

Compost End Markets in **Rhode Island**

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Compost End Markets in Rhode Island

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Executive Summary

Wasting food has negative social, environmental and economic impacts. Letting food spoil wastes the labor, time, water and energy that was used to produce the food. Organic matter that decomposes in landfills produces methane, a potent greenhouse gas that contributes to climate change. As such, building a more just and resilient local food system in Rhode Island necessarily involves addressing food waste, which can be achieved by diverting waste food to produce compost. Compost has the ability to recycle waste into a valuable resource that can support climate and zero waste goals, improve soil health and create jobs. Currently, the potential of compost in the state of Rhode Island is hampered by a lack of infrastructure; widespread organic waste collection and large and or numerous compost production sites are lacking. In order to spur investment in this infrastructure, there needs to be a well-defined, consistent/reliable and profitable set of end markets for compost.

This report explores end markets for finished compost within the state of Rhode Island with aims to identify **how** compost can be used, **how much** compost could be used and the **potential revenue** that would be generated from these markets. Understanding the extent of these end markets will help attract investment in compost infrastructure within the state. Seven major markets for compost were identified including agriculture, commercial horticulture, construction, environmental remediation, stormwater management, turf-grass management and residential uses. The existence of these markets generally align with national trends as reported by the United States Composting Council. **Together, these markets account for an estimated potential use of 13.2 million cubic yards per year in Rhode Island and a potential revenue between \$1.5 and \$6.2 billion per year.**

Calculations in this report estimate the maximum and ideal size of end markets for compost in Rhode Island. This ideal scenario assumes that all realistic stakeholders who could use compost would do so. However, this is far from the present acceptance and use of compost across the seven markets. A brief discussion in the report examines barriers to opening end markets for compost and related policy recommendations that could enable the state to move towards the ideal and maximum compost use.

Introduction

With the only landfill in the state set to be filled by 2046, exploring waste diversion is imperative. According to a 2015 waste characterization study completed by DSM Environmental for the Rhode Island Resource Recovery Corporation (RIRRC) found that 89,926 tons of organic waste that could be composted is disposed of in Rhode Island's landfill each year. This accounts for approximately 32% of the total municipal solid waste.¹ From a financial perspective, landfilling this organic waste is costing the state \$5.6 million every year in tipping fees alone²; a number that will only increase as the landfill gets closer to closing.³ Disposing of this organic waste in landfills in anaerobic conditions also lead to the production of methane, a greenhouse gas that contributes to climate change. As a coastal state Rhode Island is particularly vulnerable to climate change; sea level rise and increased temperature combined with more frequent and more severe weather events pose threats to the state and its local food system. Composting is a promising alternative to disposing of food waste and can address some of the potential concerns caused by changes in climate. Yet, current capacities to produce compost as well as utilize it are limited within the state.

Legislation in Rhode Island has recently focused on addressing food waste. A wasted food ban passed in 2016 ([R.I. Gen. Law 23-18.9-17](#)) requires large producers of organic waste to separate organic waste for processing in an authorized composting facility or anaerobic digester. The purpose of this law is two-fold: first, a food waste ban reduces the amount of organic material sent to the state's only landfill and, secondly, diverting organic waste will support food recovery businesses and composters to expand their operations with regular, high quality organic material inputs. This has helped grow Rhode Island's composting capacity. For a full review of the existing wasted food laws, see our: [Existing Compost Laws Analysis](#).

However, the current wasted food ban's specifications only requires a select number of businesses and educational institutions to divert their organic waste based on the tons of wasted food they generate. This shortcoming of the wasted food ban, coupled with a lack of enforcement and food scrap composting infrastructure, has resulted in a lack of wasted food diversion and compost production within the state. Conversations with compost producers in Rhode Island found that individual businesses are struggling to scale up their operations due to a lack of financial capital. Therefore, there is a need for investment in organic waste collection and

¹ <https://rirrc.org/sites/default/files/2017-02/Waste%20Characterization%20Study%202015.pdf>, p. 23.

² Presently RIRRC charges \$63 per ton for municipal solid waste, which includes landfilled organic waste; <https://rirrc.org/sites/default/files/Fee%20Schedule%20FY25%20-%20Effective%20April1%2C%202025.pdf>, Code 201.

³ https://rirrc.org/sites/default/files/Fee%20Schedule%20FY26%20-%20Effective%20July%201%2C%202025_0.pdf, p. 2.

composting infrastructure to fuel Rhode Island's compost end markets. Presently, compost is used within the state for small-scale gardening and landscaping applications, but the end uses of compost are more versatile than are currently realized in Rhode Island.

The goal of this report is to describe and quantify the ideal case scenario for compost use within the state of Rhode Island. Having an understanding of the potential use for compost and its associated revenue can help spur investment and legislative change to support compost production. Specifically, this report aims to answer the following three questions regarding compost in Rhode Island:

1. What end markets exist for finished compost in Rhode Island?
2. How much compost could be used for each of these markets?
3. How much revenue could be generated from these markets?

Direct data on compost end markets is scarce. So In order to make the estimates presented in this report, data was gathered and analyzed from a wide variety of reports, often unrelated to composting (e.g. the American Community Survey), and combined with interviews with some of the countries foremost compost market experts to arrive at informed estimates to answer the questions above. This included conversations with compost experts across the nation as well as local stakeholders who produce, distribute or use finished compost in the identified markets. Despite widespread collection of data and information, various assumptions are employed throughout this analysis. These are noted when necessary within the results as well as detailed fully in the appendix. Additionally, this report only explores the maximum ideal compost use within the state. For most market calculations, 100% adoption and acceptance was assumed, while other market potentials were scaled based on current operations in other Northeast states. As such, the actualized use of compost within the state will likely be less initially, but has the potential to grow to these calculated market estimations. A brief description of barriers to adaptation and increasing compost supply and demand are also included.

What are the potential markets for compost?

Drawing information from a variety of interviews with industry experts, market reports and examples, seven major end markets for compost were identified: agriculture, commercial horticulture, construction applications, environmental remediation, residential use, stormwater management and turf-grass management (Figure 1). These markets generally follow national trends for finished compost use as reported by the U.S. Composting Council 2024 report⁴ and an in-depth analysis of compost markets in California conducted by CalRecycle in 2019.⁵ Specific details regarding the size of these markets are included in the next section. Here, specific applications of compost within each market are covered, giving special consideration to how each end market manifests itself in the specific context of Rhode Island.

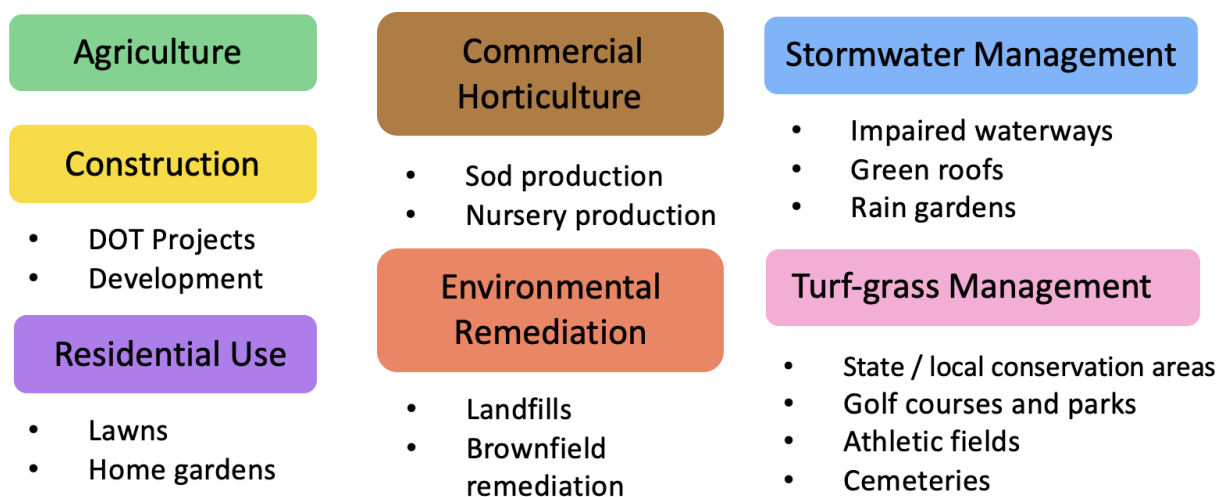


Figure 1: Seven major end markets for finished compost within the state of Rhode Island were identified. Each market is listed above with specific uses within each market included as bullet points.

Agriculture

Compost for agricultural application is one of the most commonly accepted methods of compost use. Finished compost has the ability to retain moisture and deliver necessary nutrients to plants, such as nitrogen, phosphorus and potassium. It has been consistently shown that compost grows higher quality and more nutritious

⁴ U.S. Composting Council & Environmental Research and Education, “Composting State of Practice: Results from a National Operations Survey”, 2024.
<https://www.compostingcouncil.org/news/665609/USCC-EREF-Release-Report-on-Composting-Practices-in-the-U.S..htm>

⁵ CalRecycle & California Department of Resources Recycling and Recovery, “State of Disposal and Recycling for Calendar Year 2019”, 2021.

crops.⁶ In this way, compost can act as a natural fertilizer and is beneficial for plant growth and development.

Given the state's small size, Rhode Island is a minor agricultural producer when viewed on the national or regional scale, but it is still an important part of the economy and crucial for feeding RI residents nutritious food. While agricultural production in the state only generated 1% of the state's gross domestic product,⁷ it still accounted for \$86 million in sales (a number that may well represent undercounting).⁸ Additionally, the state has committed to growing its local food production. Whether it tries to meet the 50% by 2050 goals set in the 2017 (soon to be updated) Relish Rhody Food Strategy⁹ or the more near-term New England Feeding New England Goal of 30% by 2030,¹⁰ local food production will need to increase dramatically from the current 3%¹¹ to hit targets. There is also a need for high quality compost that can improve soil quality for Rhode Island farmers and gardeners. This results in a relatively small but significant market for compost currently and one that needs to grow significantly over time.

