

Popular Education for Gardens

Includes:

Final Report

(Gardening Annotations)

Appendix

(Companion Planting Guide, Intensive Spacing Guide, Diagnosing Soil Issues, Climate Zones)

Interpretive Signs for the Garden

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GARDENING ANNOTATIONS:

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AN INTRODUCTION:

Food is a necessity that connects all people globally. Agriculture is a practice that has sustained life on earth for many centuries yet requires great skill and expertise but also offers a great deal of rewards. Growing local food is a low impact way of supporting family and community. Socially gardening can be an educational and practical method of dealing with food insecurities while also offering enjoyment and celebration. Gardening is affordable and often accessible with the right resources. This resource was created for the Trent Vegetable Gardens in conjunction with the Trent Centre for Community Based Education in order to provide gardeners with greater knowledge better their gardening experience.

This resource touches on both the technique and issues that surround gardening. These annotations were created based on some of the research and practices taking place in the Trent Gardens. Signage was created to provide individuals with some insight into what is taking place at the gardens; the annotations were developed in order to provide further detail to help blossom further projects.

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SOIL AMENDMENTS

Soil Amendments are described as any material mixed or added to the soil in order to improve soil quality and thus plant growth. Organic soil amendments can take on several forms such as mulch, compost, and compost tea. These are some of the examples this text will focus on. Adding organic matter to soil is considered crucial to routine gardening while amending soil is also for greater soil structure for future and present nourishment of both plants and the earth. Each amendment has its own set of benefits, adding organic matter to a garden bed is often as simple as returning the nutrients that have been extracted at harvest time. Some soils may require greater efforts to amend before they can yield a crop. The first step in determining how to amend your soil is to determine its features. The nature of your soil is also important to know for growing purposes and to properly amend your soil. Some soils are difficult to grow in and therefore limit some of the crops that you may grow and their success. Crops can often grow in less ideal soil environments but with less favorable results.

Fertile Soil

Soil fertility may sound like a simple concept but represents a variety of factors present in the soil. There are two fundamental aspects of soil fertility, firstly that nutrients must be present in the soil and secondly the soil must be structure so the plant can obtain these nutrients (e.g. via the presence of moisture, air, and pore sizes). For example a soil series may be heavily nutrient rich but be far too dry or compact to grow in. A great way to regenerate soil nutrients is to add organic matter to the area such as

compost. Another benefit to organic matter is that it builds soil structure. Organic matter such as compost can contribute greatly to the soil fertility, in a garden space much of the nutrients present in the soil are needed for plant growth and are then exported from the area when the plants are harvesting. Returning plant residue to the area has become increasingly more popular with the rise of soil infertility, mostly on larger scale agricultural operations. There is essential need to recirculate nutrients in a garden in order to sustain workable soil.

In your garden a soil analysis may be helpful for creating a healthy productive space. A formal soil fertility test gives you an extensive look into your growing area but can be time consuming and less economical. An alternative to soil testing is generally knowing what you are looking for when it comes to soil fertility. There are some simple steps when it comes to examining the different aspects of soil fertility at home or in your garden plot. Some major things to consider are pH, soil texture, depth, and topography, nutrient levels.

Considering your Soil:

Depth:

Some plants like to situate themselves quite deeply in soil; 75cm of dark, rich topsoil is ideal for plant growth because they can support a variety of plants. However 30 cm is often sufficient for most crops to grow modestly. You should be able to determine the lower soil horizons by the presence of parent material or rock beneath the topsoil. Rock can make it difficult (however, not impossible) for plants to properly grow and as a result root themselves in the soil. Many plants do not require 75cm of topsoil for

growth, shallow rooting plants such as spinach, radishes, and lettuce can work well in areas with minimal topsoil. Looking into the depth of your soil is quick and easily done; digging a soil pit, which reveals the soil horizon is often enough to determine what sort of soil is available. The "A" Horizon of your soil is composed of most of the healthy organic nutrients and microorganisms require producing healthy plants. This area can be easily measured by digging a soil pit.

To diagnose your soil depth by digging a soil pit that accurately reveals the soil horizons. Be careful not to disturb underlying layers of earth, the natural soil structure drains best. Depending on your plant selection 30-75cm of loose earth (with little to no rock or parent material present) is required for a good garden base.

You may amend your soil to the depth you require by adding organic matter to the surface of your garden and mixing it throughout. If your soil resources are inadequate container or raised bed gardening may be a good solution.

Nutrients levels

Mostly all plants require the primary nutrients Nitrogen, Phosphorous, and Potassium at varying degrees. Secondary nutrients sulfur, calcium, and magnesium and micronutrients zinc, iron, copper, manganese, boron, molybdenum, and chlorine are also required for plant nourishment. The presence of these nutrients is important but also their availability. Formal soil tests examine both the nutrients and their availability, the Cation Exchange Capacity. Depending on your finances and the size of your operation some knowledge of plant behavior may help solve nutrient related issues in soils.

Organic Matter

Organic matter is a very special aspect of soil maintenance. Organic matter can be composed of a variety of biotic material that then determines the varying nutrients that are made available for plants. Organic matter also contributes greatly to the structure of soil, increasing in resistance to erosion from wind and water. All of the featured soil amendment below adds an organic matter and varying degrees and forms.

PH

PH levels are very important for garden growing conditions. Most plants prefer pH levels around 6.6 – 7.4, which is a neutral level. Certain plants prefer slightly alkaline or acidic soils, which can often be indicated when purchasing seed or may require further research. Higher or lower pH level deters the plant from getting the nutrients they require out of the soil and may not produce.

- PH level can be determined by observation or by an at home pH test, the acidity of your soil should be tested prior to selecting plants.
- PH tests can be obtained from local garden centers or for more precise results (perhaps for a larger scale operation) an agricultural laboratory may be able to process your soil samples for a pH reading.

Porosity

It is much easier for a plant to both germinate and develop sufficient root systems when the earth has been adequately tilled. A healthy soil is composed of approximately 25% air, the pore size of the soil allows the plant to grow easily and reach vital water and nutrients without stress. Adequately aerated soil also indicated healthy microorganism

and earthworms. Prior to tillage bare are spots in an area may represent soil compaction, soil should also be easy to penetrate with a spade. Tilling can simulate these conditions quite effectively but some soil structures may still be prone to compaction. Clay soils tend to compact more than sand/loam and require more intensive efforts to be amended.

Soil Structure

On a global level soil fertility has been greatly declining since the dawn of the industrial revolution. Tillage on a large and small scale disturbs the natural soil structure of the land and allows nutrients and organic matter to be lost from the soil from an accelerated rate. There is a vast array of soil structures, which in an undisturbed setting can resist erosion and desertification. Working and adequate tilling of your garden are not too harmful to your soil structure if they are done so respectfully.

BASIC COMPOST

Soil Amendments: Getting to know your soil and how to improve it

Compost is an excellent way to ensure the adequate flow of nutrients in a garden. As a result the gardened area can be worked sustainably and with prosperous results if the fertility of the soil is kept in close consideration. But there are many other factors involved with the application of compost that can be examined to ensure a healthy garden space. The idea behind adding and creating compost is to increase soil fertility and therefore add to the circulation of nutrients in your garden. Getting to know your soil is a great place to start building productive land.

THREE BIN COMPOST

Three-bin composting was chosen as an effective method of soil amendment because it ensures only fully decomposed organic matter is returned to the soil. When plant matter is simply returned to the soil it redirects the microorganisms to the decomposition rather than plant nourishment. When using the three-bin compost system an effective methodology is used that encouraging the active participation of mixing (aeration), organics can then decompose more effectively than a simple compost heap.

COMPOST TEA

Compost tea is a great way to return quick and available nutrients to plants. The added benefit of compost tea is that it also encourages a unique variety of microbial activity. Compost tea can provide multiple benefits to both plants and soil structures. This amendment can offer plants protection against diseases, and increases the population and diversity of microorganism in the soil. Compost tea and particularly vermicomposting tea (made from worm castings) has been found to be a very effective method in nourishing soils. Compost tea is considered a great tool for organic growers on both individual and commercial scales. Both Anaerobic and Aerobic compost teas can offer a different array of microorganisms to your soil. This method can be very helpful for growers who wish to add nutrients to soil midseason or after planting. For method see signage.

