

HIGHROAD FELLOWSHIP REPORTS

A Guide for Making Community Gardens Accessible for all Members

July 2015

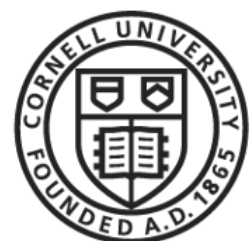
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With Grassroots Gardens

of Western New York



ILR Buffalo Co-Lab

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A Guide for Making Community Gardens Accessible for all Members



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By: Melissa Bravo

Summer 2015

¹ Image courtesy of <http://whatsnewbuffalo.com/post/42366314872/gardening-grassroots-gardens-new-garden-open>



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Introduction

A brief note on the Americans with Disabilities Act

The Americans with Disabilities Act (ADA) was first passed in 1990 to prohibit discrimination on the basis of disability status and to allow people with disabilities an equal opportunity to employment, access to state and local government services, and access to places of public accommodations. Although the ADA has been amended several times since 1990, its main goal remains the same: to create equal opportunity and access to civic life for people with disabilities. The ADA promotes the principles of Universal Design throughout its comprehensive regulations. Because this guide is intended for alterations community gardeners and the Grassroots Gardens staff can do to make their gardens more accessible, this guide will not discuss the many requirements of the ADA for city-owned land or for places of public accommodation but will instead focus on how these regulations create a solid basis for the principles of Universal Design in gardening. Despite this, it is important to note that there is enforceable legislation promoting accessibility for public spaces and that the principles of Universal Design are at the foundation of such legislation.

More information on the Americans with Disabilities Act can be found by visiting the ADA's website at: www.adagov/index.html

Or by calling the ADA Information Line at 800-514-0301

Or by writing to the Disability Rights Section Mailing Address at:

U.S. Department of Justice
950 Pennsylvania Avenue, NW
Civil Rights Division
Disability Rights Section – NYA
Washington, D.C. 205030

Why make our gardens accessible?

Our community gardens here in Buffalo serve many beneficial purposes, both tangible and intangible. To name a few, they beautify and revitalize neighborhoods by using vacant land for productive means, provide access to agricultural education, and allow for access to locally grown fresh fruits and vegetables. Additionally, gardening can serve as a therapeutic stress reliever for people of all abilities through therapeutic horticulture. The practice of therapeutic horticulture says that gardening provides a creative and stimulating activity to enrich the physical, mental,



and social aspects of our lives.² Have you ever left your garden with an increased sense of accomplishment or a reduced level of stress? Without realizing it we have been engaging in therapeutic horticulture to better ourselves through the practice of gardening. Gardening has proven to be a rewarding recreational activity for all involved. Because gardening can benefit our physical, mental, and social wellbeing, it is important that people of all abilities are included in this enriching activity. By building accessible gardens, we can ensure that everyone in our community has the opportunity to benefit from garden participation.³

The physical spaces we create can often, without intention, exclude members of the population. Through promoting the principles of Universal Design this guide is intended to offer gardeners assistance on how to make their gardens more accessible for people of all ages and abilities. Buffalo is unique in that it is composed of people from all backgrounds and walks of life and it is important that we capture this diversity in our gardening efforts by taking intentional steps to create environments of inclusion.⁴

What is Universal Design?

Dr. Rosemarie Rossetti⁵, an active member of both the gardening community as well as the disability community describes Universal Design as “a framework for the design of public and private spaces to benefit the widest possible range of people in the widest range of situations without special or separate design. Universal Design is a human-centered design made to accommodate people of all sizes, ages, and abilities”. The point of Universal Design is not to target people with disabilities but to create an environment that everyone can benefit from together. Universal Design has also been called “inclusive design”, “design-for-all”, “lifespan design”, and “human-centered design”.

The Center for Universal Design at North Carolina State University describes the 7 principles to keep in mind for designing a space using Universal Design as the following:

1. Equitable use: The design is useful to people with diverse abilities
2. Flexibility in use: The design accommodates a wide range of individual preferences and abilities

² Therapeutic horticulture definition taken from: <http://www.missouribotanicalgarden.org/learn-discover/adults/therapeutic-horticulture.aspx>

³ More information on therapeutic horticulture can be found by visiting the American Horticultural Therapy Association at their web page: <http://ahta.org/>

⁴ See Appendix A for Buffalo-specific population data

⁵ Dr. Rossetti is an inspirational public speaker, an advocate for Universal Design, and the founder of the Universal Design LivingLaboratory. More information on Dr. Rossetti can be found by visiting her website: <http://www.rosemariespeaks.com/> or by reading her article “Create a Welcoming Garden with Universal Design” found at <http://www.garden.org/articles/articles.php?q=show&id=3815>



3. Simple and intuitive use: Use of the design is easy to understand, regardless of user's experience, knowledge, language skills, or current concentration level
4. Perceptible information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities
5. Tolerance for error: The design minimizes hazards and adverse consequences of accidental or unintended actions
6. Low physical effort: the design can be used efficiently, comfortably, and with a minimum of fatigue
7. Size and space for approach and use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility

Common examples of Universal Design in everyday life include automatic doors, closed captioning in videos, and adjustable furniture designed to meet a variety of different body types and needs. This guide will discuss how we, as garden enthusiasts, can employ these principles into our community gardens so that the gardening experience is open and more enjoyable for all gardeners regardless of differences in ability.⁶

⁶ More general information on creating accessible gardens can be found in Gene Rotherth's 1994 printed book [The Enabling Garden](#)



Accessible Walkways

Inaccessible entryways and paths within the garden can be the first barrier preventing someone in the community from enjoying your garden. Creating walkways that are easily maneuverable can benefit everyone and make the gardening experience more pleasurable for all. When creating walkways, there are a few things that need to be considered:

Are there non-accessible entrances to the garden?

Think about your garden entryways. It is important to make at least one of the garden entryways accessible to people of all abilities in your community.

Fences, Gates, and Doors: Handles to garden entryways should be operable with one hand and should not require tight grasping, pinching, or twisting of the wrist. An easy way to test for accessible handles is to consider the closed-fist method of operation. Here, try opening your garden door with one arm using a closed fist. If you are able to do so, without a great deal of stress, your garden entryway has passed the closed-fist method. You should also consider the height of your gate handles. For ease of access these handles should be between 34 and 48 inches above the ground. Also, consider the heaviness of the entry door. If the gate door requires a lot of force to operate, this could be preventing some members of the community from gaining access into the garden.⁷ The dimensions of your doorway should also be considered when creating a universally-designed entryway.⁸ There should be at least 18 inches of maneuvering clearance beyond the latch side of the door and a depth of at least 60 inches to allow for the backing up and opening of the door.⁹ When door is open, there should be a clearing of at least 32 inches wide.

Are the paths wide enough?

All paths should be 36 inches wide.¹⁰ If people need to work between garden beds to access either garden bed, be sure that the space between these two beds is also at least 36 inches wide. The ADA checklist recommends a turning point of 60 inches (diameter) at reasonable intervals. Community gardens vary in size and so it is up to you and your gardeners to determine what intervals are appropriate for your gardens, but at the very least a 60-inch turning space should be available at both ends of the garden.¹¹

⁷ See Appendix B Figures 1 & 2

⁸ See Appendix B Figure 3

⁹ See Appendix B Figure 4

¹⁰ See Appendix B Figure 5

¹¹ See Appendix B Figure 6



Are the paths dangerous to travel on?¹²

Accessible paths are those that are safe for all users to use and that are barrier free. If paths are paved, pavement should be kept level and well-drained with good traction. Although paths made up of grass or dirt can be hard for people with limited mobility to maneuver on, paved paths are not always a fiscal or spatial option for community gardens. Additionally, depending on your city lease, building permanent structures like paved pathways may not be legal for your community gardens. If this is the case, unpaved paths can be made accessible for almost all users. Grass and dirt paths can be made more accessible by being regularly maintained. Grass along pathways should be kept short and dirt paths should remain even and ditch-free when possible.¹³ In all cases, paths should be kept clear of unnecessary objects such as shovels, buckets, rakes, pots and other gardening tools that pose a threat to the safety of gardeners.¹⁴

Making paved paths accessible

When done correctly, paved pathways are a great way to ensure that walkways are accessible. Paths should be firm and stable in addition to even and slip resistant. Materials and grade are two important concerns when designing your paths. Before deciding to install a man-made paved path, consult a professional landscaper or your local garden/hardware store about which material path is most appropriate for your garden size and location.

The material you chose to make your paths is really up to you so as long as paths allow for the most access possible. If you would like to install man-made paths, consider materials that are both appropriate for the garden and enabling for people of all abilities. Janet Zeller, the USDA Forest Service Accessibility Program Manager, in *Accessibility Guidebook for Outdoor Recreation and Trails*, stresses the importance of creating a firm and stable surface.¹⁵ She provides a two pronged test for determining whether your surface is accessible: 1) Could a person easily ride a narrow-tired bicycle across the surface? 2) Could a folding stroller with small, narrow plastic wheels containing a small child be pushed easily across the surface?¹⁶ If the answer is yes to both of these questions, it is probable that a person using a wheelchair or walker could also effectively use your garden path.

¹² See Appendix B Figure 7-10

¹³ See Appendix B Figure 11

¹⁴ See Appendix B Figure 12

¹⁵ More information can be found by visiting:

<http://www.fs.fed.us/recreation/programs/accessibility/htmlpubs/htm06232801/>

¹⁶ More information can be found at Accessibility Guidebook for Outdoor Recreation and Trails:

<http://www.fs.fed.us/recreation/programs/accessibility/htmlpubs/htm06232801/page09.htm#dtwifas>



Here are a few common examples for materials that can be used to create paths. In Appendix B you will find building ideas and instructions as well as the benefits and limitations of using each of the materials listed below.

1. Granite/Crushed stone
2. Brick
3. Permeable Pavers

More Garden Walkway Accessories to Consider¹⁷

If you cannot easily change the surface your garden walkways, there are other measure you can take to make your garden accessible. Although these accessories cannot remove the responsibility of maintaining a clear 36-inch wide path throughout the garden, they can ease the stress of maneuvering in gardens without firm and stable permanent pathways for people with limited mobility.

Ramps

If your garden has any vertical steps preventing access to those with limited mobility, a ramp can be installed to reduce this barrier. For every inch of height change, the ramp should be 12 inches long so that the maximum running slop is at most 1:12 or a slope of no more than 8.3%.¹⁸ Like our accessible pathway, your ramp should also be 36 inches in width. Having a sturdy ramp installed can reduce the risk of injury by members of the community who have limited mobility and can create greater ease of movement for people pushing or carrying garden equipment over changing levels of the garden. For safety, be sure that when you install a ramp that the ramp ends at a level landing. Additionally, ramps are only accessible so as long as they are maintained and so you should ensure that your ramp remains slip free and unobstructed by barriers.¹⁹ Ramps can be built by a handy community member or by utilizing a professional workforce. Prior to installing a ramp, consult with members of your garden and a contractor on where a ramp is most needed and what size ramp is appropriate for your garden space.

¹⁷ See Appendix C for more information on walkway accessories to enhance your garden walkway accessibility

¹⁸ See Appendix C Figure 1

¹⁹ More information on building a ramp can be found at The Ramp Project
<http://www.accessnorth.net/cilnm/ramp.pdf>



Railings

Although not yet a common feature in gardens, railings can be made so that they are appropriate, functional, and visually appealing in community gardens. Additionally, if you have areas of your garden that include either stairs or steep or unsteady ground surface, a railing can greatly enhance the safety of your garden. If you decide to install a railing in your garden, be sure that it enriches rather than obstructs the flow of traffic on your pathway. For safety, the railing should be continuous and uninterrupted by garden structures. The railing should not interrupt the accessible path; the path should remain at least 36 inches even after a railing is installed. Railing height should be between 34 and 38 inches for maximum use²⁰. Also, consider which type of rail gripping surface is most useful for your gardeners. If you choose a circular handrail, the gripping surface should be between a 1 ¼ inch and 2 inch diameter. If handgrip is non-circular, the perimeter should be between 4 inch and 6 ¼ inch.²¹

Once railings are accessible, you can work on beautifying them so that they enhance the aesthetics of your garden path. Try installing hanging plants, wind chimes, or other decorations that hang on the outside of the railing so that they do not interfere with the functional use of the railings.²²

Planter edges to designate walkways

Slight texture changes, so as long as they are appropriate and safe, can be used to indicate different features in the garden. These are typically already present in your garden. For example, the edge of planters placed at least 36 inches apart from each other can be used to signify a designated path. If these planters are placed at least 36 inches apart, but not too much wider, they can help someone with sight loss that uses a cane follow the designated path safely.

Signage

It is not a requirement that you have signs in your garden, but if you do, you should try to make them accessible to the greatest amount of people in your community. Everyone should be able to benefit from your directional or permanent information signs. There are a number of ways you can make non-decoration permanent signs accessible for all gardeners. Start by making sure

²⁰ See Appendix C Figure 4

²¹ See Appendix C Figure 5 & 6

²² See Appendix C Figure 7 & 8



these signs are visible for people of all heights; signs placed too high may not be readable to all gardeners. Additionally, if these signs are placed within reach, try using raised characters or pictures. This will help those of your gardeners who have experienced sight loss or may have trouble reading a traditional sign. Changing your permanent signs can be an easy and low-cost way of making your garden more accessible.

Making these alterations to your garden walkways will allow for easier physical garden access for people who use wheelchairs and walkers as well as those who are visually impaired, others with limited mobility, and elderly members of the community. Additionally, having easily operable entryways and barrier-free paths with appropriate walkway accessories, will improve the gardening experience for all gardeners by increasing safety for those carrying large or heavy objects or those pushing wheelbarrows or dollies. Everyone can benefit from and appreciate clear, safe, and accessible entryways and pathways and so striving to achieve them should be a goal of every community garden.

Accessible Access to Water

Watering is a big component of maintaining a garden. For this reason, it is important that everyone has access to the water facilities in your garden. Because water can be heavy to move, there should be smaller containers available to transport water from its source to the plants. Consider using lightweight cans with controlled valves, larger handles, and alternate ways of pouring²³. If there is a hose present, be sure that it is stored at an accessible height of no more than 40 inches from the ground and can be used without a great deal of force.