Commercial Horticulture

In 2022, nurseries accounted for 95% of agricultural land within Rhode Island, signaling the potential to be a large end market for finished compost.¹² Given its desirable nutritional and moisture content, compost is commonly used for the support of plants and crops raised in commercial horticulture. These uses encompass the production of vegetables, fruit, turf grass and ornamental plants in nurseries across the state.

Construction

The American Farmland Trust estimates that an additional 8,100 acres of farmland will be developed within the state by 2040 under “business as usual” conditions.¹³

⁶<https://www.biocycle.net/vegetable-crops-grown-in-compost-are-clear-winners/#:~:text=The%20annually%20applied%20MSW%20compost%20increased%20total.enhanced%20by%20the%20biennially%20applied%20MSW%20compost>

⁷ <https://economic-impact-of-ag.uada.edu/rhode-island/>; U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 1, p. 3.
https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1_Chapter_1_State_Level/Rhode_Island/

⁸ <https://rifofoodcouncil.org/data-dashboard/agriculture-and-land-use/>

⁹ https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/rhodeisland/rifofoodplan_es_4c00321d-d3d0-4314-8dcc-e40fd42d96db.pdf

¹⁰ https://nefoodsystemplanners.org/wp-content/uploads/NEFNE_Executive-Summary.pdf

¹¹ https://nefoodsystemplanners.org/wp-content/uploads/Rhode-Island-Local-Food-Count_2022.pdf

¹² U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 39. p.29.

¹³ <https://development2040.farmland.org/>

Construction on previously undeveloped land leads to compaction of soil: excavation of soil to make room for buildings as well as driving heavy equipment across the land leads to compaction of the soil. In fact, King County, Washington has passed a disturbed soil ordinance, which requires the use of compost and other soil to be added to sites where construction has removed or compacted the top soil.¹⁴ The application of compost after these disruptive processes can help increase soil porosity, leading to better infiltration of stormwater. Replacing disturbed soils with compost can also reduce erosion of top soil. In short, if the state wants to mitigate the effects of increases in impervious surfaces and less predictable rainfall, it should see an increase in compost utilization.

Development projects within Rhode Island come in many forms, ranging from residential to commercial properties. However, a major use of land within the state that requires continual upkeep is transportation. As such, the Rhode Island DOT could use compost to reduce erosion and promote proper infiltration along roadways. Compost is also used to raise or support new road infrastructure, which is a particularly large demand in the Providence area, which has seen the relocation of a major highway twice within the past 50 years. DOT use of compost is one specific subset of end use within construction applications; compost is currently being used in this way in other Northeast states, including Massachusetts, Maine, New Hampshire, New York, New Jersey, Connecticut and Pennsylvania.¹⁵

Environmental Remediation

Various studies have proven the cleansing abilities of compost when it comes to contaminated soils. Compost has shown promise in removing explosive contaminants (i.e. TNT), oil contamination, toxic metals, polycyclic aromatic hydrocarbons (PAHs), and pesticides.¹⁶ As such, compost serves as a natural environmental remediation tool.

Contaminated soils are typically treated with compost in two ways. First, compost could be applied directly to the contaminated soil at the contaminated site.¹⁷ In this way, compost is consumed at contaminated sites as an end market. Secondly, the contaminated soil can be excavated and added to actively decomposing compost windrows.¹⁸ This means that the contaminated soil serves as a feedstock for the

¹⁴<https://kingcounty.gov/en/dept/dnpr/buildings-property/green-sustainable-building/green-building/soil-standard>

¹⁵https://cdn.ymaws.com/www.compostingcouncil.org/resource/resmgr/documents/compost_use/Compost_Use_for_DOT.pdf, p.22.

¹⁶ <https://www.biocycle.net/environmental-remediation-by-composting/>

¹⁷ Semple, K.T., Reid, B.J. and Fermor, T.R. (2001). Impact of composting strategies on the treatment of soils contaminated with organic pollutants. *Environmental Pollution*, 112, p. 278.

¹⁸ Semple et al. (2001) p. 274.

process of composting. Depending on the size of the site, excavation and specific contaminants, either approach may be used. However, the analysis in this report primarily considers the first scenario, where contaminated soil is treated with compost instead of being used to produce compost. This decision was made to better estimate the compost being consumed in the end market of environmental remediation, not as a feedstock source to produce compost.

In addition to removing contaminants from soil, compost is also used on-site at landfills. The primary application is as an alternative daily cover (ADC), where compost is applied to the portion of the landfill that is actively being filled daily to prevent waste from blowing away and to reduce odors.¹⁹ Low-quality finished compost, which is often produced on-site using municipal yard waste, is typically used as ADC. Some states, namely California, have recently passed restrictions on what materials used as ADC will count towards their diversion goals.²⁰ The only landfill in Rhode Island is currently following this trend and does not use compost as ADC; however, they do use compost for on-site maintenance activities and landscaping.

Residential Use

Compost's characteristics make it attractive to residents for a variety of uses. Residents most frequently purchase compost for landscaping, lawn maintenance and home gardening. When applied as a top dressing, compost can improve lawn soil structure and provide nutrients to help grass and plants grow. Similar to large-scale applications, compost can also nutritionally benefit plants grown in home gardens. Compost for these applications are most frequently purchased in gardening and top soil blends, which are sold at many stores (Home Depot, Lowes, Walmart, etc.) and produced by nurseries across the state.

Stormwater Management

Given Rhode Island's positioning as a coastal state with an urbanizing population, increasing amounts of stormwater caused by climate change pose a threat to urban and rural residents alike. Rising sea level and runoff carrying contaminants into water bodies compromise water quality and sealife across the state. Continued reliance on a combined sewer system designed for Providence's much smaller population in the 1880s, stormwater management is a major environmental concern for urban Rhode Island. These issues have led to the creation of two combined sewer overflow pipes which hold excess wastewater when demand at above ground treatment plants

¹⁹ <https://news.ncsu.edu/2020/12/compost-landfill-environment/>

²⁰ <https://calrecycle.ca.gov/lgcentral/basics/adcgreen/>

have been exceeded.²¹ While the application of compost will not single-handedly fix these issues, it can help increase infiltration and serve as a primary treatment of contaminants captured by rain water flowing over impervious surfaces.

Use of compost within this end market is through incorporation into many stormwater best management practices (BMPs). These include rain gardens, bioretention systems, infiltration strips and green roofs.²² All of these BMPs take advantage of compost's high porosity and air space, which enables it to absorb and retain more stormwater. This will increase infiltration across Rhode Island and reduce runoff. Compost is also used to build compost filter socks and compost filter berms, which are placed along waterways to reduce erosion.²³

Turf-grass Management

Compost's high porosity and nutrients makes it an ideal additive to a variety of grassy surfaces. Turf-grass management includes the maintenance of golf courses, athletic fields, recreational trails, municipal parks and state parks to maintain proper infiltration of stormwater and promote grass growth. This helps ensure that parks and fields are able to be used in their intended manner. With 15 state parks and 99% of Providence residents within a 10-minute walk of a public park, this is a sizable end market with the state.²⁴

Carbon Sequestration

All of these seven individual markets can also contribute towards what is identified by some compost marketers as "carbon sequestration goals."²⁵ These goals are typically passed by individual states or municipalities as part of broader climate action plans. Compost inherently stores carbon and it's beneficial for the environment by doing so. In a way, this is not its own individual market but rather an additional motivator for people to start using these end markets more. This is a practice that is in its infancy, but could hold real potential in the future for driving use of compost for carbon credits. As a compost marketer stressed, "if Rhode Island is serious about increasing demand (for compost): reimburse customers for their

²¹ <https://www.narrabay.com/programs-and-initiatives/combined-sewer-overflow-cso/>

²² https://cdn.ymaws.com/www.compostingcouncil.org/resource/resmgr/documents/compost_use/Compost_Use-for-Stormwater-M.pdf

²³ <https://dem.ri.gov/environmental-protection-bureau/water-resources/permitting/stormwater-permitting/soil-erosion-and>

²⁴ <https://www.tpl.org/city/providence-rhode-island>

²⁵ [https://www.biocycle.net/compost-market-development/#:~:text=For%20example%2C%20in%202023%2C%20California%20farmers%20were.to%20\\$1%2C697.98/cy%20for%20compost%20procured%20from%20off%2Dsite](https://www.biocycle.net/compost-market-development/#:~:text=For%20example%2C%20in%202023%2C%20California%20farmers%20were.to%20$1%2C697.98/cy%20for%20compost%20procured%20from%20off%2Dsite)

compost cost and then have carbon credits in place.” Implementing a progressive carbon tax system for compost use and other environmental actions would position Rhode Island as a progressive environmentally minded state. Using compost as a carbon sequestration tool would help Rhode Island meet the 2021 Act on Climate²⁶ and aligns with the goals of the 2025 Climate Action Strategy.²⁷

²⁶ <https://climatechange.ri.gov/act-climate>

²⁷ <https://climatechange.ri.gov/act-climate/2025-climate-update>

How big are the potential markets for compost in Rhode Island?

Using state and national data reports paired with recommended compost application rates across the seven identified end markets, estimations were produced for the total end market size within Rhode Island. Calculations show that across all seven markets, 13.2 million cubic yards of compost could be used per year. Residential use (60.8%, 8.0 million CY/year), turf-grass management (21.6%, 2.8 million CY/year) and commercial horticulture (11.8%, 1.6 million CY/year) are the three largest potential markets for the state (Figure 2, Figure 3).

