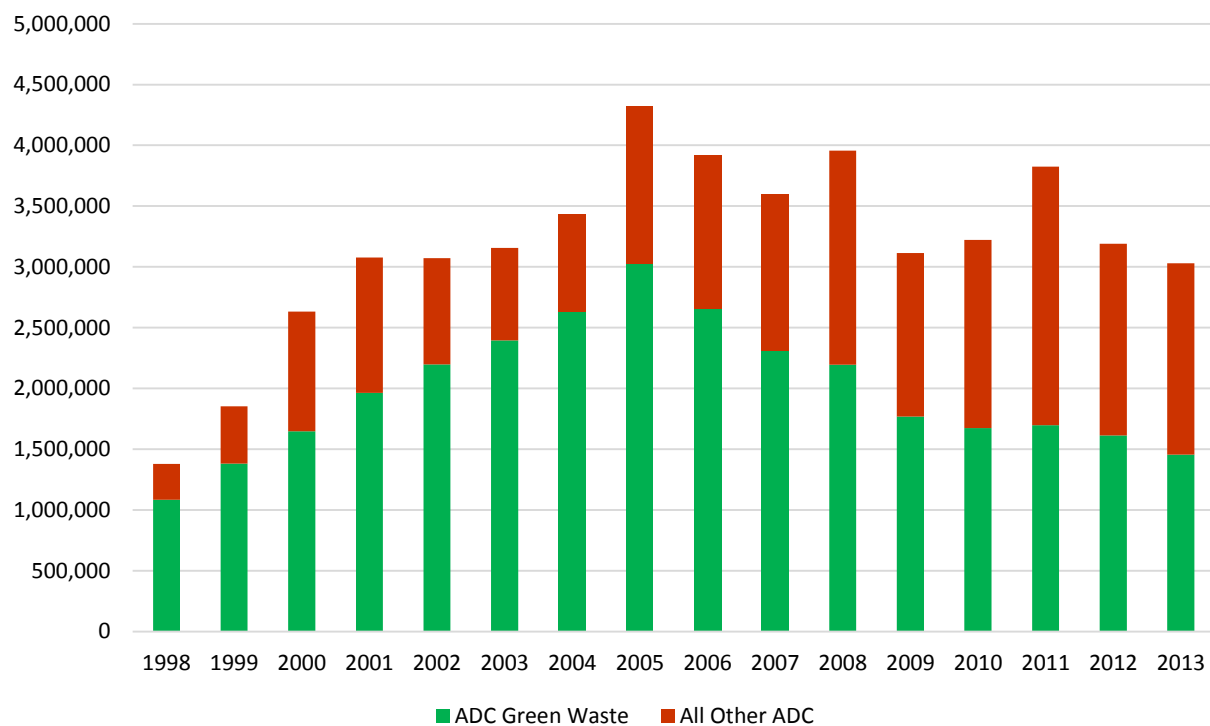


Figure 38. Green waste ADC trends 1998 – 2013. Chart showing total green waste ADC use in tons and total tons used for all other ADC material types from 1998 to 2013. Data from DRS.

Regionally, most green waste ADC use occurs in Southern California. In 2013, three facilities in Southern California had more than 100,000 tons in green waste ADC use, while five facilities in the region used between 50,000 and 100,000 tons of green waste ADC (Figure 39). In 2013, the five Southern California counties – Los Angeles, Orange, Riverside, San Bernardino, and San Diego – accounted for about three-quarters of green waste ADC use in the state, or around 1.1 million tons of the total 1.45 million tons of green waste ADC.

Green Waste ADC Tons at Landfills, 2013

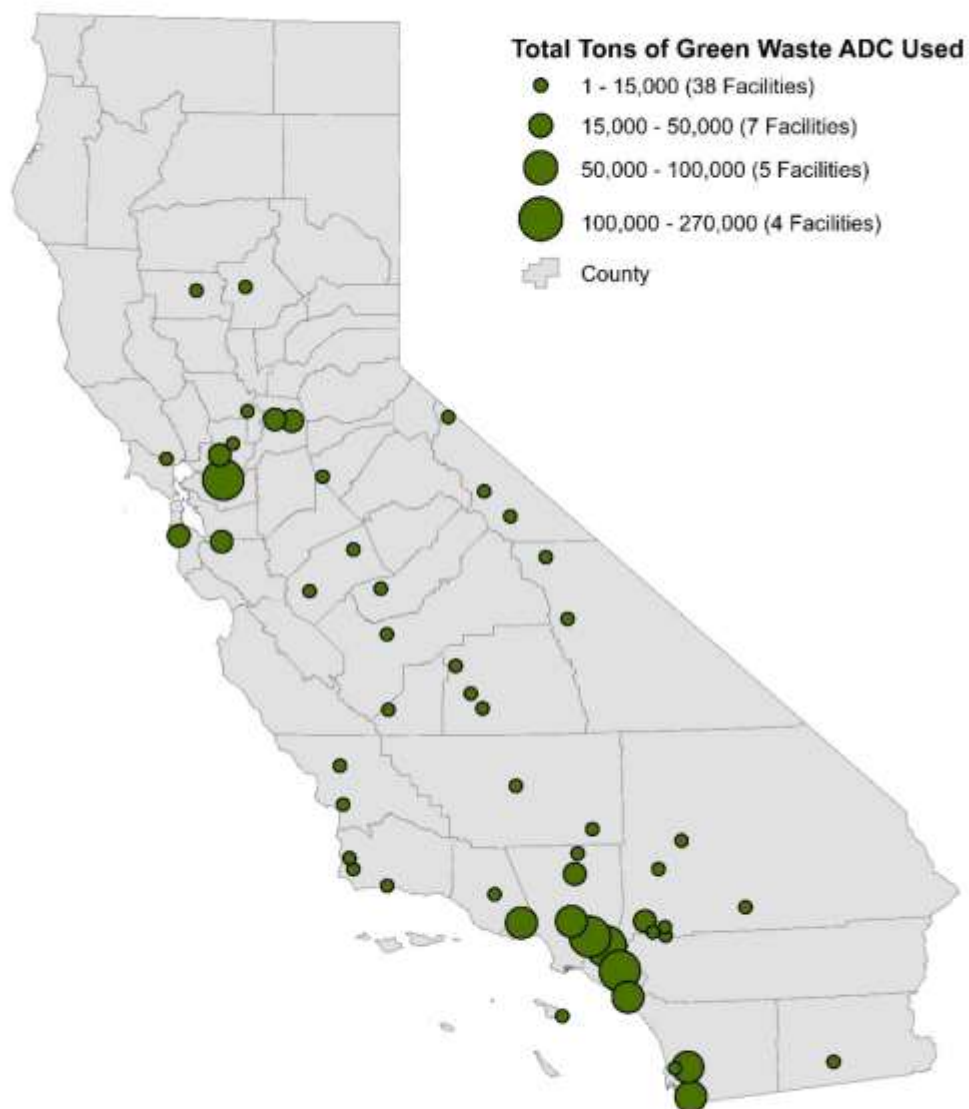


Figure 39. Green waste ADC use at landfills, 2013. The different-size circles represent different amounts of ADC green waste used at facilities in California in 2013. Data from DRS.

Jurisdiction Reliance on ADC as Diversion

In 2013, 294 jurisdictions had more than 1 percent of their total waste as ADC, 79 had less than 1 percent of their waste as ADC, and only 40 jurisdictions had no waste-derived ADC use (Figure 40).

