

Redesigning the Future of Plastic Plant Containers

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Summary

Plastic containers are common in the greenhouse and nursery industry. To avoid contributing to plastic pollution and its ecological impact, it would be ideal if plastic containers were recycled. However, over 90%

are sent to landfills. There are several reasons for this limited recycling and the current paper will discuss the current state of container use by the industry and potential alternatives to plastics for growing plants.

INTRODUCTION

Plastic plant containers have become ubiquitous in the gardening, horticulture, and landscaping industries, offering convenience, durability, and a cost-effective means

for growing and selling plants. Plastic's strong molecular chains allow it to be pressed, stretched and molded into every conceivable shape (**Fig. 1**).

What is it about plastic?

- Flexible
- Inexpensive
- Comes in various shapes and sizes
- Durability
- Easy to transport/ship (higher strength/weight ratio)
- Integrity of product



Figure 1. Attributes of plastic.

When growers' only options for containers consisted of materials that were prone to breaking and proved cumbersome, their markets were quite limited. The plastic container's popularity vastly expanded growers' markets resulting in one of the fastest growing industries in modern history. However, the widespread use of plastic plant containers has raised concerns about their environmental impact, particularly plastic pollution and resource depletion. The horticulture industry is being faced with significant pressures from the public and regulatory bodies to reduce the amount of plastic used in our products.

In 2019, I contracted with the Association of Professional Landscape Designers to research the end of life of plastic plant containers. For years, we have been disposing of them at recycling facilities, attempting to return them to nurseries or throwing them out with the trash. In 2020, I authored the white paper entitled "Plastic Pots and the Green Industry: Production, Use, Disposal and Environmental Impacts." My discovery that 95-98% of them go to landfills was sobering and quite frankly, surprising.

Plastics that are used in the horticulture industry largely include low density polyethylene (LDPE #4), polypropylene (PE #5) and polystyrene (PS #6). High density polyethylene (HDPE #2) is used for larger plants like trees and shrubs. Perennials, annuals and other small plants are typically grown and sold in #s 4, 5, and 6. Our containers use a tremendous amount of plastic: in 2009, the U.S. ornamental plant industry used 1.66 billion pounds of plastic. (Fig. 2).

Per Year, How Much Plastic is used in Horticulture?



In 2009, U.S. ornamental plant containers used **1.66 billion pounds** of plastic.

HortTechnology.

February 2015.



Figure 2. Plastic use in horticulture per year in 2009.

The overarching reason for why our containers and other plastic products go to landfills, is our recycling system is not adequately prepared to handle the vast quantities that are produced. Its production has increased 200-fold since 1950. In 1980 the

world produced 98 million tons of plastic. By 2019, 450 million tons were produced. In 2019 only 8.5% of plastic was recycled (Fig. 3).

