

Little Bluestem

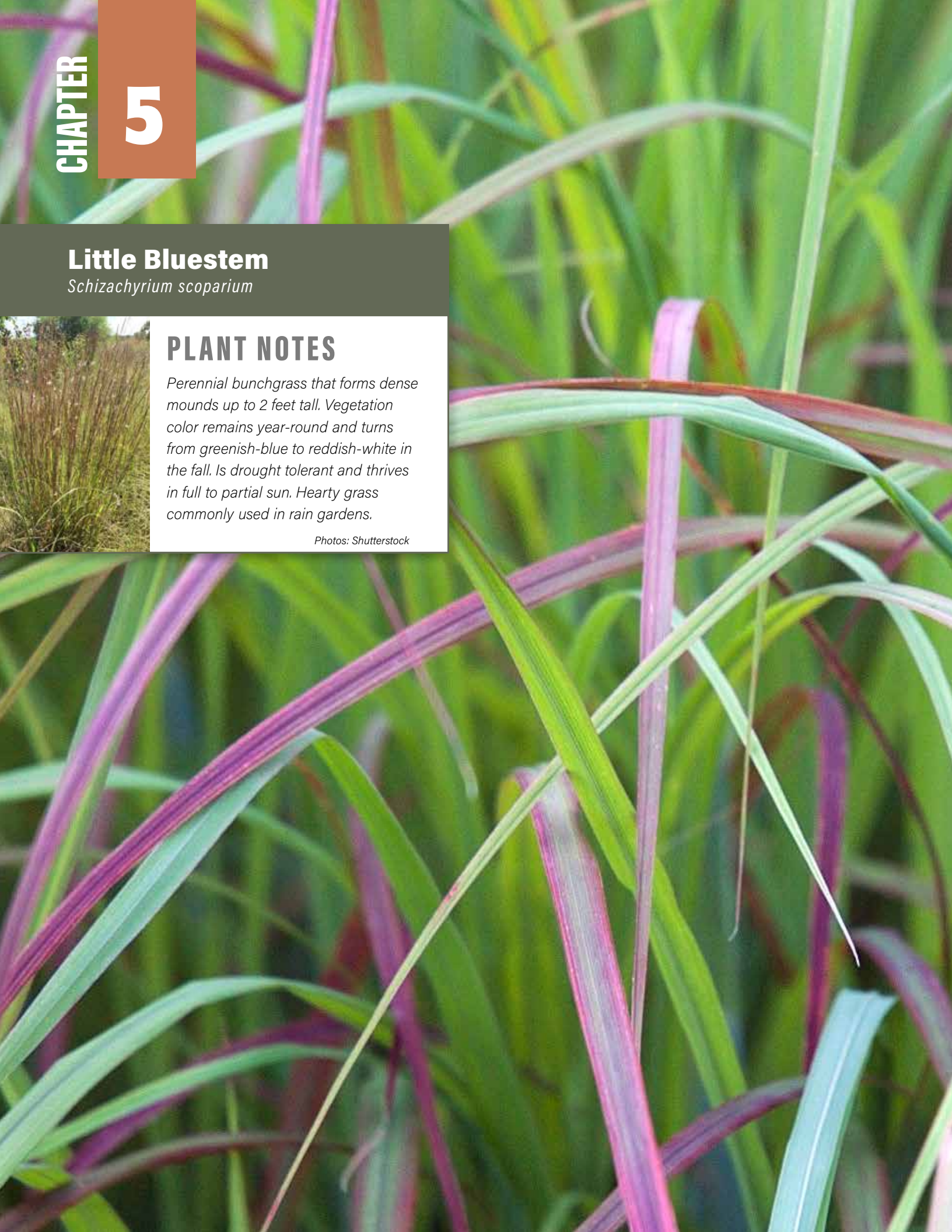
Schizachyrium scoparium



PLANT NOTES

Perennial bunchgrass that forms dense mounds up to 2 feet tall. Vegetation color remains year-round and turns from greenish-blue to reddish-white in the fall. Is drought tolerant and thrives in full to partial sun. Hearty grass commonly used in rain gardens.

Photos: Shutterstock



Chapter 5

Estimating Materials



Creating a Materials List

Once the rain garden has been designed, the next step is to create a materials list and determine the approximate amount of materials needed for installation.