Accessible Planters

There are a number of different accessible raised-bed gardening techniques that can be used depending on both your garden space and your gardeners' needs. Below are two accessible techniques that can be used in your garden. Pictures and building instructions for these raised-beds can be found in Appendix D. For whichever technique you choose to use be sure that you are utilizing the beds so that they allow for the most diverse amount of users. If you choose to use technique one, described below, make sure that you fill the bed to the highest appropriate level with soil and plants so that your gardeners do not have to reach down to garden, causing the raised-bed to limit rather than enable your gardeners. Also, for either technique, do not encase the garden beds in wire or any type of material that limits certain community members from easily accessing the garden beds. Having raised-beds should reduce the amount of hungry critters

²³ See Appendix F figures 14-15 for ideas on accessible watering cans



that want to get into your garden beds and so fencing these types of beds will not be as necessary to protect your gardens.

Raised-bed technique 1

This type of raised-bed only allows for side access to the gardening bed. This means that gardeners will have to sit or stand at the edge of the garden bed to reach inside the planter. If these beds are against a wall or can only be accessed from one side, they should remain less than 2 ½ feet wide. If the garden bed can be worked at from all sides, it can be up to 5 feet in diameter by 4 feet wide or so that all points in the garden bed can be reached without having to stand in the bed. The height of the garden bed can differ depending on the preference of your gardeners but should be kept between 20 and 35 inches in height. This should allow for both gardeners who choose to sit and those to choose to stand to garden comfortably. Additionally, because anyone can choose to sit and garden in these raised-beds, gardeners will be able to garden for longer periods of time without becoming so fatigued. See Figure 1 in Appendix D for more information on how to design and build your raised-bed using technique 1.

Raised-bed technique 2

This type of raised-bed is different from traditional raised-beds because it is raised so that people using wheelchairs, or those who wish to sit while gardening, can pull their chair underneath the planter while still accessing the full garden bed. Room for a chair is typically only available on one side of the planter. However, if the planter can be accessed from all sides by turning your chair sideways along the other three sides, like the one designed above in technique 1, then it can follow almost the same measurements as the garden bed in technique 1. If the garden bed can be accessed from all sides, regardless if a chair can be pulled underneath it at one or more points, the planter must be no more than 5 feet in diameter. If the garden bed cannot be accessed from all sides, then it can be no more than 2 ½ feet wide. The height of these beds need to be more exact since they must have room for people to sit underneath the bed while still being able to garden inside the bed. For this reason the beds need to be raised to a height of 34 inches with 27 inches of clear space underneath to allow for chair access below the bed. This will allow for 7 inches for soil and plants underneath the garden bed surface. Because of this limited space, you may have to reconsider which plants you choose to use in your raised-bed gardens. These types of raised-beds do not have to have 27 inches of height of clear space for the whole width of the garden bed if the bed can be accessed from the other sides. However, if using this technique, the 27 inches of height clear space should at least permit for the dimensions of a chair underneath; a depth of 19 inches with a height of 27 inches should allow of a person to comfortably sit with



their legs underneath the planter and have access to the garden.²⁴ See Figure 2 in Appendix D for more information on how to design and build your raised-bed using technique 2.

Accessible Alternatives to Ground Planting

Vertical gardening techniques

Vertical gardens are an excellent garden technique for maximizing your garden space and increasing accessibility in your garden. Accessible alternatives to traditional ground planters add unique features to your garden and allow for all gardeners to participate in the benefits of gardening without straining to adjust to traditional and inaccessible ground planters.

The most important things to keep in mind when choosing which type of vertical garden to use are accessibility and safety. Unlike with most ground planters, you have to seriously consider how vertical gardens will fare in wind and rain. Vertical gardens should be secured into the ground or so that they do not pose a threat to safety in extreme weather conditions. Vertical planters should also be accessible to all gardeners. If secured in flower beds, put your vertical gardens within 20 inches of the edge of the planters so that gardeners can comfortably reach the vertical garden without having to step into the flowerbed. Although the vertical gardens can be above and below an accessible height, a portion of the garden must be within the 30-55 inch range so that gardeners who cannot reach very high or very low can still participate in these gardens. Below are a few examples of different types of easy vertical gardening techniques that can be used to enhance your garden.

Crate-Style Vertical Gardening

This vertical approach gives the end look of handcrafted planters made of stacked crates. By building these beds yourself, rather than buying an already made structure, you can design the height and width of the final product so that it fits the needs of your gardeners and is appropriate for your garden space. The instructions for building this vertical garden approach from scratch can be found in Appendix E. However, you can reuse premade crates so long as you keep them between 35 and 50 inches in height. You can make your reused crate-style vertical garden higher if you fasten them together so that their height does not pose a danger to your gardeners. You can do this by following step 9 in Appendix E, but you will have to make some adjustments to support board measurements depending on the size of your containers.²⁵

²⁴ Although there is no section in this guide on the use of garden tables, it is important to note that table dimension should also allow for at least 24 inches of leg room underneath with at least 19 inches of clear depth underneath for a total height of between 28 and 34 inches.

²⁵ See Appendix E Figure 1



Shoe Pocket Vertical Gardening

This type of gardening is easy to create. Use a closet hanging shoe rack and attach to an outdoor fence or gate to create a unique hanging garden that requires very little space. There are number of different ways to hang your shoe garden but it is important to note that this type of vertical garden is not self-standing and so requires a wall or structure that it can be hung from.²⁶

Pallet Vertical Gardening

You can reuse and modify empty pallets to make easy and more accessible vertical gardens. When placed so that they stand vertically, pallets have a height of between 36 and 48 inches. Because of this they can remain on the ground, leaning against a wall, or can be attached to a wall to create a desired height range. It is important to note that this type of vertical gardening requires a wall or something that can support the plant filled pallet when standing vertically. Attaching the pallet to the wall will help it remain upright in extreme weather conditions.²⁷

Hanging Pot Vertical Gardening

Hanging pots, when placed at reachable heights and at appropriate places in the garden, can add to the accessibility of your garden as well as create more gardening space. When choosing to use hanging pots think about both your garden space and the types of plants you want to use. Some hanging pots can be used for produce like hanging tomatoes while others are more appropriate for flowers and other small plants. Consider purchasing or fastening your own plant pulleys so that the length at which these plants hang can be adjusted to meet the needs of each user. Remember, hanging plants don't have to be hung from patio edges; often they are hung from rods in the ground at lower levels.²⁸ Use the resources of your garden to set hanging plants in a unique and appropriate ways. Also, be sure that the lengths of your hanging plants do not pose a danger. Insecure hanging plants that hang low from tall structures can be dangerous for all gardeners as strong winds can cause these plants to swing. There is no set height for how low to hang your plants, but keep plants lower than 50 inches so everyone can garden in them.

Trellis Vertical Gardening

A trellis is a type of vertical garden that provides support for vine plants to grow vertically. In addition to creating a unique garden, a trellis also helps to save garden space in tight areas and works to create a greater range of accessibility. Trellis vertical gardens can come in many different shapes and sizes depending on the type of plants you decide to grow using the trellis.

²⁶ See Appendix E Figure 2-3

²⁷ See Appendix E Figure 4

²⁸ See Appendix E Figure 5



The type of trellis you will use will depend on the weight and growing height of what you intend to plant. Climbing roses, tomatoes, and beans can be used for smaller trellises. Stronger trellises must be used for heavier vegetables like squash or other vine stemmed plants.²⁹ Take this into consideration before building your trellis. Appendix E includes images and directions for three types of trellises. This is by no means a comprehensive list as there are many ways to build trellises that may be appropriate for your garden. A common feature of trellises is that they are often placed upright in garden beds, like the kind made from small bamboo u-hoops. If this is the case for your trellis, be sure that it is placed near the edge of your garden bed (at a comfortable arm's reach of less than 20 inches from the edge of bed) so that the garden bed sidewall does not pose a barrier for people to reach and garden the trellis. Sources for more information can be found in Appendix E.

Accessible Tools

Ergonomically-designed garden tools are tools that are made to reduce back, wrist, and hand stress while gardening. This allows more people to engage in gardening who would otherwise find gardening too straining to do with other tools. Additionally, because these tools are designed to create comfortable gardening for most users, they allow us to garden for longer periods of time so that we can spend more time gardening and less time recovering from the activities we enjoy. These tools are usually lightweight and have common features such as adjustable extensions and effortless grip handles. The tools shown in Appendix F are examples of the kinds of tools you should look for when shopping in your local hardware or garden store. If you choose to buy your accessible tools, make sure that they are the most comfortable for your personal use. You should not feel strain when testing these tools.

You do not have to buy new tools to promote accessible gardening. Donald Frisch, coordinator of Therapeutic Horticulture Programs at the Zimmerman Sensory Garden, recommends modifying your current tools so that they meet your individual needs. This can be done by using duct tape or another adhesive to combine the materials you already have. For example, Frisch has attached bamboo poles to shovels to extend the reach of the tools so that they connected a person using a wheelchair with the ground planter, allowing them to garden more comfortably. Modifying your planters is not always feasible; adapting your current tools so that they work for you can make up for the inability to make more permanent changes to your garden.

The International Labour Organization provides an excellent guide on how to modify tools to meet your personal needs in their 1997 article entitled "Handbook: accessibility and tool

²⁹ Information taken from Grassroots Gardens:
http://www.grassrootsgardens.org/uploads/2/6/3/8/26383225/vertical_gardening_worksheet.pdf



adaptations for disabled workers in post-conflict and developing countries”. Although this resource was created for workers outside the US, the tool modification ideas the ILO suggests in this article are universal and can be used to help you and your gardeners work with less strain in the garden. This handbook can be found by visiting:

http://www.ilo.org/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_107950.pdf

Plants for an Accessible Garden

Why use native plants?

Native plants are plants that are originally from your area. There are a number of benefits to using native plants over non-native plants. First, because they are already adjusted to Buffalo’s climate, they require less maintenance than nonnative plants. This works to make gardening easier and more enjoyable for all gardeners. Second, native plants use less water than nonnative plants because they make the most of natural rainfall. So, you will use less energy watering (a traditional watering hose is not always accessible for all users) and will be able to spend more time gardening. Because of these benefits, the use of native plants, when possible, should be considered when deciding which plants to use in your accessible gardens.

Creating a sensory garden

A sensory garden is a garden that is specifically designed to stimulate the senses for people with sensory processing disorders. In a way, all gardens are sensory gardens because they naturally tend to engage your sense of hearing, sight, smell, touch, and even taste. However we can design our gardens better, by either choosing new plants or rearranging the plants we already have intentions to plant, so that the types and arrangements of plants we use engage all of our senses to the greatest extent so we get the most benefit from spending time in the garden. Gardens around the country have been specially designed to either heighten the use of a single sense or multiple senses, depending on the community they are trying to reach. Because our communities in Buffalo are so diverse, composed of people with a wide range of abilities, we should strive to create sensory gardens that engage the widest use of senses.

Hearing Stimulation: Consider using plants that create a unique sound when rustled by the wind such as long grasses or plants with large leaves. Selecting plants that attract desirable garden critters such as bees and hummingbirds can also boost the hearing stimulation that occurs in your garden. Objects that are not plants can be used to heighten the hearing stimulation in your garden. These objects could include wind chimes or fountains.



Sight Stimulation: Plant bright, colorful, or unique looking plants that are strategically placed for maximum contrast. Alternate between bright reds/oranges/yellows and cool blues/greens/purples to avoid overstimulation. Selecting plants that attract butterflies, birds, and other welcome wildlife will also enhance the visual stimulation of your garden.

Smell Stimulation: Certain plants give off stronger and more pleasurable scents than others. Consider planting roses or other fragrant flowers to heighten the use of both sight and smell. Or plant herbs so that both your sense of smell and taste are stimulated.

Touch Stimulation: Use plants with an array of different textures that encourage participants to touch and compare the different plants. Avoid using plants that pose a danger to touch such as cacti or poisonous plants.

Taste Stimulation: Our gardens have been used to provide healthy and fresh produce to our communities. We should continue to plant a wide variety of fruits, vegetables, and herbs that allow us to take part in tasting our gardens' vegetation.

For more general information on sensory gardens see:

1. "Many Benefits of Sensory Gardens" *Planet Natural*. <http://www.planetnatural.com/sensory-gardens/>
2. "Sensory Gardens" *Natural Learning Initiative*. <http://naturalearning.org/content/sensory-gardens>
3. "Creating a Sensory Garden—Ideas and Plants for Sensory Gardens" By Susan Patterson. *Gardening Know How*. <http://www.gardeningknowhow.com/special/accessible/sensory-garden-ideas.htm>

In Appendix G you will find a list of native and nonnative plants with descriptions, images, planting requirements, and the benefits and limitations of each plant. These specific plants have been included in this guide because they either have been heavily used in Grassroots Gardens community gardens in prior seasons or because they are native to the Buffalo region. These plants are organized by which type of accessible planter is most appropriate for them in your garden.³⁰

³⁰ For more information on New York native plants see: <http://www.plantnative.org/rpl-nypanj.htm> and for more information on Buffalo native plants see Buffalo Niagara Riverkeeper's Western New York Guide to Native Plants for Your Garden available at: http://bnriverkeeper.org/wp-content/uploads/2014/07/BNRiverkeeper-Native-Plant-Guide_WEB.pdf



Conclusion and Special Thanks

There have been a lot of suggestions made in this guide on how you can make your community garden more accessible. It is understandable that some of these suggestions may be neither feasible nor appropriate for your garden at this time. Please take this guide into consideration when making future changes to your garden. This guide was designed for creating accessible community gardens in Buffalo but I hope that it will lead you to think about how to incorporate the principles of Universal Design to promote accessibility in other aspects of your life so that Buffalo becomes a fully accessible and inclusive city.

Special thanks to Linda Chisari, Bill Dawson, Donald Frish, and Dr. Rosemarie Rossetti for their invaluable insight and advice that helped shape this guide.