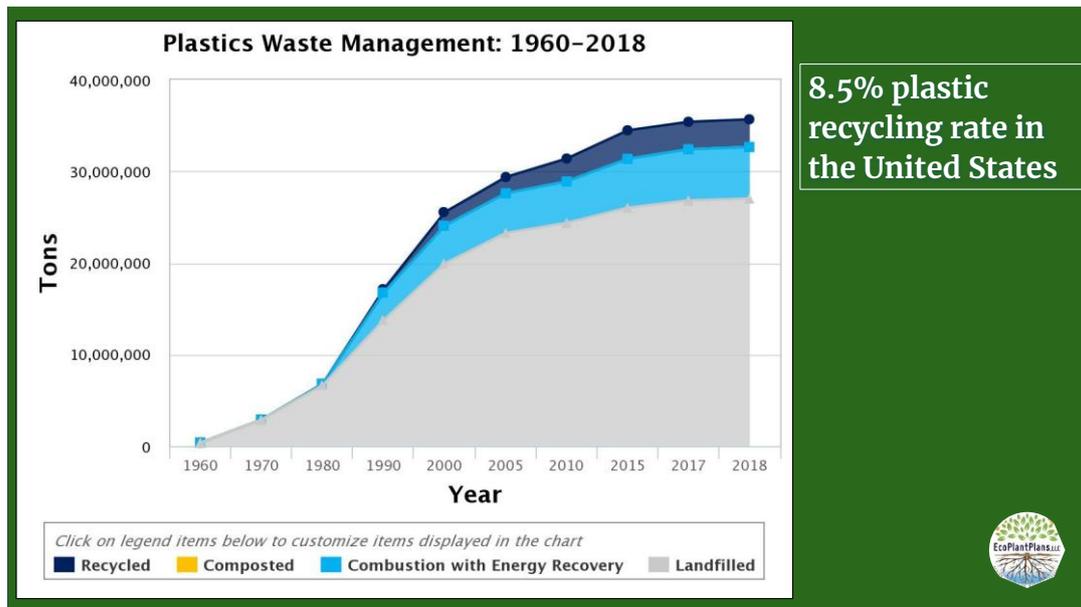


Figure 3. Plastic recycling rates between 1960 and 2018.

The numbers have not improved since. For years the United States depended on China to handle our waste. In 2017, China imposed the Sword Policy prohibiting the exportation of our waste to their borders. We were ill-prepared to handle the vast quantities of trash we had relied on them to handle.

One of the largest overarching reasons containers are not recycled, is the recycling system itself is not capable of handling the majority of common products. Aside from not having enough recycling facilities, the technology to process our waste is archaic. Collection is very inadequate. State by state residential recycling rates range between 9-37%.

Effective recycling requires precise sorting of different plastic types. Each plastic is composed of different chemicals and properties so it is difficult to recycle them uniformly.

Plastic often becomes contaminated with food residue, oils, and other material that can hinder the recycling process rendering the recycled product less viable.

The cost can sometimes exceed the value of the recycled material, especially if oil prices are competitive with recycled plastic.

Plastic can degrade each time it is recycled, limiting the number of times it can be reused before it is no longer suitable for production.

In addition to these barriers, plastic plant containers pose unique challenges. These include: optical readers cannot detect the color black, soil and chemicals can contaminate the recycling stream, they are composed of mixed plastics or weak plastics with little to no market value, it is cost pro-

hibitive to collect and clean them, it is extremely difficult to identify the resin code located at the bottom of the container, there is an insufficient access to recycling facilities, and the design of the containers can vary widely, complicating the sorting process (Fig. 4).

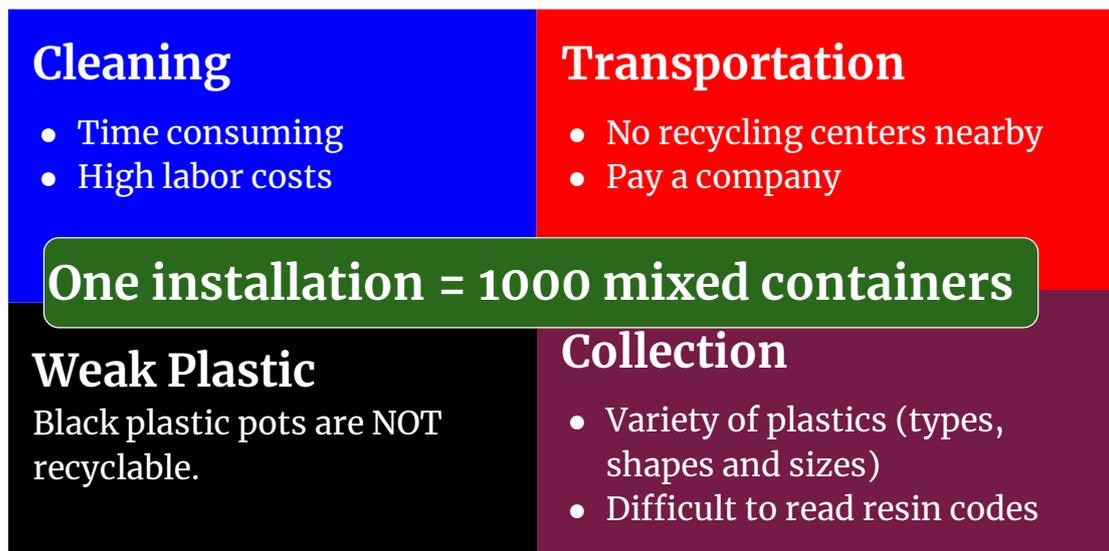


Figure 4. Complications in recycling plastic.