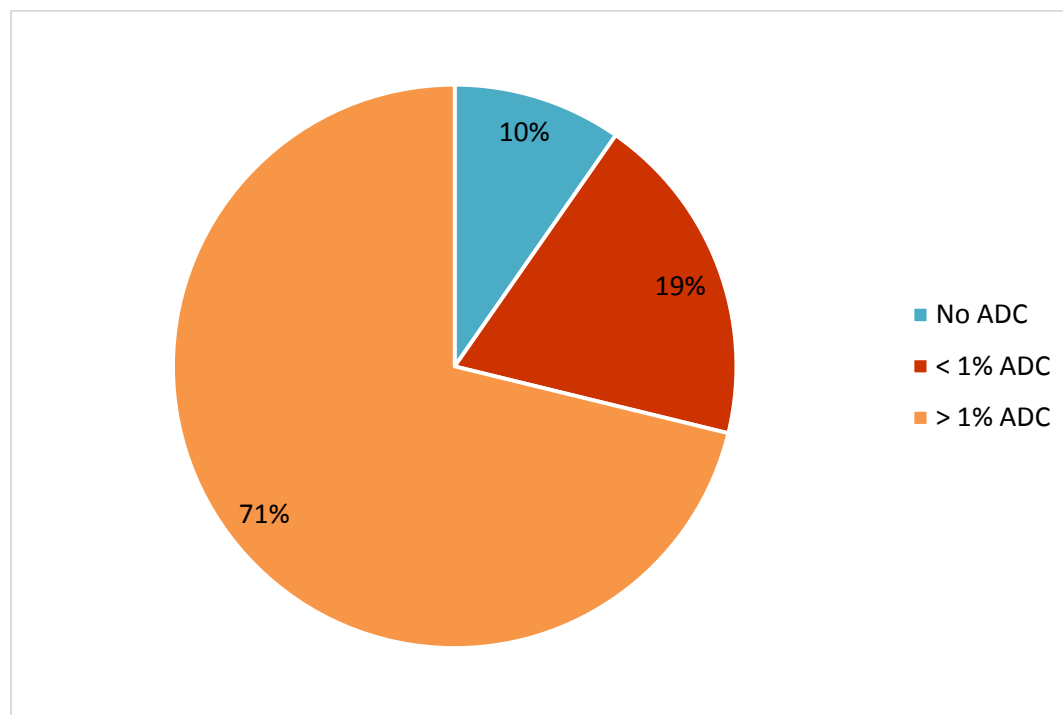


Figure 40. 2013 Jurisdiction ADC usage compared to total disposal. Chart showing the percent of jurisdictions with greater than 1 percent of their waste as ADC (71 percent), less than 1 percent of their waste as ADC (19 percent) and jurisdictions with no ADC use at all (10 percent). Data from DRS.

Of the 294 jurisdictions that had greater than 1 percent of their waste as ADC in 2013, the amount of use varies and can be significant for some jurisdictions. Three jurisdictions had ADC that was greater than half their disposal, while 28 jurisdictions had an ADC-to-disposal ratio of 25 percent to 50 percent of their disposal (Figure 41). Many jurisdictions fell in the range of ADC use as 1 to 25 percent of their disposal, 109 jurisdictions at 10 to 25 percent, and 154 jurisdictions had 1 to 10 percent.

Although 90 percent of jurisdictions have reduced disposal due to ADC use, most do not rely on ADC use to meet the AB 939 diversion mandate. If green waste ADC had counted as disposal in 2013, only about 10 jurisdictions would not have met the 50 percent diversion mandate as a result.

Percentage of ADC By Jurisdiction

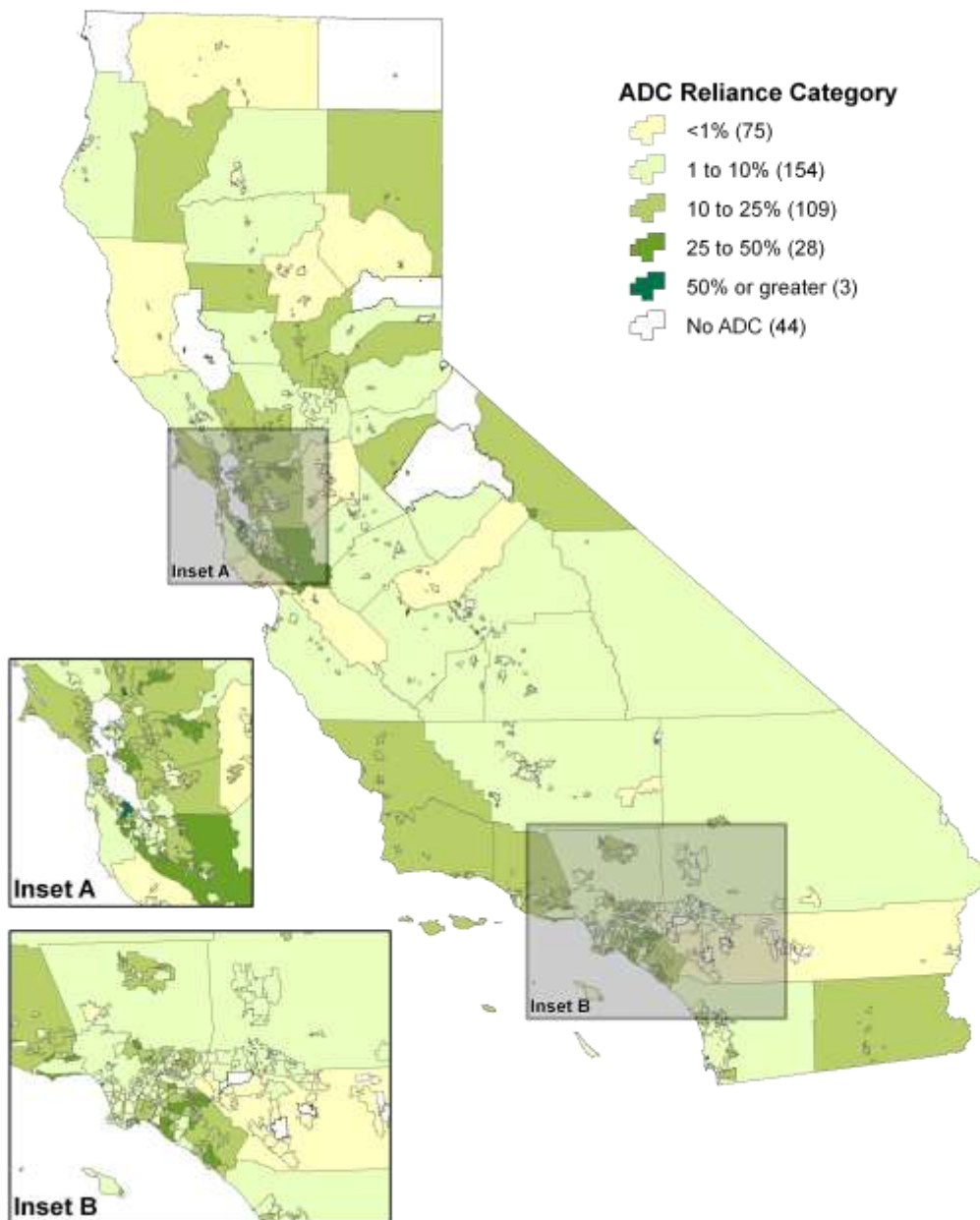


Figure 41. Percentage of ADC by jurisdiction, 2013. Map showing jurisdiction ADC usage compared to total disposal for 2013 with usage divided into six categories (less than 1 percent, 1 to 10 percent, 10 to 25 percent, 25 to 50 percent, 50 percent or greater, and no ADC use). The number of jurisdictions are listed for each category. Data from DRS.