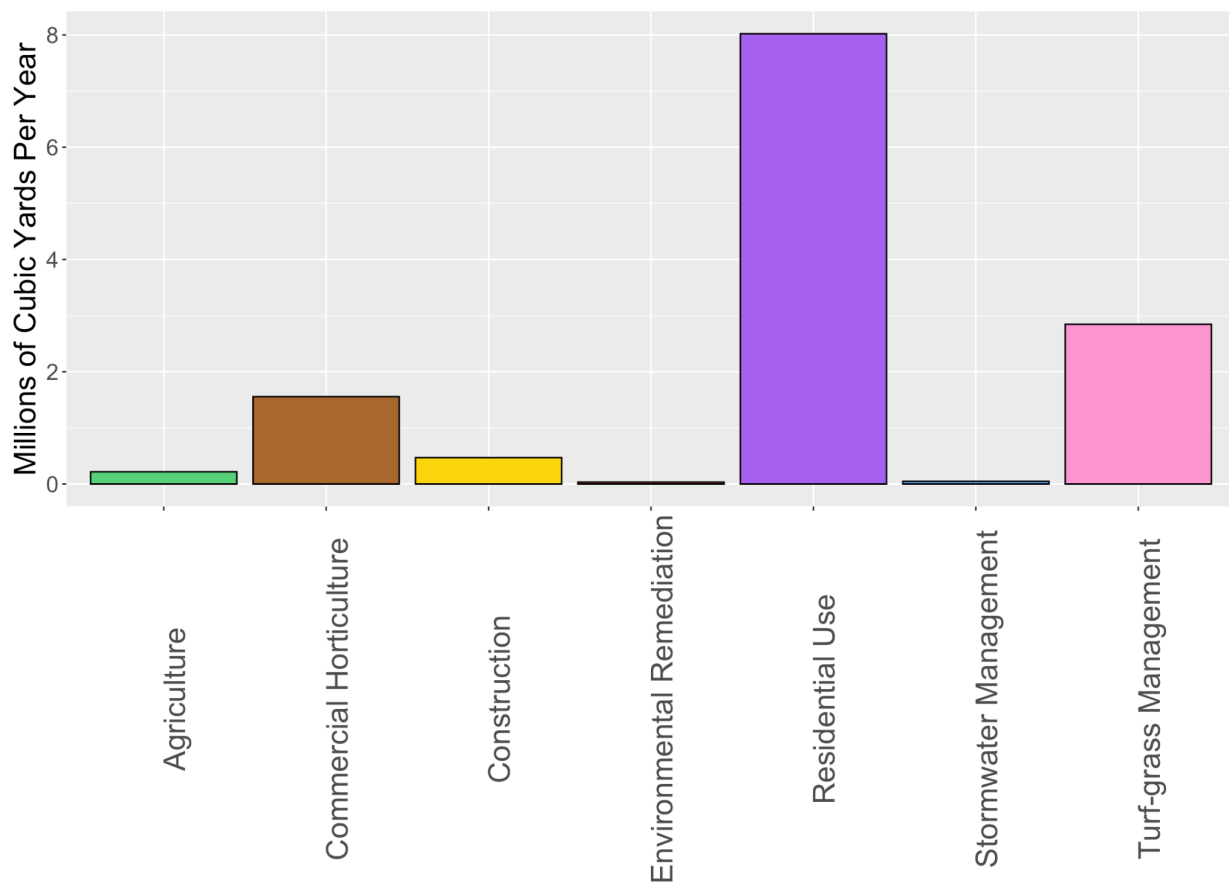


Figure 2: Estimated sizes of compost end markets in Rhode Island. Residential use is the largest market (60.8%), accounting for 8.0 million CY/year. Turf-grass management (21.6%) and commercial horticulture (11.8%) are the next largest markets, with 2.8 million CY/year and 1.6 million CY/year, respectively.

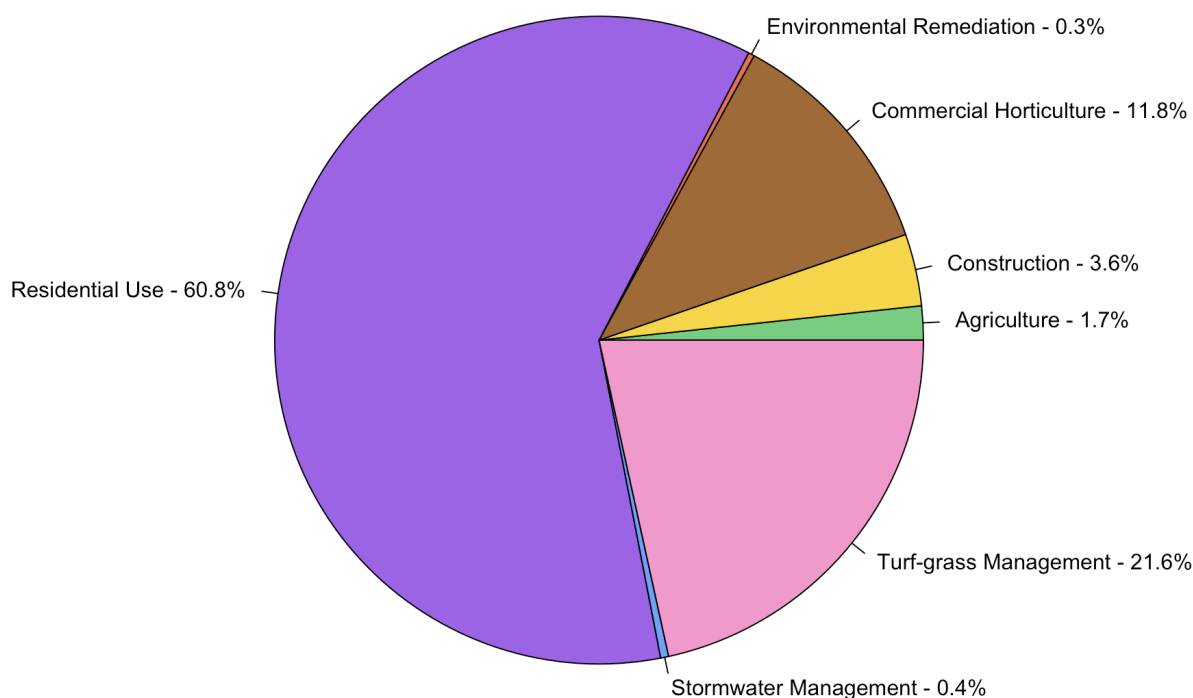


Figure 3: Breakdown of estimated end market compost use by market within the state of Rhode Island. Residential use is the largest market share, accounting for over half of the annual market. Turf-grass management and commercial horticulture are the next two largest markets, accounting for 21.6% and 11.8% of the total compost market, respectively.

These estimates are decidedly different compared to other recent state level reporting. California is the only other state to have conducted and publicly published an in-depth analysis of compost markets. A 2019 report by CalRecycle found that agriculture accounted for 65% of the total compost use within the state, followed by landscaping at 17% and nursery production at 6%.²⁸ However, these discrepancies primarily arise from two key differences. First, Rhode Island and California are very different states in many ways; California is the largest agricultural producing state in the country, which greatly impacts the amount of compost that can be used for agricultural applications. Secondly, this CalRecycle report is an examination of the current state of compost end markets, not a measure of the market potential. This report aims to estimate the market potential in Rhode Island; the following sections detail estimations, assumptions and calculations for estimating the size of each end market in Rhode Island.

²⁸ CalRecycle, p.50.

Agriculture

Although use of compost to grow agricultural products is one of the most familiar uses for compost, its market size is relatively small in the state of Rhode Island. The United States Agricultural Census from 2022 was used to determine the amount of agricultural land within the state; specifically, 15,035 acres of land were used to grow fruits, vegetables and grains in 2022.²⁹ A top compost consultant advised that typically 20 tons per acre of compost can be used annually on one acre of land used to grow grains, vegetables and fruits. Land used in orchards benefits from less compost application due to the less dense nature of trees compared to row crops. As such, an application rate of 5 tons of compost per acre was used for orchard land within the state. These calculations resulted in a total market size of 0.2 million cubic yards of compost per year. **It is worth noting that the agriculture end market alone if maximized, could support compost application that exceeds what could be produced from food scraps available within the state.**

Agriculture is the fifth largest compost end market for Rhode Island, accounting for only 1.7% of total annual compost markets. This is relatively low compared to agricultural compost use in California, which is the only other state that has published data on agricultural compost market size. Since 2010, agriculture has been the largest market for compost in California.³⁰ Given California's climate that enables multiple growing seasons per year and a larger amount of land used to raise crops, it follows that California would use more compost for agricultural applications. Comparatively, just over 15,000 acres of land (2.2% of state area) are used to grow vegetable and fruit crops in Rhode Island.³¹

Commercial Horticulture

Commercial horticulture compost use encompasses sod production and plant production within nurseries and greenhouses in the state. According to the U.S. Agricultural Census, there were 329,390 acres of nursery production in Rhode Island in 2022.³² These acres can receive the same application rate as orchard land at 5 tons of compost per acre annually. Sod production is also sizable within the state of Rhode Island, with 2,588 acres of land used to grow sod in 2022.³³ Compost use for sod fields was calculated by assuming that sod production can use the same

²⁹U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 35, 36 and 37, p. 25-28.

³⁰ CalRecycle Report, p. 11.

³¹U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 35, 36 and 37, p. 25-28.

³² U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 39, p.29.

³³U.S. Census of Agriculture: Rhode Island State and County Data (2022), Table 39, p. 29.

amount of compost as lawns; that is, $\frac{7}{8}$ of an inch on average.³⁴ These assumptions result in a calculated market size of 1.6 million cubic yards per year.

A March 2025 Composting Survey conducted by a team of URI MBA Students on behalf of the RIFPC found that the majority of nursery and garden centers in Rhode Island are already using compost in their operations in some manner. Additionally, a small percentage (15%) thought that their use of compost could increase over the next few years. These factors contribute to making commercial horticulture the fourth largest end market for compost in the state.