- **Concrete Sand.** Ensure the sand is washed and graded. Many commercial concrete sands may simply say “All Purpose Sand”. Do not use masonry sand. In enhanced rain gardens, concrete sand should account for between 75 and 90 percent of the amended soil mixture. Read more about amended soils in Appendix D.
- **Compost.** Compost is typically composed of decayed plant and tree materials. High-quality compost should be black to dark brown in color, be loose, and have a musty or earthy smell. Look for STA (Seal of Testing Assurance) certification by the US Composting Council. In enhanced rain gardens, compost should account for up to ten percent of the amended soil mixture.
- **Topsoil.** Ensure excavated or purchased topsoil is free of small rocks, roots, and debris. It should have a dark brown to black color, be loose (not sticky), and granular. In enhanced rain gardens, topsoil should account for up to 25 percent of the amended soil mixture.

Photo: ISWEP



Concrete sand is added to rain gardens to enhance percolation.

Photo: ISWEP



Compost is added to increase organic matter.

Photo: ISWEP



Topsoil provides nutrients needed for plants to survive.

- Shredded Hardwood Mulch.** Long strand, shredded hardwood mulch is used to retain soil moisture for plants. It also helps suppress weeds. Shredded hardwood mulch is recommended because it is less likely to float or wash away when the rain garden has ponded water.
- Potted Plants and Plugs.** Vegetation can be purchased as potted plants, typically in quart or gallon pots, or as plugs, which are seedlings sold in trays. Plugs are more economical but potted plants provide more immediate aesthetics. Once plants for the rain garden are selected (see Chapter 7), jot down the spacing recommendations for each plant species. Calculate the average spacing recommendations from your plant list. Most plants are placed at one plant per square foot for an average spacing of 12 inches. Spacing recommendations are measured “on-center”, or from the center of one plant to the center of the neighboring plant.
- Inlet and Outlet Rock.** Two-inch to five-inch river rock can be used to prevent scouring at the inlets and outlets of a rain garden. Larger decorative flagstones can be used alone or in combination with the rock at these locations.
- Edging.** Edging is used around the perimeter of the rain garden. It prevents turfgrass encroachment and makes mowing around the rain garden easier. Landscaping pavers, a mulch trench, cedar wood, and plastic or metal edging can be used.

Photo: ISWEP



Long-strand, shredded hardwood mulch.

Photo: ISWEP



Plant plugs ready to be planted in a rain garden.

Photo: ISWEP



Two to five-inch rock provides scour protection at inlets and outlets.

Photo: ISWEP



Plastic landscape edging along the perimeter of a rain garden.

In addition to the previous materials, the following items are needed for *enhanced rain gardens*.

- **1-inch Rock.** One-inch clean field rock or limestone surrounds the subdrain in an enhanced rain garden. The rock should be washed and adhere to DOT Section 4115, Gradation No. 3, Class 2, or ASTM D 448, #57.
- **3/8-inch Aggregate.** 3/8-inch aggregate is used in enhanced rain gardens as a choker layer that separates the amended soil from the 1-inch rock above the subdrain. Ensure aggregate selection is washed and does not have a wide range of particle sizes. Seek aggregate meeting ASTM #8 specifications and avoid road stone.
- **Subdrain Pipe.** It is recommended that a 4- or 6-inch high-density polyethylene (HDPE) perforated drainpipe be used as the subdrain in enhanced rain gardens. HDPE is resistant to corrosion, durable, and lightweight for easier installation. Pipe is typically sold in lengths of 10, 50, or 100 feet. Measure from the outlet of the pipe to the edge of the enhanced rain garden farthest away from the outlet. Add 10 percent extra to the rain garden length to ensure enough pipe is purchased. If you plan to route rainwater underground from a downspout, the same type of HDPE pipe can be used. However, it should be solid pipe and not perforated. Do not buy pipe that is smaller in diameter than the downspout. This can back water up the downspout. Ensure a water-tight seal, which may require an adapter. The outlet of the subdrain into the rain garden should be capped with a grate to prevent animals from nesting inside the pipe.
- **Overflow Structure and Grate Cover.** A solid, four or six-inch PVC pipe can be used for the riser overflow structure. PVC provides a more rigid, firm pipe that will not bend over

Photo: ISWEP / Gravelstop



1-inch washed field rock and crushed limestone rock.

Photo: ISWEP



3/8-inch aggregate.

Photo: Fairfield Elementary School



HDPE subdrain pipe in an enhanced rain garden.

Photo: Polk SWCD



Overflow structure extending to the top of the ponding depth.

time and will stay vertical at the correct angle. Make a plan on how you will connect the overflow structure to the subdrain. This step may require an adapter or coupler to create a water-tight seal. A grated inlet cover rests on top of this pipe. The grated device is located at the height of the ponding depth to drain ponded water that exceeds the design depth. Beehive (dome-shaped), square, or circular grates are common and can be purchased at a local home improvement retailer. Ensure that the diameter of the overflow pipe matches the diameter of the grate opening.