MANURE

Manure is a great way to recycle nutrients into soil. Depending on the animal and their diet manure can differ quite greatly. Some of the disadvantages of manure are accessibility; in an urban environment manure can often be inaccessible unless facilitated by gardening groups. Garden depots seasonally carry varieties of manure (often sheep manure) for a fairly reasonable price. Further transportation can cause issues of accessibility>

MULCHING

Mulch as a soil amendment is very slow process of soil building (depending on the chosen material). Mulch may also serves as a tool to help slow the need to amends soils. Bare loose soils lose organic matter (and consequence nutrients, moisture, etc.) at an accelerated rate. Yet loose earth is key to allow plant space for rooting. The application of mulch acts as a barrier for wind and water erosion, which degrades the quality of the soil. Mulch also acts as a barrier to contain soil moisture, allowing the plants to feed when required and access to essential nutrients. Mulch also eliminates the competition for resources that exists when plants and weeds must use the same resources. Soil must replenish seasonally (sometimes more often depending on the circumstances), by containing the soil mulch can elevate some of the need to reapply the chosen amendment. Depending on your mulch of choices rate of decomposition, straw mulch for example may be used for multiple seasons with some reapplication.

Alternatives to Soil Amendment

Amending soil is often easy but there are some other alternatives to this level of effort such as community garden plots, which often change hands seasonally. Most soils lack the characteristic that would qualify them as ideal for plant growth but crops can still produce. Ideal growing conditions allow plants the resources to produce at their fullest potential; most soils will produce crops at varying degrees. You may also choose crops that work well with your given soil or tolerant to poor soils. Container gardening and raised beds are also a very effective alternative (see below for more information). This style of intensive gardening suggests gardeners add several inches of earth fertile on top of the ground allowing for a fresh section of earth to work with. Some soils may also just increase the amount of maintenance required, e.g. soil with poor drainage may be watered less or more frequently.

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INTENSIVE GARDENING METHODS

“Utilizing garden space to its full potential”

The general purpose of intensive gardening is to obtain the most produce on any allotted space during the growing season. Community gardeners are often conflicted by space limitations and conventional gardening tends to leave a lot of space empty of plant life, such as the rows or the sprawling country garden style. Further; methods of intensive gardening can also help plant life to receive the most care and resources as possible; and even improve taste, water usage, time, fertilizer and energy. The foundation of Intensive Gardening is deep, well drained, weed- free, soil that creates the ideal environment for plants will stimulate better quality produce and often greater quantities. Traditional gardening may suit some gardener’s style, but its tendency to leave a lot of unused space may not work for all community or urban gardeners. Lengthy rows upon rows leave gardeners with a substantial amount of unproductive space and bare soil that loses resources at an accelerated rate. Weeds easily site themselves in these bare spaces, which can stress the gardeners. Intensive gardening is about concentrating energy and resources into a smaller amount of land with greater results. Vertical Gardening, Interplanting (or Companion Planting), raised beds, and practical spacing are some of the examples of how intensive gardening can be practiced. These methods consider important elements such as plant needs, growth patterns, seasonality, and require a great deal of garden planning.

Vertical Gardening

“Transforming urban spaces into room to grow”

Vertical gardening makes use of upright space and can be used to make for a great array of fruits and vegetables. Support frames are an easy and affordable option for vertical gardening, tree limbs, old posts, or other structural material can be used to train crops such as cucumbers and tomatoes from sprawling on useful land and potentially improving plant life. Tomatoes are often trained using cages but they can overgrow their cages and more affordably be made using poles and string. Pole systems should be approximately 5-6 feet tall and footings placed as wide as the plants are spaced. Tying the crop is very strategic; a variety of different styles may be used as long as the crop is supported. Stakes and string is also a great way to improve space usage and improve plant quality, keeping the crop off of the ground.

Trellises may also be created with inexpensive materials such as netting, strings, cages, When practicing container gardening, sprawling plants can make use of given surfaces such as walls, patios, and banisters, which can transform more urban spaces into room to grow and produce. Vertical gardening leaves much room for creativity; there are no limitations when designing garden trellising. Vining and sprawling plants tend to take up a great amount of ground space, so growing upwards is a practical and appealing alternative. Several varieties of beans such as pole beans will climb surfaces rather easily with little ground space needed which makes these crops excellent candidates for container gardening as well. Some species require more training than others such as the pole bean, this variety of bean will climb surfaces easily while tomatoes often have to be tied and encouraged. The tying and trellising of plant such as

tomatoes is especially important, intertwining plants may not be getting sufficient sunlight and therefore shielding the plant from producing more fruit. Plants may also grow in undesirable areas compromising other plants growth, caging is often the preferred method to vertically train tomatoes simply because of their simplicity but are often not the most economically feasible. Training plants with twine or string must be done so carefully in order to keep the plant limbs intact. There are some drawbacks with vertical gardening; because the plant is maximizing space from the ground the plant can experience drying which may be elevated with consistent watering. Vertical gardening has a lot to offer intensive gardeners as a means to transform space and increase production

Raised Beds

“Concentrated resources and energy”

Raised beds can be found in both landscaping and garden spaces. They have a lot of benefits to offer the plant and the gardener. These beds are the basic unit of intensive gardening, which allows the gardener to concentrate soil amendments such as compost, fertilizer, manure, etc. into one area for the mutual benefit of the plants nutrient uptake and the gardener’s resources. The beds can be created in various lengths, widths, depths, and patterns preferred by the gardener but there are a series of factors that may be considered. Such as the habits of the plant itself which are going in the bed such preferred depth, the plants species growth patterns and more practical variables such as its accessibility of the bed for weeding, mulching, harvesting, etc. and esthetic appeal. Preferably there should be approximately 10-12 inches of loose earth

above the unearthed soil. The bed will benefit from a “Double Dig” prior to seeding and transplanting earlier in spring to improve drainage and therefore resource availability. Soil testing is also an asset to these gardens but may not be necessary depending on what sort of inputs you have consciously added to your soil. Phosphorous, potassium, calcium, magnesium are nutrients needed by all plants, nitrogen is also a requirement but can be heavily crop specific (e.g. corn is a heavy feeder) your plants will also need micronutrients such as iron, manganese, copper, zinc. Raised beds can be free standing beds or be contained by various types of frames such as wooden or rock. Frames may also contribute to the rate which soil loses moisture. Another aspect of raised beds which must be considered is walking space, although space may be limited there must be enough room for the gardener to move about the garden space and maintain the crops with ease without damaging the beds or plant life. Raised beds must be oriented with both the sun (e.g. in which direction does the sun rise and set? Does the plant get at least 6 hours of sunlight? Is there anything shading the garden space for any period throughout the day?) And the crop type (e.g. build bigger beds for crops which you wish to produce higher yields such as potatoes or that require more space such as cabbage) to ensure that each gets the resources and space they require. The idea within these beds is to plant species equally amongst the space and soil amendments may be easily added prior to the growing season.

Interplanting (or Companion Planting)

“Improve plant life, taste and space usage”

Interplanting planting can be used to both enhance plant growth and quality planting is another method of intensive gardening but many factors need to be considered before planting multiple species amongst one another. Variables such as plant family, light preference, season lengths, growth patterns, nutrient and moisture requirements, and feeding habits. To begin Interplanting species, rowed patterns is the easiest place to begin and manage. Plants with an early maturation may work well with plants, which mature later in the growing season. Similarly heavy feeders such as the brassica family may be planted with less glutinous species such as lettuce, which are also shade tolerant.

Below are some other ways Interplanting is practiced:

- To build soil quality – Crops have different nutrient requirements; heavy feeders such as corn can easily deplete some nutrients such as nitrogen. The limited availability of nutrients such as nitrogen can then hinder the growth of future crops. Legumes are also a great asset to build soil quality; by nature they fix atmospheric nitrogen in soil for future plant usage.
- Taste – crops may be planted amongst one another to enhance the taste of one or both of the crops. Most commonly tomatoes are planted amongst
- Pest Control - Certain crops may be used to deter disease and insect problems. Many disease and insect issues tend to be family specific, and also prevent larger scale. This also reiterates the notion that Intensive gardening often takes a greater level of planning than conventional gardening.
- Land management – one of the most recognized interplanting crop is the Three Sisters crop, which is an example of effective land management and a

sustainable agricultural system. The Three Sisters are corn, beans and squash; the corn acts as a pole for the beans to vertically climb, the squash acts as ground coverage to conserve water resources, while also being shaded by the corn stalk. These plants also balance each other's nutrient requirements as a part of a sustainable agricultural system.

