Development of a Flower Garden Planting and Maintenance Plan

Includes:

Final Report

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Land Acknowledgment

We humbly acknowledge that Peterborough County and Trent University is located on the Treaty 20 Michi Saagiig territory. In addition, it lies on the traditional territory of the Michi Saagiig and Chippewa Nations, also known as the Williams Treaties First Nation. We greatly honour the Alderville, Beausoleil, Curve Lake, Georgina Island, Hiawatha, Rama and Scugog Island First Nations (Peterborough County, n.d.).

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Introduction

There is more to flower gardens than what meets the eye. The implementation of flower gardens in communities can provide environmental, financial, and wellness benefits. Pollinators are essential to ecosystem health and biodiversity but unfortunately, they are declining globally. Implementing pollinator gardens is one of the ways that communities can help with this issue on a local scale. Pollinator gardens tend to focus on native plants and wildflowers. While these plants are typically the most efficient, even ornamental flowers that are more likely to be planted domestically and commercially still attract pollinating insects (Garbuzov et al., 2014). Also, by replacing monoculture grass lawns with flower gardens, the area's biodiversity is increased. Flower gardens are not only attractive to pollinators, but to humans as well. There is much beauty to appreciate in flowers. They are not only nice to look at but can also improve overall wellbeing, as access to both public green spaces and private gardens has been shown to have positive effects on mental wellbeing (Collins et al., 2023).

Flower gardens can be a source of a variety of different revenue streams. Not only can it be a resource for selling goods, but it can be a sold service. Due to their aesthetic appeal, they can be rented as a venue for photoshoots and special occasions. Another avenue for commercial flower gardens is to host a “U-Pick” style business, where customers can pay to pick their own flowers. Flower gardens can be a business of their own or can be an additional stream of income for established businesses. It is an especially great option for businesses that value nature and wellbeing that have the space for it.

This project was done in partnership with Gather on Trent, a small business in Campbellford that hosts cottage rentals, programs, and retreats with holistic healing in mind. The goal of this project is to propose a plan for implementing and maintaining a small commercial flower garden

to support programming and selling bouquets of cut flowers. This included identifying suitable plants, creating a planting and harvesting calendar, designing the landscape, and making guidelines for how to maintain the garden. The local climate and soil conditions were considerations made during the development of this project. Although cost and feasibility of the garden were considered throughout the project, the creation of a budget, cost-estimates, and potential revenue were outside the scope for this project. The project objectives were to create an implementation plan, maintenance plan, and landscape design for a small commercial flower garden for Gather on Trent.

Methodologies

Description of Site Location/Study Area

The site location is at 432 County Road 38, Campbellford, Ontario. Its coordinates according to Google are 44°19'08"N and 77°46'58"W. The study area is surrounded by a driveway on each side as well as the main road of Northumberland 38 to its south. It is also approximately 310m southeast of the Trent – Severn Waterway, Lock 13 – Campbellford. The study area is approximately a quarter of an acre. Google Earth provided an estimate of 1098.5m^2 or 0.27 acres (Figure 1). There are existing features such as hedges around the property that had been planted prior to this project. The garden lot currently consists of exposed topsoil.

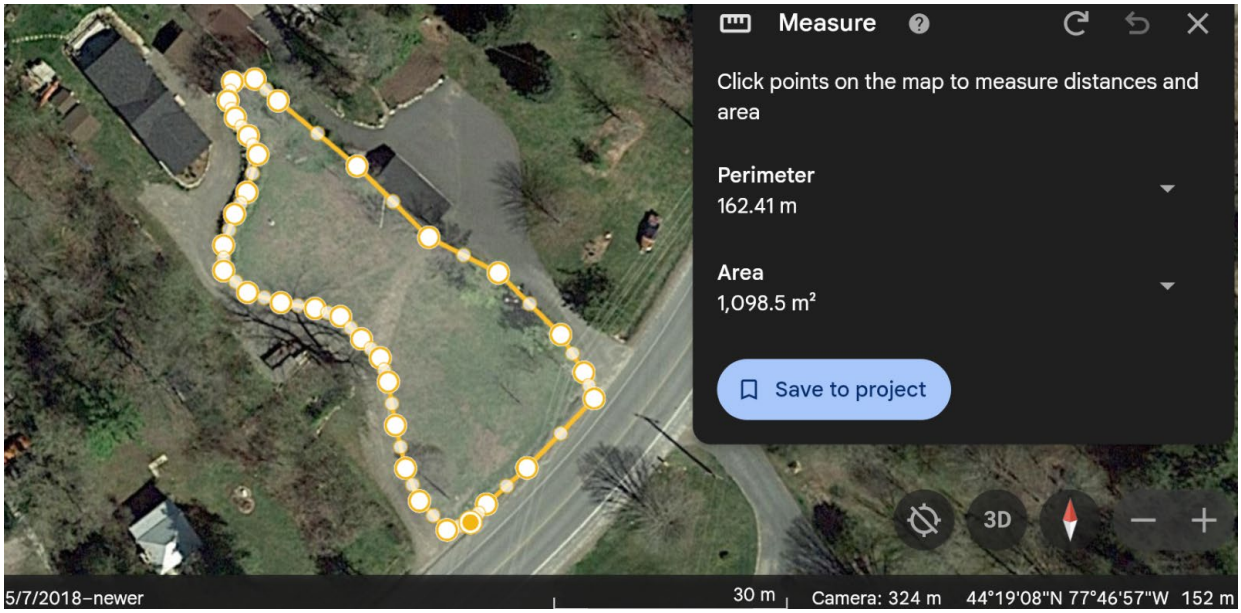

Figure 1: Map displaying the Gather on Trent property with future garden site outlined. Retrieved from Google Earth (2018). [Available online]

Description of Community Group, Gather on Trent

Gather on Trent is a resort on the waterfront of the Trent River in Campbellford. They host retreats and offer cottage rentals year-round. Their vision is to create a healthy and meaningful experience for their guests in a nurturing and holistic manner.