Appendix A: Buffalo Population Distribution Characteristics

Population Distribution Characteristics

	United States	Erie County	City of Buffalo
Total Population	316,128,839	919,866	260,568
Residents under 65 Years with a Disability	271,554,673	769,928	229,821
% of Total Residents Under 65 Years with a Disability	8.40%	9.10%	13.60%
Residents Under 18 Years	7,369,519	83,707	59,528
% of Total Residents Under 18 Years	23.30%	20.80%	22.00%
Residents Under 18 Years with a Disability	294,780	3,934	3,750
% of Residents Under 18 Years with a Disability	4.00%	4.70%	6.30%
Residents Over 65 Years	44,574,166	149,938	30,747
% of Total Residents Over 65 Years	14.10%	16.30%	11.80%
Residents Over 65 Years with a Disability	16,046,699	54,727	12,913
% of Residents Over 65 Years with a Disability	36.00%	36.50%	42.00%

Appendix B: Accessible Walkways

Figures 1 & 2: Garden door handles should be stationed 34-48 inches above the ground and should allow for easy operation, using little force with the closed-fist method.

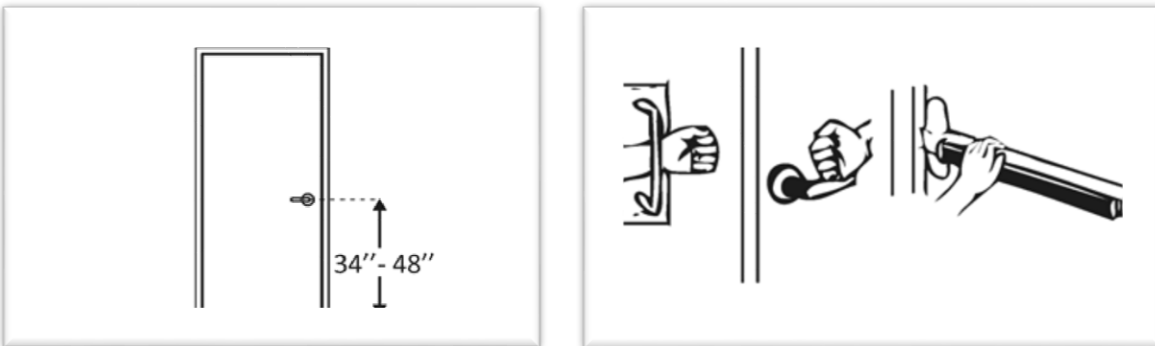


Figure 3: There should be a 32 inch clear entryway when garden door is opened 90 degrees or greater.

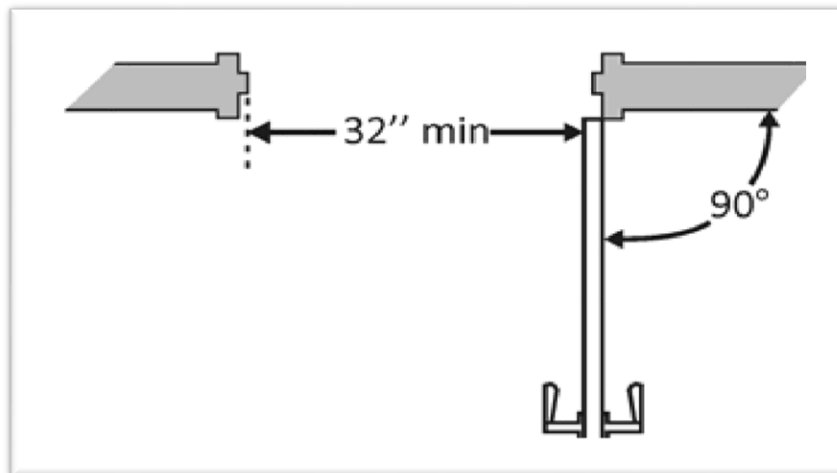


Figure 4: For pull doors of entry access, there should be a clearing space of 18 inches next to the gate handle to allow for operating the door. 60 inches should be provided on handle side of door so that gardeners can safely back up to open the door.

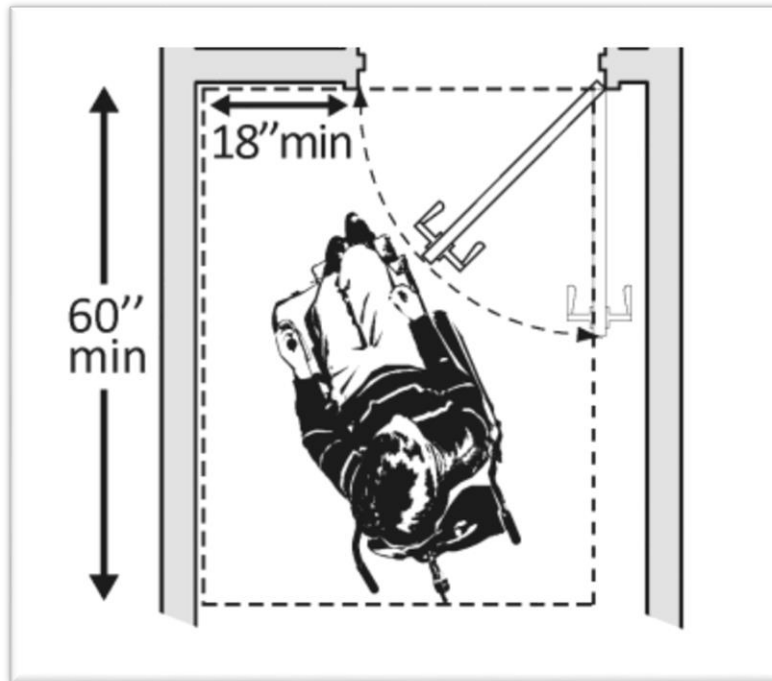


Figure 5: Walkways should be 36 inches wide at the minimum to allow wheelchair and walker access. Making paths 48 inches wide should allow for two people to pass each other comfortably or walk alongside each other; 48 inch paths, although not a recommendation of the ADA checklist, benefit everyone and promote Universal Design.



Figure 6: There should be a turning point with a 60 inch diameter distanced at appropriate lengths in your garden. If your garden is a small community garden with one main path, turning points should be placed, at a minimum, at the front and back ends of your garden. A T-shaped turning area, as pictured below, can also be used. T-shaped spaces should use the minimum dimensions given below.³¹

³¹ Images for Figures 1-6 were taken from the 2010 ADA Checklist for Existing Facilities. More information can be found at: <http://www.adachecklist.org/doc/fullchecklist/ada-checklist.pdf>



Grassroots
Gardens
of Buffalo

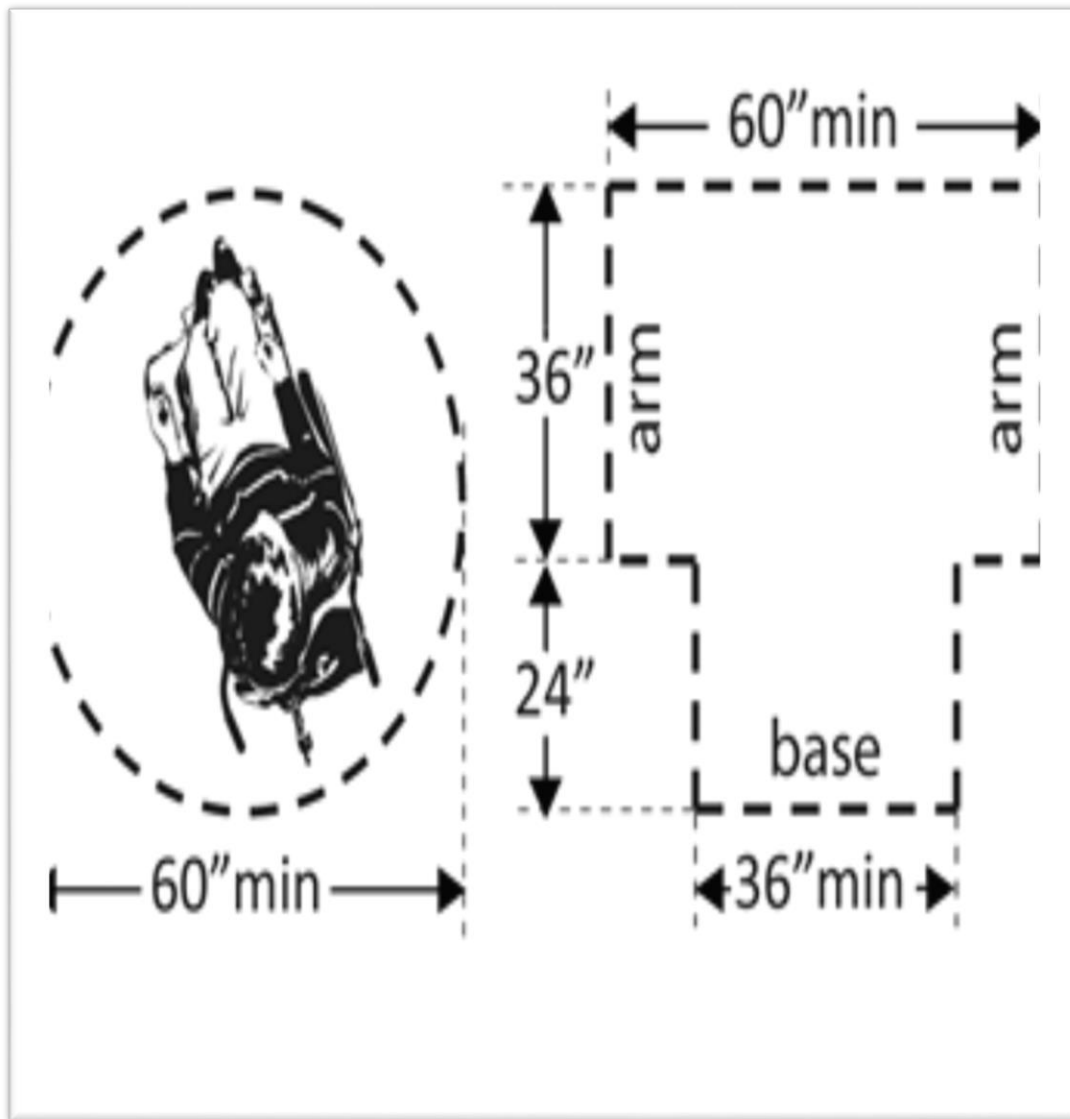


Figure 7-10: Pictured below are paths that are **not accessible** and pose a safety hazard for all gardeners. Although some paved paths can be visually appealing, when designing walkways, accessibility should be considered so that the greatest amount of people with the widest amount of abilities can comfortably access the walkways.

Figure 7³²



Figure 8³³



Figure 9³⁴



Figure 10³⁵

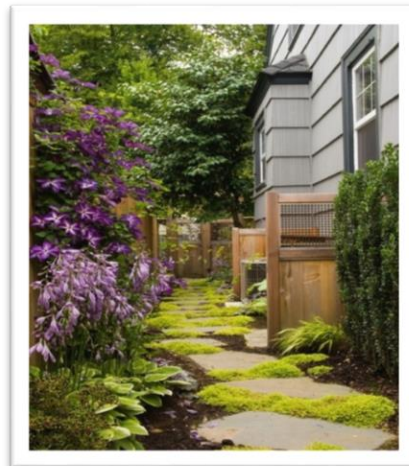


Figure 11: Natural paths can be made more accessible by creating a level and maintained surface that is barrier free. This allows for safe travel for all gardeners.³⁶

³² Figure 7 image courtesy of <http://breatheforlove.net/best-stone-walkway-ideas/best-crushed-stone-for-walkways/>

³³ Figure 8 image courtesy of <http://www.energyauditorhq.com/eco-friendly-building-materials/>

³⁴ Figure 9 image courtesy of http://www.foxislandwa.net/boy_scouts.htm

³⁵ Figure 10 image courtesy of <http://www.minimalisti.com/home-garden-design/06/tips-garden-design-paths-planning.html>

³⁶ Figure 11 image courtesy of <http://www.minimalisti.com/home-garden-design/06/tips-garden-design-paths-planning.html>



Figure 12: Hazardous walkways can be a threat to the safety of all who come to enjoy the garden. Make sure that after each gardening session, paths are cleared of tools and other objects that might interfere with safe travel.³⁷



Figure 13: Gravel/Crushed Stone³⁸

³⁷ Figure 12 image courtesy of <http://www.bw-rubbish-removal.co.uk/gardenclearance.php>

³⁸ Figure 13 image courtesy of <http://www.americantrails.org/resources/trailbuilding/ArtCrushedStone.html>

Using a type of crushed stone for paved paths will create a formal and more long lasting garden path. The most important thing to consider when deciding to work with crushed stone is choosing a material that can be made easily compact. Gravel, when loose, can create more of a hazard than a natural path would have. To avoid this hazard, use smaller crushed stones (instead of rounded stone pieces) that will lock together to form a firm surface. Additionally, avoid materials like sand that will cause gardeners using wheelchairs or pushing wheeled-carts to sink into the sand because of a lack of binding surface material.



Graded stone paths, like Figure 13 pictured to the left, can create greater access for all gardeners. The path should be built with a grade of no more than 6%-8%. To minimize error, please consult with your local gardening store or a professional landscaper prior to starting your path project. One approach to installing a crushed stone path may not be appropriate for all gardens' needs and so it is important to consult with a professional prior to starting your project. Below are steps detailing one way to install a crushed stone path.