- Succession Planting - Succession planting describes replanting after harvesting a crop. This works well with a variety of crops such as a planting early succession plants such as spinach, radish, spring lettuce followed by later season crops such as brassica transplants, carrots, beets, or peas. This method requires a good amount of knowledge on the crops (e.g. seasonal and temperature preference). The area should be cleared of all plant residue and weeds prior to reseeding and may also need fertilizing. Seeds may also need to be planted deeper in the soil in order to stay moist later in the growing season. This method ensures two or more harvests from the same plot of land.

Interplanting is a great tool used by organic gardeners to deal with issues that conventional agriculture would resort to harsh chemicals or other unsustainable practices. Interplanting can be very effective when used in both small and large scale operations but requires a substantial amount of knowledge and research in order to be carried out to its full extent.

Spacing

"Considering layout in order to improve plant life and production"

Spacing is an essential detail that must be configured prior to planting an intensive garden. Space saving is often a factor that must be dealt with in both community and urban garden spaces, but improper space considerations can have a great affect on the gardens productivity.

Planning

“Creating a productive and organized space”

Intensive gardening can be very useful, but in order to take full advantage of the practice it must be well planned. Firstly, is deciding on what to grow. Evaluating the crops you would like to grow a very personal part of gardening, questions such as: what will I be able to make most use of? Do I plan to store or preserve any of my harvest? What is the most economical? Do I have the space? Must I start these plants from seed? How much will this crop yield? These are all examples of some of the aspects that must be considered before planting a garden. I may be helpful after gathering all required resources to map out a garden plan, considering thing such as soil types, bed structure, plant spacing, light requirements, access to water, topography, etc. This plan can also help guide what preparations are required before putting your garden in the ground. Early spring and late winter is a great time to begin planning your garden, you can then look into different sources for seed, tools, etc. Some plants may be started earlier in the growing season such as spinach which grows well in the cooler temperatures, these are important considerations so that planting is not a great overwhelming task.

Growing in Ontario

Knowing your growing region is essential to planning your Garden. Peterborough is located in Climate Zone E in Ontario, which specifies the average day of last spring frost, the average day of first fall frost and the average number of frost-free days. These factors are all crucial to the crops chosen for your garden and when you plan on starting your transplant. Certain crops are more resistant to frost than others, but your frost-free days are considering your regional growing season. Seed packages, online sources, and literature can provide detailed information on your crops required growing season. The days, which exceed your growing season, are the days your plants must be started indoors prior to transplanting. Plant can be started even earlier if you wish to have produce earlier on the season. Starting your seeds is a rather simple task but requires a good degree of plant knowledge and adequate sunlight and warmth.

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FEATURED CROPS

The Trent Vegetable Garden features a great variety of plant life, including heirloom varieties of both vegetables and fruits. The crops that are chosen for The Trent Gardens represent some of the plant diversity available for growers to experiment with. Any garden space has great potential to grow a diverse selection of crops that are not easily accessible otherwise via supermarkets and other industrial food producers. Diversifying your plant selection can be both exciting for the garden and your diet. Incorporating different types of crops can be both challenging and rewarding for the grower. Selecting your crops is greatly a reflection of personal choice but reflecting on your area and how it is being grown can also influence your choices. New plants and varieties can involve a broader plant and gardening knowledge. Incorporating new plants into your at home cuisine also encourages healthy diverse dishes and a different set of vitamin and nutrients.

Genetics and Heirloom Crops

Heirloom varieties are also a proactive way of encouraging genetic diversity. Traditionally gardeners across the globe raised thousands of different plant varieties; today industrial food producers only rely on select breeds to feed the majority of the population. In combination with the decline of seed saving and traditional gardening practices genetic erosion is occurring at an astonishing rate. The genetics present in heirloom plant varieties allow crops to combat certain pests and disease more effectively than others. For example if you grow two varieties of the same crop one may

be affected by a pest (e.g. Blyth) and the other may be left untouched. This is both dangerous to global food security, diets and threatened biodiversity.

To be considered an heirloom crop the plant must be at least 50 years old (some believe 100 years old) although many varieties are much older. This standard is to avoid human intervention; many of the seeds present in modern agriculture have been modified based on uniform traits. Plant traits such as marketability e.g. durable skin for shipping (for more information see Section 5 – Seed Saving). Groups and families have saved heirloom crops for generations based on more personal factors such as flavor and eating quality. The demand for heirloom crops is increasing because of individual desire for more flavor and the increased consciousness of the issues around industrially produced crops.

Below are some of the unique crops featured at the Trent Gardens:

Heirloom Tomatoes:

Heirloom tomatoes are one of the exciting crops the garden produces. There are thousands of varieties of heirloom tomato plants. Originating from the Andes tomatoes have spread globally and became a staple of many diets worldwide. Tomatoes can serve multiple purposes some may best serve in pastes and sauces while others shine in salsas and canning.

Green Zebra – Like most heirloom tomatoes the Green zebra looks and tastes very unique. It is sweet, tangy, and sometimes even tart and this variety is

productive. This variety must be monitored for Blossom End Rot, this can be avoided by added calcium and ensure that the plant is evenly watered.

Black Krim – This variety originated from the Ukraine. It is a medium-large in size, with a soft/thin skin. The flavor has been described as intense, sometimes smoky and very juicy. This variety is ideal for slicing. This variety produces best with heat and can often be hard to find because of their dark color.

Russian – intense flavor of sweet and acidity, medium sized tomato with unusual flavor, good producer

Ground Cherry – similar to the tomato and tomatillo (also in the nightshade family) this crop originated from South and Central America, travelled North in the 17th century was adopted into North American diets especially the Dutch of Pennsylvania. The Ground Cherry is easy to grow with a delightful sweet taste recommended for pies and sauces

Tomatillo – The Tomatillo is contained in a similar husk, but larger in size. This plant grows tall similarly to the tomato with little to no need for staking. Has a sweet yet sharp taste and firm texture. Tomatillos are best used in salsa (green salsa) or grilled.

Featured Herbs

Oregano – An herb commonly used in Spanish and Italian dishes. It should be planted in full sunlight in well-drained soil, mature plants like to be planted 12-inches apart.

Oregano also works well in container gardens.

Mint- is a perennial in most its varieties. Mint seedlings should be planted in rich, moist soils. It should also be thinned every three years, as it tends to sprawl.

Tarragon – has a strong licorice flavor, and is considered essential to French cuisine.

Tarragon should be planted using root division and planted in well-drained soil with full sunlight. Tarragon must also be subdivided every 2 -3 years to keep them from overcrowding

Seed Sourcing

The Trent Gardens likes to purchase seed distributors which hold similar ideals; open pollination, organic gardening's, heirloom varieties, GMO free. The Garden's also tends to purchase seed from smaller distributors such as the Cottage Gardener. For more variety Seeds of Diversity is also a good resource. Some of the seeds used at the gardens have been saved and distributed locally. Heirloom seeds are especially unique because they represent the farmers, which have kept their species alive, and their journey.

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URBAN AGRICULTURE

Two of the largest food issues of today's is firstly its production and secondly distribution. The 20th century has presented both great success and challenges to modern agriculture. With the modernization of food production many opportunities have been developed for urban gardeners. Contrary to the industrial style of farming the organic movement was formed and became the basis for a series of alternative food movements. Most modern food movements have been built upon the principles of environment, health, politics and social change in contrast to the industrial modern food systems. Our ability to produce such quantities of food is astounding but the way and form it is distributed throughout communities is quite disproportionate. Urban agriculture was developed in order to reach individuals that might be considered food insecure. It is a low impact, feasible option that promotes food secure and healthy community. Food sovereignty describes the notion that all individuals should have access to healthy food. Urban agriculture strives to give individuals the tools to provide themselves with healthy food in creative ways.

Centralized Food Resources

Agriculture supports great populations, however the distribution of food throughout the world is very unequal on both the global and local level; those who need food have difficulty accessing it. Food deserts have resulted with the urbanization of communities; food resources must be transported into urban centers with little to no production inside its boundaries. Consequently a lot of waste is also transported out of

cities. Urban agriculture is a great way to centralize food resources and recycle organic waste, which can improve the sustainability and independence of cities. Today most accessible food is from factory farms and is often processed into the products that we consume. In the history of civilization most foods were grown or gathered on a community level, which resulted in a very tangible relationship with the land. A more conscious method of food production is required to regenerate this individual ability to make communities food secure. The threat of food security is greater amongst different populations Industrial foods have been related to serious health complications and environmental degradation of health on vast levels. In response many individuals have chosen these active alternatives for food.