Major Considerations

The major considerations for planning the garden were the climate and local conditions of the site (including temperature, light exposure, and soil characteristics), the need for a flower and greenery selection process, scheduling for planting and harvest of flowers, design of the garden itself, and an overall maintenance plan to ensure the ongoing prosperity of the garden.

Climate & Local Conditions

To effectively choose plants for any type of garden it is necessary to match the choices to the physical and climatic conditions of the site. Campbellford falls into hardiness zone 5b, meaning that the lowest temperature it will generally reach is –20°C (Government of Canada, 2022). Any plants that can survive that minimum winter temperature can be considered a perennial while those that cannot are considered annual (Boeckmann & Wilcox, 2024). Another important aspect of selecting plants is to match the choices to the amount of light they will receive each day. According to the host, the garden area receives at least 6 hours of direct sunlight a day, meaning that the plants selected for this garden will have to be able to tolerate full sun conditions.

Flower Species

Species selection was influenced by the purpose of the garden, making our main considerations height, flowering season, flower colour, and the showiness of the flowers for use in bouquets or cut flower arrangements. Some of the flowers were chosen specifically because of their popularity in the floral industry, others because they were requested by the host, and the remaining ones for their popularity as garden specimens with showy flowers that could be used in arrangements. Over time, perennials may grow to produce more flowers than annuals, but perennials do require more time to adapt to the conditions of their new environment. Therefore, it should be expected that for the first growing season after being planted that the perennials will not produce as many flowers as the annuals will (Starman et al., 1995).

Grasses, Greenery, and Fillers

To break up the garden and add some variation in height and colour without adding extra flowers, greenery is an important addition to any garden. Ornamental grasses were decided upon as being the best choice as they grow taller than they do wide and offer both an aesthetic appeal and some degree of privacy if tall varieties are placed with that purpose as a consideration.

Soil Characteristics

Soil characteristics were one of the major considerations for creating the plan. As soil is vital for the growth of flowers, research was conducted to figure out the best parameters for soil sampling as a recommendation for related projects or for future students to utilize. It is recommended that future studies may test the pH of the existing soil, analyzing the soil texture (whether it is sandy, silty or clay), and finally, the health of the existing soil (Sweetser, 2024). Knowledge of these parameters may help form revisions to the current planting plan in the future (Sweetser, 2024). Further soil analysis held within laboratory settings would be according to the garden owner's choice and budget.

Creating the Seeding & Harvesting Plan

Planning the seeding/harvesting schedule was based on four aspects: 1) ideal timing to sow the seeds of each of the chosen species, 2) best timing to plant nursery stock if growing from seed is not recommended, 3) best timing during flower development for harvesting to maximize the length of time the flowers will last in a bouquet, and 4) the point at which seeds will be ready for harvest. Information about ideal times to sow seeds and

plant nursery stock was sourced largely from the Old Farmer's Almanac growing guides (Boeckmann & Wilcox, 2024).

Estimates for the last spring frost and first fall frost dates for Campbellford were compiled from a few sources for an increased likelihood of accuracy. These dates were used to estimate the length of the growing season to better arrange the schedule. Scheduling flower harvesting was based on guides published by Wilcox in 1988 and Dole & Schnell in 2017. Information gathered from these guides was combined with the flowering season for each plant and used to schedule flower harvest for bouquets. Information on seed harvesting was gained from the recommendations of an experienced seed harvester (Patterson, 2012).

What Flowers to Use

The community host suggested many flowers to guide the student team in the direction she wanted the flower garden to go. A table (Table 1, Appendix B) was created to organize the flowers by their traits to streamline the selection process. The traits included were flower colour, height, flowering season, if it is annual or perennial, if it should be of primary or secondary focus, whether to grow it from seed or plant nursery stock, when to harvest the flowers or seeds, cultivars of interest, and any special notes about that plant. Flowers were selected from the compiled list of 43 flowering species based on certain criteria from the above list.

Criteria for Chosen Flowers

The criteria for the chosen flowers were based on the flower colour, height, flowering season, whether it was an annual or perennial, and whether it should be planted or seeded in the spring. The annual flowers were chosen first as they are the type required to be planted every year. The perennials were chosen next to provide a good mix between the two types. The colour scheme chosen was to be reminiscent of a sunset/sunrise colour palette, inspired by the sun on the logo of Gather on Trent. The height parameters were chosen to provide a range between the flowers and for the purpose of providing depth upon looking at the flower garden. The range of heights also allowed shorter flowers to be displayed at the front (closest to the driveway), which are then followed by an increase in flower height as they get further towards the other side of the garden. The colour and height of the flowers were significant as a part of the criteria as the driveway on Gather on Trent is how the flower garden would be viewed first by customers as they enter the location. The flowering season was focused on spring to allow growth of the flowers as our community host planned to start the flower garden this year. Respectively, the planting and seeding criteria were based off to start the flower garden in spring.