Construction

Compost can be used to prevent erosion and maintain porosity, or air soil space, in construction projects. This primarily happens in two avenues: department of transportation (RIDOT) projects and development projects. Development projects can include housing and commercial development. Both of these application avenues along with data sources and calculation assumptions are described below.

Using data from Providence's Development Mapper³⁵, the American Community Survey and RI Housing³⁶, it was estimated that 1,320 acres of land is developed for residential and commercial purposes annually. This estimate by no means accounts for all land developed within the state; specifically, information is not easily available regarding development in cities other than Providence. However, this estimate of 1,320 acres corresponds to approximately 0.2% of Rhode Island's total land area, which seems reasonable. Suggested compost application on these developed acres is a depth of 2.5 inches. This follows guidance outlined in the King County Post-Construction Soil Standard in the state of Washington; this disturbed soil ordinance stipulates that any land being developed and requiring a site permit must add 8 inches of amended soil, 2.5 inches of which is compost.³⁷

The second avenue of compost use in construction applications is through state DOT projects. Currently, RIDOT does not use compost in any projects despite this being a common practice. In fact, 31 state DOT offices use compost in projects, accounting

³⁴ <https://archive.epa.gov/wastes/conserve/tools/greenscapes/web/pdf/la-specs.pdf>, p.10; <https://www.biocycle.net/compost-use-fact-sheets/>

³⁵ <https://pvdgis.maps.arcgis.com/apps/webappviewer/index.html?id=ab28206d40a54791b7128555cd8e7e18>

³⁶ <https://www.rihousing.com/rihousing-releases-rhode-islands-2024-low-and-moderate-income-housing-chart/>

³⁷ <https://kingcounty.gov/en/dept/dnrp/buildings-property/green-sustainable-building/green-building/soil-standard>; <https://www.youtube.com/watch?v=1H6MpQcdAss>

for consumption of at least 480,350 cubic yards of compost annually.³⁸ While RIDOT is not directly responsible for purchasing and applying compost in projects, they can require individual contractors that are awarded projects to use compost. This would create a potential end market for compost.

Two sources of information were used to estimate the amount of compost that could be used through RIDOT projects. First, RIDOT's most recent quarterly report was used to identify that there are 539 active projects across the state.³⁹ Based on the provided project description, approximately 355 of these projects could utilize compost. Projects excluded from this count involved exit renumbering, pedestrian safety improvements, road resurfacing and bridge work; included projects involved highway reconstruction, moving freeway ramps and roadside maintenance. Most of the listed projects had been active for about ten years, which was used to create an average of 36 RIDOT projects per year that could use compost.

Secondly, examples of compost use in state DOT projects were accessed through New York State's DOT Contract portal.⁴⁰ In the last three months, 12 projects have stipulated the use of compost, with amounts ranging from 3 to 2,050 cubic yards. These examples were used to estimate how much compost is used for different sized projects as well as the distribution of project sizes in New York. These estimates were then applied to the 36 RIDOT projects occurring annually, resulting in an estimated consumption of 19,690 cubic yards per year.

Environmental Remediation

Using compost to treat contaminated soil has yet to gain popularity despite a variety of research trials that prove the remediation potential of compost.⁴¹ This specific end market has yet to be considered in any other state wide analysis, but has the potential to be a significant compost market given Rhode Island's industrial past.

Environmental remediation, on the other hand, is estimated to be the third largest end market for compost in Rhode Island. The size of this market is primarily driven by the amount of brownfield sites within the state that have soil contamination from previous industrial use. A staff member at the Rhode Island Department of Environmental Management (RIDEM) estimated that there are 750 brownfield sites

³⁸https://cdn.ymaws.com/www.compostingcouncil.org/resource/resmgr/documents/compost_use/Compost_Use_for_DOT.pdf, p.22.

³⁹ <https://www.dot.ri.gov/accountability/index.php>

⁴⁰ <https://www.dot.ny.gov/portal/page/portal/doing-business/opportunities/const-notice>

⁴¹ Megharaj, M. and Naidu, R. (2017). Soil and brownfield remediation. *Microbial Biotechnology*, 10(5), 1244-1249.

within the state that account for 4,600 acres.⁴² Because most of the current brownfield sites are from post-industrial contamination it is difficult to predict if there will be additional contaminated sites in the future and therefore, for purposes of this estimation, we assumed there will not be.

Using compost to treat contaminated soil can be achieved through two methods: direct application onto the contaminated soil or excavation and incorporation of contaminated soil into windrow piles.⁴³ Direct application is the most frequently used method due to cost effectiveness; it is costly to excavate several feet of soil and much cheaper to apply compost on top. One study found that applying 154.5 cubic yards per acre of compost was found to be effective for treating contaminated soil.⁴⁴

Assuming that 95% of brownfield land in Rhode Island would receive direct compost application and only 5% would be treated via excavation, estimated compost use was calculated to be 2.5 million cubic yards to remediate all present brownfield sites. Assuming that all of these sites will be remediated over the next 75 years (1.3% of sites or 6,133 acres per year), this results in an estimated compost use of 33,500 cubic yards per year.

Residential Use

Residential use of compost on lawns and in home gardens is by far the largest end market in Rhode Island. It is estimated that 8.0 million cubic yards of compost per year could be used on residential lawns and within home gardens. This aligns with national and Northeast-specific trends, as a prominent compost marketing consultant and author shared that residential compost use will continue to be the largest end market.

Estimations for this market were made assuming residential lawns received $\frac{7}{8}$ of an inch of top dressing of compost per year⁴⁵ while gardens receive 1.5 inches of compost annually.⁴⁶ With average lawn size of 0.25 acres,⁴⁷ 55% of residents⁴⁸ having a garden of 96 square feet⁴⁹ and 270,497 households in the state,⁵⁰ it was estimated

⁴² A list of sites with environmental land use restrictions is maintained by RIDEM, which includes but is not exclusive to brownfield sites: https://dem.ri.gov/sites/g/files/xkgbur861/files/2025-04/elursite_0.pdf

⁴³ Whelan, A., Kechavarzi, C., Coulon, F., Sakrabani, R. and Lord, R. (2013). Influence of compost amendments on the hydraulic functioning of brownfield soils. *Soil Use and Management*, 29, 260-270.

⁴⁴ Whelan et al., 2013.

⁴⁵ <https://archive.epa.gov/wastes/conserve/tools/greenscapes/web/pdf/la-specs.pdf>, p.10;
<https://www.biocycle.net/compost-use-fact-sheets/>

⁴⁶ <https://archive.epa.gov/wastes/conserve/tools/greenscapes/web/pdf/la-specs.pdf>, p.4

⁴⁷ <https://todayshomeowner.com/lawn-garden/guides/average-yard-size/>

⁴⁸ <https://raleighrealty.com/blog/gardening-statistics-trends>

⁴⁹ <https://www.yourgreenpal.com/blog/home-gardening-statistics-in-the-us>

⁵⁰ American Community Survey 5-year Estimates, 2023.

that there are 67,625 acres of residential lawns as well as 328 acres of home gardens. Combining the use of compost for residential lawns and home gardens resulted in a market size of 8.0 million cubic yards of compost per year.

Stormwater Management

Calculations to estimate the amount of compost that could be used for stormwater management included three specific applications: erosion control along impaired waterways, green roofs, and rain gardens.

To estimate the amount of compost used for erosion control and preliminary remediation along contaminated waterways, data was downloaded from the RI Department of Environmental Management (RIDEM) impaired waterways data.⁵¹ As a state, RI is required to tabulate and submit a list of waterways that are “impaired,” meaning they are not safe for swimming, fishing or drinking. Compost could be part of a beneficial treatment for these waterways in the form of filter socks, filter berms and compost blankets. Presently, there are 690 miles of impaired waterways in the state. Given Rhode Island’s annual rainfall and climate, compost filter socks are recommended to be 18 inches in diameter⁵² while compost berms are specified to be 1.5 feet tall and 3 feet wide.⁵³ It was assumed that half of the waterways would receive a compost filter sock while the other half would have compost berms built along their banks. These assumptions resulted in 37,239 cubic yards of compost utilized to treat impaired waterways.

Green roofs and rain gardens are two stormwater BMPs that would be suitable for Rhode Island. As a leading provider of soils for green roofs shared, “green roofs will never eat up a lot of compost.” Although it is a smaller market, it is also a high value market as the blended soils used in green roof installation are more expensive. There is also additional revenue to be made from installation and continual service of green roofs. This makes green roofs an interesting stormwater management tool to consider in calculating compost end markets. To estimate the amount of green roofs that could be added in Rhode Island, a 1% adoption rate was assumed, which is representative of the current implementation of green roofs.⁵⁴ However, adoption rate could increase to 25 to 50%, which means that the estimated consumption of compost would also increase concurrently. This present calculation may very well be an underestimation. The area of 1% of buildings in Rhode Island accounts for 2,538

⁵¹ <https://www.arcgis.com/home/item.html?id=ec82a5e6af9140548014ead13584dd65>

⁵² RIDOT TAC 0440: Compost Filter Sock and LOD;
<https://www.pmp.dot.ri.gov/PMP/DesktopDefault.aspx?aM=udoc&oM=list&c1P=cat&c2p=docs&appindex=0&appid=0&podid=-1&mth=1&label=DPMs#pageAnchor5>

⁵³ <https://archive.epa.gov/region5/waste/solidwaste/compost/web/pdf/filter%20berms%20and%20filter%20socks%20standardcompostforerosionspecs1.pdf>, p.4

⁵⁴ <https://drawdown.org/solutions/green-and-cool-roofs>

acres. A leading green roof soil provider shared that 15% of green roof media is composed of compost, which results in 10,239 cubic yards of compost used in green roofs per year.