Revitalization

Agriculture is a great way to build community. Historically many communities gathered around food resources and agriculture as a means of survival. Sharing skills and knowledge in an agricultural environment is an excellent way to build healthy and happy communities. Food is a great example of a human need which can also be fun and creative. Both child and adults can gather around food and its production both recreation and educationally. Urban agriculture is a great way to encourage environmental education about the issues surrounding food. Food is also a great networking device that connects various people to one another also improving the conditions and quality of life of its inhabitants. There are also notions of personal growth, self-reliance, empowerment and sometimes even income that can results when agricultural investments are made in an urban setting.

Closing the Loop – Sustainability

Today's food system is notoriously unsustainable; forms of urban agricultural have been adapted to elevate some off these environmental and systematic woes. Masses of food are transported to the city to supply the great urban populations and then consequently waste is transported out of the city. Urban agriculture works to close this loop by utilizing urban spaces for food production and reincorporating waste into soils and other resources. Many communities on a global scale have prospered from urban agriculture; there is great potential for investment, which can help elevate some waste management and food security issues. Making the city more sustainable is often an ill funded cause by the state although it does have great long-term rewards. In some communities green space is also an issue of urban planning does not consider the viability of urban agriculture. As issues such as "peak oil" and food security become more conscious a greater level of attention is being drawn to sustainable communities, including their food system.

Rooftops

Rooftop gardening is becoming increasingly popular as cities become more developed. In its current context Rooftop gardening represents a movement towards healthier and more localized food systems. Spaces such as Roof Top Gardens orient themselves around a variety of causes such as education, social justice, food security, environmental initiatives, horticulture, individuals and economics. Gardens can be organized on a community, individual or organizational level. Green roofs have also been incorporated to prevent storm runoff and can act as a regulating body for the building space bellow (contains heat in the winter and lowers temperature in the summer). Rooftop garden space and food production is

more accessible for people in urban communities. It may also be easier to organize and collaborate with other members. Planning a Rooftop garden such as the Trent Gardens can be fairly extensive even with the ideal space, roof top gardens must be created orienting the sun, space planning and considering the dynamics of the roof itself. But also some parties maybe more or less apt to support such a cause. If an entire rooftop can't be committed to vegetable growing container gardening also works in much of the same manor with similar resources.

Community gardens

The development of community gardens is a very practical way of addressing issues of food security; urban environments often contain idle land and resources that may be converted into productive agricultural spaces for communities. Unused spaced close or within the boundaries to the urban core that may not be suitable for development or private owned, etc. and can provide individuals with great opportunity to grow. The urban agriculture movement has been taking a hold of these opportunities to make unusable urban space suitable for growing via passionate individuals and organizations. Community gardens are also a great way to revitalize urban spaces, not only do these spaces contribute positively to the aesthetics of an area but they contribute to community mental, physical health and overall well being. These spaces can also be helpful to facilitate environmental education.

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SEED SAVING

History of Seed Saving

Seed saving has been a practiced art for centuries. The first sign of seed saving have been traces to the Fertile Crescent of the Middle East where local populations developed seed saving techniques for staple grains and other food still heavily used today (e.g. grain, rye, barley). The act of seed saving allowed for greater populations to be supported and civilizations to grow. For as long as conventional civilizations have existed, seeds have been required to sustain their populations therefore representing the beginning of agriculture. Today food is heavily associated with quality of life; it is not often that the quality and nature of seed is associated with the quality of our foods, and further our food system. With the spread of these practices local farmers world wide developed expertise on seed saving using a vast variety of seed, which was, selected on traits, which best suited the local environment. Today it is estimated that approximately 75% of seed varieties have been lost, and approximately 97% of those plants lost occurred in the 20th century. Today's seed saving practices have become highly mechanized and specific with many negative affects. Although today's seed has been developed to produce at a much greater level, many essential traits of the plants have been modified putting both the plant and human populations at risk.

Why Save Seed

Saving seed a great skill and practice to acquire. It is also a great way to exercise food sovereignty; food sovereignty is a movement that states that all people have the right to

safe and nutritious food sources. By saving ones own seed you are then ensuring your harvest for the next growing season. Personal health and food safety can be challenged by Genetically modified seed which further can be seen as unreliable and possessing traits which threaten food security for future generations. There are many issues surrounding the commercial food industry, which conflict with the ideals of organic gardening. Genetically modified seeds are prevalent in our contemporary food system which multiple negative repercussions for the people, the land and biodiversity. Multiple seeds of garden vegetables has been modified in order to produce great quantities, ripen at a certain rate, travel well, all the traits which make produce more usable for food producers and grocery stores. So why should the same quality be grown in a personal garden? Indeed some of these traits are valuable but overlook some of the natural qualities of these seeds and diminish some of the diversity present in agriculture.

Genetic Diversity

Genetic diversity is becoming increasingly more important as genetically modified seed and hybrid seeds becoming increasingly more dominant in the global market. Hybrid seeds are defined as . Hybrids are usually marked with an F1 or “Hybrid” notation on seed packaging. Hybrid seed dominates certain crops such as summer squash, broccoli, tomatoes, and cabbage. Heirloom or open pollinated seed are the alternative Seed saving is an act that connects us to the very tangible ways of our ancestors, land, and food. Historically seed savers have been responsible the vast

availability of heirloom and it is essential that modern gardeners continue this practice
in order to ensure global food security and genetic longevity

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EDUCATION AND GARDENING

Education is a great tool that encourages and perpetuates local food security initiatives and action. Although all individuals are deeply invested in this issue there is still a very prominent disconnect between people and their food resources.

Education may be used on an institutional and grassroots level in order to increase the awareness and shape the approach communities take to becoming more food secure. Educational gardening in this context defined as a “teaching hub” that brings together an array individuals around ecological education in order to enrich the lives and practices of the community around local, sustainable food sources. These services are oriented around nutrition, ecology, and food security. This form of environmental education is designed to help inspire more conscious food related choices and environmental stewardship. Educational gardens exist in many forms and can have a variety of focuses depending on the organization. Universities, colleges, elementary schools, community gardens, non-profit organizations, and churches have all acted as educational gardening hubs. Quality educational programming is held as the primary focus in many of these organizations. The development, execution and assessment these programs relate to the further project goals and link goals with the outcome and impacts of the programs to create a valuable educational experience. Valuable education can be targeted to many different audience levels around food and its place within individual lifestyles and the greater community.

Project Development

Modeling and outlining are the two essential aspects of creating an effective education plan. Projects and organizations may utilize these strategic plans based on their individual needs. These needs whether they are community, organization, environmental, when properly identified can act as grounds to develop adequate educational planning. They may also be easily modified in order to reach their desired outcome and goals that through the course of these programs are in constant fluctuation and adaptation (e.g. more student involvement, independence, community enrichment). Assessment is essential to the organizational understanding of their levels of engagement and the quality of the education. Evaluating popularity however is much easier; a medium between the two results in a greatly executed model for educational gardens. Assessments may be required on an annual or even monthly periods based on the rate of progress, assessments can also be used on a very individual level. They can be helpful to refocus the educational model to best suit the organizational needs.

Self improvement is also key to an effective educational garden, goals of the organization must be revised and reevaluated to address the needs of the patrons and wider community. It is important to recognize the achievements of the organization and reevaluate future goals based on what has/hasn't occurred within the educational programming. These documentations can also act as greater grounds for grants and funding but can also improve and greater establish the organization. Records and "report cards" are also helpful for providing the organizers with the kind of feedback required for improving the existing

programming. These report cards have been used by other organizations via interviews with patrons; data is then collected and assembled in a way that can help improve the organization, such as progress reports. Benchmarks can be used as indicators of success, determine what will measure the programs success. When reporting and redefining the project these benchmarks will also be changed in order to refocus the project.