Plastics are notoriously difficult to break down in the environment. It can take anywhere from 500 to 1,000 years to decompose. Instead, they persist in the environment, where they pose a range of environmental risks. Chemicals leach into waterways and groundwater.

When plastics enter aquatic ecosystems, they break down into microplastics, which are consumed by marine life. This contamination affects everything from plankton to fish and seabirds and can ultimately impact human food sources (Figs. 5 and 6).

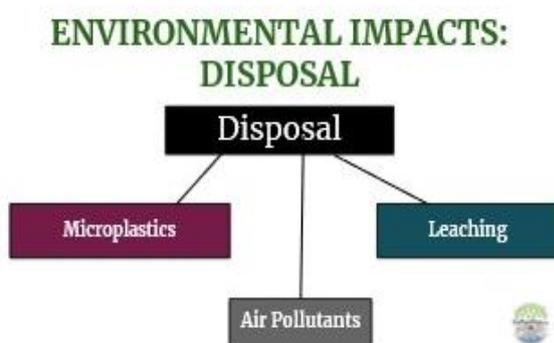


Figure 5. Environmental impacts on disposal.



Figure 6. Environmental impacts on manufacturing.

Plastics, especially those that break into smaller pieces, can be ingested by animals leading to blockages, injuries, and even death. The MacArthur Foundation estimates that humans ingest the equivalent of a credit card's worth of microplastic per week. Recent studies have found nano plastics in sperm and placentas.

For these reasons, there is growing concern over the negative impacts plastics are having on our planet. In response, a great deal of attention is being given to plastics that are used for short periods of time and discarded. Otherwise known as single use plastics, the majority of them are produced by the packaging industry. According to the Environmental Protection Agency, containers and packaging are defined as products that are assumed to be discarded the same year the products they contain are purchased. Plastic plant containers fall into this category.

A growing outcry against single-use plastics and the burgeoning quantity that is impacting our planet has the public demanding that manufacturers be responsible for the products they produce. In 2022, the IPSOS surveyed 20,000 people across 28 countries. 85% of the respondents want manufacturers and retailers to be held responsible for reducing and recycling plastic packaging. A USA public opinion poll indicated that 80% of voters are in favor of holding companies accountable for plastic waste and 82% favor products with less plastic packaging (**Fig. 7**). In July 2024, the U.S. government said it would phase out its purchases of single use plastics (**Fig. 10**). This was a significant step considering it is the largest buyer of consumer goods in the world. This is not a phase, but a new movement demanded by environmentally conscious consumers.

Plastic's Unpopularity

2022 IPSOS global public opinion:

20,000 surveyed across 28 countries

- 85% of respondents want manufacturers and retailers to be held responsible for reducing and recycling plastic packaging

2023 USA public opinion

1,000 voters across 50 states

- 80% are in favor of holding companies accountable for plastic waste.
- 80% concerned about single use plastics.
- 82% favor products with less plastic packaging.



Figure 7. USA public opinion poll on plastics.

Horticulture Industry Responds

In the United States there are a growing number of facilities accepting horticultural

containers. We can close the loop by capturing the material before it is disposed of.

East Jordan Plastics, a container manufacturer, works with growers to collect used containers they then recycle and use for new products. A line of their products is composed of 100% recycled content (**Fig.**

8). Five years ago, Pride’s Corner in Lebanon CT created a program with the States of Maine and Vermont to collect containers when making deliveries to nurseries. At present, it is the only large collection hub in New England.

East Jordan Plastics, Inc. Michigan



- Picks up #s 2, 5 and 6 plastic pots.
- Recycles 20 million pounds of horticultural containers/year.