What you'll need:

1. Edging (twice the length of your path and tall enough so that $\frac{1}{2}$ remains uncovered after layers of crushed stone are placed)



2. Crushed stone (Avoid rounded pebbles. Ask your local garden store about which materials are most appropriate for your specific garden needs to create a compact, firm surface)
3. Stone pack (You will need at least 6 to 7 cubic feet for every 10 feet of path. Stone pack includes a mix of stone dust and crushed $\frac{3}{4}$ inch stones)
4. Landscaping fabric to cover the length and width of your path
5. Tools: square-edged shovel, rake, hand tamper, hammer and wooden block

What to do:

1. Create an outline of your path shape using ropes or spray paint to mark the edges. You can make straight or curved paths using crushed stone.
2. Remove 4 inches of soil within your border outline. Be sure to use a square-edged shovel so that the sides and bottom of your path are even.
3. Smooth the bottom of your trench with your shovel or a steel rake and use a flat surface to compact the soil. A hand tamper can be used for this purpose.
4. Create a compact base of tamped-down stone pack by creating a mix of $\frac{3}{4}$ inch stones and stone dust. Add 2 $\frac{1}{2}$ inches of crushed stone pack to your path evenly. You can use your rake to create an even and level surface.
5. Lightly spray the stone pack layer with a watering can or hose and then use your flat surface tool or hand tamper to pound the stone pack into a compact hard surface.
6. Lay landscape fabric shiny side up over your stone pack layer. Use pins to hold the fabric down over your compact base.
7. You can use many different materials for your edges, depending on where your path is in the garden. For example, you can use 3-5 inch tall edging or bricks or stones for a stable edge. For this example, we will look at the use of edging to line your path. Depending on which type/brand of edging you have chosen to use, follow the manufacturer's instructions for building care. Line the inside of the trench with edging pieces so that they are on top of the landscape fabric. Using a wood block and a hammer, tap the edging in to the ground so that it is straight and not leaning in or away from your path.
8. Backfill along the backside of the edging to insure that edging is and will remain stable.
9. Fill your path with crushed stone so that $\frac{1}{2}$ inch of edging remains visible.
10. A crushed stone path is only accessible if it is properly maintained. Regularly rake and weed your path as necessary so that it remains firm and stable.³⁹

Getting More Information:

³⁹ Building instructions taken from *This Old House Magazine*. More information can be found at: <http://www.thisoldhouse.com/toh/how-to/intro/0,,20048448,00.html>

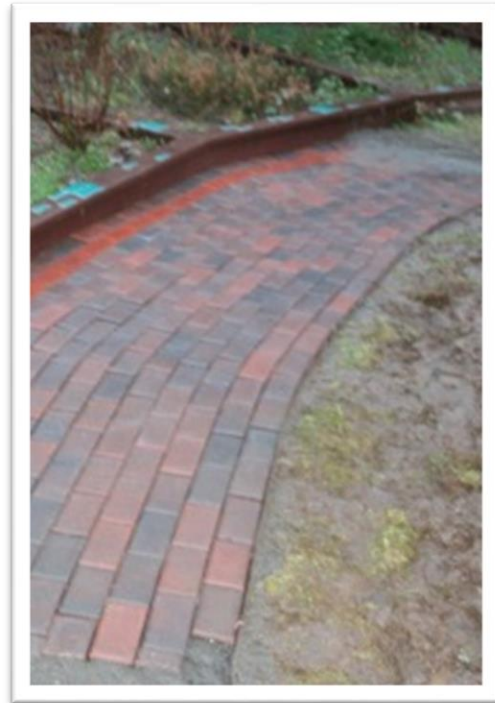
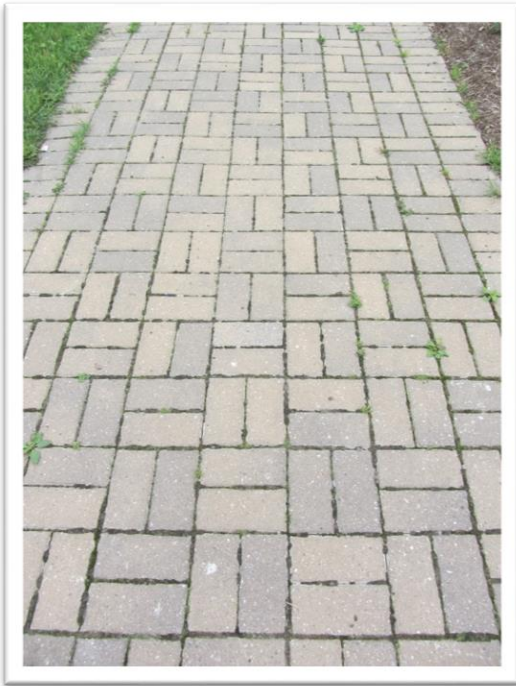


1. “How to Lay a Gravel Path” in *This Old House Magazine* by Alexander Brandon.
<http://www.thisoldhouse.com/toh/how-to/intro/0,,20048448,00.html>
2. “Building Crusher Fines Trails” by Louis Bachensky *American Trails.org*
<http://www.americantrails.org/resources/trailbuilding/BuildCrushFinesOne.html>
3. “The Art of Building Crushed Stone Trails” by Tony Boon *Arrowhead Trails, Inc.*
<http://www.americantrails.org/resources/trailbuilding/ArtCrushedStone.html>
4. “Accessibility Guidebook for Outdoor Recreation and Trails” by Janet Zeller, Ruth Doyle, and Kathleen Snodgrass *The Forest Service, United States Department of Agriculture*
<http://www.fs.fed.us/recreation/programs/accessibility/htmlpubs/htm06232801/>
5. Affordable Garden Path Ideas *The Family Handyman*.
<http://www.familyhandyman.com/garden-structures/garden-paths/affordable-garden-path-ideas/view-all#step1>
6. *Paths and Walkways: Simple Projects, Contemporary Designs (Garden Design)* by Hazel White and Matthew Plut. Chronical Books: 1998

Figure14⁴⁰ & 15⁴¹: Brick

⁴⁰ Figure 14 image courtesy of Melissa Bravo taken in Buffalo June 2015

⁴¹ Figure 15 image courtesy of http://www.foxislandwa.net/boy_scouts.htm



Installing a brick walkway in your garden can be an excellent way to create an accessible walkway if it is installed and maintained properly. However, it can be more expensive and labor intensive than installing a crushed stone path. Talk with your local garden/hardware store prior to installing your path to determine which material is best for your garden space.

What you'll need:

1. Bricks
2. Crushed-stone base
3. Masonry sand, garden edging
4. Spray paint or rope
5. Landscape fabric
6. Tools: rubber mallet/brick hammer, measuring tape, rake, hand tamper, level

What to do:

1. Remove existing pavers and clear intended path of debris, loose rock, and plants.



2. Mark an outline for your new path using spray paint and rope. Measure your width every few feet to ensure that you have created a consistently wide enough path to meet the ADA requirements listed above. Be sure to measure your path so that an even number of bricks can be applied to your path. If you do not measure beforehand, you risk having gaps in your path. An uneven or unsolid brick path can be far more dangerous for people with limited mobility than a natural path.
3. Compact the loose soil using a hand tamper.
4. Lay ground cover fabric over the full length and width of your path.
5. Spread a base of crushed limestone (ask your local hardware store which base is most appropriate for your chosen brick material). Apply the crushed limestone to a depth of at least 4 inches to create a compact and solid base.
6. Use a level and piece of wood to ensure that your base is even.
7. Use a hand tamper to compact the base.
8. Insert your metal edging to both sides of your path so that it is over the fabric and then stake it down. Because different edging materials and brands require different installing instructions, you should always follow the instructions provided in your edging kit.
9. Using the backside of your rake, apply a layer of masonry sand to your base.
10. Use a piece of wood and level to ensure that your sand layer is even.
11. Compact your sand layer using a hand tamper.
12. Lay bricks in desired pattern. Tap bricks into place (so that they are even with edging) using a mallet. Use the level and piece of wood to ensure that your bricks are placed at an even level.
13. Pour masonry sand over top of brick layer and sweep into every opening so that the path is compact and bricks are not loose.
14. Depending on weather conditions, the sand and brick layer may take up to a week to settle.

For more information on brick pathways see:



1. “How to Install a Traditional Brick Walkway” *DIY Network*
<http://www.diynetwork.com/how-to/outdoors/structures/how-to-install-a-traditional-brick-walkway>
2. “How to Lay a Brick Path” by Jennifer Stimpson *This Old House*
<http://www.thisoldhouse.com/toh/how-to/intro/0,,20200448,00.html>
3. “How to Build Pathways: Brick and Stone Pathways” *The Family Handyman*
<http://www.familyhandyman.com/masonry/how-to-build-pathways-brick-and-stone-pathways/step-by-step#step6>
4. “Making Paths & Walkways: Stone, Brick, Bark, Grass, Pebbles, & More” by Paige Gilchrist Blomgren. Lark Books: June 2001

Figure 16⁴²-17⁴³: Permeable Pavers



Permeable pavers come in many different shapes, sizes, and styles. Permeable pavers are a type of pavement that can be manipulated to be accessible for garden walkways. Permeable pavers also soak up excess rainwater so that paths remain safe and slip resistant for all users. This type of walkway can be made of porous asphalt, concrete, paving stone, and manufactured grass pavers. Before considering using permeable pavers, you should consider the benefits and limitations of using this material. Depending on the season and your garden soil type as well as the design and material you choose, permeable pavers can require varying levels of installation and regular maintenance. Additionally, to reduce the risk of error, installing a permeable pavement path should be done with the oversight of a professional crew. Consult with a professional on whether installing a permeable pavement path is the best solution to make your specific garden space accessible. Because this type of pavement should only be installed with professional oversight, building instructions have not been included.

⁴² Figure 16 image courtesy of <http://www.pavesearch.com/permeable-pavers-menu.htm>

⁴³ Figure 17 image courtesy of <http://naturalfamilytoday.com/lifestyle/sustainable-landscaping-maintenance-tips-for-homeowners/>



More information on permeable pavers:

1. Permeable Paving *Massachusetts Low Impact Development Toolkit*
http://www.mapc.org/sites/default/files/LID_Fact_Sheet_-_Permeable_Paving.pdf
2. Permeable Pavement Fact Sheet Information *University of Maryland Extension*
https://extension.umd.edu/sites/default/files/docs/programs/master-gardeners/Howardcounty/Baywise/PermeablePavingHowardCountyMasterGardeners10_5_11%20Final.pdf
3. “How to Install a Permeable-Paver Driveway” by Troy Johnson *This Old House*
<http://www.thisoldhouse.com/toh/how-to/intro/0,,20579725,00.html>

Appendix C: Accessible Garden Walkway Accessories

Figure 1: Accessible Ramps

For every inch of height increase, the ramp should be 12 inches long so that the maximum running slope is at most 1:12 or a slope of no more than 8.3%. Like your accessible pathway, the width of the ramp should be at least 36 inches.

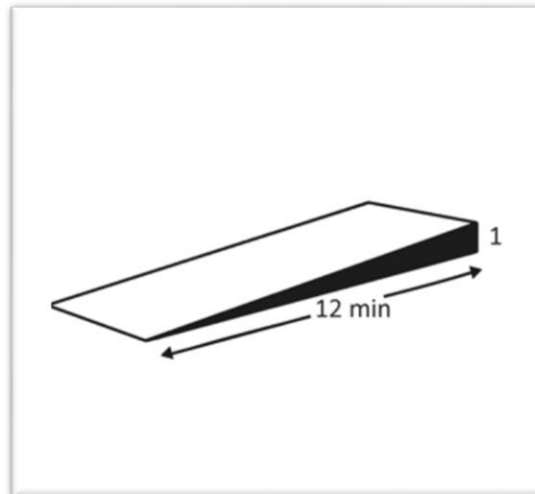


Figure 2: Accessible Ramps

Ramps that rise more than 6 inches should have accessible railings on both sides.

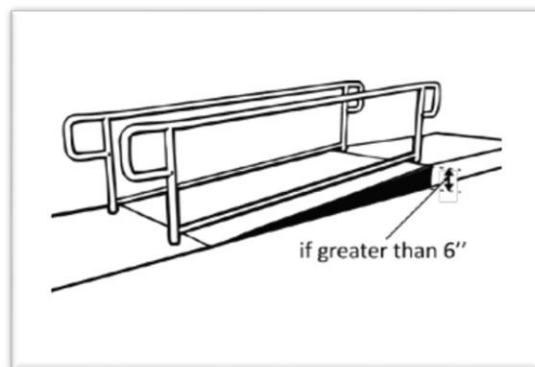


Figure 3: Accessible Railings

If you would like to install a railing at any point in your garden walkway, make sure that doing so does not decrease the 36 inch-wide pathway that is required for accessibility.

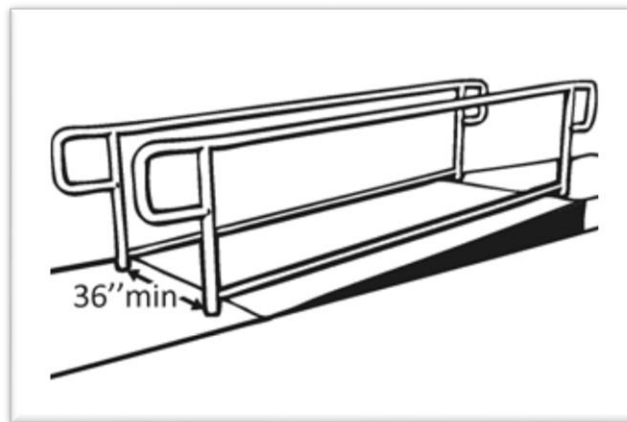


Figure 4: Railing Height

Additionally, the railing should be at an appropriate height so that the greatest number of people can benefit from using it. The ADA checklist recommends that the railing be between 34 and 38 inches from the ground surface at all points, whether the ground is sloped or flat.

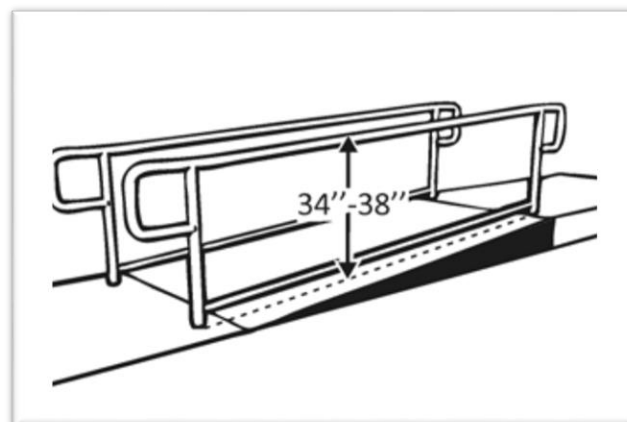


Figure 5: Railing Grip Surface

If you choose a circular handrail, the gripping surface should be between a 1 ¼ inch and a 2 inch diameter.