Designing the Garden Layout

Google Earth was used to help visualize the flower garden. Its shape was originally hand-drawn to figure out how the layout might look. Different shapes were considered, but the sun from the logo of Gather on Trent stood out the most. The layout incorporated how the front (closest to the driveway) represents the sun in the sky and was drawn using straighter segments. As it is reflected by the water, the segments become curvier to represent the waves of the water, as well as embodying a rippling effect.

Maintenance Plan Development

To develop the maintenance plan, information about each chosen plant species and their care needs was gathered from academic and grey literature sources. The maintenance plan includes both ongoing and annual care. Ongoing care includes components such as watering, fertilizing, and weeding. Annual care covers the preparations needed at the beginning and end of the season. The information has been organized into a comprehensive guide that can be followed easily. To account for variability in the temperature and weather, there are some recommendations of how to proceed under certain circumstances, (e.g., extreme heat days). Additionally, there is a small section of common plant issues and solutions.

Results

Cut Flowers

The timing of flower harvest is important to allow for the longest life span of a cut flower (Dole & Schnelle, 2017; Wilkins, 1988). Flowers borne on sprays (multiple flowers per stem) should be cut when 1/3 to 1/2 of the flowers have begun to open. Flowers borne singly on a stem are cut either once the buds have changed colour or after they have begun to open, with daisy-like flowers being an exception as they can be cut once they have fully opened (Dole & Schnelle, 2017; Wilkins, 1988). For bouquets it is best to cut when the flowers are still budding or have just begun to open to reduce the threat of damage post-harvest and maximize the time they will be open, though for local markets selling bouquets

same day, you might choose to cut flowers that are further developed/more open (Wilkins, 1988).

Proper maintenance of flower stems after they have been harvested from the plant is imperative. There are many considerations for storing flowers before they are sold including the temperature at which they are stored, the amount of light they receive, the water they sit in, and the food given to them (Dole & Schnelle, 2017; Wilkins, 1988). One study by Starman et al. also found that longer stems are better to harvest. Shorter stems must be cut lower on the stem which potentially reduces the number of buds available on the plant that can produce more flowers, meaning that the bloom period and total number of blooms may be reduced during the growing season (1995).

Scheduling Plan

The necessary considerations for the gardening schedule were the appropriate times to sow seeds, plant stock, and harvest seeds and flowers. Combining these four aspects into a single schedule did not allow for a week-by-week style, instead working better as a schedule separated into five time periods: Early Spring, Late Spring/Early Summer, Midsummer, Late Summer/Early Fall, and Late Fall (see Table 2). Early Spring should begin after the last frost date of spring and Late Fall should end at the first frost date of fall. The last frost will likely occur in early May and the first frost will likely occur in either late September or early October, giving the total growing season about 20-24 weeks in all (MAFRA, 2024; PlantMaps, 2024; Yankee Publishing Inc., 2024). Therefore, the five time periods on the

schedule should be allotted about four or five weeks each starting after the last frost in spring.

Table 2: Garden master schedule – seed sowing, stock planting, and seed & flower harvest.

	Sow seeds	Plant flowers	Harvest flowers	Harvest seeds
Early Spring	Bachelor buttons, corncockle, salvia	Baby's breath, bachelor buttons, cardinal flower, carnation, poppy, purple fountain grass	Daffodils, tulips	Chinese silver grass
Late Spring/ Early Summer	Celosia, cinnamon basil, marigolds	Celosia, corncockle, Shenandoah switchgrass, Karl Foerster grass, marigolds, petunias	Bachelor buttons, carnation, corncockle, daffodils, marigolds, poppy	N/A
Mid-Summer	N/A	N/A	Baby's breath, bachelor buttons, carnation, celosia, lavender, marigolds	Marigold, poppy
Late Summer/ Early Fall	N/A	Blue fescue, lavender, salvia, tulip bulbs	Baby's breath, carnation, lavender, marigolds	Cardinal flower, cinnamon basil, marigolds, poppy
Late Fall	Cardinal flower, poppy	Daffodil bulbs	Marigolds, lavender	Cardinal flower, cinnamon basil, marigolds

Design Layout

A sun design was chosen based on previous work done for a flower garden (shown in Figure 2) by student Janna Torres and was the basis for the layout.

Figure 2: Sun Design Inspiration

The design layout below (Figure 3) was created for the flower garden's aesthetic values regarding the study area's shape.

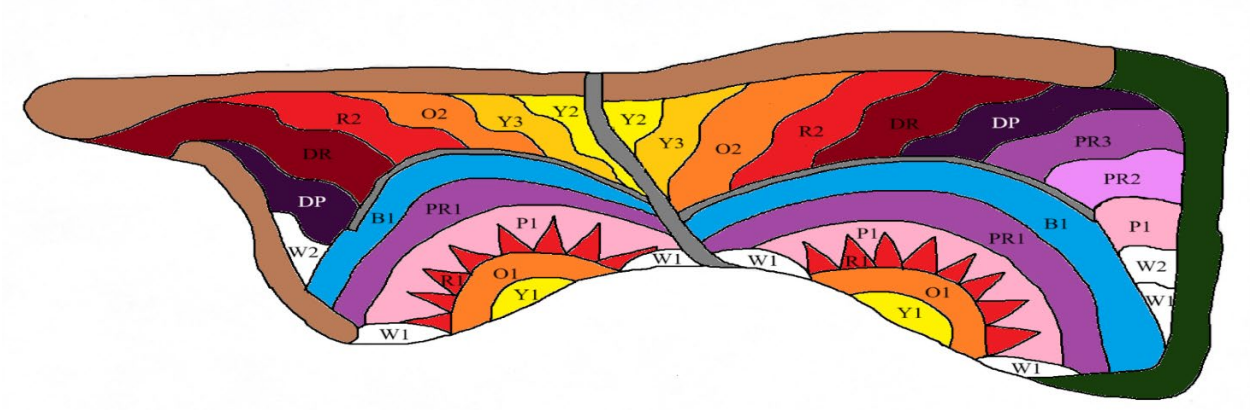

Figure 3: Design Layout

The location being near water inspired the wave-rippling effects on the upper section of the layout. The sunrise-sunset concept being reflected in the water was what helped in applying the different colours of each flower. The colouring used in the layout represents