✓ Creating a Budget

The cost of installing a rain garden will vary based upon the footprint area, ponding depth, amount of plants, type of edging, and if subsurface drainage is used. Enhanced rain gardens will be more expensive than basic rain gardens and are typically designed and installed by a contractor. The following are simple cost ranges for estimating the total project cost of a "Do-It-Yourself" installation. Estimated ranges reflect material costs in 2021.

Photo: Shutterstock



Individual bags of long-strand, shredded hardwood mulch.

Basic Rain Gardens = \$4 - \$10 per square foot

(assumes a rain garden less than 400 square feet, 6" ponding depth, 12" plant spacing, edging)

Enhanced Rain Gardens = \$10 - \$20 per square

foot (assumes an enhanced rain garden less than 400 square feet, 6" ponding depth, 12" plant spacing, subdrain infrastructure, and edging)

Use the tables on pages 41 and 42 to develop a more accurate estimate of the materials needed and potential costs.

Photo: Shutterstock



Bulk delivery of long-strand, shredded hardwood mulch.

Depending on the size of your rain garden, buying materials in bulk may be more cost-effective than purchasing individual bags. Bulk delivery of materials typically includes a delivery fee.

In addition to buying in bulk, out-of-pocket costs can be reduced by utilizing a local stormwater BMP cost-share program. Cost-share programs are offered by many cities and SWCDs in Iowa.

Common programs fund fifty percent of the

project cost, usually up to a specified dollar amount. Cities encourage residents to adopt stormwater practices on their property to help improve local water quality and reduce flash flooding. A complete list of participating communities and organizations can be found at www.bit.ly/IowaCostShare.

Estimated Cost Ranges for Rain Garden Materials

Item	Purchased in Bulk	Bulk Cost Range	Purchased as Individual Bags	Cost Range
Topsoil	1 Cubic Yard	\$20 - \$55	0.75 Cubic Ft.	\$2 - \$5
Compost	1 Cubic Yard	\$15 - \$45	0.75 Cubic Ft.	\$2 - \$5
Concrete Sand	1 Cubic Yard	\$30 - \$40	0.5 Cubic Ft.	\$3 - \$8
Shredded Hardwood Mulch	1 Cubic Yard	\$18 - \$35	2.0 Cubic Ft.	\$3 - \$6
1" Rock	1 Cubic Yard	\$30 - \$40	0.5 Cubic Ft.	\$3 - \$6
3/8" Aggregate	1 Cubic Yard	\$40 - \$55	50 Lbs. Bag	\$4 - \$8

Refer to Appendix H for calculating material quantities.

List of Communities that Sell Compost, Topsoil, or Mulch

Some municipalities in Iowa have facilities that convert yard waste to mulch or compost. This is an environmentally friendly way of diverting biomass from the landfill and reusing organic materials. It's also a more cost-effective solution for homeowners and contractors, materials are typically cheaper than buying commercially. Some cities even offer free materials to residents. The following is a list of facilities in Iowa that are STA certified by the US Composting Council.

Region	Location	Agency	Materials
Eastern	Cedar Rapids	Solid Waste Agency	Compost, Mulch
Eastern	Davenport	City of Davenport	Compost, Garden Soil, Potting Soil, Mulch
Central	Des Moines	Metro Waste Authority	Compost

Are amended soils always necessary?

Basic Rain Gardens

Soils in newer developments are often heavily disturbed. Typically, it is desirable to amend the soils in the base of the garden, especially if percolation rates range from ½ - 1.0 inch per hour. Amendments include topsoil, washed concrete sand, and compost. A recommended starting point is to amend with 2 inches of purchased topsoil, 3½ inches of washed concrete sand, and ½ inch of compost for a total depth of 6 inches of amended soils. Compost is naturally high in nutrients such as nitrogen and phosphorus. Use no more than a ½ inch of compost at any time to prevent contamination of groundwater from excess nutrients. The amount of sand can be adjusted based on native soils. If there is more clay present, use more sand. Over excavate the bottom of the rain garden to account for the soil amendments to make sure that the design ponding depth is achieved. Rototill to create a uniform blend of topsoil, sand, and compost. If you have healthy soils, topsoil that is loose and uncompacted with good percolation rates, it may not be necessary to amend the soils in the base of the rain garden.

Enhanced Rain Gardens

Amended soils are used in enhanced rain gardens. Follow recommendations in the Iowa Stormwater Management Manual (ISWMM) for bioretention cells. The amended soils (or modified soils) consist of a mixture of washed concrete sand (75-90%), topsoil (0-25%), and compost (0-10%). The trench above the choker layer and rock-embedded subdrain may be filled with amended soils or choker rock.