In 2014, AB 1594 (Williams, Chapter 719) specified that as of 2020, green material used as ADC will no longer count toward diversion for local jurisdictions. However, the green waste ADC will still not be subject to the disposal fee, and facilities will still be allowed to use green waste as ADC. If green waste ADC use does decline further, it is not clear which materials could or would be used in its place as ADC.

Investigation of Apparent ADC Overuse

Data from landfills can show an ADC-to-disposal ratio that is higher than expected industry norms. CalRecycle has conducted several investigations to determine whether the ratios are the result of the overuse of ADC. In each of those investigations, overuse was identified at some facilities. However, in most cases, it appears that the high ratios are the result of errors in the methods used to track, record, and report on ADC. Even if reporting is correct, valid operational reasons may exist for high ADC-to-disposal ratios, so high ratios do not necessarily mean overuse. In 2013, the ratios of ADC to waste varied greatly (Figure 42). CalRecycle will continue to monitor ADC usage by facilities and to investigate potential ADC overuse and misreporting.

Percentage of ADC Use at Landfills, 2013

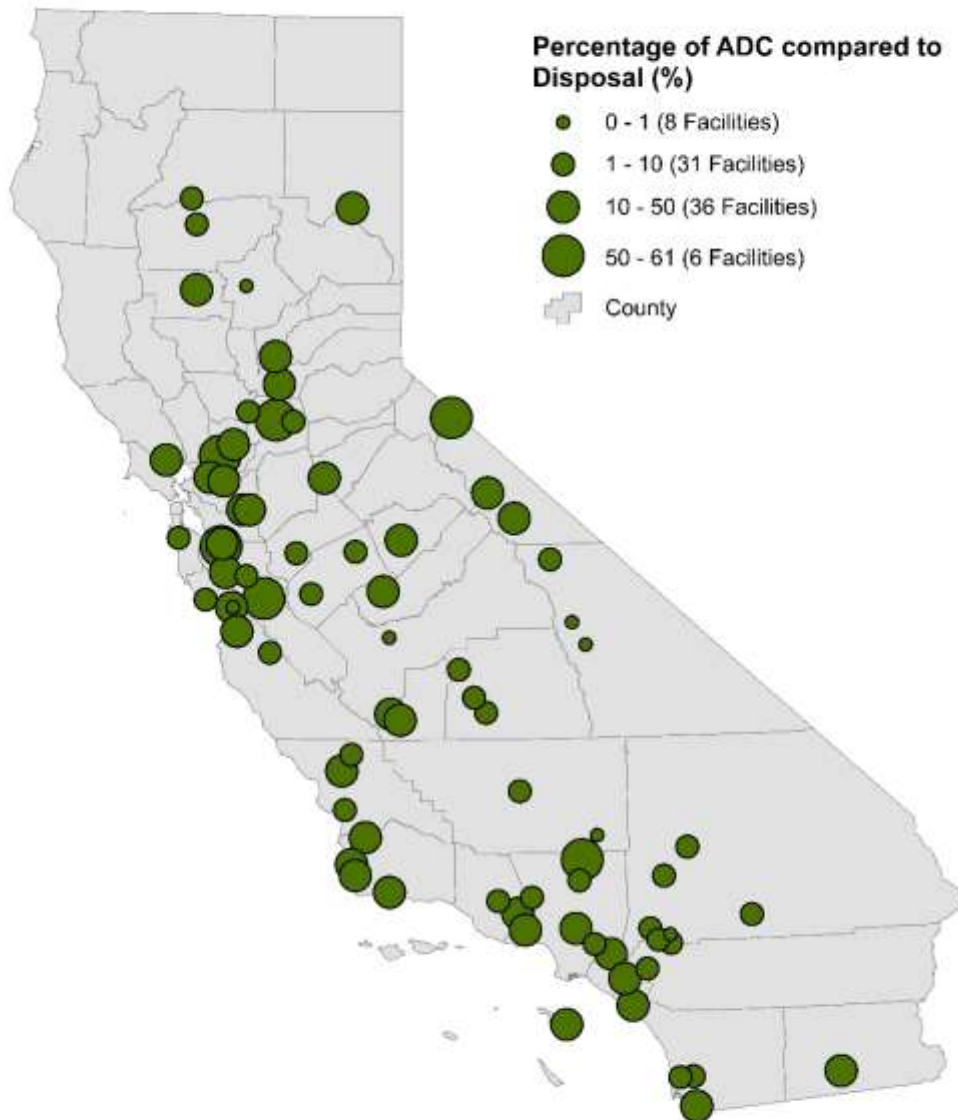


Figure 42. Percentage of ADC use at landfills, 2013. Map showing the percentage use of ADC compared to disposal at all landfills in California for 2013. Data from DRS.

ADC Findings

To reach the statewide 75 percent recycling goal by 2020, much of the 3 million tons of material used for ADC would likely need to be diverted from landfills. Since green waste ADC comprises about 44 percent of ADC use, programs will need to focus on diverting green materials to composting or other higher and better uses. In addition, the 2.3 MT (2013) of beneficial reuse will also count as disposal under the 75 percent recycling goal, and programs will have to focus on diverting these materials away from landfilling.

ADC Data Collection and Limitations

Under Title 14 of the California Code of Regulations (CCR section 18810.9), landfill operators are required to report the total tons of each type of ADC and AIC by jurisdiction of origin. They must also report on the amount and type of beneficial use but are not required to report on this activity by jurisdiction.

CalRecycle staff conducted a survey of ADC use and regulations in other states, but the requirements, materials, and tracking vary so much that state-to-state comparisons with California ADC use are not possible.

ADC tracking within DRS is challenging, as ADC overuse investigations have highlighted. Materials are often stockpiled for later use as ADC and may be subsequently redirected to other end uses, so some misreporting may occur.

Because ADC, AIC, and beneficial reuses are charged different (usually lower) rates and are not subject to the state \$1.40 per ton Integrated Waste Management Account Fee (IWMAF), there may be some incentive for material to be reported as ADC when in practice it is disposed.

CalRecycle specifies conditions for use and application, including in many cases the maximum, minimum, and average thickness of applied ADC materials.²⁴ Overuse of ADC is defined as exceeding the maximum allowable depth of ADC. Any excess material should be counted as disposal. Local Enforcement Agencies and CalRecycle monitor ADC use and investigate ADC overuse to prevent inappropriate disposal reduction/diversion credit, lost landfill capacity, wasted materials (e.g. green waste), and misapplication (intentional or unintentional).²⁵ Investigations of apparent ADC overuse have generally found a mixture of appropriate use, some overuse, and recordkeeping and reporting issues.

Landfill Fees and Funding Mechanisms

Most landfills charge a fee to accept waste, but some publicly owned sites are funded through different mechanisms, such as property taxes or the General Fund.

Publicly Posted Self-Haul Landfill Tipping Fees

Tipping fees are paid at the gate of a landfill for waste disposal by the customer and are based on the weight or volume of the load, truck type, customer type, and/or existing negotiated rates. Tipping fees at landfills may not always represent the complete cost of landfilling. CalRecycle conducted a survey of these fees publicly posted tipping fees for municipal solid waste at landfills in 2013, and published the findings in 2015.²⁶

Tipping fees are a complex data set with regional variations that reflect California's diverse demographics and population distribution. California's statewide median publically posted self-haul tipping fee was \$45 per ton, and 46 percent of landfills were found to charge between \$36 and \$50 per ton. As shown in Figure 43, there is a wide range of assessed fees (\$0 to \$125). In the Bay Area and Coastal regions, the median posted self-haul tipping fees is higher than the state median (Bay Area median \$68, Coastal median \$64). The Southern region median was less than the Bay Area or Coastal regions, but at \$56 per ton was still was above the state median. In contrast, the Central Valley region's median was the same as the statewide median (\$45 per ton median), and all but four of the fees in the Central Valley fell below the statewide median. The only region that did not clearly fall below or above the statewide median was the Mountain region, with half the landfills in the region charging below \$42 per ton and the other half charging above \$70 per ton. The study also found, from a small sample of 22 agreements, that negotiated rates between haulers/jurisdictions and landfills were approximately \$25 less than the posted rates. These negotiated rates were discounted between 11 percent and 76 percent, with only two negotiated fees being higher than the posted public tipping fee rate (both were 20 percent higher).