each flower's colour, whereas the letters represent the colour type, and the numbers are allocated to the chosen flower's names. For example, Y1 represents a yellow marigold, O1 an orange marigold, and so on. In addition, brown is for existing features, green is for the chosen grasses and grey is the path for both guests and workers to walk on. The legend of the design layout can be found in more detail in Figure 4.

The reason for the design was to increase the benefits for Gather on Trent by improving the property's aesthetics and for enhancing the guest's experience once the flower garden has fully bloomed.

Chosen Flowers & Grasses

Our community host, Shamila Mackie, provided a list of flowers for consideration. Table 1 (in appendix B) was the foundation for figuring out the criteria, whereas Table 3 (below) summarizes the selection criteria that led to the choice of flowers shown in Figure 4. Establishing a criterion was significant for choosing the right flowers and grasses to ensure they would grow successfully in the climate of zone 5b and survive throughout the seasons.

Table 3: Criteria of Chosen Flowers

Name of Flower	Colour	Height	Annual/Perennial	Flowering Season	Planted/Seeded
Carnations	White	25-50cm	Perennial	Spring to Summer	Seeded in spring; Plant in Spring or Fall
Baby's Breath	White	up to 120cm	Perennial	Summer to fall	Both in spring
Marigolds	Yellow	Various	Annual	Spring, Summer, Fall	Both in spring
Daffodils	Yellow	15-60cm	Perennial	Spring	Plant bulbs at least 2-4 weeks before first ground freeze
Petunias	Yellow	15-45cm	Annual	Spring, Summer, Fall	Plant in spring
Marigolds	Orange	Various	Annual	Spring, Summer, Fall	Both in spring
Celosias	Orange	25-40cm	Annual	Summer	Both in spring
Marigolds	Red	Various	Annual	Spring, Summer, Fall	Both in spring
Poppies	Red	60-90cm	Both	Spring	Both in spring or fall
Cardinal Flower	Red	60-90cm	Perennial	Summer to fall	Planted in spring
Cinnamon Basils	Purple	50-75cm	Perennial	Summer	Both in spring
Lavender	Purple	30-90cm	Perennial	Summer	Plant in Spring or Fall
Corn Cuckle	Purple	60 - 90cm	Annual	Spring	Both in spring
Salvias	Purple	30-90cm	Annual	Spring, Summer, Fall	Seed in spring; Plant in Spring or Fall
Tulips	Pink	15-60cm	Perennial	Spring	Plant bulbs 6-8 weeks before first ground freeze
Bachelor's Buttons	Blue	30-60cm	Perennial	Spring to Summer	Both in spring

Figure 4 (below) incorporated the legend (on the left of the figure) of the design layout, as well as showcasing the letters/numbers allocated to each chosen flower and grasses' names with their respective images (pictured on the right).

Figure 4: Chosen Flowers and Grasses

Perennial species chosen were baby's breath (*Gypsophila* spp.), cardinal flower (*Lobelia cardinalis*), carnations (*Dianthus* spp.), daffodils (*Narcissus* spp.), lavender (*Lavandula*

spp.), poppy (*Papaver* spp.), garden sage (*Salvia* spp.), and tulips (*Tulipa* spp.). Annual species chosen were blue bachelor buttons (*Centaurea cyanus* cultivar), cock's combs/celosia (*Celosia argentea*), cinnamon basil (*Ocimum basilicum*), corncockles (*Agrostemma githago*), marigolds (*Tagetes* spp.), and petunias (*Petunia* spp.).

As soil is an important component to a successful flower garden, Table 4 shows the additional criteria based on soil pH and preferred soil type for each flower chosen. According to Kader et. al. (2022), the optimum range for soil pH is between 6.0 to 8.5, where 7.0 is the ideal for plant growth. The preferred soil pH of the chosen flowers lies within this range and therefore, maintaining soil within this range for the flower garden is the most appropriate.

Table 4: Chosen flowers' preferred soil pH and type

Chosen Flowers	Preferred soil pH	Preferred type of soil
Carnations	6.7 - 6.9	well draining, fertile soil
Baby's Breath	7.0 - 7.5	well draining, slightly sandy, abundant with organic matter
Marigolds	5.8 - 6.2	well draining, loamy soil with organic matter
Daffodils	6.0 - 7.0	well draining, moist, loamy soil
Petunias	5.4 - 6.0	well draining, moist, fertile soil, slightly sandy with organic matter
Celosias	6.0 - 6.5	well draining, slightly sandy, abundant with organic matter
Poppies	6.5 - 7.0	well draining, loamy soil with organic matter
Cardinal Flower	6.0 - 7.5	moist, humus-rich, fertile soil with organic matter
Cinnamon Basils	6.0 - 7.0	well draining, loamy soil with organic matter
Lavender	6.7 - 7.3	well draining, slightly sandy, abundant with organic matter
Corn Cockle	6.5 - 7.0	well draining, moist, slightly sandy
Salvias	5.5 - 6.5	well draining, sandy-loam, dryer soil
Tulips	6.0 - 7.0	well draining, slightly sandy, loose and crumbly soil
Bachelor's Buttons	7.2 - 7.8	well draining, sandy loam