Incentives

As previously mentioned educational gardens can have many different motivations such as nutrition, food security, ecological stewardship, decentralized food systems, etc. There are many incentives to grow ones own garden, projects and organizations that identify as educational gardens can offer resources to gardeners about these incentives. These resources must be made available (depending on the scope of the organization) in an accessible, affordable way as many gardener may not have otherwise had access to these forms of education (e.g. factsheets, tutorials, videos). As apart of the organizations role as an educator it is important to provide access to both conceptual resources as well as guidance for practical skills required dealing with these issues. For example it is important for gardeners to know the importance of organic seed and further how this forms practice (seed sourcing, seed saving) in an affordable and accessible way such as seed exchanges. It is also very important when identifying as an educational garden to acknowledge the goals and incentives of the project to their audience by providing a mission statement.

One example of educational garden incentives is nutrition: most of us have developed a notion about our personal food security based on the amount and

calories we intake rather than the nutritional value of our food. Educational gardens should also identify and offer resources on how local food sources can contribute to a healthy diet as well as how they may be used, cooking workshops. Organizations such as The Stop have effectively used nutrition as one of the basis for their food and cooking education outreach projects with great results. Gardeners are educated on how to grow and utilize healthy, organic vegetables which is based on the concept of food security in this low-income area of Toronto. The mission of this organization is to provide education to these low income individuals of this area, this organization presents itself through their document: *In Every Community a Place for Food: The Role of the Community Food Centre in Building a Local, Sustainable, and Just Food System*. This document effectively describes the organization and how they have designed their programming based on their needs and mission.

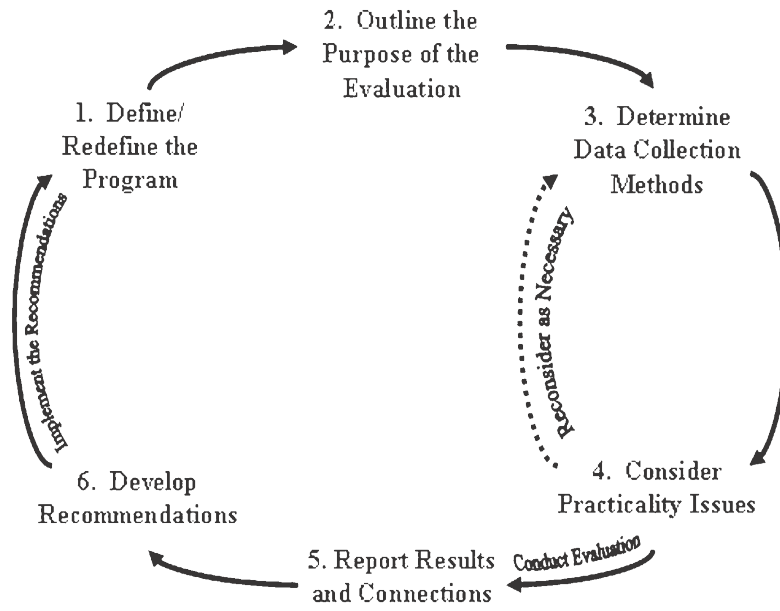
Educating Educators

One of the most hopeful aspects of the mission to educate people on food and farming is that the educated become the educators. Providing youth and adults alike with a diverse skill and knowledge set to deal with a vast array of food and garden issues. Planting from seed and transplants, proper watering techniques, organic gardening strategies, weed identification, how to compost, and when to harvest are all examples of great knowledge individuals can share with one another. Educational gardening creates a great forum to share skills and resources with one another that may not take place in every day life.

Today there are also many tools, which educational gardens can utilize in order to promote and distribute educational materials such as social media. In this act of

education each individual that has been involved in the programming can be given the skills to enrich their community by expanding and contributing to the local incentives that are already in place or are waiting to be created. Hands on experiential learning is very important because allows patrons to fully engaged with the food. Creating a good forum for diverse hands-on-learning has great personal and organizational benefits more empowers patrons because it allows them to be apart of end result, food. There are also many non-tangible skills that can be developed through the hands on process of educational gardening such as patience for plant growth and environmental responsibility.

There is also a great degree of creativity that may be exercised in this process if properly facilitated and organized. When patrons are given a degree of independence it allows them to use their creative intuition to plant seeds, make trellises, all which further this notion of empowerment and gives individuals the confidences to also share their skill. Sharing these skills and empowering individuals really perpetuates the notion of a teaching hub, growing as a collective and a learning community is what makes educational gardens such a great forum for greater environmental change. Teaching youth and adults alike to also be facilitators is important to the environmental education because it really fosters the educational movement as a whole (this is effectively modeled by the Garden Mosaics Program in NYC). By teaching patrons to embody the aspects of education that these organizations hold dearly it develops a responsibility and actions towards these causes.



<p>1. Define/Redefine the Program</p> <ul style="list-style-type: none"> a) What are the ideal goals and objectives of the program? b) Who is the program intended for? c) What is the theory that supports the program? d) What stage is the program in? New? Established? e) What are the history, background, context, and perception of the program and its function? 	<p>2. Outline the Purpose of the Evaluation</p> <ul style="list-style-type: none"> a) Why is the evaluation being done? When can an evaluability assessment be done? b) How will the evaluation be used and what priority does it have in the organization? c) Who are the stakeholders? d) Who will see the evaluation? e) Who will use the results of the evaluation? 	<p>3. Determine Data Collection Methods</p> <ul style="list-style-type: none"> a) What outcomes or achievements should be used to measure success? b) What data collection tools are appropriate/will be used? c) What data is already available? d) How often will you collect data? e) Who will conduct the evaluation (internal or external)? How will that influence the results? f) What threats to validity and reliability exist?
<p>4. Consider Practicality Issues</p> <ul style="list-style-type: none"> a) How much time is available to complete the evaluation? b) When is the appropriate time period to complete the evaluation? c) How much funding is available to complete the evaluation? d) Who is supportive/unsupportive of the project and how should they be managed? e) What partnerships are possible to support the evaluation? f) How will the evaluation be integrated into the program? 	<p>5. Report Results and Connections</p> <ul style="list-style-type: none"> a) What are the program's actual achievements and how do they compare with the program's goals? b) What components of the program are responsible for specific outcomes? c) Who does the program actually serve and what are the effects on those participants? d) How will the evaluation apply outside the program? e) How should the results be reported so they are best utilized? 	<p>6. Develop Recommendations</p> <ul style="list-style-type: none"> a) What changes must be made to the program? b) How will these recommendations be accommodated and accounted for? c) How should the evaluation itself change?

Fig. An improved evaluation approach for educational programs at public gardens schematic. (Steil, A. & Lyons, R.E., 2009)

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CONCLUSION

The Trent Vegetable Garden was created with the vision of presenting agricultural alternatives in an educational way to both the Trent and Peterborough community. As sustainability becomes more of a global focus, these forms of agricultural methodologies will become increasingly more important. Gardening and agriculture are very important aspects of global food security and ecological stewardship. With the heightened pressures of the peak oil crisis it will become increasingly fundamental that individuals become more educated on their food resources. This includes both the conceptual reasoning and practical skills. This resources was created in order to offer gardeners some insight into these issues and practices in part of a greater education plan for organizations such as the Trent Vegetable Gardens.

Companion Planting Guide

Vegetable	Companion	Remediation
Beans	Potatoes	Deters Mexican bean beetles.
Beets	Onion Family	Onion family repels many insects as well as rabbits.
Carrots	Onion Family	Deters carrot flies, rust flies and some nematodes.
Cabbage	Onion Family	Deters maggots.
Cabbage	Tomatoes	Deters flea beetles, cabbage maggots, white cabbage butterflies and imported cabbageworms.
Corn	Potatoes	Deters most insects.
Cucumbers	Radishes	Deters cucumber beetles.
Eggplant	Green Beans	Deters Colorado beetles
Lettuce	Carrots & Radishes	Deters most insects
Potatoes	Beans & Corn	Deters most insects
Radishes	Cucumbers	Deters most insects
Basil	Tomatoes	Improves growth & flavor. Deters some insects including tomato hornworm & some flies.
Bee Balm	Tomatoes	Improves growth & flavor.
Borage (be careful, as Borage spreads 'everywhere')	Tomatoes, Squash & Spinach.	Improves growth & flavor, deters tomato worm. Flowers attract honey bees.
Catnip	Eggplant, beans & around border of garden.	Deters flea beetle and mosquitoes.
Dill	Cabbage, onions & lettuce.	Improves growth & attracts beneficial insects. Good trap plant for green tomato worms.
Garlic	Beans, tomatoes & cucumbers.	Deters aphids.
Marigold	Throughout garden.	Deters Mexican bean beetles, nematodes and some other insects. Attracts honey bees. Marigolds are used in some organic insect sprays.
Mint (grow in container sunk in garden. Can take over garden otherwise.)	Cabbage & tomatoes.	Deters white cabbage moth, aphids & improves flavor. Attracts beneficial insects & honey bees. Reputed to repel a variety of insects.
Nasturtium	Radishes, beans, cabbage & peppers.	A trap crop for aphids (aphids prefer Nasturtiums to other plants). Is said to repel squash bugs, striped pumpkin beetle, & cucumber beetle,.
Peppermint	Cabbage	Deters white cabbage butterfly.
Rosemary	Cabbage, beans, broccoli & carrots.	Deters cabbage moth, bean beetles & carrot fly.
Sage	Cabbage & carrots.	Deters cabbage moth & carrot fly. Improves growth. Flowers attract honey bees.
Tarragon	Entire garden.	Enhances growth of most vegetables.
Thyme	Cabbage	Deters cabbage worm & maggots & flea beetles. Honey bees love Thyme.