Finally, rain gardens can help improve stormwater infiltration and retention. Their small footprint makes them an ideal stormwater BMP for urban areas. It was assumed that 550 rain gardens could be added across the state over 20 years. These rain gardens would be 200 square feet with a depth of 2.5 feet. Compost typically accounts for 30% of rain garden media. This resulted in 41.7 cubic yards of compost utilized to create rain gardens annually.

Turf-grass Management

The state of Rhode Island has many natural areas that could benefit from the application of compost in the form of turf-grass management. Three ArcGIS layers were used to identify these areas: local conservation areas,⁵⁵ state conservation areas⁵⁶ and land use and land cover.⁵⁷ Developed recreation areas, such as golf courses and athletic fields, vacant land, cemeteries, transitional areas as well as land with wind and solar energy systems were identified areas that could benefit from compost application. In total, 56,450 acres, or 8.2% of Rhode Island's land area, could benefit from compost application for turf-grass management. Typically, between a quarter and a half of an inch deep of compost is applied to these areas.⁵⁸ Assuming an average of $\frac{3}{8}$ of an inch applied over these 56,450 acres resulted in a total compost usage of 2,846,056 cubic yards per year.

How much revenue can compost markets generate in Rhode Island?

By estimating the potential revenue for compost within the state, investors, legislators, and local stakeholders can confidently make investments to scale up compost production in Rhode Island. Industry experts who market compost shared that prices vary based on quantity purchased, certification and quality of the

⁵⁵https://www.rigis.org/datasets/b876bcc2cd3c4e3eb3df391444811774_0/explore?location=41.695793%2C-71.407648%2C13.72

⁵⁶https://www.rigis.org/datasets/25e8c5b45ddb4a4e8aa75b370c4c5858_0/explore?location=41.600369%2C-71.493949%2C10.52

⁵⁷https://www.rigis.org/datasets/af22130a825e4299822e67480cf0aa10_1/explore?location=41.581173%2C-71.361231%2C9.63

⁵⁸ <https://naturcycle.com/direct-compost-uses/>; <https://www.biocycle.net/compost-use-fact-sheets/>

feedstocks used to create the compost. Each of these variables and their impact on price are described below.

Generally, wholesale compost is cheaper because more is bought at once. These larger markets are referred to as “volume” markets, as opposed to smaller “dollar” markets that are more profitable per unit volume.⁵⁹ In the Northeast, wholesale values range from \$70 to \$95 per cubic yard. Delivery for these large quantities is typically not included and adds an additional charge which depends on distance the material will be delivered. One specific DOT project shared by an industry expert sold wholesale compost for only \$10 per cubic yards, showing that there is variation and prices can be lower when purchased at much larger volumes. Smaller retail quantities are more expensive, ranging in price from \$6.48 to \$27.81 per cubic foot (\$162 to \$729 per cubic yard).⁶⁰ An industry expert shared that costs of \$15 to \$25 per cubic yard is a “pretty safe estimate” for the Northeast, while another gave a higher estimate for retail prices of \$40 to \$60 per cubic yard. Consequently, it is safe to assume that retail prices fall within this range of \$15 to \$60, with variability caused by certification, feedstock quality and blends.

Certification and testing of compost also impacts the product price. The two most common certification methods used for compost are Seal of Testing Assurance⁶¹ (STA) and Organic Materials Review Institute (OMRI).⁶² STA is a quality assurance program operated by the United States Composting Council. OMRI standards are preferred for farms seeking to maintain organic production. Achieving these certifications require more extensive testing, resulting in higher labor and production costs which increase cubic yard pricing. One producer in Rhode Island who meets OMRI certification standards sells their compost for \$11 per half a cubic foot (equal to nearly \$600 per cubic yard). Part of this severe price increase is from selling in such a small quantity, but the certification and more precise screening also contribute significantly.

The quality of feedstocks used to produce the compost also impacts price. Lower quality inputs, such as woodchips and leaves, lower the price. Yard waste is currently composted and sold to the public in bulk by RIRRC for \$30 per cubic yard.⁶³ This is a significantly lower price than compost made from food scraps, a higher quality organic material (\$70 to \$95 per cubic yard).

⁵⁹ <https://www.biocycle.net/compost-market-development/>

⁶⁰ <https://www.lowes.com/pd/Black-Kow-1-cu-ft-Organic-Compost-and-Manure/1000875388;>
<https://www.homedepot.com/p/Back-to-the-Roots-Organic-Compost-Soil-Amendment-1-cu-ft-Bag-47096-DS/333989394>

⁶¹ <https://www.compostingcouncil.org/page/CertifiedCompostSTA>

⁶² <https://www.omri.org/compost-standards>

⁶³ <https://rirrc.org/recycling-composting-disposal/get-compost>

Compost is also used as an amendment in engineered soils. These products are sold at a higher rate per cubic yard given that they include additional components, such as sand and gravel. Engineered soil prices range from \$50 to \$125, with variation resulting from the different ratios of compost to other components.

Categorizing each of the seven potential markets for compost in Rhode Island into wholesale or retail marketing methods can be used to estimate their potential revenue. Using the estimated market sizes from earlier in this report along with ranges for wholesale and retail prices in Rhode Island, the potential revenue for each market can be estimated. Compost for residential has the highest potential revenue with a maximum potential revenue of \$5.8 billion. All seven markets combine for an estimated revenue between 1.5 and 6.2 billion dollars per year (Figure 4). This analysis shows that compost end markets have the potential to generate consequential revenue. Even considering the lowest revenue estimate of \$1.5 billion, significant investments in composting infrastructure could be made.

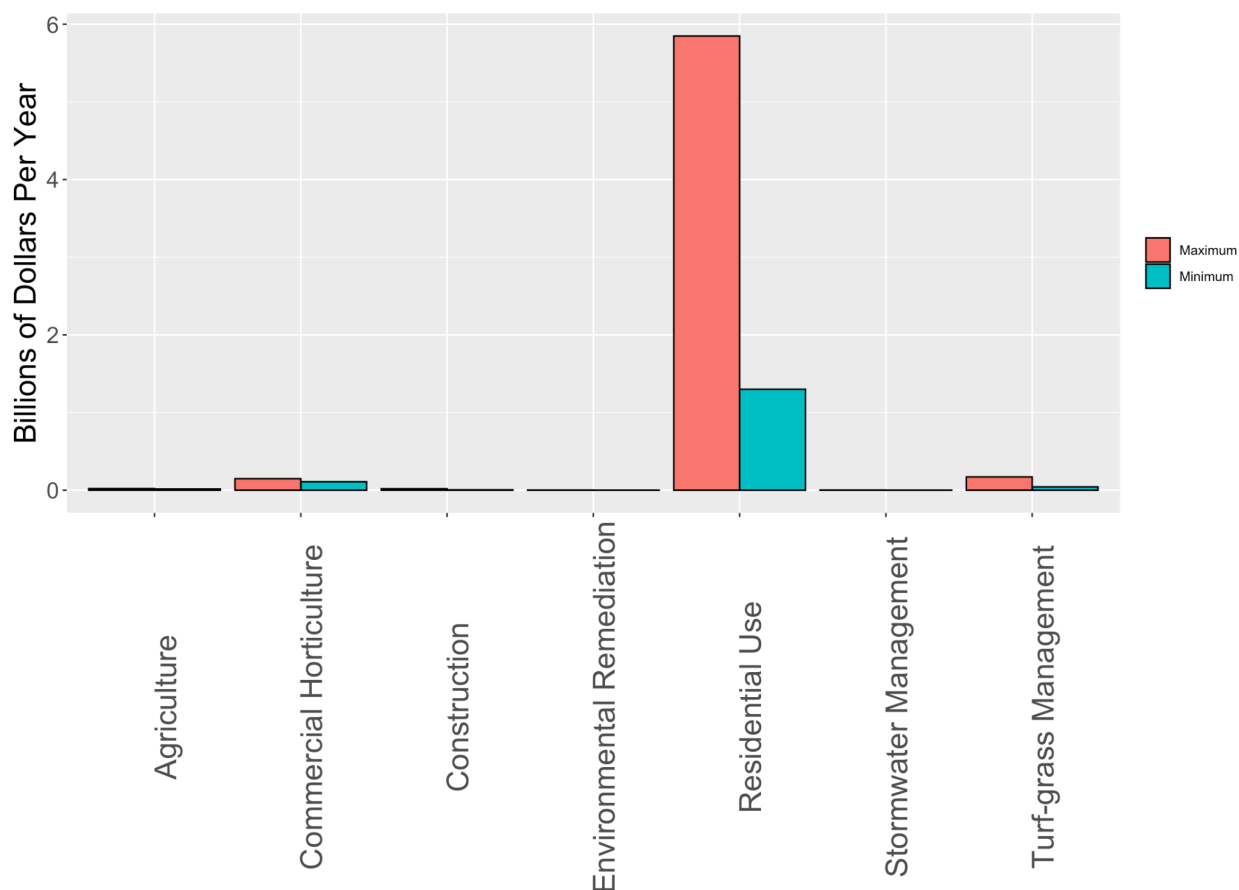


Figure 4: Estimated annual revenue across the seven end markets for compost. Residential use is the most profitable market (\$1.3 to \$5.8 billion/year) followed by turf-grass

management (\$43 to \$171 million/year) and commercial horticulture (\$109 to \$148 million/year).

A realistic goal for the state is to sell enough compost through these end markets to fund infrastructure investment to process all organic waste in Rhode Island. As mentioned earlier, there are 89,926 tons of organic waste that could be diverted from the landfill via composting.⁶⁴ To compost this amount of waste, the state would need four composting facilities that can process 100 tons of organic waste per day. From discussions with compost site developers who have led similar projects in the Northeast, it is estimated that a site with this capacity would cost between \$3 and \$5 million to build, accounting for a total of \$12 to \$20 million to build facilities to handle all of Rhode Island's organic waste. Scaling down our estimates from \$1.5 billion of revenue for 13.2 million cubic yards of compost, Rhode Island compost producers would only need to sell between 105,600 and 176,000 cubic yards of compost to cover the cost of these four facilities. This is only 0.8% to 1.3% of the 13.2 million cubic yard estimated end market use and is reasonable for the state to achieve.