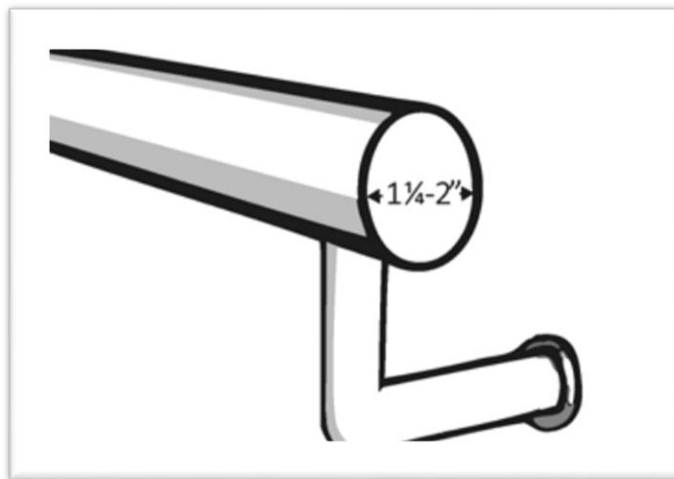


Figure 6: Railing Grip Surface

If the handgrip of your selected railing is non-circular, the perimeter should be between 4 and 6 ¼ inches.⁴⁴

⁴⁴ Figures 1-6 were taken from the 2010 ADA Checklist for Existing Facilities. More information can be found at: <http://www.adachecklist.org/doc/fullchecklist/ada-checklist.pdf>

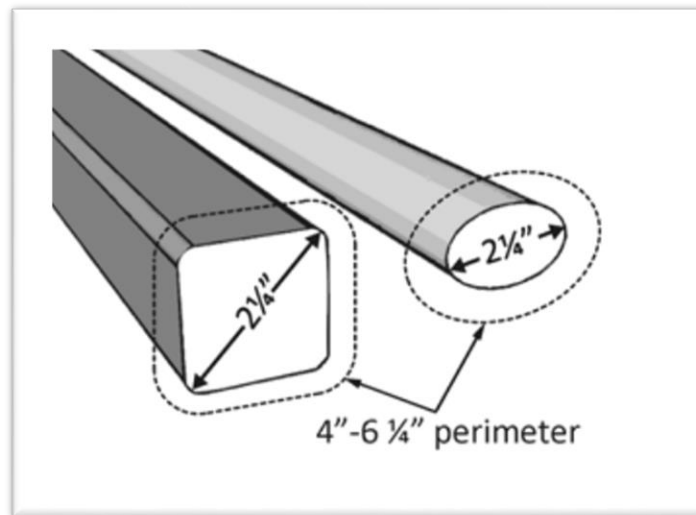


Figure 7 & 8: Beautifying Your Garden Without Decreasing Accessibility

You can attach hanging plants, wind chimes, or other decorations to hang either underneath or on the outside of your railing. Your accessories should not interfere with someone's access to using the railing. It is more important to have functional railings than aesthetically appealing railings. Consider how your decorations will behave in variable weather conditions. Hanging plants or objects should not swing inward to limit your path access.



45



46

⁴⁵ Figure 7 image courtesy of <http://offbeathome.com/2011/06/library-cats-photos>

⁴⁶ Figure 8 image courtesy of http://guide.alibaba.com/shop/railing-wrought-iron-hanging-basket-flower-pot-rustic-balcony-diaolan-flower-plants-belt-chain-hanging-basket_6280581.html

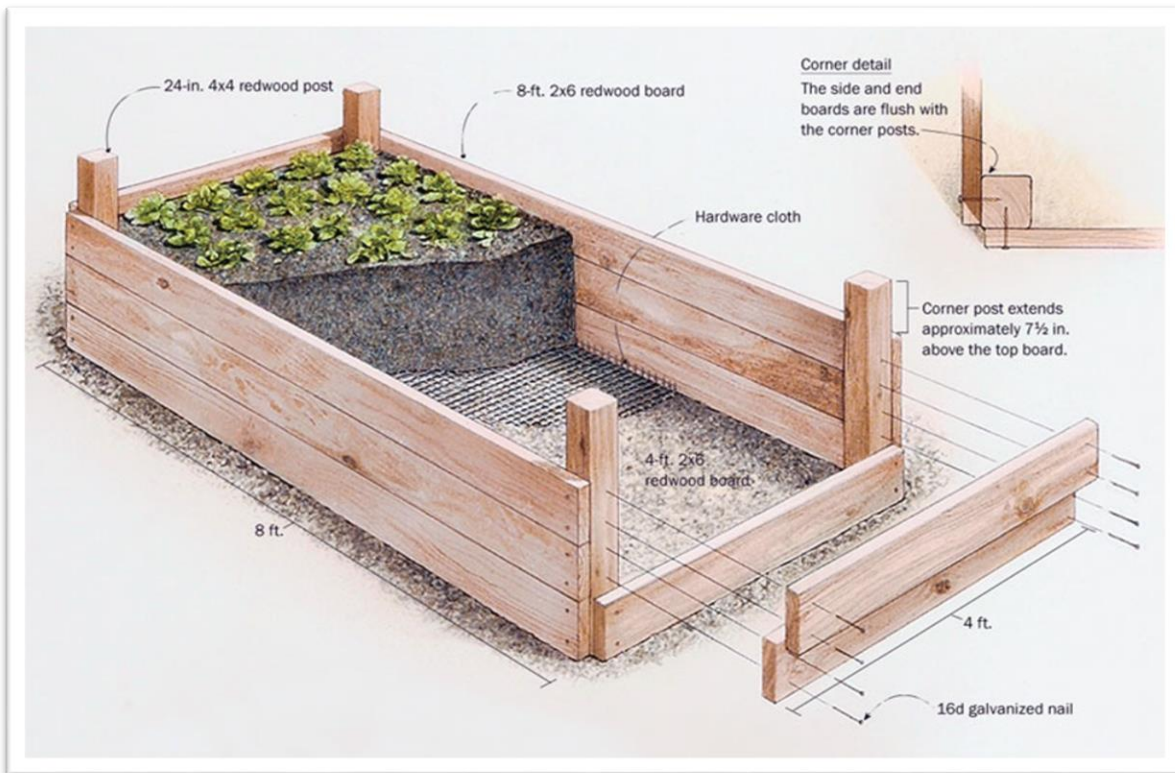


Appendix D: Accessible Planters

Figure 1: Accessible Planter Technique 1⁴⁷

The design described below is for raised-beds that will measure 4x8 feet. Although this is longer than the recommended 5-ft diameter, the beds are still accessible so as long as there is an accessible 36-inch wide path on both of the 4ft wide sides of the beds so that gardeners can easily reach all points of the garden bed.

⁴⁷ Figure 1 image courtesy of <http://www.vegetablegardener.com/item/2606/build-your-own-raised-beds/page/2>



What you'll need:

- One 8-ft 4x4 redwood post (another sturdy wood can be used for this project instead of redwood)
- Nine 8-ft 2x6 redwood boards
- One 1-lb. box of 3 1/2 inch galvanized nails
- 1/2 inch 4-ft by 8-ft hardware cloth
- Tools: measuring tape, pencil, hammer, staple gun

What to do:

1. As with installing any garden bed, be sure that you have cleared a flat patch of garden space equal to that of your intended bed.
2. Cut your corner posts from your 4x4 into four 24-inch lengths.
3. To make your long sides, nail three 2x6 boards stacked vertically to two of your corner posts. The 2x6 boards should align with the bottom of the post while having about 7 1/2 inches of clear space at the top of the posts. Do this process twice to make two long sides.

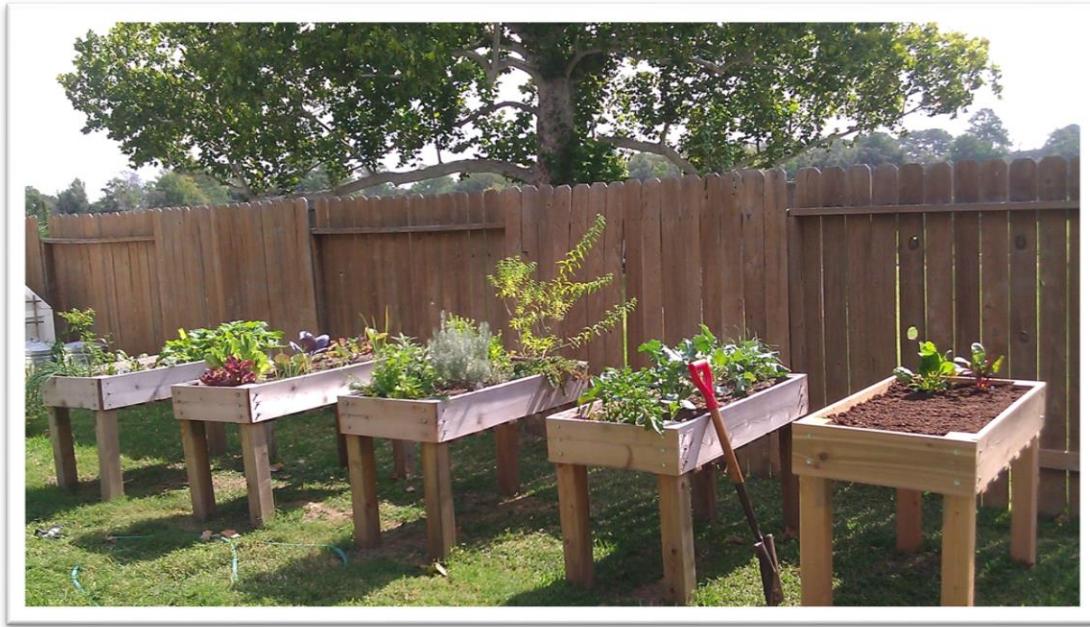


4. Cut three 2x6 boards in half so that you have six 4-foot 2x6s for the shorter ends of the bed. Stack and nail the 2x6 boards to the end posts so that they are stacked vertically, three to each side. These should also align with the bottom of the corner posts, leaving a 7 ½ gap of clear space at the top of the boards.
5. Staple a 4ft by 8ft piece of ½ in hardware cloth across the bottom of the box.

For more information on how to build this type of raised garden bed visit:

1. “Build your own raised beds” by Linda Chisari from *Kitchen Gardener Magazine*
<http://www.vegetablegardener.com/item/2606/build-your-own-raised-beds/page/2>
2. “DIY Garden Planter Box Tutorial” from *Mom on Timeout*
<http://www.momontimeout.com/2012/05/diy-garden-planter-box/#comment-94562>
3. “30” Raised Bed” by Tammy and Mel Glover
http://www.blackhillsgarden.com/index.php?p=1_178_30-high-raised-bed

Figure 2: Accessible Planter Technique 2



What you'll need:

- Two 4x4 fir or cedar post
- Two 1x8x8 cedar boards
- Two 1x3x8 cedar boards
- One role of 1x4" hardware cloth 50x24"
- Sixteen 2-inch 14-20 hex bolts
- Sixteen washers
- Sixteen threaded inserts (like these: <http://www.grainger.com/product/Hex-Drive-Threaded-Insert-4ZU78>)
- Twelve 1 ½ inch brass or galvanized screws
- Tools: measuring tape, staple gun, pencil, drill, saw, wire cutters, safety glasses and hearing protection

What to do:



1. For the garden legs, use your saw to cut the 4x4s into four 36-inch legs.
2. For the garden box sides, use your saw to cut one of the 1x8x8 cedar boards into two 48-inch lengths.
3. For the garden box ends, use your saw to cut the other 1x8x8 cedar board into two 24-inch lengths.
4. For the bottom slats, use your saw to cut the two 1x3x8 cedar boards into six 24-inch lengths.
5. Using your wire cutters, cut the bottom hardware cloth into a 24x50-inch rectangle.
6. Prior to building, sand your boards and clean off excess sand with a wet cloth. Apply primer or wood conditioner as needed.
7. Assemble to bed upside-down using one or two pin nails on each side of the leg to hold it together. Use a hand drill to put 3 holes onto each side piece so that the legs are also marked.⁴⁸
8. Drill the leg holes as straight as possible to the depth of your bolts.
9. Insert the threads and bolt the sides with the threaded inserts, washers and bolt screws so that the sides and legs are screwed tightly together.
10. To attach the hardware cloth, cut the cloth to the appropriate size and staple the cloth around the legs.⁴⁹
11. Add slates to the bottom of your box so that the weight of the soil and plants do not pull off the hardware cloth.
12. Screw the slats in place using two galvanized screws at each end of each slat.

Figure 3: Upside-Down Assemblage

⁴⁸ See Figure 3 below courtesy of <http://ana-white.com/2012/11/plans/counter-height-garden-boxes-2-feet-x-4-feet>

⁴⁹ See Figure 4 below courtesy of <http://ana-white.com/2012/11/plans/counter-height-garden-boxes-2-feet-x-4-feet>



Figure 4: Attaching the Hardware Cloth



For more information on how to build and design this type of raised garden bed visit:

1. “Counter Height Garden Boxes 2 Feet by 4 Feet” from *AnaWhite* <http://ana-white.com/2012/11/plans/counter-height-garden-boxes-2-feet-x-4-feet>
2. “My Little Garden” from *AnaWhite* http://ana-white.com/2015/05/DIY_furniture/my-little-garden
3. “How to Build an Elevated Garden” from *Addicted to Decorating* <http://www.addicted2decorating.com/how-to-build-an-elevated-garden.html>

More ideas for Raised Planters:

Figure 5: Wheelchair-Designed Accessible Planters⁵⁰



⁵⁰ Figure 5 image courtesy of <http://www.universaldesignstyle.com/terraform-wheelchair-accessible-garden-kit/>

Figure 6: Accessible Pipe Planters⁵¹



Figure 7: Cement Garden Planters⁵²



⁵¹ Figure 6 image courtesy of <https://davesgarden.com/community/forums/fp.php?pid=2421664>

⁵² Figure 7 image courtesy of <http://www.diyncrafts.com/10898/home/brilliant-gardening-project-how-to-make-a-raised-garden-bed-using-cement-blocks>

Figure 8: Accessible Brick Planters⁵³



Figure 9: Accessible Circular Gardens⁵⁴



⁵³ Figure 8 image courtesy of <http://forum.vpaaz.org/forum/topics/cinder-blocks-for-raised-beds>

⁵⁴ Figure 9 image courtesy of Melissa Bravo taken in Buffalo June 2015

Figure 10: Sitting Planters⁵⁵

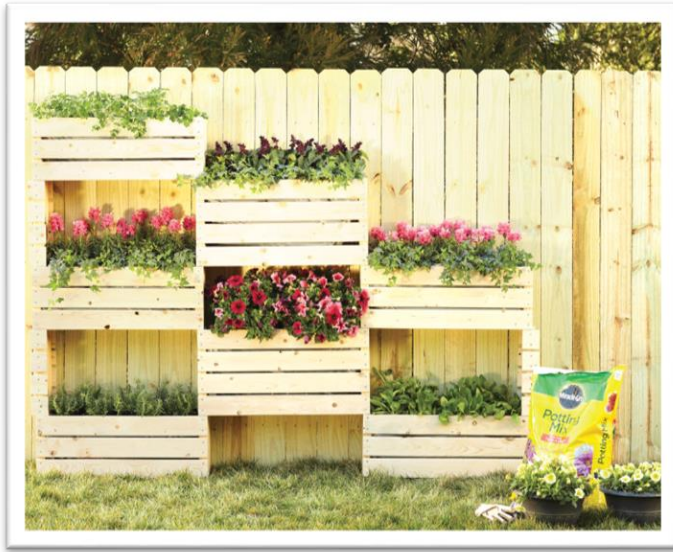
These planters allow gardeners to garden by sitting on the six inch wide edge of the planters. The brick and cement planters in the above figures, because of their wall width, also allow gardeners to sit on the edges of the planters. This prevents gardeners from having to bend down for extended periods of time to reach the beds. Although the type of design shown in Figure 10 may be more accessible for certain populations, it also limits the reach of others who are not able to sit comfortably on the bed edges. Despite this, it may be an appropriate type of planter for your community as it may benefit your gardeners more than it harms them.