INTENSIVE SPACING GUIDE

Note: to determine spacing for interplanting, add the inches for the two crops to be planted together, and divide the sum by 2. For example, if radishes are planted next to beans, add 2" + 4" = 6", then 6" divided by 2 = 3". The radishes should be planted 3" from the beans.

Plant	Inches	Plant	Inches
Asparagus	15-18	Lettuce, head	10-12
Beans, lima	4-6	Lettuce, leaf	4-6
Beans, pole	6-12	Melons	18-24
Beans, bush	4-6	Mustard	6-9
Beets	2-4	Okra	12-18
Broccoli	12-18	Onion	2-4
Brussels sprouts	15-18	Peas	2-4
Cabbage	15-18	Peppers	12-15
Cabbage, Chinese	10-12	Potatoes	10-12
Carrots	2-3	Pumpkins	24-36
Cauliflower	15-18	Radishes	2-3
Cucumber	12-18	Rutabaga	4-6
Chard, Swiss	6-9	Southern pea	3-4
Collards	12-15	Spinach	4-6
Endive	15-18	Squash, summer	18-24
Eggplant	18-24	Squash, winter	24-36
Kale	15-18	Sweet corn	15-18
Kohlrabi	6-9	Tomatoes	18-24
Leeks	3-6	Turnip	4-6

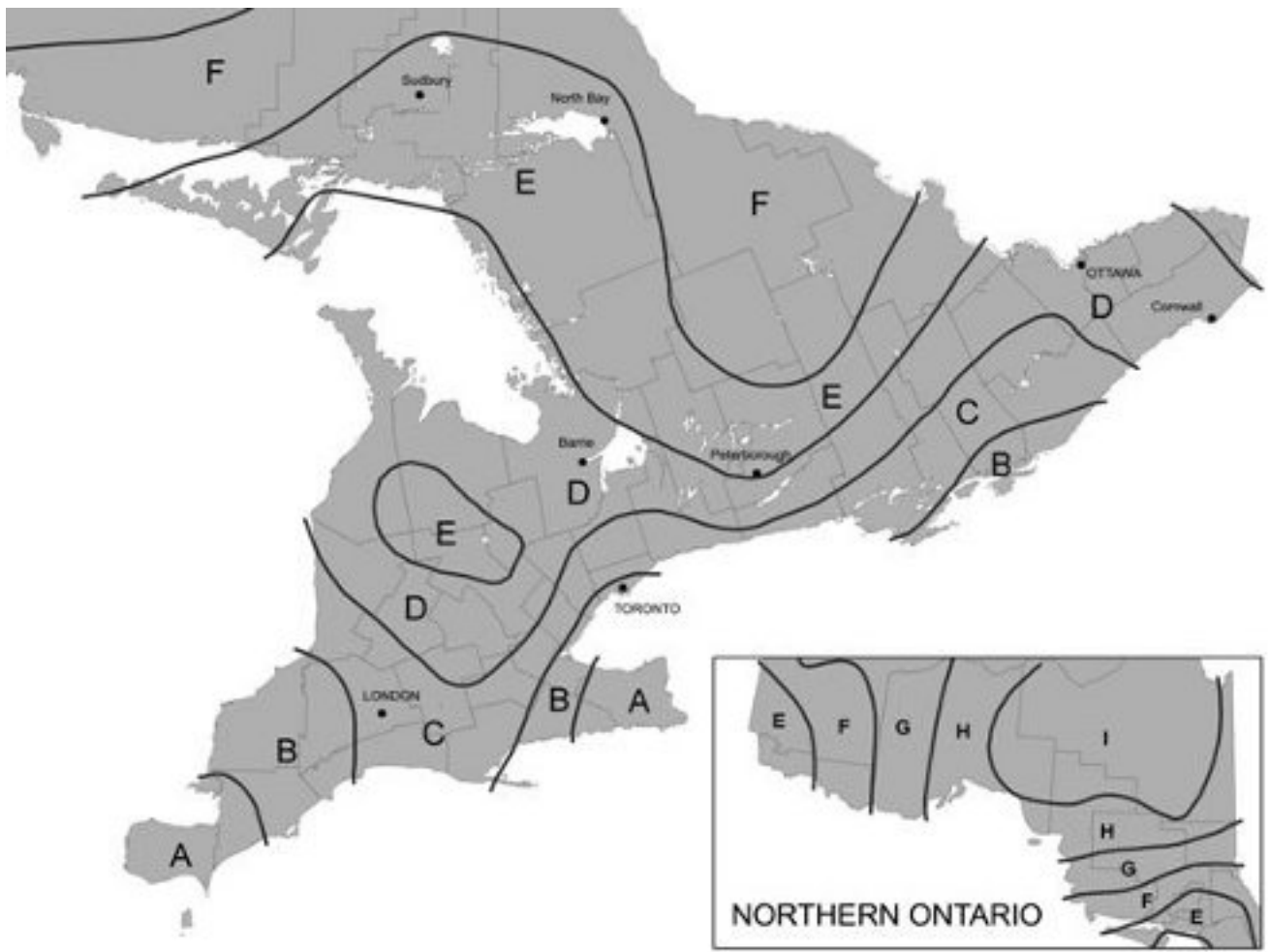
Relf, McDaniel, & Niemiera, 2009.

Diagnosing Soil Issues and Their Solutions

Soil Issue	Problems	Solutions
High clay content	<ul style="list-style-type: none"> • Compacted, heavy and difficult to handle • Insufficient drainage • Crust formation in dry weather • Difficult for plants to root, establish and grow 	<ul style="list-style-type: none"> • Aerate • Select plants suited to clay soil, and/or • Work in organic matter, such as well-rotted manure, compost, grass clippings and/or leaves • Plant or green manure*
High sand content	<ul style="list-style-type: none"> • Soil generally low in organic material and less fertile • Good drainage, poor water-retention capability 	<ul style="list-style-type: none"> • Select plants suited to sandy soil (note that plants adapted to sandy soil are also adapted to low nutrient levels), and/or • Work in organic matter
Poor structure	<ul style="list-style-type: none"> • Difficult to work the soil • Poor drainage • Inability to hold nutrients • Lack of fertility and aeration • Plants experience growth difficulty 	<ul style="list-style-type: none"> • Aerate • Select plants suited to poor soil, and/or • Work the soil to loosen • Work in organic matter • Plant or green manure*
Poor moisture	<ul style="list-style-type: none"> • Plants experience growth difficulty and wither 	<ul style="list-style-type: none"> • Select plants suited to dry soil, and/or • Work in organic matter
Low fertility	<ul style="list-style-type: none"> • Low levels of organic material and soil organisms • Poor drainage and structure, hard to work, inability to hold nutrients • Plants experience growth difficulty 	<ul style="list-style-type: none"> • Select plants suited to dry soil, and/or • Work in organic matter • Plant or green manure*
Low nitrogen	<ul style="list-style-type: none"> • Plant growth problems • Pale green or yellow foliage 	<ul style="list-style-type: none"> • Work in organic matter • Work in blood meal, corn gluten meal or fish emulsion • Plant green manure* or include nitrogen fixers in your plant mix
Low potassium	<ul style="list-style-type: none"> • Plant growth problems • Poor stem strength • Scorched leaf edges • Less disease resistance and winter hardiness 	<ul style="list-style-type: none"> • Work in ground rock potash (granite dust), wood ash, compost, dried poultry manure, leaves or hay
Low phosphorus	<ul style="list-style-type: none"> • Plant growth problems • Late maturity • Purple colour on the leaves 	<ul style="list-style-type: none"> • Work in bone meal or rock phosphate