Alternatively, the state could view investment in composting infrastructure from the perspective of the revenue generated from composting the organic waste within the state. Compost made from food waste typically produces between 50 and 75 finished tons of compost for every 100 tons of organic waste. Consequently, the aforementioned four composting facilities in the state would produce 44,963 to 67,445 tons of finished compost, or 34,587 to 51,880 cubic yards of compost annually. Based on revenue estimates in this report, this amount of compost would generate between \$3.9 and \$5.9 million per year from sales of compost alone. This results in a pay-back period of about 4 years to cover the costs of investment in four composting facilities.

In summary, investing in four composting facilities would enable the state to transform all organic waste presently being landfilled into compost that would generate between \$3.9 and \$5.9 million annually. The compost generated from these four facilities accounts for 0.8% to 1.3% of the ideal end market for compost within Rhode Island.

Barriers to Opening Compost Markets

This report has estimated the maximum use scenarios for compost within Rhode Island. These calculations assume that all stakeholders who could utilize compost would do so. However, conversations with stakeholders within the state revealed that

⁶⁴ <https://rircr.org/sites/default/files/2017-02/Waste%20Characterization%20Study%202015.pdf>, p. 23.

there are significant barriers to both the large-scale production of compost within the state as well as hesitation to using compost. This section briefly details a few of these barriers and corresponding policy recommendations that could help address them.

First, conversations with four compost producers within the state revealed limitations to increasing compost production and revenue. Main concerns included limited land to produce and store compost, with many operations lacking capital funds to scale up their production. A lack of quality feedstocks to produce compost was also mentioned as a barrier to their businesses' success. Without reliable and consistent feedstocks, scaling up compost production is impossible. Finally, two producers emphasized that the revenue potential is limited because small-scale operations currently share compost for free, which makes it difficult for them to market compost as a valuable product that is worth purchasing.

Secondly, stakeholders within the state are hesitant to use compost across the seven identified markets. Concerns around quality of the compost and regular availability were frequently mentioned as barriers to use. Unfamiliarity with the variety of uses of compost also contributed; many stakeholders shared that they hadn't considered using compost in certain end markets, especially in regards to environmental remediation and stormwater management. These comments are corroborated by California's survey of compost producers. Education to inform customers and the public about the value and benefits of compost was listed as the most notable barrier to increase compost revenue and use within California.⁶⁵ Passing legislation to mandate the use of compost in certain applications combined with education and local success stories of compost use in Rhode Island can help create consistent demand for compost.

Finally, compost marketers working in the Northeast shared that the regulations for compost use and required screening or testing vary by state. Given that Rhode Island is the smallest state in the country, compost markets within the state will inherently be affected by nearby Connecticut and Massachusetts. Adapting to different state-level policies and regulations makes it more difficult to expand markets into multiple states. DOT and erosion control legislation requirements change from state to state, requiring marketers to spend extra time and energy to adapt to local requirements. As one marketer said, the current legislative landscape "could benefit from a little more uniformity" when it comes to compost regulations.

⁶⁵ CalRecycle, p. 80.

Policy Recommendations to Open Markets

This research and conversations with market experts have identified three policies that could be passed or enforced in the state of Rhode Island to open and support compost end markets.

- 1. Enforce Rhode Island's Wasted Food Ban:** will ensure that quality organic material is diverted from the landfill and available as a feedstock to compost producers. This will boost supply of compost throughout the state. For more detailed recommendations, see our: [Existing Compost Laws Analysis](#).
- 2. Pass disturbed soil legislation:** Following King County in the state of Washington's lead,⁶⁶ Rhode Island could pass legislation that requires construction and development projects to replace any disturbed soil with compost-amended soil.
- 3. Require use of compost on RIDOT Projects:** requiring RIDOT to mandate use of compost on projects will enable Rhode Island to match standards already set by other Northeast states.⁶⁷ This will not only increase use of compost in construction markets, but also make it easier for compost producers and marketers to comply with specifications that vary from state to state.

⁶⁶ <https://your.kingcounty.gov/dnrp/library/solid-waste/greentools/post-construction-soil-standard.pdf>

⁶⁷ https://cdn.ymaws.com/www.compostingcouncil.org/resource/resmgr/documents/compost_use/Compost_Use_for_DOT.pdf

Conclusion

Addressing food waste through composting is a critical element of ensuring a just and resilient local food system in Rhode Island. In order to spur investment in compost infrastructure, this report estimated the size and revenue of compost end markets. Informed by interviews with compost industry experts, compost producers and local stakeholders combined with market reports and state level data, estimations found that a total of 13.2 million cubic yards of compost could be used in Rhode Island per year. Seven unique end markets were identified, with the majority of compost use falling within residential, commercial horticulture and turf-grass management markets. Compost use across all seven end markets would generate a potential revenue stream between \$1.5 and \$6.2 billion per year. This is enough capital to fund composting sites to process all of the state's compostable organic waste that is currently being landfilled.

In order to open these end markets, investment in compost infrastructure and creating reliable demand for compost must occur. Investing in compost infrastructure could include curbside collection of organic waste or building and operation of several large compost production sites. A variety of legislative changes could also help create demand for compost across the seven identified end markets; specifically, a disturbed soil ordinance and mandates to use compost in RIDOT and construction projects will create demand for compost. Additionally, enforcing Rhode Island's Wasted Food Ban will ensure consistent feedstocks of high quality organic material to drive compost production.

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Additional Data

End Market	Sub-categories	Market Size (CY/year)
Agriculture	Crop production	217740.2
	DOT projects	19690.2
Construction	Disturbed soil from deveopment	449991.4
	Sod production	304449.4
Commercial Horticulture	Nursery production	1251682
	Landfills	200
Environmental Remediation	Brownfields	33490.47
	Residential lawns	7955241.6
Residential Use	Home gardens	66121.5
	Impaired waterways	37,238.50
	Green roofs	10,238.5
Stormwater Management	Rain gardens	41.67
Turfgrass management	Developed recreation (including state and local conservation areas), vacant land, cemetaries, pasture, idle agriculture, brushland, transitional areas, mixed barren areas, solar systems and wind energy systems.	2846056.1
	Total market size (millions CY/year)	13.2

Figure 5: Compost end markets with their specific uses and calculated market size.

Table 1: Estimates of compost revenue by end market in Rhode Island.

Market	Classification	Price (\$/CY)	Market Size (thousand CY/year)	Potential Revenue (mil \$/year)
Agriculture	Wholesale	\$70 to \$95	217.7	15.2 - 20.7
Construction	Wholesale	\$10 to \$40	469.7	4.7 - 18.8
Commercial Horticulture	Wholesale	\$70 to \$95	1556.1	108.9 - 147.8
Environmental Remediation	Wholesale	\$10 to \$40	33.5	0.34 - 1.3
Residential Use	Retail, small quantity	\$162 to \$729	8021.4	1,299.5 - 5,847.6
Stormwater Management	Wholesale	\$10 to \$40	47.5	0.475 - 1.9
Turfgrass Management	Retail, blends	\$15 to \$60	2846.1	42.7 - 170.8
Total:				1471.8 - 6208.9

Appendix

Calculations and Assumptions

This appendix details the specific data sources, calculations and assumptions utilized to estimate the size of compost end markets for the state of Rhode Island. **Assumptions are listed in red** and data sources are referenced or linked when possible. Assumptions that are relevant to all market calculations are listed first followed by a step-by-step description and logic applied in the calculations for each end market.

Overall Assumptions

The following assumptions were applied to all seven end market calculations:

- **Density assumption:** The final estimation for size of the end markets for compost in the state of Rhode Island is given in cubic yards per year. Some compost application rates used to generate this estimation were originally given in tons of compost. To convert between the weight and volume of compost, I assumed an average compost density of 2,620 pounds per cubic yard. This density assumption results in one cubic yard (CY) of compost equating to 1.3 tons of compost. This value was taken from an [online compost calculator](#) shared by a U.S. Composting Council contact.
- **Maximum or ideal market size:** Calculations were made assuming either 100% adoption rate or adoption rate that is similar to nearby Northeast states. The assumed adoption rate will be noted when applicable in the calculations below.

Useful Conversions

These are unit conversions that were used throughout the following calculations and are useful to have on hand.

- 1 acre = 43560 square feet
- 1 cubic yard = 27 cubic feet
- 1 hectare = 2.471 acres
- 1 acre = 4840 square yards

Table 1: Agricultural Use Calculations

Crop Type	Acres	Tons/acre	CY/ton	X-times/yr	Compost Use (CY/year)
Grains	11,987.0	20	0.76	1	182,202.4
Vegetables	1,964.3	20	0.76	1	29,856.8
Fruits	137.0	20	0.76	1	2,082.4
Orchards	947.0	5	0.76	1	3,598.6
Total					217,740.2

Agriculture

Data was collected from the [2022 U.S. Census of Agriculture](#) for the state of Rhode Island. This is the most recent and complete data collection on agricultural production for the state. The agricultural census reports the number of acres used to grow specific crops. In 2022, 15,035.3 acres of land produced grains, vegetables or fruits or were used in orchards.

Application rates were recommended by a compost marketer. A rate of 20 tons per acre was assumed for land used to grow fruits, vegetables and grain crops. A lower rate of 5 tons per acre was used for orchards. **It was assumed that every farmer within the state of Rhode Island would apply compost to their agricultural land.** These calculations resulted in a total agricultural market size of 217,740.2 cubic yards per year (Table [1](#)).