Figure 8. Recycling plastic containers.

We can “re-design” our way out of concerns over plastic by minimizing the amount we use in our containers. The horticulture industry does have alternative products that can be used (**Fig. 9**). The majority of them are either plantable or compostable thus negating concerns over disposal. A number of them have been on the market for quite some time, however the majority of growers are not familiar with them.

Understandably, the reliability of plastic and the unproven benefits of switching has slowed the course. Recently, a host of alternative containers have been tested including the new bioplastic containers made from cellulose. The excitement behind this material is it does “behave” similarly to plastic but will biodegrade over a period of 5-6 years without leaving toxic chemicals and can be produced on existing equipment. Large quantities require industrial composting. Another new product from Blackmore, uses a milk carton-like material to contain the plant that decomposes (**Fig. 10**). Like the other alternative materials (wood pulp fiber, rice hulls, coconut coir fiber, etc), what is left behind returns to the soil. New studies will be published soon comparing some of these alternative containers’ performance.

Types of Alternative Pots

- Plantable
- Compostable
- Recycled Content - NEW



Figure 9. Types of alternative containers.

Blackmore Company



Figure 10. Alternative milk carton-like containers.

Regulatory Activity

For years Europe has been utilizing extended producer responsibility laws, extending responsibility for products on producers rather than municipalities and taxpayers. California was the first state to invoke the extended producer responsibility regulations (SB54), followed by Oregon, Washington, Maine, Colorado and New Jersey. To improve recycling a handful of states have adopted Extended Producer Responsibility (EPR) laws. Governments and industry organizations are beginning to adopt Extended Producer Responsibility policies, which place the onus on manufacturers to manage the disposal of their products after they reach the end of their life. Under such programs, companies that produce plastic plant containers would be required to take responsibility for the collection and recycling of these items.

A synchronous attempt to reduce plastic are laws requiring a minimum percentage of recycled plastic in each product. In New Jersey for example, a law requires that products be composed of at least 10% post consumer resin (PCR). The PCR must come from commonly recycled products

not industrially recycled. The ratio in this state and others will incrementally increase each year. By 2025, it will rise to 50%.

Truth in Labeling Laws (California SB), have been created to accurately inform consumers of how to handle their plastic purchases. Replacing the typical arrows surrounding the plastic type number, a triangle without arrows is now being stamped onto products.

The main drive behind these changes are consumers looking for sustainable options. Many products purchased by big box stores for example, are required to be third party certified as sustainably produced with minimal impact on the environment.

At present, the Horticultural Research Institute's Plastic Task Force is defining the challenges by tackling the issue from a number of different angles. Education of recent and upcoming regulations is paramount. Sharing knowledge of where to source PCR that works with a brand's color. This is real and being felt by producers. Container manufacturers and growers need reliable sources that are affordable and

readily available. Create standards to ensure compliance and transparency. Involving consumers would behoove growers and companies. Getting a seat at the table to ensure plastic plant containers are on the radar as new recycling infrastructures are built would be in our best interest (**Fig. 11**).

There is a call to action for the green industry to work together and advocate for healthier practices and products. As Dr. Charles Hall from states: “Economic data

shows that there is a payback for investment in sustainability. It is worth it. “

While plastic plant containers have become an integral part of the gardening industry, their contribution to plastic pollution is a growing environmental concern. By adopting sustainable alternatives and steadily reducing the amount of plastic used in the manufacturing process, the horticulture industry can contribute to a greener, cleaner future for both plants and people.

Regulatory Activity Across States



January, 2024 – New Jersey -10% PCR in 2024, 50% by 2025

Fall, 2025 – California SB-343 Truth in Advertising

July, 2025 – Oregon SB-582 Fees for plastics sold into state, reporting requirements

January, 2025 – Colorado HB22-1355 EPR

2027 – Maine 2146 EPR

2028–California SB-54–EPR



Fees for plastics sold into state, reporting requirements



Figure 11. Pending or enacted regulatory action in several States from 2024 to 2028.