Too alkaline	<ul style="list-style-type: none"> • Soil nutrients less available • Plants experience growth difficulty 	<ul style="list-style-type: none"> • Select plants suited to acid soil, and/or • Work in powdered sulphur or sustainable harvested peat moss • Work in composted coniferous needles, wood chips, and/or sawdust
Too acidic	<ul style="list-style-type: none"> • Soil nutrients less available • Plants experience growth difficulty 	<ul style="list-style-type: none"> • Select plants suited to acid soil, and/or • Periodically apply lime, wood ash and/or bone meal to raise pH • Make adjustments gradually based on annual testing results

Adapted from: Canada Mortgage and Housing Corporation, 2004



Zone	Frost-Free Period (Average in Days)	Average Date of Last Spring Frost	Average Date of First Fall Frost
A	170-190	April 25	October 20
B	160-170	April 30	October 13
C	150-170	May 3	October 8
D	130-165	May 11	October 1
E	125-145	May 17	September 26
F	115-125	May 24	September 22
G	100-115	May 27	September 17
H	100-110	June 3	September 16
I	90-100	June 7	September 9

OMAFRA. (2011). Climate zones and planting dates for vegetables in Ontario.
<http://www.omafra.gov.on.ca/english/crops/facts/climzoneveg.htm>

TRENT GARDENS INTERACTIVE TOUR



The Trent Vegetable Gardens (TVG) in collaboration with the **Trent Centre for Community Based Education**, have composed a series of educational signs to inform gardeners about some of the efforts happening around the Gardens. TVG is a unique organization which is dedicated to sustainable growing practices and education. This tour is one aspect of the TVG commitment to education - providing an independent and accessible learning space for the public to learn about helpful garden practices and other aspects of organic farming.

Please enjoy the gardens and the tour!

*Further reading on the tour subjects are available in greater detail online

Tour and Annotations Developed by: Emily Mask, April 2012

BASIC COMPOST



Fertile soil is essential for growing crops. Compost is a great way to build fertile soil. How can you make compost? What makes good compost? Compost is not difficult - it is simply a natural process which gardeners may take advantage of.

Compost is the end result of **decomposition**; it is rich in organic matter and contains, rich nutrients that the plant can utilize. Compost is composed of microorganisms, organic matter, moisture, and air. This is a science of collaboration; use every weed, manure variety, plant etc. that allows your compost to cover more of the nutrient spectrum.

Compost should be **mixed** depending on age and composition. “Green” material is young, moist, organic material. “Brown” refers to dry, older, more porous, organic material. A proper 50/50 layered mix of these materials will ensure the proper decomposition and nutrient levels in your compost. The location of your compost heap is also important for its usage, preferably in a shaded warm area where the heap will not lose moisture and contain heat. Each layer should be approximately three inches thick. Microbial activity produces heat when the heaping method is used in compost. The “green” material provides nitrogen, which breaks down carbon rich material found in the “Brown”, resulting in the ideal decomposition of organic material.

Air is also a major contributing factor to decomposition; the air flowing through the heap allows aerobic bacteria to “breathe”. Over time the horizons of the compost heap will blend, resulting in a dark brown rich material when the heap is ready for garden application. Mixing or aerating is also encouraged to enhance the rates of decomposition.

THREE BIN COMPOSTING

This is just one of the many methods of composting. It is a great way of ensuring only completely composted material is added to the soil and also encourages the gardener to actively aerate their compost heap.

- **Bin 1:** The raw material bin. Daily refuse from the kitchen such as coffee grounds, eggshells and vegetable shavings, refuse from the vegetable or flower garden, grass clippings, shredded leaves. Turn **every** two to three weeks.
- **Bin 2:** The next stage of decomposed material, which is taken from, the bottom of bin 1 goes into this bin and is mixed with the brown material excluded from the first bin. It is turned every three to four days until the material is humus. It is then transferred to bin 3.
- **Bin 3:** The finished compost or humus, ready for use.



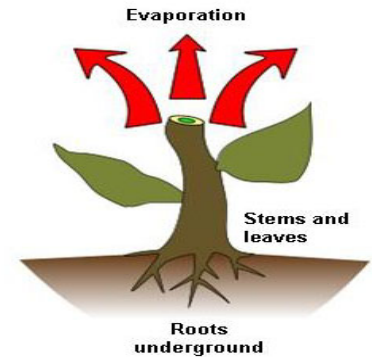
COMPOST TEA

Compost tea can provide multiple benefits to plants and soil structures. This soil amendment is a quick and available source of nutrient for crops, it enhances plants protection against diseases and increases the population and diversity of microorganisms in the soil. Compost tea and particularly vermicomposting tea (made from worm castings) has been found to be a very effective in nourishing soils. Compost tea is considered a great tool for organic growers on both individual and commercial scales.

Making Compost Tea: The application of Anerobic Compost tea has been practiced for centuries. First an organic compost mixture is created. Once it is fully decomposed it must be suspended in a bucket of water (or strained), until it has matured which may last from two to four weeks. Today people often incorporate different technology such as bubblers (for aeration) or larger brewers on a greater scale. Application of Aerobic compost tea is the more popular method that encourages active mixing and oxygen circulation via an air pump or bubbler inserted into the mixture over the course of four to seven days. It is also a healthier bacterial content.

Applying Compost tea: Compost tea application is similar to watering. A light application around the root system should suffice depending on the size of the plant and the nutrients it requires.

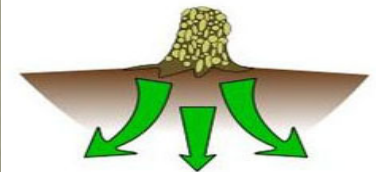
Without Application



With Application



Microbes coat and close the plant's pores so no respiration takes place. Microbes capture the nutrients.



Decomposition is accelerated so that nutrients are restored back into the soil rather than being lost to the air.

MANURE



Manure has been used for generations as a favorable soil amendment. It has been found that a mixture of plant matter and manure works best for vegetation in comparison to manure alone. This mixture allows for a more aeration, nutrient and moisture content.

Aged manure is best to apply to gardens rather than fresh. Fresh manure contains high nitrogen that can be caustic for the vegetation. Manure can be added to compost heaps to create a good variation for plant retention.

The most widely used forms of manure come from horses, cows, sheep and goats. Poultry manure is highly concentrated and ought to be applied with care.

Nitrogen is very often the limiting factor in both gardens and in larger scale agriculture. Nitrogen is a required nutrient for most plants; some more than others (e.g. corn and the Brassica family are heavy feeders). The reapplication of nitrogen into the soil via manure or compost or nitrogen fixing legumes is paramount to a garden's success (e.g. beans and peas).

MULCHING



Mulching is known as a method of low maintenance gardening. Mulch may be used to suppress weeds and control soil moisture. Weeding is often seen as a tedious gardening task; so by limiting the amount of light that reaches the soil, weeds cannot germinate. Thick mulch is essential to keeping weeds at bay; patchy or thin mulch can allow weeds to begin their cycle. Bare soil loses moisture quickly during sunny, dry, windy or hot conditions. Vegetation (i.e. crop cover) or layers of organic material help contain some of the moisture within the soil and then also allowing it to be available for plant uptake. Soil moisture also makes it easier for plants to absorb other necessary nutrients (i.e. water soluble nutrients).

- **Types:** the mulch of choice by organic vegetable gardeners is primarily straw mulch. It spread easily, its cost effective, decomposes slowly, doesn't contain seed and is moderately accessible and available throughout the season depending on the farm. Another varieties of mulch is cedar mulch which is aesthetically pleasing and works great in flower gardens. However, cedar mulch may contain other additives, which may contribute negatively to a vegetable garden. Cardboard or paper mulch also works great in vegetable gardens similar to straw, although it decomposes quickly and is not as maneuverable. Similarly, colored and bleached paper can leach harmful chemicals into the soil.
- **Applying Mulch** – Mulch is usually applied on the surface of your garden bed and thick mulch is encouraged. Concentrating more around the plant will ensure soil moisture is better maintained. Be sure not to smother your crop – especially transplants or seedling. Mulch can be applied at any point during the season; the earlier application of mulch will ensure weeds can't begin in the garden. Mid season mulch can be helpful with containing moisture in the warmer months and pre-winter mulch ensures that the garden wont lose nutrients during the harsh winter. If weeds do surface, pulling them before they go to seed will ensure they won't be a problem in future growing seasons.