Tipping Fees in California, 2013 Regional Data

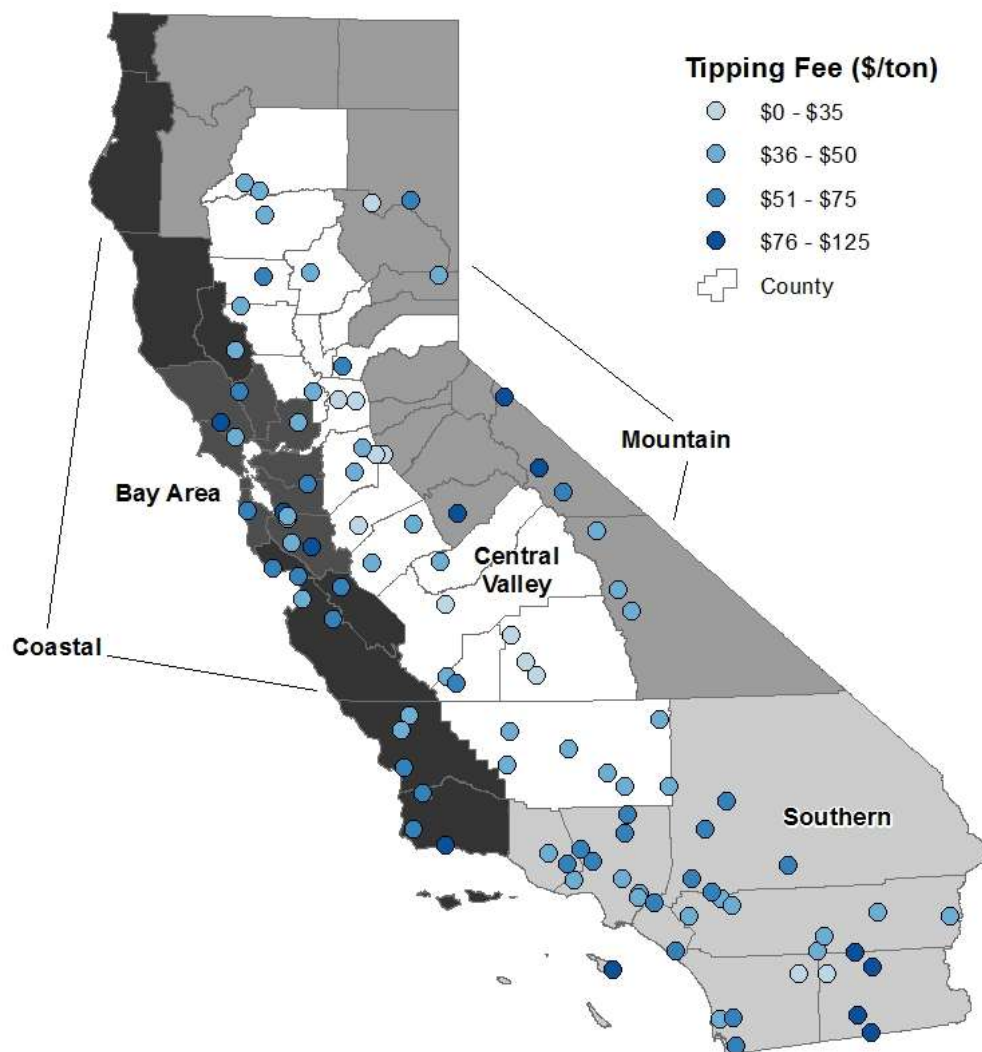


Figure 43. Publicly Posted Tipping fees by region. Map showing ranges of tipping fees in California's five regions. Different color circles represent different tipping fee ranges with dark blue representing the highest fees. Data from 2015 report "Landfill Tipping Fees in California."

In order to compare California to the United States and the European Union, an average was calculated for the publicly posted self-haul gate fees for facilities in California. These fees do not include negotiated fees by facilities with commercial hauling companies. California's publicly posted self-haul (not negotiated) gate fee of \$54 per ton was higher than the national average tipping fee of \$49 per ton. As noted in both European Union and U.S. data on tipping fees, high tipping fees seem to correlate with a low percentage landfilled and can serve as a disincentive for landfilling. Interestingly, California has a lower percent landfilled than would be expected, given the average tipping fee at landfills (Figure 44). This is likely due to California's aggressive mandates, programs, policies, and requirements for increasing diversion and reducing landfilling. The European Union charges higher tipping fees than California does; in 2012, the average tipping fee in the European Union was \$100 per ton.

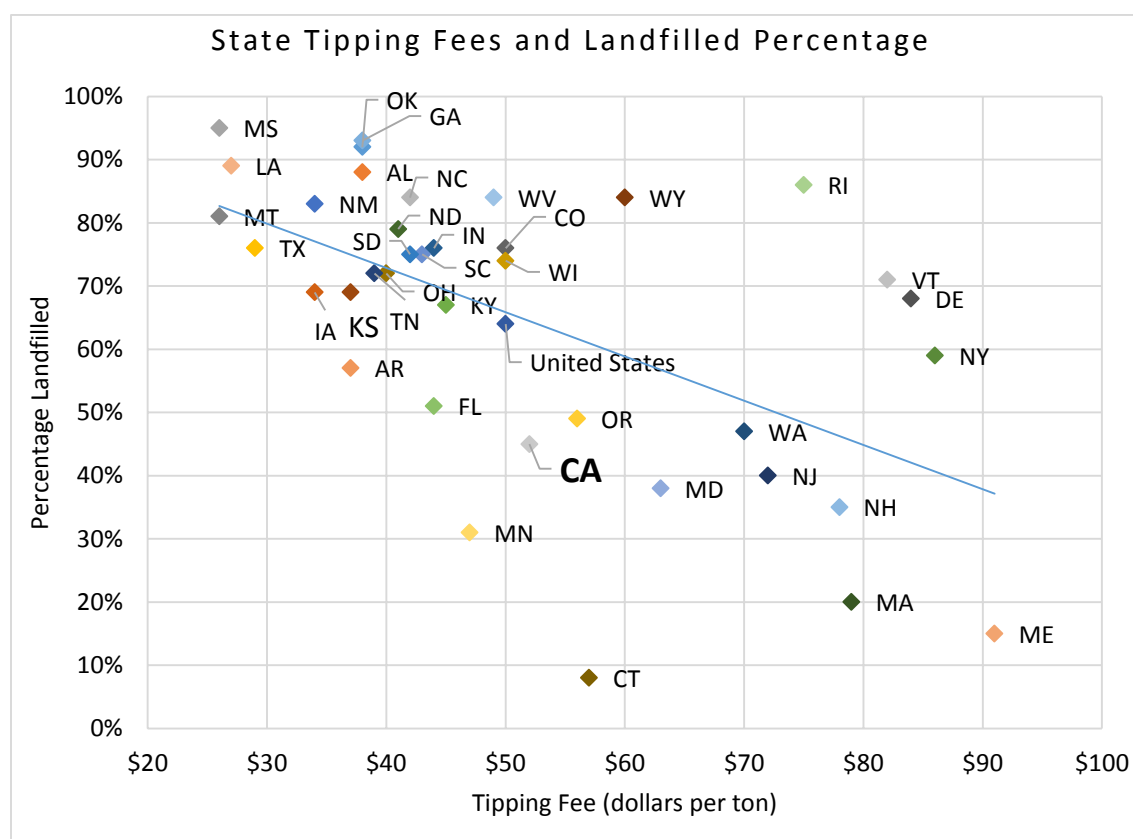


Figure 44. Relation between average landfill tipping fee and percent landfilled, by state. California is shown in gray. The correlation between tipping fee and percent landfill is mild ($R^2 = 0.32$). California's tipping fee represents the average publicly posted self-haul gate fee for facilities in California and does not include gate fees negotiated by facilities with commercial haulers. Data from 2014 Columbia University study.