⁵⁵ Figure 10 image courtesy of <http://lindachisari.com/Pages/PhotosKitchen.htm>

Appendix E: Accessible Alternatives to Ground Planting

Figure 1: Crate-Style Vertical Gardening⁵⁶



This approach may require a different amount of materials depending on how high you choose to build your structure. If you want all levels of the structure to be accessible, build it no higher than 50 inches. You may also attach the structure to a wall to create additional support for the structure so that it is not damaged in extreme winter conditions and so that it does not pose a danger to gardeners. The instructions below are for designing a structure of five small crates so that the structure remains below 50 inches. (Figure 1 to the left

uses 5 small crates and 2 large crates and is taller than the recommended height for safe and accessible vertical gardening).

What you'll need:

- Two 8-foot 2x10s
- Three 8-foot 2x4s
- 10 8-foot 1x4s
- 1 roll of wire mesh with half inch gap
- 1 roll of weed barrier
- 1 box of 1 ½ inch screws
- Tools: saw, drill with a 1/8 inch drill bit, staple gun, tape measure, gloves, safety goggles

What to do:

1. Using your saw, measure and cut ten 11 inch pieces of your 2x10 wood boards.
2. Using your saw, measure and cut thirty 30 inch long pieces of your 1x4s wood boards.

⁵⁶ Figure 1 image courtesy of <http://www.countryliving.com/gardening/garden-ideas/how-to/a35138/vertical-planter-project/>



3. Using your saw, measure and cut sixteen 2 inch long pieces of your 1x4s wood boards.
4. Using your saw, measure and cut ten 27 inch long pieces of your 2x4 wood boards.
5. For each of the five boxes: use 3-inch exterior deck screws to attach two 2x4 pieces and two eleven inch 2x10 pieces. Be sure to attach the 2x4 pieces at the lowest point of the 2x10s spaced so that plants have some room underneath to drain (No more than a cm but use your discretion, as measurements may vary depending on which plants you intend to use in these bins). To make the sides of your smaller crates, pre-drill all screw holes through the six 30 inch 1x4s and into the 2x10s, leaving a ¼ inch gap between the boards. Screw the 1x4 pieces onto the front and back using 1 ½ inch screws into your pre-drilled holes.
6. Use the wire cutters to cut the ½ inch gap wire mesh into 9"x27" pieces, and line the bottom of the planters.
7. Use a staple gun to fix the wire in place.
8. Cut and staple pieces of polypropylene weed barrier and line the entire interior of the crate. This protects the wood from moist soil.
9. For each of the side supports of the planter, take one of the 11 inch 2x10s and eight (four for each side of the 2x10) of the 2 inch long 1x4s. Pre-drill and then screw the 2x10s through the 1x4s. The supports should equal the height of the crate. Drill the side supports into the top outer edge of the bottom smaller crate and the bottom outer edge of the top smaller crate. This process should be done twice so that each end of the whole vertical garden is supported by these side supports. Next, drill screws into the bottom corners of the large crate so that the large crate is attached to the two smaller crates. Drill screws into the bottom inside corners of the top smaller crates so that the top smaller crates are attached to the middle smaller crate.

For more information please visit "Build a Wall of Flowers for Your Backyard" by Lauren Piro of *Country Living* <http://www.countryliving.com/gardening/garden-ideas/how-to/a35138/vertical-planter-project/>

Figure 2: Shoe Pocket Vertical Garden⁵⁷



This type of gardening is easy to build and maintain and provides the garden with a unique hanging feature.

What you'll need:

- Hanging pocket shoe organizer
- 2 Poles with wall attachments (optional; many hanging shoe organizers come with a hanging pole and screw attachments)
- 4 Hooks to attach shoe organizer to wall or fence (the amount will depend on the heaviness of what you plan to plant. Have at least four hooks to support the weight of your garden)
- Role of sturdy wire that can support the weight of your garden
- 2x2 piece of wood as long as the width of your pocket organizer

What to do:

1. Adjust your shoe organizer to your desired height. You can lower the height of your shoe organizer by pinning back layers so fewer levels are used for plants. Because of the

⁵⁷ Figure 2 image courtesy of <http://www.instructables.com/id/VERTICAL-VEGETABLES-quotGrow-upquot-in-a-smal/>



length of your shoe organizer, all layers may not be accessible once the shoe organizer is hung up. Be sure that some layers are accessible and within 30-50 inches of the ground. Also, consider your gardener population when choosing your shoe garden height; do not set organizer so high that step ladders would be necessary for your gardeners to reach the top levels.

2. Attach pole with metal fitting to sturdy wall to a height that allows your shoe organizer to hang but so that you can still easily reach all levels.
3. Use hooks and wire (see Figure 3 below) that can hang from pole and support the weight of the shoe organizer with compost, plants, and water. Use the wire hooks to attach the shoe organizer to the attached wall pole.
4. Make sure that your shoe organizer will drain. Do this by pouring some water in the pockets prior to planting. If pockets do not drain, punch a few holes in the pockets with a sewing needle. The holes should be large enough to allow for slow drainage while still allowing the plants to hold in water and nutrients.
5. Attach your piece of wood lengthwise to the bottom of your hanging garden. To avoid puncturing the pockets, staple the very edges of your shoe organizer to the piece of wood.
6. Attach the ends of the piece of wood to your wall or fence using a pole as you did for the top of your garden. This time, however, use wire wrapped around your piece of wood instead of metal hooks as most shoe organizers do not allow for hook attachments at the base. This will prevent your garden from blowing out of control in extreme weather.
7. The water will drain downward from each level, so place plants that need the most water in the bottom and plants that require the least at the top.
8. Avoid using plants that will become heavy or require a lot of space when full grown (don't plant vegetables in this container!)

Figure 3: Supportive Wire Hooks⁵⁸

⁵⁸ Figure 3 image courtesy of <http://www.instructables.com/id/VERTICAL-VEGETABLES-quotGrow-upquot-in-a-smal/>



More information can be found at:

<http://www.instructables.com/id/VERTICAL-VEGETABLES-quotGrow-upquot-in-a-smal/>

Figure 4: Pallet Vertical Gardening⁵⁹

This pallet vertical garden is perfect for creating an easy vertical garden. It requires minimal building and maintenance and can be built using materials you have lying around from previous projects. The materials listed below are excellent suggestions, however the size and type of materials needed for this project can vary because of the size of your pallet as well as which materials you have available. In deciding what types of plants to use in you pallet garden, consider the size of the plant when it is full grown.

⁵⁹ Figure 4 image courtesy of <http://www.countryliving.com/gardening/garden-ideas/how-to/a35123/how-to-turn-a-wood-pallet-into-a-vertical-garden/>



What you'll need:

- A pallet
- 1x4s (The number of pieces of 1x4s depend on the dimensions of your pallet and how many layers you intend to have. The painted picture above has 4 gardening layers)
- 1 2x4 the length of your pallet
- Box of nails (any small nails that are available and will go work to attach the 1x4s and the 2x4s to the pallet)
- Paint (optional)
- Tools: hammer, nails, paintbrush

What to do:

1. Clean the pallet of any rubble using a hose. Air dry.
2. Remove any loose wood fragments that will not be able to support the weight of your vertical garden.
3. If you desire, replace the wood fragments that you removed while cleaning with new wood planks to create more layers and support for the garden.
4. Nail 1x4s to the pallet shelves so that plants can rest on shelves.
5. Nail your 2x4 to the bottom layer so that the base is sturdier.



6. To add aesthetic value to your garden, paint you pallets vibrant colors. (This is a great portion of the project to involve children or gardeners who may not have been able to help with the building of the pallets).
7. Plants can be planted directly into the pallet or placed in small pots in the pallet.
8. Pallet will need to be leaned against a wall or fence. Consider running wire through the pallet to attach it at ground level to your fence. This will prevent the pallet from falling over in strong winds or storms.
9. See the below link for instructions on how to attach a pallet to a wall above ground level.

You can find more information on how to build a pallet vertical garden by visiting:

1. “Brighten Up Your Garden with This Clever Repurposed Pallet Planter” from *Country Living* <http://www.countryliving.com/gardening/garden-ideas/how-to/a35123/how-to-turn-a-wood-pallet-into-a-vertical-garden/>
2. For instructions on how to mount a pallet to a wall see: “Creating a Pallet Garden” by Joes Lamp’l *Growing a Greener World* <http://www.growingagreenerworld.com/creating-a-pallet-garden-step-by-step-instructions/>



Figure 5: Shepard's Hook Hanging Plants⁶⁰

Hanging plants can add to the accessibility of your garden. By having flowers in hanging pots you create more space for larger plants to be grown in garden beds. The material you choose to use for your hanging pots is up to you, so as long as they are sturdy, accessible, and secured so that they do not pose a danger to your gardeners. You can use readymade hanging pots from your local gardening store or recycled materials such as old paint cans which can be decorated to make beautifully designed hanging flower pots.

⁶⁰ Figure 5 image courtesy of <http://hangtuffhangers.com/hangers.html>



Figure 6: Bean Trellis⁶¹

The actual size of the trellises in Figure 5 are 3 feet wide by 4 feet high. These dimensions may not be appropriate for your garden space and so consider altering the below directions so that the trellises can be used to enhance and make your garden more accessible. The directions below are for building 1 trellis; four are pictured above.

⁶¹ Figure 6 image courtesy of <http://www.wholefoodsmarket.com/blog/diy-trellises-if-you-build-it-they-will-grow>



What you'll need:

- Galvanized economy wire fencing or chicken wire
- Four pieces of untreated 1x2 cedar 4 feet tall or other wood that is pest-resistant
- Three 1x2 three foot long piece of cedar
- Four coated screws
- One-Two hinges (per trellis)
- Staple gun
- Four tent stakes (per trellis)

What to do:

1. Lay out cedar frames in desired shape.
2. Use one rust-proof deck screw to connect each of the two base boards to the 3 foot cedar board to create a sturdy base.
3. Repeat this step so that you have created two sides of the trellis. You may have to adjust to create the angle you desire for your trellis
4. Cut fencing so that it fits the length of your two trellis sides.
5. Staple the fencing between the two boards on each side of the trellis.
6. Cut ends of the fencing so that it does not pose a danger by exceeding the width of the fence.
7. Connect the two sides of your trellis using hinged at the top.
8. Use tent stakes to keep the trellis upright in your garden bed.



Figure 7: Bike Tire Trellis⁶²

This trellis is easy to build and can be made using recycled materials. Like with the bean trellis above, be sure that the tire trellis can be reached without stepping into your garden bed. They should be placed within 20 inches of the edges of your flower bed to remain accessible.

What you'll need:

- 2 bike tire frames
- Wire or garden twine
- Upright metal bar
- Metal tent stakes
- Tools: wire cutting scissors

What to do:

1. Connect the two tire frames using the metal bar so that the structure stands up vertically.
2. Tie wire or garden twine from one rim to the other until the whole wire is covered. The distance between each wire will depend on which plants you chose to use. However, tighter and closer strands will allow for more controlled growth. Do not allow for slack as this wire will need to support the weight of your plant.
3. Stake down your structure using tent stakes. This should prevent your trellis from falling over in strong winds.

More information can found at:

⁶² Figure 7 Image courtesy of: <http://www.goodshomedesign.com/diy-bike-rim-trellis/>

1. “DIY Bike Rim Trellis” form *Garden Home Design*
<http://www.goodshomedesign.com/diy-bike-rim-trellis/>

Figure 8: Squash Trellis⁶³



What you'll need:

- 8-10 foot length of ½ inch electrical conduit pipe
- Two 24 inch lengths of ½ rebar
- Electrical conduit connectors
- Nylon garden trellis mesh
- Tolls: hammer, staple gun

⁶³ Figure 8 image courtesy of <http://onecreativemommy.com/going-buggy-diy-garden-trellis/>



What to do:

1. Hammer a length of rebar vertically into the ground where you want to put your trellis. This should be done on the outside edge of your wooden garden box frame near the north end. Do this twice to create the two sides of your trellis. You should hammer them in the ground to about half the length of the rebar.
2. Bend the electrical conduit pipe to the desired length. You can do this by using either a pipe bender or by holding the pipe behind a strong beam and pulling the ends towards you. Do this step twice for each side of the trellis. Be sure that you bend the pipes so that you make the two sides even.
3. Trim excess pipe if the two pipes overlap when placed on the rebar.
4. Connect the two pipes with electrical conduit connectors.
5. Tie on the nylon garden mesh and, stretching it tight, use your staple gun to attach your mesh to your wooden planting bed.
6. Trim off any excess mesh.