Commercial Horticulture

Calculations to estimate the amount of compost that could be used in nurseries and sod raising in the state were done in a similar manner to agricultural estimations. Data was once again accessed from the [2022 U.S. Census of Agriculture](#). **It was assumed that all nurseries and sod raising facilities would utilize compost. It was also assumed that nurseries would receive the same recommendation application rate as orchards;** that is, 5 tons per acre per year of compost (Table [2](#)).

With little information available regarding how much compost to apply to sod raising, **it was assumed that sod would receive the same application rate as residential sod;** this is likely an under-estimation. Regardless, this is assumed to be an average depth of $\frac{7}{8}$ inches. There are 2,588 acres of sod production in Rhode Island.

Table 2: Commercial Horticulture Use Calculations

Crop Type	Acres	Tons/acre	CY/ton	X-times/yr	Compost Use (CY/year)
Nursery	329,390	5	0.76	1	1,251,682
Total					217,740.2

$$\frac{0.875 \text{ inches}}{12 \text{ inches}} * \frac{1 \text{ foot}}{12 \text{ inches}} * \frac{2,588 \text{ acres}}{1} * \frac{43,560 \text{ square feet}}{1 \text{ acre}} = 8,220,135 \text{ cubic feet}$$

$$\frac{8,220,135 \text{ cubic feet}}{27 \text{ cubic feet}} = 304,449.4 \text{ cubic yards}$$

By adding the compost use for nursery and sod production, it is found that commercial horticulture can consume 1,556,131 CY/year.

Construction

The estimate of the construction end market relies upon **the assumption of how many acres of land are developed in the state annually**. Information was triangulated from a variety of sources in order to generate an informed assumption for annual developed acres. This data does not capture all of the development occurring in the state; specifically, only city-level information is readily available for Providence. As such, this market may be an under-estimation.

1. **RI Housing:** In 2024, there were 343 new low-income to moderate income housing units constructed. **Assume that half of these units (170 units) were constructed in rural areas and the other half in urban areas (173 units)**. Specific projects listed show that, on average, 40 units occupy 6 acres in rural areas; meanwhile, 62 units occupy 1.5 acres in dense urban environments.

$$\frac{6 \text{ acres}}{40 \text{ units}} * 170 \text{ units} = 25.5 \text{ acres of rural housing development}$$

$$\frac{1.5 \text{ acres}}{62 \text{ units}} * 173 \text{ units} = 4.2 \text{ acres of urban housing development}$$

2. **Providence Development Mapper:** There are currently 85 active development projects in Providence, 75 of which are listed as completed. **Assuming that there is an average of 80 development projects per year that are 0.25 acres in size**, there are 20 acres of land developed annually in Providence.
3. American Community Survey: the number of households in Rhode Island over the past 5 years changed increased by an average of 5,080 households. **Assuming that**

the average lawn size of these new households is 0.25 acres , this results in 1,270 acres of new housing per year.

These three pieces of information combine to create an estimate that 1,320 acres of land are developed in Providence annually. Based on compost applications required by the King County Construction Soil Standards, 2.54 inches of compost should be applied to developed land. This equates to 341 CY per acre of land assuming the given density at the beginning of this document.

$$\frac{341 \text{ CY}}{1 \text{ acre}} * \frac{1,320 \text{ acres}}{1} = 449,991 \text{ CY/year}$$

Another specific application of compost in construction projects is through DOT projects. To estimate the amount of compost that could be used by RIDOT, it was assumed that New York State and Rhode Island have the same distribution of types of DOT projects. Projects and their corresponding compost use is available through New York State's DOT contract portal. This is a generally safe assumption given that both states are located in the Northeast; however, the amount of coastal areas and bridges that Rhode Island has may impact the amount of road miles where construction is occurring, making the distribution of projects and thus their relative compost use different. However, this is the best data available to project the compost usage of RIDOT.

To do so, two pieces of information were used:

1. RIDOT 2025 Q2 Report: shows that there are 539 active projects across the state, 355 of which could utilize compost. These projects typically last for 10 years, so there are 36 projects per year that could use compost.
2. Current projects in New York State. Projects that used compost had the following distribution:
 - 67% of projects used 30 CY or less. These 8 projects used an average of 14.8 CY.
 - 16.7% of projects used 30 to 200 CY. These two projects used an average of 106 CY.
 - 16.7% of projects used more than 1,000 CY. These two projects used an average of 3,116.5 CY.

Mapping this distribution of project compost consumption onto Rhode Island's 36 DOT projects per year results in 19,690 CY of compost used per year.

$$14.8 \text{ CY} * \frac{8}{12} * 36 \text{ projects} = 355.2 \text{ CY}$$

$$106 \text{ CY} * \frac{2}{12} * 36 \text{ projects} = 636 \text{ CY}$$

$$3116.5 \text{ CY} * \frac{2}{12} * 36 \text{ projects} = 18,699 \text{ CY}$$

Combining development compost use and RIDOT potential compost use, the construction end market for compost in Rhode Island is 469,682 CY/year.

Environmental Remediation

This market encompasses landfill use of compost and remediation of industrial contaminated sites called brownfields. Currently, the state's only landfill uses compost solely for landscaping and estimates that they use 200 CY per year.

There is an estimated 4,600 acres of brownfields in Rhode Island. This land can be remediated using compost in two ways:

1. Direct application. Recommended rate by Whelan et al. of 154.46 CY/acre.
2. Excavation of contaminated soil to be composted. 15 feet deep excavated down to the water table. Excavated area would be refilled with 33% compost.

Assume that 95% of brownfield acres are remediated via direct application while the other 5% are excavated and refilled with compost amended soil. Also assume that this remediation occurs over the next 75 years; that is, 61.3 acres of land are remediated annually.

$$4600 \text{ acres} * \frac{95}{100} * \frac{154.5 \text{ CY}}{1 \text{ acre}} = 675,005 \text{ CY}$$

$$4600 \text{ acres} * \frac{5}{100} * \frac{43,560 \text{ square feet}}{1 \text{ acre}} * 15 \text{ ft} * \frac{1 \text{ CY}}{27 \text{ cf}} = 5,566,000 \text{ cf}$$

$$5,566,000 \text{ CY} * 0.33 = 1,855,333 \text{ CY}$$

These two values combine for a total of 2,511,785 CY to be used over 75 years. This equates to 33,490.5 CY annually. Adding in the 200 CY of landscaping for RIRRC results in a total market size of 33,690.5 CY annually for environmental remediation.

Residential Use

Residential compost use includes top dressing for lawns and compost in home gardens. Data from the American Community Survey and general practice for lawns and home gardens were used to estimate this market.

In 2023, the American Community Survey reported that there were 270,497 households in the state. The average lawn size in Rhode Island is 0.25 acres. Lawns typically receive between $\frac{3}{4}$ and 1 inch of compost top dressing. Assuming that every household in the state has this average lawn size and applies $\frac{7}{8}$ of an inch of compost annually, residential lawns will use 7,955,242 CY/year.

$$270,497 \text{ households} * 0.25 \text{ acres} = 67,624.25 \text{ acres of lawns}$$

$$67,624.25 \text{ acres} * \frac{43,560 \text{ sq ft}}{1 \text{ acre}} * \frac{7}{8} \text{ in} * \frac{1 \text{ foot}}{12 \text{ inch}} * \frac{1 \text{ CY}}{27 \text{ sq ft}} = 7,955,241 \text{ CY}$$

A similar approach was used to estimate home garden compost usage. With 270,497 households, it was assumed that 55% of households had a garden of 96 square feet. Homegardens should receive between 1 and 2 inches of compost annually. An average of 1.5 inches was assumed for this calculation, resulting in homegarden compost use of 66,121.5 CY/year across the state.

$$270,497 \text{ households} * \frac{55}{100} * 96 \text{ sq ft} * \frac{43,560 \text{ sq ft}}{1 \text{ acre}} = 327.8 \text{ acres of gardens}$$

$$327.8 \text{ acres} * \frac{43,560 \text{ sq ft}}{1 \text{ acre}} * 1.5 \text{ in} * \frac{1 \text{ foot}}{12 \text{ inch}} * \frac{1 \text{ CY}}{27 \text{ sq ft}} = 66,121.5 \text{ CY}$$

Combining use between residential lawns and home gardens results in a residential use market of 8,021,363 CY/year.

Stormwater Management

This end market is comprised of three uses: compost to line impaired waterways, green roofs and rain gardens. All of these practices were assumed to be implemented over a 20 year time span, which is a good time range for funding and progress to be made in their implementation.

Impaired waterway data was collected from RIDEM's tabulations. There are 690.3 miles of waterways that are classified as "stormwater impairment confirmed" or as "stormwater impairment potential." Based on RIDEM's classifications, both of these categories could benefit from compost application in the form of compost filter socks (CFS) or compost filter berms (CFB). In Rhode Island, CFS are recommended to be 18 inches in diameter.

$$(9 \text{ inch})^2 * \pi * \left(\frac{1 \text{ foot}}{12 \text{ inch}}\right)^2 = 1.77 \text{ square feet per length}$$

Area of a Trapezoid

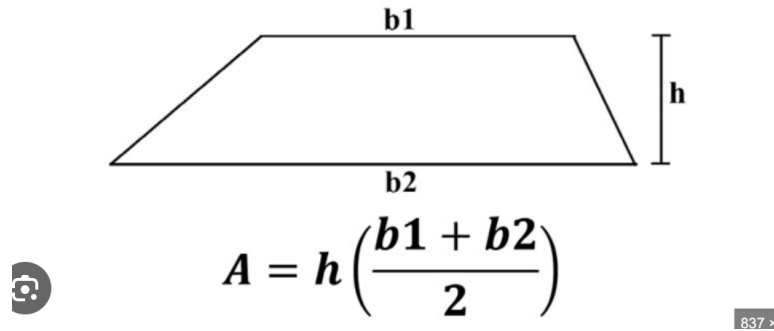


Figure 1: Area of a trapezoid used to calculate volume of compost in CFB.