Funding Mechanisms in California and Other States

It is important to distinguish between landfill tipping fees (discussed above) and fees imposed by state or local governments on landfill disposal. For each ton of waste disposed at a California landfill, the landfill must pay a \$1.40 Integrated Waste Management Fee (IWMF), which is collected for CalRecycle by the Board of Equalization and used to fund many CalRecycle programs.

CalRecycle staff surveyed other states and collected information on state-level fees and funding sources for state-level solid waste and recycling programs. Of the states that responded to CalRecycle's inquiries, no two had identical funding mechanisms. This survey specifically collected state-level fee information on solid waste, tires, oil, electronics, beverage container, annual operating or permit fees, and miscellaneous fees.

State Imposed Fees on Landfill Disposal

Of the 50 states, 31 states (62 percent) are funded by a fee similar to California's IWMF disposal fee. In those states collecting a disposal fee, the lowest disposal fee was \$0.12 per ton in Virginia and the highest was \$13.00 per ton in Wisconsin (Figure 45). The average solid waste disposal fee was \$2.12 per ton, with a median of \$1.25 per ton. The California IWMF is only collected on waste disposed in landfills within California; it does not cover transformed or exported waste. Nebraska, Tennessee, Kansas, Ohio, Oregon and North Carolina collect a solid waste fee on waste exported out of state through transfer stations. Preliminary data from other states indicate that some states subsidize transformation and some charge a fee on transformation, but more research would be required to get accurate data.

In the European Union, six member states charge a fee on transformation.²⁷ The average landfill fee in the European Union was \$35 per ton. The European Union uses higher disposal fees and landfill taxes as a strategy to drive material away from landfills, in combination with other policies (i.e. landfill bans). In the European Union, the higher landfill fees make alternative waste management options, like composting and anaerobic digestion, more competitive and help push material away from landfills.



Figure 45. Solid waste funding for the 50 states. Map showing the dollar amounts for state solid waste fees and other revenue sources. Data collected based on surveys conducted by CalRecycle staff, 2014.

Other Fees

In many states, the state-level solid waste disposal fee is not the only fee collected to fund solid waste disposal and recycling programs. Other states collect fees such as permitting fees, an annual operating fee, or other fee mechanisms.

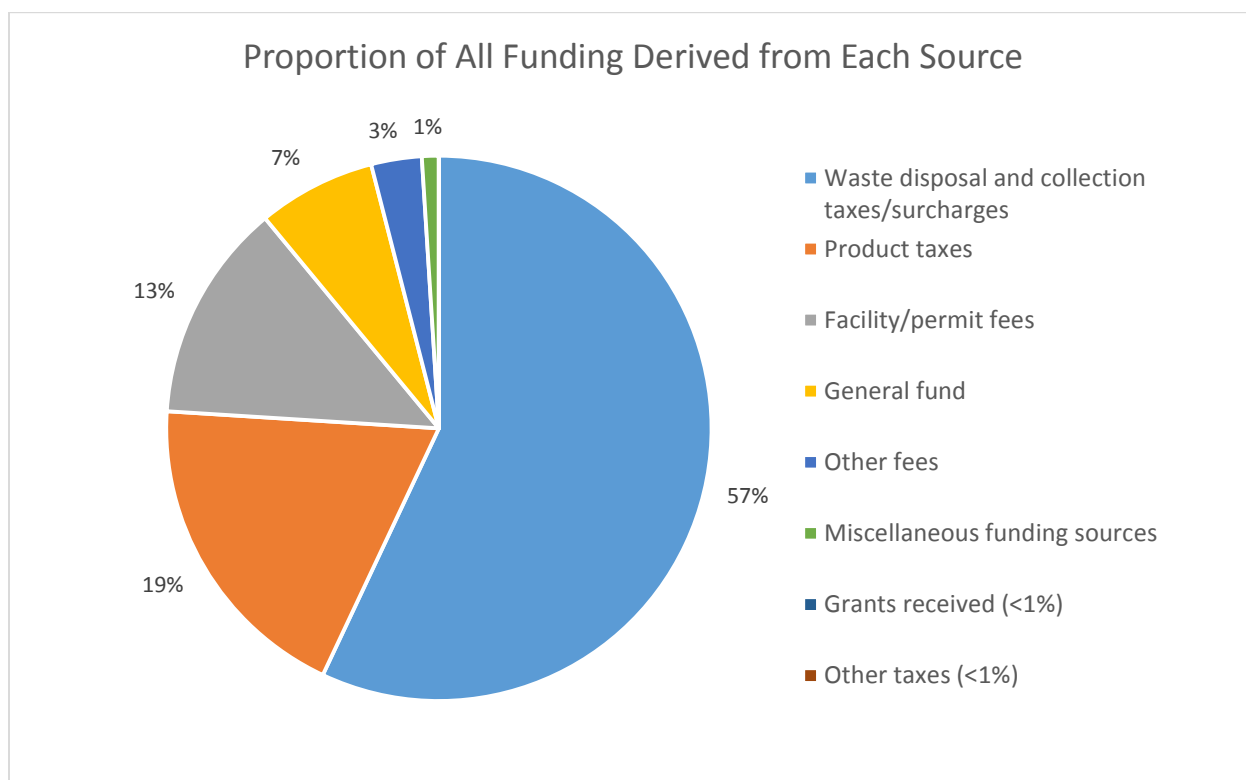
In addition to the IWMF, California collects fees on a number of individual materials or products, including beverage containers, oil, tires, and electronics. Table 12 shows the total number of states that impose a fee on these material types, or use other fee mechanisms. Additional states may be collecting fees on these materials or products but are excluded from this table if the fees do not directly support their solid waste and recycling programs.

Table 12. Summary of funding mechanisms supporting solid waste and recycling programs. Data obtained by CalRecycle staff through Internet research, phone calls, and emails to states, 2014.

| Total States | Disposal Tax/ Surcharge | Tires | Used Oil | Beverage Container | E-Waste | Permit Fee | Annual Fee | Other Fee |
|---------------------|--------------------------------|--------------|-----------------|---------------------------|----------------|-------------------|-------------------|------------------|
| 50 | 30 | 34 | 7 | 6 | 10 | 21 | 15 | 14 |

CalRecycle also collected information on other funding mechanisms that are not utilized in California. There are 21 states that impose a permitting fee and 15 states that collect an annual operating fee on solid waste and/or recycling facilities. Lastly, 14 other states used some other funding mechanism, such as litter reduction fees, rental car tax, property tax, and other fees or taxes to fund their solid waste and recycling programs.

Of the 50 states that were surveyed and responded to questions regarding their fees, only 29 states responded with specific information regarding overall funding of solid waste programs in the state. The following discussion applies only to the 29 states that responded to the funding survey. Shown below is the total funding for the 30 states, including California, divided by the eight funding categories to show the proportion of the total funding for each source (Figure 46). Of the total funding in the 30 states, 57 percent came from waste disposal and collection fees and surcharges.