Other Estimated Costs for Basic and Enhanced Rain Gardens

Item	Details	Cost Range
Plant Plugs	Native/Non-Native Species, Sold as Flats	\$1 - \$5 per plant
Potted Plants (Quart)	Native/Non-Native Species, Sold Individually	\$3 - \$10
Potted Plants (Gallon)	Native/Non-Native Species, Sold Individually	\$5 - \$45
HDPE Perforated Pipe	4-inch Diameter by 100 foot Length	\$35 - \$45
PVC Non-Perforated Pipe	4-inch Diameter by 10 foot Length	\$8 - \$15
Drain Grate	4-inch Round, Square, Beehive, or Atrium	\$5 - \$15
Pipe Adapters	Varies by Brand and Material	\$5 - \$15

Example Materials List

Continuing with the example provided in Chapter 4, the homeowner intends to install a basic rain garden with a footprint of 256 square feet and a ponding depth of 6 inches. The homeowner has chosen to amend the soils based on the recommendations on page 42. Always round up to make sure you purchase enough materials. See Appendix H for a blank worksheet.

Topsoil (Suggested **0.5 ft [6 in.] Amended Soil Layer = 0.33 [33%] of Mixture = 2 in. Layer of Topsoil**)

$$256 \text{ ft}^2 \text{ (rain garden SF)} \times 0.5 \text{ ft} = 128 \text{ ft}^3 \times 0.33 \text{ \% Mix (decimal)} = 42 \text{ ft}^3 / 27 = 1.56 \text{ cu yd}$$

$$1.56 \text{ cu yd} \times 2,400 \text{ lbs.} = 3,755 \text{ lbs.} / 2,000 = 1.88 \text{ tons}$$

Compost (Suggested **0.5 ft [6 in.] Amended Soil Layer = 0.08 [8%] of Mixture = 1/2 in. Layer of Compost**)

$$256 \text{ ft}^2 \text{ (rain garden SF)} \times 0.5 \text{ ft} = 128 \text{ ft}^3 \times 0.08 \text{ \% Mix (decimal)} = 10 \text{ ft}^3 / 27 = 0.38 \text{ cu yd}$$

$$0.39 \text{ cu yd} \times 1,200 \text{ lbs.} = 455 \text{ lbs.} / 2,000 = 0.23 \text{ tons}$$

Concrete Sand (Suggested **0.5 ft [6 in.] Amended Soils = 0.58 [58%] of Mixture = 3 1/2 in. Layer of Sand**)

$$256 \text{ ft}^2 \text{ (rain garden SF)} \times 0.5 \text{ ft} = 128 \text{ ft}^3 \times 0.58 \text{ \% Mix (decimal)} = 74 \text{ ft}^3 / 27 = 2.75 \text{ cu yd}$$

$$2.75 \text{ cu yd} \times 3,000 \text{ lbs.} = 8,249 \text{ lbs.} / 2,000 = 0.412 \text{ tons}$$

Shredded Hardwood Mulch (Suggested **0.17 ft [2 in.] Depth**)

$$256 \text{ ft}^2 \text{ (rain garden SF)} \times 0.17 \text{ ft (mulch depth)} = 44 \text{ ft}^3 / 27 = 1.61 \text{ cu yd}$$

$$256 \text{ ft}^2 \text{ (SF of berm \& slopes, if applicable)} \times 0.17 \text{ ft (mulch depth)} = 34 \text{ ft}^3 / 27 = 1.26 \text{ cu yd}$$

TOTAL MULCH: $1.61 \text{ cu yd (base)} + 1.26 \text{ cu yd (berm/slopes)} = 2.87 \text{ total cubic yards (cu yd)}$

Edging Type of Edging Trench edging with mulch Approximate Linear Feet 67

Vegetation The rain garden square footage only accounts for the flat bottom of the rain garden. If plants are desired for the side slopes and berms, measure the total square footage of the area to calculate needed plants. Spacing options include 1 plant per square foot, 1 plant per 1.5 square foot, and 1 plant per 2 square feet.

$$256 \text{ ft}^2 \text{ (basic rain garden SF)} / 1.00 \text{ ft}^2 \text{ (average plant spacing)} = 256 \text{ total plants}$$

$$200 \text{ ft}^2 \text{ (SF of berms \& slopes, if applicable)} / 1.50 \text{ ft}^2 \text{ (average plant spacing)} = 134 \text{ total plants}$$