For more information on this type of trellis building see:

1. “Going Buggy! DIY Garden Trellis” from *One Creative Mommy*
<http://onecreativemommy.com/going-buggy-diy-garden-trellis/>
2. “The Indestructible DIY Tomato Trellis” from *The Petite Farmstead*
<http://petitefarmstead.com/2013/06/indestructible-diy-tomato-trellis/>

For more information on general trellis building techniques visit:

1. 15 Inspiring DIY Garden Trellis Plans, Designs, and Ideas from *The Self Sufficient*
<http://theselfsufficientliving.com/15-inspiring-diy-garden-trellis-plans-designs-ideas/>

Figures 9-10 include more unique vertical gardening ideas and links on where you can find building instructions. Some of these designs may need to be modified to be accessible for your garden. As always, be sure that these vertical structures are appropriately placed in your garden and that they work to increase the accessibility of your garden.

Figure 9: Soda Bottle Garden⁶⁴

This image is courtesy of Phil Stamper-Halpin of *The Dirt Uniting the Built & Natural Environments*. Directions can be found at: <http://dirt.asla.org/2013/08/13/diy-vertical-gardening/>



⁶⁴ Figure 9 image courtesy of <http://dirt.asla.org/2013/08/13/diy-vertical-gardening/>

Figure 10: Vertical Planter Garden⁶⁵

This image is courtesy of *Ruffles & Truffles*. Directions can be found at:
<http://rufflesandtruffles.com/2013/10/diy-vertical-planter-garden/>



⁶⁵ Figure 10 image courtesy of <http://rufflesandtruffles.com/2013/10/diy-vertical-planter-garden/>

Appendix F: Accessible Tools Use

The tools shown in Appendix F may not be accessible for all users. Based on the principles of Universal Design, ergonomic tools are meant to be accessible for the widest range of users regardless of difference in ability. However because of our diverse population, one tool may not be the most comfortable option for all users. You can buy new accessible tools or you can modify your existing tools to be more accessible. For ideas on how to make your tools more accessible please look at the figures below and see the ILO's disability tool handbook at: http://www.grassrootsgardens.org/uploads/2/6/3/8/26383225/vertical_gardening_worksheet.pdf for more information on how to modify our current tools to better suit your needs to make gardening a less straining and therefore more enjoyable activity.

Handheld Tools

Figure 1: This handheld shovel is designed to allow the gardener to grip the shovel without straining the wrist.⁶⁶



⁶⁶ Figure 1 image courtesy of www.disabilityworktools.com

Figure 2: The rubber handle on this small shovel may be easier to use for gardeners who have trouble using shovels with traditional handles.⁶⁷



Figure 3: This two-in-one handheld weeding tool and hoe is designed to be lightweight so that less strain is put on the user. With the ergonomic foam grip, a gardener can easily weed in a raised garden bed.⁶⁸

⁶⁷ Figure 2 image courtesy of http://www.health.com/health/gallery/0,,20689785_4,00.html

⁶⁸ Figure 3 image courtesy of <http://www.hgtvgardens.com/garden-basics/accessible-gardening-techniques>



Figure 4: The shape and angle of these non-slip pruners are designed to reduce hand/wrist stress.⁶⁹



Figure 5: This pruning snip is designed for gardeners who have arthritis or who cannot grasp handheld tools easily. The spring grip reduces hand and wrist strain.



⁶⁹ Figure 4-6 images courtesy of <http://www.hgtvgardens.com/garden-basics/accessible-gardening-techniques>

Figure 6: Look for shears that have shock-absorbing bumpers to reduce the impact of the jarring motion that occurs with each cut.



Adjustable Reach Tools and Accessories

Figure 7: A common feature of accessible tools is a nonslip padded handle and an adjustable length. This rake can be used easily in raised beds or can be extended to rake in ground-level planters.⁷⁰



Figure 8: Extendable reach pruners allow for more access to areas of the garden that you may not have been able to reach. Additionally, foam grips allow for more comfortable and controlled use.



⁷⁰ Figure 7-8 images courtesy of <http://www.hgtvgardens.com/garden-basics/accessible-gardening-techniques>

Figure 9: The extended grip tool below, although not specifically designed for garden use, can be used to help gardeners reach more areas of the garden.⁷¹



Tool Adjustments

You can either purchase alterations or make your own adjustments to your tools so that the tools you already own are easier to use.

Figure 10: Tools like these back-saver grips are designed to reduce the stress on your back while you engage in raking, shoveling, or sweeping. A product like this allows you to garden without having to bend down as far to get the work done.⁷²



⁷¹ Figure 9 image courtesy of www.disabilityworktools.com

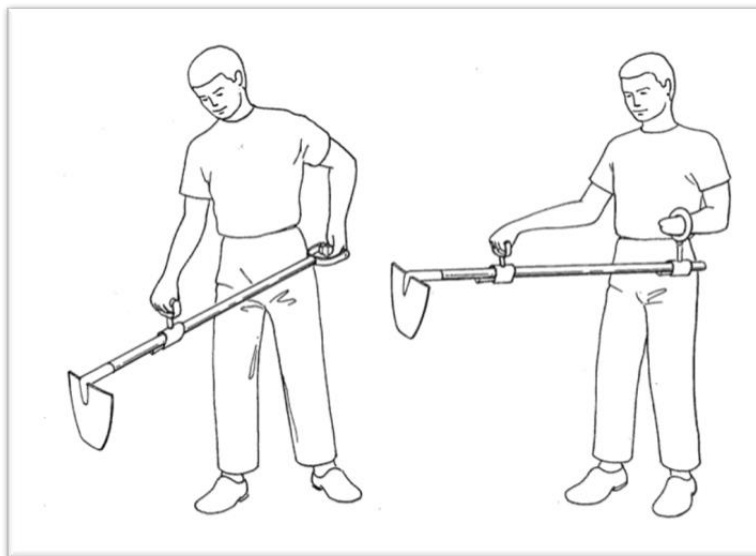
⁷² Figure 10 images courtesy of http://www.lifewithease.com/back saver_grip.html

Figure 11: Multipurpose handgrips can be securely attached to a number of different size tools to extend your reach and allow you to weed, sweep, and rake with less strain. The specific tool below is called the “Robo-Handle”⁷³ and may be harder to find at your local gardening store, but they are available online at sites like www.disabilitywordtools.com



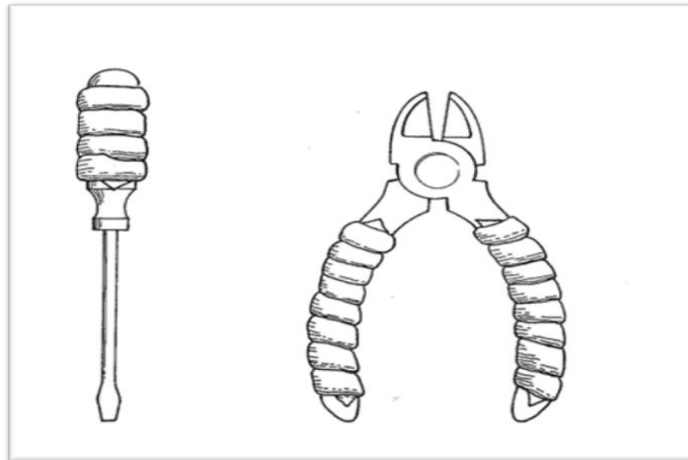
Figure 12: You can build modifications to your current tools as has been done in the below image. For instructions on how to make these changes visit:

http://www.ilo.org/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_107950.pdf



⁷³ Figure 11 image courtesy of www.disabilitywordtools.com

Figure 13: You can use a variety of materials to alter your current handheld tools to make the grips more comfortable to use. Consider adding a leather or rubber material to your handles to make them easier to grip and operate.⁷⁴



Watering Cans

Figure 14: This Easy-Pour watering can allows for multiple grip options, a reversible spout, and varied water pressure settings.⁷⁵



⁷⁴ Figure 12-13 images courtesy of http://www.ilo.org/wcmstp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_107950.pdf

⁷⁵ Figure 14 image courtesy of http://www.lowes.com/pd_339042-77374-20-47287CP_1z0wg71_?productId=3510072&pl=1

Figure 15: This watering can has a control valve that lets you pour a set amount of water, preventing water waste and making watering easier.⁷⁶



Appendix G: Plants for Creating a Sensory Garden

Key



Causes, or attracts animals that cause hearing stimulation



Causes, or attracts animals that cause sight stimulation



Causes sense of smell stimulation



Provides touch stimulation through unique texture



Provides taste stimulation/ is edible



Plant is native to Western New York

Raised-bed Techniques

⁷⁶ Figure 15 image courtesy of http://atwiki.assistivetech.net/index.php/Watering_can_accessibility

Raised-beds are great for gardening because most plants that will not outgrow their containers can thrive in them. However, because we usually have a limited amount of garden-bed space, we should strive to put only plants that really need to be grown in beds in our accessible raised beds. If you plan on using edible foods in your garden, plant this produce in your raised beds to avoid soil contamination. Planting produce in accessible raised-beds will also prevent critters from getting into your fruits and vegetables. And, since raised beds keep the soil 5-10 degrees warmer, you can plant your produce earlier than your ground plants. Spices and beautiful annuals can be grown in other accessible planters like pallets or hanging pots. Native groundcovers and shrubs can thrive on the ground. Additionally, you should not plan on using perennials in your raised beds if you want to remove your beds from the garden during the winter months. The following section lists the most popular produce grown in Buffalo community gardens that are most appropriate for accessible raised garden beds. Produce like beans, peppers, tomatoes can be appropriately grown in raised-beds but because they can also be grown using accessible vertical techniques, they have been included in the vertical garden section of this appendix. You can conserve garden space by using vertical growing techniques like trellises at the edge of your beds so that vine plants grow upwards instead of outwards. Fruits and vegetables are your best bet for accessible raised garden beds. Do not plant produce that will require more than 7 inches of soil and root space in raised-bed technique 2 described in Appendix D; these types of produce should be planted in raised-bed technique 1.

Broccoli (multiple varieties)   

Broccoli can be harvested between late spring and early fall, depending on when you choose to plant it. Plant broccoli in moist soil with regular watering and with at least 6 hours of sunlight per day. Broccoli should be planted after the weather has warmed to above 65 degrees.⁷⁷

Broccoli does best in cool temperatures while the weather is in the 60s and 70s.







⁷⁷ Image courtesy of <http://www.seaislandgarden.com/tag/butternut-squash/>

Cabbage (multiple varieties)    

Cabbage should be planted in the late spring. Unlike other vegetable, cabbage is more resilient to cooler temperatures. It requires moist well-drained soil and at least 6 hours of sunlight per day. Cabbage take a little over two months to grow and so if planted in late spring, your cabbage should be ready to harvest in the mid to late summer.⁷⁸



Carrots (multiple varieties)    

Carrots are an excellent choice for raised planters because they are not appropriate to grow in other forms of vertical or accessible planters. Plant carrots in moist, well-drained soil in mid to late spring once the soil has warmed. Carrots take 8 weeks to grow and will be ready to eat in mid-summer.⁷⁹





Corn (multiple varieties)     

⁷⁸ Image courtesy of <http://lesurvivaliste.blogspot.fr/2011/06/le-jardin-sureleve.html>

⁷⁹ Image courtesy of http://garden.lovetoknow.com/wiki/What_are_Good_Vegetables_to_Plant_in_Late_Summer

Planting corn in raised beds can yield a better crop because corn naturally needs moist, well-drained soil. Plant corn in the late spring a few weeks after the last frost in short rows and so that each plant is staggered about 10-12 inches apart. Expect to harvest your corn 2 1/2 - 4 months after planting.⁸⁰



Eggplant (multiple varieties)   

Eggplant can be easily grown in your raised-beds. They should be started indoors as seeds 1-2 months before the soil is warm enough to plant or should be planted as seedlings in your outdoor beds a few weeks after the last frost. Once outside, they require moist soil and full sunlight. Because of the large size of eggplants, they may need to be supported by a stake or trellis as the plant continues to grow. Eggplants should be ready to harvest in the mid to late summer.⁸¹

⁸⁰ Image courtesy of <http://photos.hgtv.com/photos/corn->

⁸¹ Image courtesy of <http://garden-photos-com.photoshelter.com/gallery/Purple-Vegetables-Stock-Images-Photos/G00001apifnP8zVg/>



Lettuce (multiple varieties)    

Grow lettuce in moist well-drained soil in full sun to partial shade. Lettuce can be planted from a seed a month before the last frost of the season. Lettuce will take between 70 and 100 days to grow and should be ready to harvest in mid summer.⁸²







Onion (multiple varieties)    

Onions grow best in well-drained, moist soil mounds with plenty of sunlight. This can be achieved in raised beds. Harvest time depends on the size you want your onions to grow to. Growing green onions from seedlings can take as little as one month to harvest. Growing other varieties of onions from seeds can take as long as four months to harvest.⁸³

⁸² Image courtesy of http://www.blackhillsgarden.com/index.php?p=1_178_30-high-raised-bed

⁸³ Image courtesy of <http://www.onehundreddollarsamonth.com/page/213/>



Pumpkin (multiple varieties)    

Pumpkins may be a particularly difficult plant to use in raised beds because of their long and untamed vines. These vines can take up large portions of your beds and push out other plants. However, if you plant your pumpkins near the edge of your beds so that the vines grow over the bed edges, this will pose a safety issue and may make the beds inaccessible. For this reason I recommend planting your pumpkins separate from your other produce so that they can take over their own raised bed without destroying other crops. Plant your pumpkins in late May or early June in fertile soil and full sun so that they are ready to harvest in the fall.⁸⁴







Squash (multiple varieties)    

Summer squash is easy to grow in full sun and warm, moist and well-drained soil. Plant squash seeds 18-30 inches apart a few weeks after the last frost so that they are ready to harvest in 7-8 weeks. Depending on the type of squash you wish to enjoy, some squashes can be planted in raised beds and trained so that they climb up vertical structures like trellises in your garden.⁸⁵

⁸⁴ Image courtesy of <http://karenkiwi.blogspot.com/2009/12/i-have-so-many-plans-for-you.html>

⁸⁵ Images courtesy of <http://lovelymorning.com/index.php/2009/05/>



Strawberries (multiple varieties)    

Strawberries should be planted a few weeks after the last frost. They will be ready to enjoy in just over a month and will tend to ripen twice during the season. They grow best in moist, well-drained soil and in warm temperatures and full sunlight. Strawberry plots are commonly raided by small rodents, birds, and critters. Having them in raised beds will prevent this from happening to your crop.⁸⁶