Ornamental Grasses

Four popular ornamental grasses were chosen for their aesthetic value to add greenery in the flower garden (Figure 4). Three of the grasses are perennials in zone 5b and one is annual. The annual is purple fountain grass (*Pennisetum setaceum* 'Rubrum') as it is widely available and valued for its dark foliage and fuzzy flower heads. It can grow up to 60cm/2ft tall and wide. The perennials are blue fescue (*Festuca glauca*) which grows only about 30cm/1ft tall and wide, a feather reed grass cultivar named Karl Foerster (*Calamagrostis x acutiflora* 'Karl Foerster') which grows to about 1.2m/4ft tall and 60cm/2ft wide, and Shenandoah switchgrass (*Panicum virgatum*). The switchgrass cultivar called "Shenandoah" has attractive red tipped foliage and grows to about 1m/3ft tall and wide. Like the annual grass, the perennial grasses were chosen both for their unique aesthetic appeals and their popularity as garden ornamentals.

Care for Cut Flowers

Flower harvest

The best time to harvest flowers that are going to be sold the same day is different than flowers that are going to be stored and sold later. Flowers that will be sold the same day as harvest can be cut when the flowers are almost fully open or once they have fully opened (Wilkins, 1988). If the flowers are cut in advance of being sold, for example to prepare arrangements for a market day or a pre-ordered bouquet, the timing varies somewhat. When these flowers should be cut is listed in Table 5 and is based both on a guide by Dole & Schnell (2017) and the general recommendations of Wilkins (1988). All tools used in the process of harvesting should be sterile or at least cleaned often.

It is best to cut the flowers in the morning as water content in the flower is lower in the heat of the afternoon, which lowers the length of time the flower will continue to bloom after being cut (Dole & Schnell, 2017), hereafter referred to as shelf life. After being harvested, another inch or so should be cut off from the bottom of each stem while submerged in a bucket of water. This is done underwater to prevent air from being drawn into the stem while being cut. Air bubbles drawn into the vasculature of the stem can block water flow through the plant tissues, which reduces shelf life (Dole & Schnell, 2017). This process can be easily done in a large bucket. Using water that is warm (110°F/43°C) and/or slightly acidic (with a pH between 3-4) will help to increase water uptake into the flower but is not a requirement (Dole & Schnell, 2017; Wilkins, 1988).

Table 5: Guide for timing of harvest for flowers and seeds of selected plants

Plant name	When to harvest
Baby's breath	Flowers: When 30-50% of flowers on stem are open
Bachelor buttons	Flowers: When flower is 25-50% open
Cardinal flower	Seeds: In fall when seed pods have turned brown
Carnation/Dianthus	Flowers: When 1-2 flowers in a spray are open
Celosia	Flowers: When the whole flowering structure has opened
Cinnamon basil	Seeds: When seed pods have turned brown
Corn cockle	Flowers: When 1-2 flowers on a stem are open
Daffodil/Narcissus	Flowers: When the buds have just started to open
Lavender	Flowers: When the buds have just started to open
Marigold	Seeds: When flowers have withered, and the cup of the flower has turned brown
Petunia	N/A
Poppy	Flowers: as soon as the buds crack open. Seeds: cut seed pods off plant when brown, dry for 2 weeks
Salvia (Sage)	Seeds: When seed pods turn brown
Tulips	Flowers: When buds have developed colour but are not yet open

Temperature and light

Stored flowers should be kept cool, ideally around 32-35°F/0-2°C to minimize foliar respiration and water loss from the flower, though freezing should be avoided (Dole & Schnell, 2017; Wilkins, 1988). Refrigeration at these temperatures is generally recommended for storing flowers overnight and even during the day post-harvest and pre-sale, to maximize their longevity. Light is not a major concern, but the cut flowers should have some light to prevent foliage loss.

Feeding and vase solutions

Flowers can be fed easily by keeping them in a solution of sugar water (Dole & Schnell, 2017; Wilkins, 1988). Three tablespoons of sugar per liter of water is commonly used, but adjustments can be made if it is not producing the desired effect. The sugar water solution should be made with warm water, at the same temperatures mentioned in the "flower harvest" section. There are also many water-soluble plant foods available that can be used instead and that should be used by the customer as the above solution may not be optimal for long-term use.

Harvesting seeds

Seeds are best collected when the flowers have completely faded and the seed pods have dried out (Patterson, 2021). Often the stem will also be dried out, which is not an issue if the seed pods appear fully developed. Seeds should be harvested on a dry day, as moisture may cause mould or rot of the seed heads. During collection the seed heads should be stored in labelled paper bags for two reasons: 1) so the seeds of different species don't get mixed up, and 2) because using plastic bags will trap moisture and create a humid environment around the seed pods (Patterson, 2021). To store seeds over winter, keep them in the labelled paper bags in a cool, dark spot, around 40°F/5°C (Patterson, 2021). If seeds from perennial poppies are collected, they require at least 6 weeks of cold stratification before they will be able to germinate (Wilcox, 2024). Seeds of annual plants should not be allowed to experience temperatures below freezing as it is likely to kill them. Suggestions for the timing of seed harvest can be found in Table 5.