*Figure 46. Proportion of all funding derived from each source. Chart showing the total funding percentage by category for the 30 states that participated in the funding survey. The proportion received from each funding source is shown. For example, of the total funding for the 30 states, 57 percent was received from waste disposal and collection taxes/surcharges. Data obtained by CalRecycle staff through a funding survey of 29 states plus California, 2015. *Grants received 0 percent due to rounding, and “Other Taxes” is zero.*

The majority of the funding for the states surveyed is received from waste disposal and collection taxes or surcharges followed by facility and permit fees and product taxes. States can be funded by a combination of these sources (Figure 47).

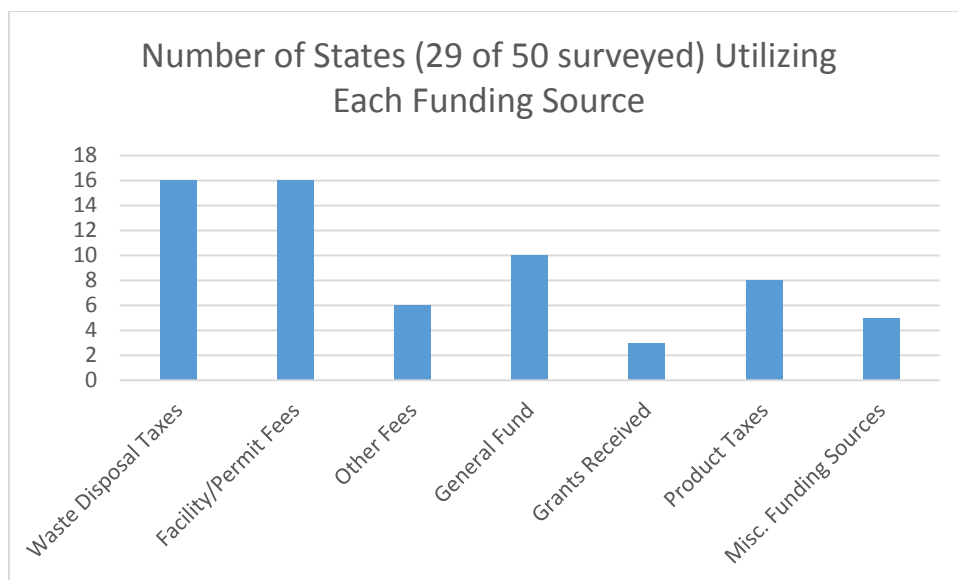


Figure 47. Number of states utilizing each of the eight funding sources. Data obtained by CalRecycle staff through a funding survey of 29 states plus California, 2015.

The variations in funding mechanisms are due in part to differences among state-level programs. Unlike California, the majority of the surveyed states have the primary responsibility of permitting, inspecting, and enforcement for solid waste facilities. A small portion of the surveyed states, including California, have shared responsibility with local governments. In California and Washington, permitting, inspection, and enforcement are provided primarily by local governments with oversight provided by the state.

California's Integrated Waste Management Fee

A large portion of CalRecycle's waste management programs are funded through the \$1.40 IWMF collected on landfill disposal. When the IWMF was first established in 1989, the intent of the fee was to fund the overall operations of CalRecycle (then the Integrated Waste Management Board), including regulating solid waste, permitting, financing, establishing a system for jurisdictions to reach their diversion mandates, and reviewing compliance with programs. In the 25 years since the IWMF was established, the fee on landfilled materials has continued to support many of CalRecycle's regulatory disposal, diversion, and recycling programs.

The IWMF has only been raised twice in its 25-year history. The fee was first raised from \$0.75 per ton to \$1.34 per ton, effective July 1, 1994; this corresponded to an expansion in CalRecycle's mandated responsibilities for permitting, inspection, enforcement, and public outreach. The fee was raised to its statutory cap of \$1.40 per ton on July 1, 2002. Since then, the amount charged by CalRecycle on landfilled material has not changed. This is despite the very ambitious 75 percent statewide recycling goal and the efforts CalRecycle must make to meet that goal by 2020.

In 2014, AB 1594 (Williams, Chapter 719) specified that as of 2020, green material used as ADC will no longer count toward diversion for local jurisdictions. Jurisdictions and landfills can still use green material as ADC. While AIC and other beneficial reuse will continue to count as diversion and continue to not pay the fee, even after green waste ADC is classified as disposal it will not be subject to the \$1.40 per ton IWWMF. This creates a situation in which a material that is defined as landfill disposal can be landfilled without being subject to the disposal fee. This could pave the way for efforts to exclude other disposed materials from the fee. Further, it continues to incentivize green waste ADC use over composting.

Integrated Waste Management Account Funding Projections

As described above, CalRecycle relies on the IWWMF to fund a large portion of its general operations, particularly as they relate to disposal. One important consequence of using an IWWMF on disposal to fund the Department's operations is that it ties the department to a declining revenue source. The statewide 75 percent recycling goal is intended to encourage additional source reduction, composting, and recycling throughout California. In meeting that goal, the amount of material entering landfills should decrease by half; this means that there will be correspondingly less revenue to support CalRecycle's operations overall.

In order to estimate the impact of continuing to rely so heavily on the IWWMF to support the Department's operations, CalRecycle staff projected the impact of the 75 percent recycling goal on revenue (Figure 48). If this projection holds true, and assuming that CalRecycle's funding obligations remain constant and that there are no increases in funding for recycling, there will be a \$29 million gap in expenditures relative to revenue in 2020.

This projection only represents one aspect of the total revenue equation, it does not include the additional funding necessary to manage activities needed to achieve the 75 percent goal and to maintain this level of recycling. The projection is limited to revenue losses that will occur as a direct result of declining disposal fee income. The \$29 million deficit represents only a small portion of the true anticipated budget shortfall that CalRecycle will incur as the state supports and oversees infrastructure necessary to achieve the 75 percent recycling goal.

Meeting the 75% goal will require significant investments by all entities in infrastructure, recycling programs, and market development. Businesses and local government will require significant financial and technical assistance to capitalize expanded or new recycling, composting and anaerobic digestion infrastructure, and to develop local programs. Financial and technical assistance needs include, but are not limited to: grants and loans (and possibly incentive payments) for infrastructure; grants for MRFs to improve feedstock quality; grants to jurisdictions to assist in implementing AB 1826 and enhanced collection programs.

The expanded and more diverse solid waste infrastructure will require resources for additional permitting, inspection and enforcement to ensure public and environmental health. Not all of the increased oversight can be accomplished by CalRecycle, local agencies will continue to play a key role and will need to be further supported. Additional enforcement will be needed to monitor new and expanded programs, such as minimum recycled content requirements and new or expanded extended producer responsibility programs. Importantly, there will be an increase in the probability that local and state government will need to be prepared to address the unmet liability for closure and post-closure care of landfills as disposal decreases and landfills close early. Finally, the current funding structure of the IWMF does nothing to incentivize the diversion of materials away from landfills and towards recycling. In short, if CalRecycle is to develop and maintain the infrastructure required to meet the goals of AB 341, an increased and diversified revenue stream that incentivizes diversion would be a key part of the effort.