INTENSIVE GARDENING



Intensive gardening is a practice used to generate the maximum amount of produce on minimal land (e.g. community garden plots). Traditional long rows may work for some but can take up greater space than other practices.

It allows for the individual to redirect effort to other aspects of their garden such as nutrition. Gardening often requires some degree of exploration to find a practice that fits the individual.

Intensive gardening requires a greater degree of **planning**, as one must consider the interrelationships of plants including their nutrient needs, shade tolerance, above-and-below ground growth patterns and preferred growing seasons. Some featured methods of intensive gardening are: raised beds, vertical gardening, interplanting and companion planting.

INTENSIVE GARDENING METHODS



Raised Beds:

An aesthetically appealing way to concentrate soil amendments.

- Beds may be shaped into any variety of pattern the gardener desires with approximately 10-12 inches of loose till above the earth. Wider beds are encouraged in order to utilize space. The gardener must always be able to reach into the space for maintenance purposes. Walkable pathways must also be emphasized so the space is accessible. Soil testing may be an asset to determine the resources available to plants in such a confined space (i.e. phosphorus, potassium, calcium, magnesium, and other micronutrients). Compost and/or manure may also be easily added to these beds. They may also be reinforced with a frame, rock, etc. or stand freely. Exercise caution when spacing plants throughout the bed.

Vertical Gardening:

- Vertical gardening is a great way to grow vining and sprawling plants when space is limited (e.g. pole beans, cucumbers, squashes, tomatoes, etc.). Trellises, nets, strings, cages, poles are all used to support vertical gardening. This method sometimes results in smaller yields because of over-drying; this can be avoided with consistent watering. Some species are less prone to climbing but with some encouragement can produce great results.

HEIRLOOM TOMATOES



Tomatoes originated from the Andes of South America which reaches from Ecuador to Peru. The species migrated North towards Mexico and were adopted by the Aztecs and grown as part of the Three Sisters movement to the north. Tomatoes were firstly used by Europeans decoratively as they were presumed toxic, then eventually integrated into diets that were brought to North America. There are approximately three to four thousand tomato varieties, including many different colors, levels of sweetness, texture, and hardness. In modern industrial agriculture the varieties of tomatoes used have been narrowed extensively based on production needs.

Genetically, many species have been altered to produce at a certain level and under different conditions. Seed savers and gardeners alike have developed a particular interest in heirloom tomatoes as they represent **biodiversity** within small scale agriculture.

Tomato seeds are easily saved and distributed: Different varieties of tomatoes may be better equipped for different usages (e.g. canning, freezing, sauces, salsas, pastes). Seeds are selected based on the characteristics of the plant (e.g. productiveness, free from cracking, smoothness, skin properties). Today tomatoes represent a great part of worldly diets. Heirloom varieties of tomatoes are both a representation of genetic biodiversity and are a great addition to gardens.

COMPANION PLANTING



Companion planting (also known as interplanting) is another method of intensive gardening. Companion planting can be used to enhance plant growth and quality of neighboring plants and for improved taste (such as companion planting basil and tomatoes). Variables such as plant family, light preference, season lengths, growth patterns, nutrient and moisture requirements, feeding habits and other plant factors need to be considered before planting multiple species amongst one another.

Beginning companion planting: Row patterns are the easiest place to begin and manage this method of organic farming. Plants with an early maturation may work well with plants, which mature later in the growing season. Similarly, heavy feeders such as the brassica family may be planted with a less glutinous species such as lettuce variety, which must be shade tolerant. Sources such as [The Complete Guide to Companion Planting by Dale Mayer](#) (available online) provides in depth detail into tested plant companionship.

Legumes can also be an asset to build soil quality. Legumes fix nitrogen in soil, which is often a limiting factor to plant growth.

Companion crops may also be used to deter disease and insect problems, which tend to be family specific, and can also prevent larger scale problems such as wildlife (e.g. rabbits and marigold plants). Companion planting is a great ally for organic growers to improve their soil, produce, taste and yields while utilizing space.

PERENNIAL HERBS



Perennials are herbs or plants that come back yearly; annuals must be replanted. Perennial herbs are a great way to ensure fresh affordable herbs, which may also be dried for further use beyond the growing season. Some locally suited perennial herbs are oregano, mint, thyme, chives, lavender, marjoram, rosemary and tarragon.

Caring for Perennial Herbs:

- Thinning: When harvesting or thinning herbs early and frequently is best to inspire growth, harvest no more than 2/3 of the plants biomass so the plant may adequately regenerate itself. Perennial herbs shouldn't be cut after August because it inhibits their ability to regrow for the next season.
- Dividing: Over years herbs may sprawl within the garden or moving the plant to another location may be desired. Dig up soil around the plants root system you wish to relocate, preferably the one with most top growth and leaving the root systems as unharmed as possible. Split the plant in two or more sections (this may require lightly dividing the root systems) and relocate the plant in an adequate bed where it may be replanted and hydrated. Water until new growth appears. Herbs may also be propagated by cuttings with intact root systems

Preserving Herbs: Herbs should be dried in a dark, well-ventilated area. Sunlight and humidity can compromise the quality of the herbs. Herbs can be gathered in small bundles and strung up to dry in two-week increments. The flavours of the herbs are contained in the oil of the plants cells. Herbs can be over dried and therefore lose most of their flavor. Storing herbs in an airtight container can prevent over-drying. Some herbs should be rubbed before adding them to a dish (i.e. mint) because of their intense flavor.

SEED SAVING



In the past seed saving was a necessary ritual to ensure community food security. Today seed saving has become unnecessary because of the commercialization of seed companies and food distribution. Saving seeds a step towards food security and an act of political change; seed is **fundamental** to food production. Buying seed has several downfalls: limited varieties, market fluxuations, personal finances, genetic limitations, and dangers of genetically modified seed.

Saving seed for different varieties of produce can vary substantially. Some seed may be eaten such as corn, beans, peas, squashes, melons, tomatoes, okra, peppers, and eggplant. Often these seeds may be fermented (they must complete their life cycle) then dried to be planted the following growing season. Lettuce and other varieties of greens may be left to go to seed after they are fully matured, then sifted and dried. Biennials require two growing seasons (and must over-winter) before they produce seed such as spinach and endive. Many root vegetables are also biennials but cannot endure freezing so they must overwinter out of the frost (inside or covered) before they produce seed. Plants that self pollinate (e.g. tomatoes, peppers, pears) are a great way to begin saving seed. Savers must also be aware of the problems of cross pollination (e.g. zucchini and squash). For the home grower “Seed to Seed” by Suzanne Ashworth is an excellent book to help new seed savers gain more practical knowledge.

Storing Seed: Seed should be stored in a well-ventilated, dry, room temperature environment. Temperature fluctuation and moisture can damage seeds. Seed must also be protected from insect infestation, which makes seed unusable. Storage in an envelope, tin container or cloth bag works well.

Saving seed at a local level integrates individuals with natural plant cycles, reduces the dependence on corporations and promotes biodiversity.

GREENROOFS

With the help of contemporary innovations, structures such as roofs, balconies, and other urban areas can be transformed into lush food producing spaces.

Rooftop gardening is becoming increasingly popular as cities become more developed. In its current context Rooftop gardens represents a movement towards healthier and more localized food systems. Spaces such as Rooftop Gardens orient themselves around a variety of causes such as education, social justice, food security, environmental initiatives, horticulture, individuals and economics.

Green roofs can also help prevent storm runoff and can act as a regulating body for the building space below (i.e. they contain heat in the winter and lower temperature in the summer).

By creating Rooftop garden space, food production is more accessible for people in urban communities. Planning a Rooftop garden can be fairly extensive even with a seemingly ideal space, rooftop gardens must be created orienting the sun, planning space carefully and considering the dynamics of the roof itself. **Rooftop challenges:** Patterns of the wind at greater altitudes can make plants susceptible to wind throw and crop damage. Rooftops can also be quite warm which make irrigation essential to successful gardening.

If an entire rooftop can't be committed to vegetable growing **container gardening** works in much of the same manner with similar resources!