Maintenance Plan

The maintenance of this garden will be simple as the selected plants are resilient and most do not require frequent watering. Watering must be done one to three times a week as some plants must be watered more frequently than others. The ongoing plant-specific care required is outlined, along with any additional end-of-season care needed (Table 6). The information in this table was gathered from the Almanac Growing Guides (2024).

Table 6: Plant-Specific Maintenance Guidelines

Flowers	Watering Frequency	End of Season Care	Additional Notes
White Carnations	2-3x a week		Yellow leaves = overwatering
Baby's Breath	1-2x a week	cut back to about an inch above soil	
Marigolds	1-2x a week		Water at base and let soil dry between watering Increase watering frequency in high temperatures.
Daffodils	1x a week	Add bone meal at end of the season	Do not cut leaves until they turn yellow
Yellow Petunias	1x a week		Monthly fertilizing. If they become "leggy" (long stems with no leaves and a flower on the end), prune to about half the length.
Celosias	1x a week		
Red Poppies	1x a week		
Cardinals	1-2x a week		
Cinnamon Basils	1-2x a week		
Lavenders	1-2x a week	Insulate with winter mulch or straw	Yellow leaves = overwatering

Tulips	1x a week		Don't water if it has rained that week. Add bone meal or bulb food to soil once leaves sprout in the spring.
Corn Cockles	1-2x a week		
Salvias	1x a week	After kill from first frost, cut stems 1-2 inches above the soil.	Deadhead periodically
Bachelors Buttons	1x a week		No fertilizing

Annually, in early spring, the soil of the garden will be very compact. Using a cultivator tool is recommended to loosen and break up the soil in preparation for future seeding and planting. Any weeds present should be removed at this point. A layer of compost or triple mix should be added on top of the garden, which will reintroduce nutrients and replace any soil that may have escaped the area through run off or erosion. Triple mix is a mix of top-soil, compost, and manure, and is a common option available at most greenhouses and garden centers.

Discussion

Cut Flowers

The timing of flower harvest is dependent on the desired time frame for selling the flowers. If the goal is to sell the flowers the same day or within a couple days, they can be harvested when they are nearly or completely open. If flowers are to be kept stored for some

time before going to a customer, like in the case of a pre-ordered bouquet, the flowers may be harvested earlier in bud development.

Scheduling Plan

The schedule (Table 2) separates the growing season into five time periods that can be used to guide the timing of different garden activities. The last spring frost will likely occur around May, and the date it occurs can be considered the queue to begin the scheduled activities. The first frost of fall will likely occur between late September and early October, when all gardening activities should cease to prevent frost damage to plants. Because of the variable length of the growing season, which can range anywhere from about 20-24 weeks on average, the five periods can be allotted either four or five weeks each at the discretion of the user. The timing of activities in the schedule are guidelines and do not represent an exact timeline; plants are variable and may flower for longer or shorter periods than is suggested in the schedule, depending on the conditions each year.

Design Layout

The main objective of the design layout was incorporating an aesthetically pleasing visual for both community host and customers. Nevertheless, the diagram provides a practical attribute for keeping track of the plants for harvesting and maintenance. It has each chosen flower and grass in sections for easy access and if necessary, spacing for manual irrigation. Moreover, it would allow customers to view each section and to choose what they want for their bouquet composition. As it is Gather on Trent's purpose to provide their customers with a holistic experience, the

flower garden has an additional social benefit for both the guests and community host in terms of enhancing mental well-being and connecting back to nature.

Chosen Flowers & Grasses

The given criteria included a variety of colours for visual aesthetics of bouquet compositions, whereas the height was for mainly smoothing out the flower garden's gradation. It was best to select a mix of both annuals and perennials for the sake of the flower garden having a good foundation (perennials), but also allowing room to experiment (annuals) for years to come. The different flowering seasons also provide a span of time to allow the flowers to bloom and for the purpose of attracting pollinators such as bees and hummingbirds as an environmental benefit.

Ornamental Grasses

The ornamental grasses were designed to be on the outside perimeter close to the road on the garden layout to reduce noise pollution from traffic and incoming vehicles. The grasses that were chosen requires less maintenance and irrigation than the chosen flowers and can withstand harsher conditions caused by the roads, such as road-salt application and surface runoff. The heights were also intended for gradation of the flower garden to add privacy to property for the sake of the guests.

Care for Cut Flowers

Flower harvest

Flowers should be harvested in the morning using sterile or clean tools. Long stems should be preferentially harvested over shorter stems as longer stems do not need to be cut as low, which increases the potential for more flower buds to develop from that stem. Post-harvest, stems should be cut back again underwater to remove any air bubbles drawn into the stem when it was originally cut, as they can hinder water uptake and induce earlier wilting.

Temperature and light

Flowers being stored for any amount of time should be kept cool to encourage longevity. Giving the flowers some light is recommended as well, to avoid the loss of any foliage kept on the stem.

Feeding and vase solutions

It is recommended to use pre-made solutions available from retailers, as they have a consistent make-up and are known to work well. However, if none is available, then mixing about three tablespoons of sugar into a liter of water will do just fine as well.

Harvesting seeds

Seeds may be harvested once the plant has killed off the stem the seed pods are growing on. This will mean that the seed pods and stems appear dried out and brown in most cases. This means that the seeds are fully developed, and the plant no longer needs to expend any energy on keeping that stem alive. This indicates to us that the seeds are ready to

be harvested. It is best practice to store the seeds in labelled paper bags, which helps to prevent mix-ups and lowers humidity while the seeds are being stored.