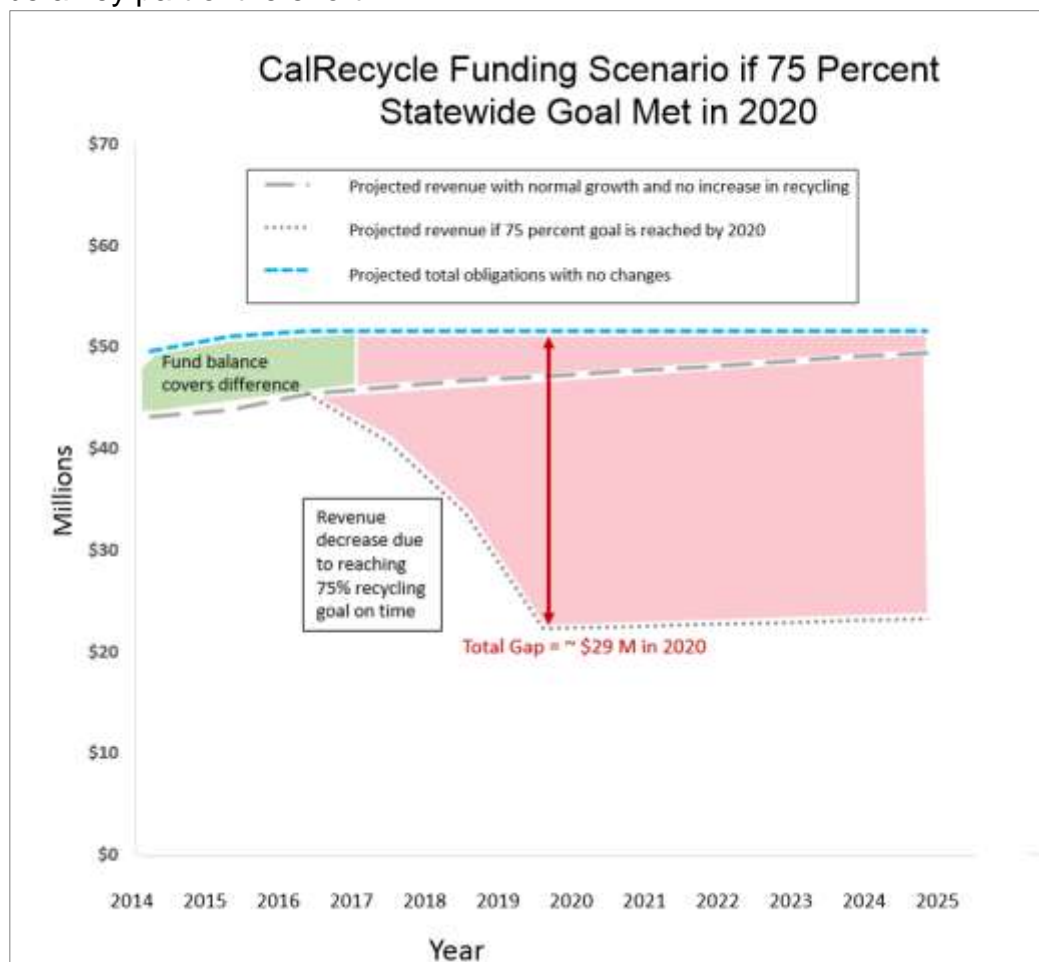


Figure 48. CalRecycle funding scenarios if statewide recycling goal is met. Graph showing projected CalRecycle revenue decrease due to lower disposal fee collection as California meets 75 percent recycling goal.

Fee and Funding Data Findings

Funding CalRecycle

Using either the average or median tipping fee, the IWMF makes up about 3 percent of landfill tipping fees in California. The IWMF could be raised in statute to a level high enough to continue to fund CalRecycle's programs. However, a funding structure based primarily on a disposal fee is likely not sustainable given the statewide 75 percent recycling goal. This funding disparity is challenging because as CalRecycle pushes for broader recycling initiatives, it is simultaneously decreasing its revenue to fund its programs. As a result, it is important to consider how CalRecycle can continue to fund its operations in the long term. If a zero waste goal gains traction in California, then a disposal fee would become completely ineffective for funding CalRecycle's programs and other statutory obligations.

An increase to the IWMF could also be used as a policy driver to discourage disposal and raise the cost of disposal to a level at which recycling alternatives are more competitive.

Fee and Funding Data Collection and Limitations

In 2015, CalRecycle completed an analysis of statewide tipping fees in the report "Landfill Tipping Fees in California." The report compiled data from jurisdiction and hauler websites and gathered additional data through phone surveys.²⁸

Fee data, especially negotiated rates, are considered to be proprietary data by many, so it is difficult to get this information. Revenue projections depend on many assumptions about future conditions.

Projections always present challenges because the future is difficult to predict. Funding projections rely on many assumptions regarding the total obligations that CalRecycle will have and the amount of statewide disposal and associated revenue that CalRecycle will receive. Obligations include many variables, such as changes to baseline operating expenses, changes in programs necessary to reach 75 percent recycling and . Revenues include also include many variables, such as

Conclusions

California's waste disposal system is highly dynamic. In 2013, the total amount of disposed municipal solid waste increased for the first time since 2005. This is likely reflective of the improved California economy, and it is not clear what the long-term impacts of this rise in disposal will be for California's waste management and disposal reduction programs. In addition, a significant amount of waste moves around the state before it is finally disposed. A majority of counties send some of their waste elsewhere for disposal. Waste exports to other states, including Oregon, Nevada, and Arizona, and imports from Native American tribal lands represents a small portion of the waste stream at less than 2 percent of total disposal. In addition, untracked solid waste may leave the state in bales of recyclable materials that are sent overseas for final processing. Many factors can affect the flow of waste, including daily limits on the quantity of accepted waste, local ordinances restricting final disposal locations, agreements with haulers or facilities, weather or terrain conditions, and the cost of transportation and individual facility fees.

California landfills currently have sufficient capacity statewide for several decades. Data from DRS and FacIT show that there is approximately 1.7 billion tons of landfill capacity as of January 2014. Three models used to project future disposal – a high disposal rate, current disposal rate, and low disposal rate – show that California landfills would last at least another 25 years. If California reaches its 75 percent statewide recycling goal by 2020, there will be available landfill space until the 2080s. There is greater variation in available capacity regionally, particularly for the Mountain region. CalRecycle will continue monitoring capacity and try to improve data and projections to track this important issue.

Characterizing the materials in the waste stream through periodic waste characterization studies provides critical information that informs California waste policy. Data from the studies is used to help agencies, planners, and jurisdictions target materials that could be diverted from the waste stream; help waste diversion planning; and help track changes in the disposed waste stream due to population changes, diversion programs, or other factors. The last waste characterization study was completed in 2008, and CalRecycle is currently finalizing the data from its 2014 study. By updating the study, the Department hopes to gain insight on the success of new recycling and composting programs. The report will be available in the spring of 2015 and will be published on CalRecycle's website.

As the rules and regulations governing disposal change, waste management practices, including use of alternative daily cover (ADC) and waste to energy, are receiving renewed focus.

The use of ADC has declined significantly over the last decade, from 4.7 million tons in 2005 to 3.3 million tons in 2013. However, this corresponds to the general decrease in overall disposal during this same period. Under the statewide 75 percent recycling goal,

ADC counts as disposal; this classification provides some incentive to reduce ADC in order to meet the goal by 2020. In addition, the passage of AB 1594 stipulates that as of 2020, green material ADC will no longer count as diversion for jurisdictions. Although only 10 jurisdictions currently would not meet their 50 percent diversion goal if green material ADC did not count toward diversion, this law may create additional incentives to divert these materials to other uses.

A small but consistent portion of California's waste, roughly 1 percent of generated waste, is converted to energy through transformation at three facilities. AB 1126 passed in 2014 and established rules about engineered municipal solid waste (EMSW) facilities, allowing them to process up to 500 tons per day of engineered waste such as tire-derived fuels as a replacement for fossil fuels.