CFB are recommended to be shaped as a trapezoid. Specifically, they should be 3 feet wide at the base, 2 feet wide at the top and 1.5 feet tall.

$$\frac{(2 \text{ feet} + 3 \text{ feet})}{2} * 1.5 \text{ feet} = 3.75 \text{ square feet per length}$$

Assume that compost lines both sides of impaired waterways and that 50% of erosion control are CFS and the other 50% are CFB. That is, 690.3 miles of river bank will receive CFS and another 690.3 miles will receive CFB.

$$1.77 \text{ square feet} * 690.3 \text{ miles} * \frac{5,280 \text{ feet}}{1 \text{ mile}} * \frac{1 \text{ CY}}{27 \text{ cf}} = 238,935 \text{ CY}$$

$$3.75 \text{ square feet} * 690.3 \text{ miles} * \frac{5,280 \text{ feet}}{1 \text{ mile}} * \frac{1 \text{ CY}}{27 \text{ cf}} = 506,220 \text{ CY}$$

$$(238,935 \text{ cf} + 506,220 \text{ cf}) * \frac{1 \text{ CY}}{27 \text{ cf}} = 744,770.6 \text{ CY}$$

In total, this will use 744,771 CY of compost over 20 years. This results in a use of 37,239 CY per year.

The second use of compost for stormwater management is through green roofs. For this calculation, it was assumed that green roofs would be added to 1% of structures in Rhode Island. This aligns with current adoption rates. Using data from a GIS building footprint layer and assuming that structures cover 50% of lot area on average. Land use and land cover data was also used to inform developed land where buildings would be located. Analyzing the area of features in these two shapefiles resulted in 169,232 acres of developed land in Rhode Island and 366,799 buildings which account for 84,616.2 acres. 1% of these structures results in 2,538 acres of buildings that could be turned into green roofs.

Typically, green roof media is composed of 15% compost. Green roofs are designed

to be a depth of 2 to 6 inches; **an average depth of 4 inches was used**. Combining these assumptions resulted in 204,771 CY of compost to be used.

$$4 \text{ inches} * \frac{1 \text{ foot}}{12 \text{ inches}} * 2,538 \text{ acres} * \frac{43,560 \text{ sq feet}}{1 \text{ acre}} * \frac{1 \text{ CY}}{27 \text{ cf}} * 0.15 = 204,771 \text{ CY}$$

Assuming that these would be built over a 20 year period, 10,239 CY of compost would be used each year.

Finally, rain garden calculations were completed **assuming that 550 rain gardens would be added across the state**. Specifically, 50 rain gardens would be added in urban areas at a **depth of 2.5 feet**. The other 500 rain gardens would be in residential areas **with an average depth of 0.5 feet**. Typically, rain gardens are 20% to 40% compost (**assume an average of 30%**) with an average size of 200 square feet.

$$50 \text{ rain gardens} * 200 \text{ sq ft} * 2.5 \text{ ft} * \frac{1 \text{ CY}}{27 \text{ cf}} * 0.3 = 277.8 \text{ CY}$$

$$500 \text{ rain gardens} * 200 \text{ sq ft} * 0.5 \text{ ft} * \frac{1 \text{ CY}}{27 \text{ cf}} * 0.3 = 555.5 \text{ CY}$$

Together, urban and residential rain gardens will use 833.3 CY of compost. Spread evenly over a 20 year implementation period, this results in 41.6 CY/year.

In total, the stormwater management market, which is comprised of rain gardens, green roofs and CFS/CFB along impaired waterways, will use 47,519 CY/year.

Turf-grass Management

A variety of land uses were selected to be able to benefit from general compost application in the form of turf-grass management. The **2020 land cover and land use** data was once again used to identify these areas. The following use types were selected for analysis in ArcGIS Pro:

- Developed recreation
- Vacant land
- Cemeteries
- Pasture
- Idle Agriculture
- Brushland
- Transitional areas
- Mixed barren areas
- Solar Energy
- Wind Energy

Local and **state conservation** designated areas were also included in an effort to capture public recreation and conserved lands that may not have been designated in the land

Finding areas of conservation that are not accounted for in turf_use_2020

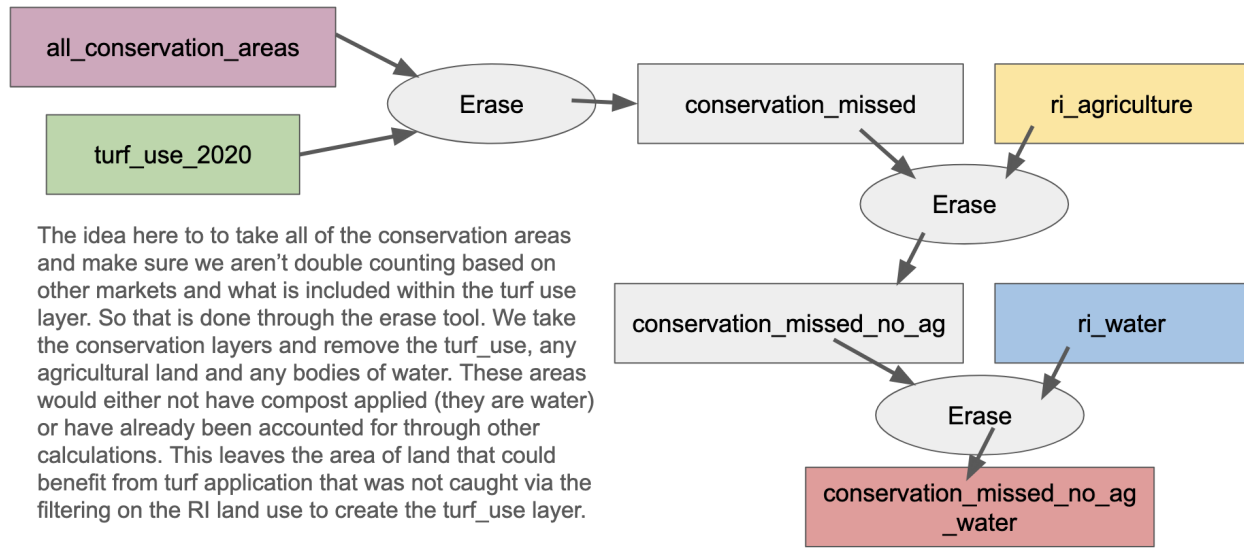


Figure 2: GIS process to select areas from the local and state conservation areas that were not already included in the filter land use layer “turf use 2020.”

use layer. Analysis in ArcGIS Pro was conducted to ensure that area was not double-counted between these three different layers (Figure 2). Combining the total area of the “conservation missed no ag water” with the filtered land use total area resulted in 56,450 acres of land that could benefit from general compost application for turf-grass management.

Yearly maintenance of turf-grass includes the application of between 1/4 and 1/2 inches of compost. It was assumed that 3/8 of an inch would be applied annually to the 56,540 identified acres of land. This resulted in use of 2,846,056 CY/year.

$$0.375 \text{ inches} * \frac{1 \text{ foot}}{12 \text{ inches}} * \frac{56,450 \text{ acres}}{1 \text{ acre}} * \frac{43,560 \text{ sq ft}}{1 \text{ acre}} * \frac{1 \text{ CY}}{27 \text{ cf}} = 2,846,056 \text{ CY/yr}$$

Cost Analysis

Calculations were conducted to conceptualize the size of the compost end market and its revenue within the context of Rhode Island. The results of these calculations are on pages 19 and 20 of the report. These calculations assume that compost within the state would be sold evenly across all identified end markets at the lowest potential revenue. That is, the 13.2 million CY of compost generates a revenue of \$1.5 billion, or about \$114 per CY.

The first calculation is to quantify how much compost would need to be used within the state to fund enough composting infrastructure to process all of the organic waste currently being landfilled in the state. Currently, 89,926 tons of organic waste are landfilled annually. It is estimated that a composting facility that can process 100 tons of organic waste per day will cost \$3-5 million. So, assuming that each facility would operate for 260 days per year, it will take four facilities and \$12 - 20 million to compost the state's organic waste. The state would need to sell between 105,600 and 176,000 CY of compost to pay for these four facilities.

$$260 \text{ days} * \frac{100 \text{ tons}}{1 \text{ day}} = 26,000 \text{ tons processed per facility per year}$$

$$89,926 \text{ tons} * \frac{1 \text{ facility}}{26,000 \text{ tons}} = 3.5 \text{ facilities (round up to 4 facilities)}$$

Minimum amount of compost needed to pay for these facilities:

$$\$12 \text{ million} * \frac{1 \text{ CY}}{\$114} = 105,600 \text{ CY}$$

Maximum amount of compost needed to pay for these facilities:

$$\$20 \text{ million} * \frac{1 \text{ CY}}{\$114} = 176,000 \text{ CY}$$

Secondly, we also calculated how much revenue would be made generated from compost produced by composting all currently landfilled organic waste in the state. It was assumed that 100 tons of organic waste when combined with other feed stocks would produce between 50 and 75 tons of finished compost. As such, the 89,926 tons of organic waste could produce between 34,587 tons and 51,880 tons of finished compost.

$$89,926 \text{ tons OW} * \frac{50 \text{ tons finished}}{100 \text{ tons OW}} * \frac{1 \text{ CY}}{1.3 \text{ ton}} * \frac{\$114}{1 \text{ CY}} = \$3,942,909$$

$$89,926 \text{ tons OW} * \frac{75 \text{ tons finished}}{100 \text{ tons OW}} * \frac{1 \text{ CY}}{1.3 \text{ ton}} * \frac{\$114}{1 \text{ CY}} = \$5,914,364$$

Selling this amount of compost at the average revenue rate of \$114 per CY results in \$3.9 to \$5.9 million of revenue annually. This is enough revenue to pay for the four processing facilities (\$12 - \$20 million) in 3 to 4 years.