Maintenance Plan

Since the flower garden is not the business' main focus, it should not be mentally, physically, or financially strenuous. The maintenance was kept relatively low and simple to try to avoid having a rough start in the first year. The chosen flowers are resilient and do not require very frequent watering, allowing for lower labour costs. The identification and solutions of common problems was included in the additional notes column to make it easier to anticipate and act in these cases (Table 6).

Conclusion & Recommendations

The first year of this garden will likely be less than perfect but will be a valuable learning experience. It's recommended to record notes and observations of challenges and successes that are encountered within the first year. These can include keeping track of yield, sales, customer engagement and maintenance. The observations from the first year can be used to evaluate what has and has not worked, and how improvements can be made for the following year. If there is to be another community-based research project on this garden or a similar project, it is recommended that the researchers involved make a site visit to better evaluate the existing conditions of the property. The implementation of this garden will be beneficial for the business, the community, and the environment.

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Authorship Statement

Janna: wrote the section for Acknowledgements, Site Description, Soil Characteristics, Criteria for Chosen Flowers, Design Layout, and Chosen Flowers & Grasses. In charge of designing and producing the Garden Layout. Created the figures for Design Layout, Chosen Flowers & Grasses Table & Images, and Table for Soil pH & Type. Contributed to discussion section. Format Table of Contents.

Dexter: wrote the sections on the Major Considerations, Climate & Conditions, Flower Species, Greenery/Filler Species, Cut Flowers, Scheduling Plan, What Flowers to Use, Care for Cut Flowers and Ornamental Grasses. Created the tables containing all the flower information (Table 1 in Appendix B) and the seeding/planting/harvesting schedule (Table 2). Contributed to formatting and editing the report.

Catrina: Wrote the Maintenance Plan section and the description of the community host, Introduction, Conclusion & Recommendation. Contributed to the discussion section. Created the table for the Maintenance Plan.

Appendices

Appendix A

Site photos, provided by Shamila Mackie on January 30, 2024

Appendix B

Table 1: complete flower information table on plants requested by Shamila Mackie and some additional flowers.

Plant name	Flower Colour(s)	Height	Flowering Season	Annual/Perennial (5a-b)	Primary/ Secondary	Planted/ Seeded	Cut/ Garden	Cultivars of interest	Special notes
Agiratum	Blue, purple	up to 90cm/3 ft	Summer	Annual	Secondary	plant in spring	Garden		
Amaranth	Usually pink or red	60-120cm/2-4ft	Summer	Annual	Primary	Both in spring	Cut		
Ammi	White, pink, green	Around 90cm/3ft	Spring or fall depending on variety	Annual, can reseed itself	Secondary	Both in spring	Cut	*Ammi majus* (white), *A. visnaga* (green), Dara ammi (pink or white)	Sap from this plant can cause a painful blistering reaction when it comes in contact with skin, especially in sunlight. Take caution when harvesting for bouquets
Anemone/Windflower	Usually pink or white	Various	Spring, summer, fall	Perennial		Plant in spring	Both		
Baby's breath	White	Up to 120cm/4 ft	Summer to fall	Perennial	Secondary	Both in spring*	Cut		They make a great filler flower in bouquets
Bachelor buttons	Blue, purple	30-60cm/1-2ft	Spring to summer	Perennial	Primary	Both in spring*	Both		
Bee balm	Pink, red	60-120cm/2-4ft	Summer	Perennial	Secondary	Plant in spring or fall*	Garden		Many native species to use as wildflowers (*Monarda fistulosa* and *M. didyma* can commonly be found in garden centres)

Cardinal flower	Red	60-90cm/2-3ft	Summer to fall	Perennial			Garden		Prefer moist conditions
Carnation/Dianthus	White, pink, red	25-50cm/10-20in	Spring to summer	Perennial			Cut	Sweet William is a popular variety	
Celosia	Red, orange, yellow, pink	25-40cm/10-16in	Summer	Annual		Both in spring	Garden		Three different flower types, plumes (feathery), candles (cylindrical), crested (coral-like)
Cinnamon basil	Pink, purple	50-75cm/18-30in			Secondary	Both in spring	Garden		
Coneflowers	White, pink, yellow, orange	Up to 120cm/4ft	Summer to fall	Perennial		Both in spring*	Both		Purple coneflower (*Echinacea purpurea*) is a native wildflower
Corn cockle	Pink, purple, white	60-90cm/2-3ft	Spring	Annual	Secondary	Both in spring	Cut		
Cosmo	White, pink, orange	Various	Summer to fall	Annual		Both in spring	Cut		
Daffodil/Narcissus	Many, classic are yellow	15-60cm/0.5-2ft	Spring	Perennial		Plant bulbs at least 2-4 weeks before first ground freeze	Both		Daffodils are a species of *Narcissus*, other species can have different colours than daffodils but similar flower shapes
Dahlia	Many	Around 120cm/4ft	Summer	Annual, possible to overwinter indoors		Plant in spring	Cut		To overwinter, remove the tubers from the ground before first frost and store in a cool, dark place over winter, replant in spring after last frost