One critical component in evaluating all aspects of disposal in California is disposal reporting compliance. Over the last five years, CalRecycle has tracked and identified several issues of noncompliance with disposal regulations, including facilities or counties submitting reports late, past the deadline, or not at all; facilities refusing to help jurisdictions verify disposal allocation errors; and facilities intentionally misreporting or not reporting disposal data. Noncompliance decreases the quality of disposal data, increases the amount of resources expended by CalRecycle to get quality data on time, and delays jurisdictions in reporting disposal rate information. Current statute does not give CalRecycle sufficient enforcement power to get facilities and counties to report accurate disposal data in a timely manner.

The disposal reporting system implemented by CalRecycle allow the Department to track and evaluate the amount of solid waste that moves through various waste facilities in California. In addition, the waste characterization studies provide quantitative information on the types of waste in the disposal stream. Together, this data illustrates the complicated and dynamic landscape of waste disposal. Although there are limitations on the type and completeness of the data that is collected, there is sufficient information to enable and quantify policy changes aimed at decreasing the amount of disposed waste.

Currently, the majority of CalRecycle's waste management programs are funded through an IWMF of \$1.40 per ton on landfilled material. As California moves toward the statewide 75 percent recycling goal, the amount of material entering landfills will decrease. If there is no increase in expenditures and no increase in funding for recycling programs, current projections suggest that this will result in a gap of at least \$29 million in expenditures relative to revenues for CalRecycle by 2020. This gap is a very conservative estimate because it does not take into account the additional CalRecycle must incur to develop and maintain the infrastructure required to meet the goals of AB 341. This funding deficit will severely limit the Department's ability to implement its broader recycling initiatives. It is critical to consider how to fund California's recycling programs as the amount of disposed material decreases and the goals get more ambitious.

Other Questions

Data-Based Questions

What affect will EMSW conversion facilities have on the waste stream and disposal?

How many tons do transfer stations process annually, and to which facilities do they send waste?

How many tons do MRFs process annually, and to which facilities do they send waste?

What are the continuing effects of the Puente Hills Landfill closure on the statewide and regional level? Data in this report was based on only two quarters of data; CalRecycle should continue monitoring disposal data patterns.

What are the dynamics of negotiated tipping fees between commercial haulers and local jurisdictions in California?

What are the annual percentages of residential and commercial waste in California's waste stream?

Policy Questions

What is the future of thermal technologies for managing solid waste in California?

What options will be developed to improve disposal reporting compliance?

What impacts will the changing classification of green waste ADC have on landfill operations, if any?

What are the necessary changes needed to secure the funding required for CalRecycle programs as we strive for 75 percent recycling in 2020 and beyond?

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Glossary of Terms

Alternative daily cover (ADC)/Alternative intermediate cover (AIC): The use of CalRecycle-approved materials (e.g. green waste) to cover disposed waste in a landfill cell at the end of the landfill operating day (daily cover) or at some other interval (intermediate cover) to control odors, fire, vectors, litter, and scavenging. Traditionally, earthen materials, such as soil, are used for cover. Alternative cover materials include tire shreds and low-grade wood chips.

Anaerobic digestion (AD): The process of biologically decomposing organic matter with little or no oxygen in a fully enclosed structure (in-vessel digestion) to produce biogas, liquid fertilizer, and compost.

Beneficial reuse: Beneficial reuse of solid wastes at a solid waste landfill shall include, but not be limited to, the following: alternative daily cover, alternative intermediate cover, final cover foundation layer, liner operations layer, leachate and landfill gas collection system, construction fill, road base, wet weather operations pads and access roads, and soil amendments for erosion control and landscaping.

Beneficiation: Glass beneficiation is the process of upgrading the value or utility of glass, typically by sorting, removing contaminants, and crushing so it can be used as an industrial feedstock for glass manufacturing facilities.

Biomass conversion: The process of using controlled combustion of specified types of organic materials (essentially wood, lawn, or crop residue) to produce electricity. Biomass conversion facilities are not permitted as solid waste facilities. See PRC section 40106 (a).

Chipping and grinding: The process that separates, grades, and resizes woody green wastes or used lumber to be sent to a composting facility, a landfill to be used for ADC, or miscellaneous end markets such as feedstock at biomass-to-energy plants.

Construction and demolition materials (C&D): Includes but is not limited to concrete, wood, and drywall, usually found as a mixed material. C&D materials are usually taken to a C&D processing facility for intermediate processing such as sorting by material type and size reduction for construction fill or raw feedstock material.

Disposal Reporting System (DRS): The system used to track disposal information in California. For more information go to:
<http://www.calrecycle.ca.gov/LGCentral/DRS/default.htm>

Disposal: The process of collecting municipal solid waste and transferring it to a transfer station, landfill, or transformation facility.

Facility Information Toolbox (FacIT): Informational database on disposal and recycling activities in the state of California. For more information go to: <http://www.calrecycle.ca.gov/FacIT/>

Food waste: All surplus food scraps. The term has fallen out of favor with some composters, who prefer to view this material as a resource rather than as waste material. However, this term is interchangeable with food scraps.

Green waste: A term used to refer to urban landscape waste generally consisting of leaves, grass clippings, weeds, yard trimmings, wood waste, branches and stumps, home garden residues, and other miscellaneous organic materials.

Household hazardous waste (HHW): Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients, other than used oil. HHW is not considered to be municipal solid waste material; non-recyclable household hazardous waste is sent to a specialized landfill and is not reported as disposal.

Inerts: A category of waste that includes concrete, asphalt, asphalt roofing, aggregate, brick, rubble, and soil. Construction and demolition and inert materials are usually taken to a C&D processing facility for intermediate processing such as sorting by material type and size reduction for sale for construction fill or raw feedstock material.

Landfill: A permitted facility that provides a legal site for final disposal of materials including mixed solid waste, beneficial materials used for landfill construction, and ADC. Landfills also include specialized sites for materials such as waste tires and construction and demolition waste.

Material recovery facility (MRF): An intermediate processing facility that accepts source-separated recyclables from an initial collector and processes them for wholesale distribution. The recyclable material is accumulated for shipment to brokers or recycled content manufacturers, or for export out of state.

Municipal solid waste (MSW): Garbage. Refuse that may be mixed with or contain nonorganic material, processed industrial materials, plastics, or other recyclables with the potential for recovery. It includes residential, commercial, and institutional wastes.

Organic materials management: Processes that grind, chip, and/or decompose organic wastes in a controlled process for intermediate or final use as a landscape material or soil amendment.

Other beneficial reuse: Using a waste material for a productive use, other than ADC/AIC, at a landfill within regulatory guidelines, such as for road base, erosion control, or cell wall construction.

Per capita disposal: A numeric indicator of reported disposal divided by the population (residents) specific to a county, region, or state.

Residue: Unusable waste byproducts remaining after recyclables are processed.

Self-hauler: A person who hauls their own residential or business waste to a solid waste facility.

Solid Waste Information System (SWIS): The database that tracks solid waste facilities in California. For more information go to:

<http://www.calrecycle.ca.gov/SWFacilities/Directory/Default.htm>

Tipping fee: The amount of money per ton of waste charged at the gate of a landfill for a self-hauler. It is publicly disclosed either online or by phone.

Transfer station: Receives, temporarily stores, and ships unprocessed waste and recyclables.

Transformation: The use of incineration, pyrolysis, distillation, or biological conversion (other than composting) to combust unprocessed or minimally processed solid waste to produce electricity. See PRC section 40201.

Waste tire-derived fuel: Waste tires used as fuel in a power plant or cement kiln.