Delphinium	Blue, pink, purple, white	Various	Summer	Perennial		Plant in spring	Both		If grown from seed, start them indoors in December or January and planted after last risk of frost
Dill	Yellow	Up to 120cm/4 ft	Summer	Annual, can re-seed itself	Sec-ond-ary	Both in spring	Gar-den		
Forsythia	Yellow	Various	Spring	Shrub - perennial	Sec-ond-ary	Plant in spring or fall	Gar-den		Different cultivars grow to different heights, pick one for the location and surroundings. Flow-ers early in spring and then only has foliage the rest of the growing season
Gladiolus	Many	60-150cm/2 -5ft	Summer	Annual, possible to overwinter indoors	Pri-mary	Plant corms or plants in spring	Cut		To overwinter, re-move the corms from the ground be-fore first frost and store in a cool, dark place over winter, replant in spring af-ter last frost
Goldenrod	Yellow	Various	Summer to fall	Perennial		Both in spring			Many native spe-cies to use as wild-flowers (*Solidago canadensis, S.*
Gomphrena	Pink	Up to 60cm/2ft	Summer to fall	Annual		Both in spring	Both		Seeds will need to be started indoors a few weeks before the last frost if growing them your-self
Hollyhock	Many	1-2.5m/3-8ft	Summer	Biennial		Both in spring or fall	Cut		Hollyhock are bien-nial, they produce flowers only in their second growing season and then they die. Flowers produce many seeds that grow into new plants

Host	White, pink, purple	30-90cm/1-3ft	Summer	Perennial			Garden		Grown for foliage, not flowers. They usually prefer shade but some varieties have been bred to tolerate sun
Hydrangea	White, green, pink, red, blue	Anywhere between 1-3m/3-10ft	Start in summer, mature in fall	Perennial	Primary	Plant in spring or fall	Both	Limelight, Annabelle, Firelight, dwarf varieties	Most varieties flowers turn from white or green to pink or red, some (like annabelle) stay white. Flowers in bloom can be used in bouquets, flowers that are allowed to dry on or off the plant can be cut and used as decor. Some varieties flower on old wood and others flower on new growth, so you should know which before pruning
Japanese maple	N/A			Shrub - perennial	Primary		N/A		
Lavender	Purple	30-90cm/1-3ft	Summer	Perennial	Secondary	Plant in spring or fall	Both		
Lily	Many	Various	Spring, summer, fall	Perennial			Both	Asiatic/Oriental and day lilies	Day lilies generally have smaller flowers than asiatic or oriental lilies, but they are taller. Asiatic or oriental lilies can be good bouquet flowers. Anthers (pollen producing bits) can be pulled off to stop pollen staining on the petals and helps the flowers stay open longer

Lisianthus	Many	30-90cm/1-3ft	Summer to fall	Annual		Plant in spring	Cut		Plant before the last frost, they appreciate a period of cool soil
Marigold	Red, orange, yellow	Various	Spring, summer, fall	Annual	Secondary	Both in spring	Garden	Jedi	African marigolds are better planted, not seeded, and tolerate dry conditions. French marigolds can be planted or seeded and can tolerate more moist conditions
Milkweed	Pink or orange	About 60cm/2ft on average	Summer	Perennial	Secondary	Both in spring or fall	Garden		Two native species, common milkweed has pink flowers and butterfly milkweed has orange flowers. Both are native wildflowers
Millet	N/A	90-120cm/3-4ft	Summer to fall	Annual	Secondary	Plant in spring	Garden	Purple majesty	The brighter the light this grass receives the darker its foliage will become, if partially shaded it will stay green
Petunia	Many	15-45cm/6-18in	Spring, summer, fall	Annual		Plant in spring	Garden		They don't grow very tall but they do spread along the ground
Poppy	Red, orange, pink, white	60-90cm/2-3ft	Spring	Perennial or annual, based on variety		Both in spring or fall	Both		Perennial poppy seeds require about 6 weeks of cold stratification to germinate, they also require light so don't bury them when growing from seed
Rose	Many	1-2.5m/3-8ft	Spring, summer, fall	Many are perennial	Primary	Plant in spring	Cut	Hybrid tea roses are good for use in bouquets, long stem with a single flower	

Salvia	Usually blue, pink, purple, or white	30-90cm/1-3ft	Spring, summer, fall	Perennial	Sec-ond-ary	Seed in spring, plant in spring or fall	Gar-den		
Shasta dai-sies	White	60-90cm/2-3ft	Spring, summer, fall	Perennial		Both in spring or fall	Both		
Sunflower	Yellow	Various	Summer	Annual		Seed in spring	Cut		Smaller varieties grow to be 30-60cm/1-2ft while medium varieties grow between 1.5-2m/5-6ft
Tickseed/Co-reopsis	Red, orange, yellow	Up to 120cm/4 ft	Summer to fall	Perennial		Plant in spring or fall	Gar-den		Native species to use as wildflowers (*Coreopsis lanceo-lata* and *C. tincto-ria*)
Tulips	Many	15-60cm/0.5-2ft	Spring	Perennial		Plant bulbs 6-8 weeks before first ground freeze	Both		
Wisteria	Purple, white	Vines can reach 9m/30ft long	Spring	Vine - per-ennial		Plant in spring or fall	Gar-den	Blue moon	Can be grown from seed but will take quite a few years to mature and reach flowering age
Yarrow	White, pink, yellow, red	60-150cm/2-5ft	Summer	Perennial	Sec-ond-ary	Plant in spring	Gar-den		*Achillea millefolium* is a native wild-flower, most varie-ties found at garden centres are larger than ones found in the wild. Sneeze-wort (*A. ptarmica*) is in the same ge-nus and looks simi-lar but is not native
Zinnia	Many	Various	Summer to fall	Annual		Both in spring	Both		There are many va-rieties, some stay short, others grow to medium height and others grow very tall

							* = long-lived perennials may not flower within the first one or two growing seasons but once they do start flowering they will do so reliably every year. Vines and shrubs may take more than a couple years to reach flowering age.