Turnips (multiple varieties)    

Turnips grow very well in raised beds with well-drained soil with at least 4 hours of daily sun. They should be planted 4 weeks before your last frost to be ready to pick in 1 ½ months.⁸⁷

⁸⁶ Image courtesy of <http://www.diy-accessibility.com/accessible-garden.html>





⁸⁷ Image courtesy of <http://www.backyardnature.net/n/a/fleabeet.htm>



Grassroots
Gardens
of Buffalo



Crate-style Vertical Gardening

Blackeyed Susan (*Rudbeckia hirta*)    

This beautiful native flower can grow in full sun to partial shade in dry to moist, well-drained soil. It should be planted in mid-May and will bloom from June to September. It grows up to 1-3

feet in height and can spread quickly if not grown in a container. It attracts both birds and butterflies.⁸⁸



Borage (*Borago officinalis*)   

This annual edible flower is covered in a light fuzz that gives a unique texture and the edible leaves provide a delightful cucumber-like flavor for gardeners. Best results occur if plant is grown indoors for 3-4 weeks and then replanted when soil is warm. Blooms June-July.⁸⁹



Cilantro (*Coriander*)    





The herb cilantro can become an invasive species if it is not contained separately. This makes it the perfect candidate for crate-style vertical gardening. Plant cilantro in late spring after the last frost and it will be ready for harvest in about 4 weeks.⁹⁰

⁸⁸ Image courtesy of <http://www.almanac.com/image/black-eyed-susan>

⁸⁹ Image courtesy of <http://tpermaculture.blogspot.com/2012/05/permaculture-plants-borage.html>




⁹⁰ Image courtesy of <http://www.commonweeder.com/2013/08/30/preserving-cilantro-herb-of-the-day/>



Oregano (*Origanum vulgare*)    

The herb oregano, like cilantro, will continue to spread if not contained in a crate-style vertical garden. Plant cilantro in a sunny area of your garden after the last frost. Oregano is best picked and eaten in mid-summer before it has bloomed.⁹¹







Parsley (*Petroselinum crispum*)   

This herb can grow up to a foot high and can be ready to eat in the late spring through early fall. Unlike many other herbs, parsley is more resilient to colder conditions and so can be planted during the spring near the last frost. This herb is best if eaten before it blooms.⁹²

⁹¹ Image courtesy of <http://pantrygardenherbs.com/shop-for-organic-herbs/oregano-varieties/dsc00930-2/>

⁹² Image courtesy of <http://pantrygardenherbs.com/shop-for-organic-herbs/parsley-varieties/8-24-04-097-2/>



Wild Stonecrop (*Sedum ternatum*)    

This native plant can be grown in partial shade and requires a moist soil. It should be planted after the last frost and blooms 6-12 inches in the spring/summer with unique star-shaped flowers to attract butterflies.⁹³






Shoe Pocket Vertical Gardening

The plants listed below may outgrow your shoe pocket before the end of the season if not regularly maintained so that they do not overgrow their containers. At a certain point in your season, you may choose to replant the plants into larger spaces. Many of the plants listed below





⁹³ Image courtesy of http://www.sandmountainherbs.com/root/stonecrop_wild.html

are typically perennials, however because of Buffalo's cold winter climate they will need to be replanted each year in your shoe-pocket vertical garden.

Basil (*Ocimum basilicum*)   

This herb requires little space and maintenance. Plant in late spring after the last frost and be sure that basil gets at least 6 hours of daily sun. It will be edible throughout the summer.⁹⁴

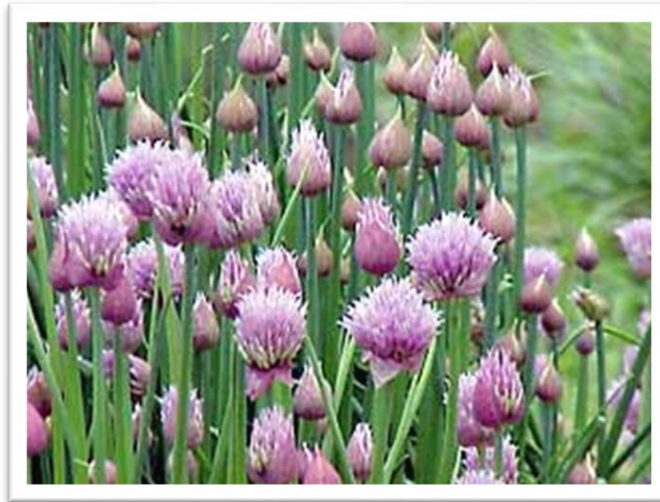


Chives (*Allium schoenoprasum*)    

In late spring, plant chives in moist soil. Chives can grow to about a foot in height by the end of your growing season. They will be ready to eat six weeks after planting seeds.⁹⁵

⁹⁴ Image courtesy of <http://evoomarketplace.com/evoo-marketplace-online-store/flower-infused-olive-oils/basil-olive-oil/>

⁹⁵ Image courtesy of <http://www.garden.org/foodguide/browse/herb/perennial/1238>



Rosemary (*Rosmarinus officinalis*)    

Plant rosemary in moist soil in the late spring or after the last frost. Rosemary grows best in sunlight but can grow in partially shaded areas. Enjoy the herb throughout the summer and early fall. Rosemary can grow up to 3 feet high and will need to be removed from your shoe pocket vertical garden if it is allowed to grow beyond a few inches in height.⁹⁶






Small Annual Flowers    

Small flowers can be used in your shoe-pocket vertical garden because they require little root space and care. Be sure that the type of flowers you chose to use in these pockets all require the same amount of sunlight since they will be held in the same vertical planter. Plant these flowers

⁹⁶ Image courtesy of <http://pantrygardenherbs.com/shop-for-herb-seeds/rosemary-seeds/rosemary-common-3/>

in late spring when you are ready to set out your planter for the season. These types of flowers will attract pollinating insects as well as hummingbirds to your garden. Consider flowers like petunias and other flowers that will bloom during the summer months.⁹⁷



Thyme (*Thymus vulgaris*)   

Grow young plants, rather than seeds, in spring so that thyme will be ready to use beginning in the late spring or early summer. Thyme requires lots of sunlight and must be kept in a well-drained container.⁹⁸



Pallet Vertical Gardening    

Pallet gardens are unique in that you can grow your plants either in small pots supported by the pallet boards or you can plant directly in your pallet. This will depend on the size and sturdiness of your pallet and whether it can hold in water to keep the soil moist. If your pallet has too many

⁹⁷ Image courtesy of <http://www.parkswholesaleplants.com/spring-plants/annuals-jz/petunia-madness-orchid/>

⁹⁸ Image courtesy of <http://www.podgardening.co.nz/thyme.html>

gaps to hold in the plant, soil, and water, you may want to use the pallet garden as a pot holder instead of planting your plants directly in the pallet. Small annuals or herbs are the optimal choice for this type of vertical garden. Pallet gardening works best when planting seedlings rather than seeds and plants should be planted a few weeks after the last frost so that they can grow comfortably outside. Put plants that require the same amount of sunlight in the same pallets. Below are two examples.⁹⁹



Hangin-Pot Vertical Gardening

Tomatoes (multiple varieties)    

⁹⁹ Images courtesy of <http://www.mindstreamacademy.org/getting-started-with-pallet-gardening/> and <http://palletfurnitureplans.com/pallet-ideas/creative-with-pallets-diy/>





Baby tomato plants can be used in a hanging pot vertical garden, creating more space below for other plants and produce. This can be done by planting a small tomato plant upside down in a hanging pot. Cut a hole in the bottom of your pot so that the seedling vine of the plant sticks out of the hole and can grow downward. Fill the pot with soil and then hang in a sunny location and water frequently. Tomatoes can become heavy as they continue to grow throughout the summer season; take into account the weight of the soil, water, and full grown plant when choosing an appropriate basket.¹⁰⁰






The following annuals are perfect for hanging-pot vertical gardening so that you can add a beautiful splash of color to your garden without taking up much needed garden space. These flowers can be planted from seedlings after the last frost thru the summer so that you have

¹⁰⁰ Image courtesy of <http://www.gardeningknowhow.com/edible/vegetables/vgen/vegetables-grown-upside-down.htm>





beautiful flower arrangements throughout the bloom season. The flowers below attract both butterflies and pollinating insects.

Petunia¹⁰¹ (any variety)    



Verbena¹⁰² (any variety)    







Zinnia¹⁰³ (any variety)    

¹⁰¹ Image courtesy of <http://www.dreamstime.com/photos-images/petunia-hanging-basket.html>





¹⁰² Image courtesy of <http://aggie-horticulture.tamu.edu/floriculture/hanging-basket/cultivars/pages/VerbenaTukanaDenimBlue.htm>

¹⁰³ Image courtesy of <https://orwfd.wordpress.com/category/chambers-county-master-gardener-newsletter/>








Poppy¹⁰⁴ (any variety)    



Morning Glory¹⁰⁵ (any variety)    



Trellis Vertical Gardening

American Wisteria (*Wisteria frutescens*)     





¹⁰⁴ Image courtesy of

https://www.google.com/search?q=Poppy+hanging+basket&rlz=1CITSNO_enUS499US499&espv=2&biw=677&bih=619&source=lnms&tbn=isch&sa=X&ved=0CAcQ_AUoAmoVChMivYqkxPfaxgIVTDY-Ch1jUwx4#imgrc=

¹⁰⁵ Image courtesy of <http://www.bloom.uk.com/bl/morning-glory-hanging-basket>





This native vine can grow in any sunlight level and requires rich, moist soils. It grows up to 30 feet and its fragrant flowers which grow in a variety of colors attract local butterflies.¹⁰⁶



Beans (most vine varieties)    

Beans that grow vertically are known as pole beans. Using a trellis for beans allows for more beans in a small space compared to growing bush beans. These include but are not limited to green beans, Romano pole beans, pencil pod beans and Golden Sunshine beans. Beans require very moist soil and should not be planted until late spring or a few weeks after the last frost. Beans should be ready to eat in mid to late summer.¹⁰⁷







Cucumber (*Cucumis sativus*)    

¹⁰⁶ Image courtesy of <http://pixgood.com/wisteria-chain-link-fence.html>

¹⁰⁷ Image courtesy of <http://www.wholefoodsmarket.com/blog/diy-trellises-if-you-build-it-they-will-grow>

Cucumbers can take up a lot of space if grown at the ground or garden bed level. To conserve space and grow more produce, you can grow your vine variety cucumbers, as well as other gourds, vertically so that they climb up a trellis in your garden bed. Cucumber plants will need full sunlight and will end up growing up to 6 feet. Because of this they may block your other plants' access to sunlight and so should be grown in the back of your garden. Plant in well-drained soil a few weeks after the last frost for a mid to late summer bloom.¹⁰⁸



Dutchmans Pipe (*Aristolochia macropylla*)    

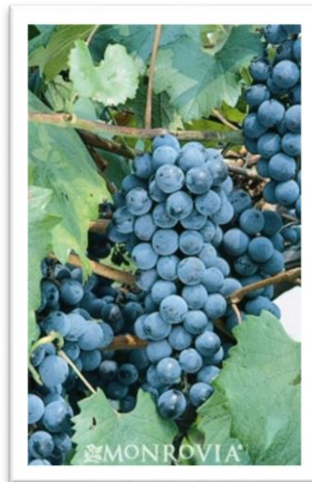
¹⁰⁸ Image courtesy of <http://free-stock-illustration.com/growing+cucumbers+without+trellis>

This native vine can grow in full sun to partial shade and needs moist, well-drained soil to flourish. It will typically grow up to 20 feet long and will flower in late spring into the summer. Its large flat leaves and old Dutch pipe resembling flowers provide a unique texture and fragrance for gardeners as well as attract bees, hummingbirds, and butterflies.¹⁰⁹



Fox Grape (*Vitis labrusca*)     

This versatile native vine can grow in any sunlight level in dry to moist soil conditions. It will grow up to thirty feet and the fruit it produces is not only edible but will attract local birds and bees. The vine will flower in midsummer and grapes should become ready to eat by early fall.¹¹⁰



Peppers (multiple varieties)     

¹⁰⁹ Image courtesy of <http://www.excelsagardens.com/?p=1718>

¹¹⁰ Image courtesy of <http://www.monrovia.com/plant-catalog/plants/2222/eastern-concord-grape/>





Peppers can be planted a few weeks after the last frost. They require at least six hours of daily sunlight and well-drained moist soil. The height and size of the trellis you will need to use to guide your pepper plants depends on the type of pepper you choose to plant. If growing from a seed, plant seeds when soil has warmed (it has reached an average of 60 degrees in the day) so that your peppers can be ready to eat in late summer.¹¹¹



Tomatoes (any variety)     

Tomatoes typically grow on a trellis because they need vertical guidance to grow upward. Plant tomatoes in your garden bed near your trellis so that as the plant grows, it will grow upward. This will save space in your garden bed and make the tomatoes more accessible.¹¹²







Trumpet Creeper (Campsis radicans)    

¹¹¹ Image courtesy of <http://www.tomatoville.com/showthread.php?t=16694&highlight=tainer&page=5>

¹¹² Image courtesy of http://www.homeproductsnmore.com/Skyscraper_Garden_p/wrf5555.htm

This aggressive native vine requires full sun and moist, well-drained soil. It will climb up to 30 feet and its trumpet-like flowers attract hummingbirds. It blooms in the early summer and can become quite aggressive and heavy. Use a sturdy (preferably non-wire), isolated trellis for this type of vine.¹¹³



Trumpet Honeysuckle (*Lonicera sempervirens*)    

This native vine is perfect for adding color to your vertical garden. It grows best in full sun and moist soil and will climb up to 20 feet. It attracts local birds, bees, butterflies, and hummingbirds. It blooms with bright yellow and orange flowers in spring and early summer. Plant 2-3 months prior to last frost of the season.¹¹⁴




Ground planting

¹¹³ Image courtesy of <http://www.felderrushing.net/vines.htm>

¹¹⁴ Image courtesy of <http://vnps.org/wildflowers-of-the-year/wildflower-year-2014-coral-honeysuckle-lonicera-sempervirens/>

Native plants provide excellent ground plants because they require less water and maintenance than other plants. The below plants are all native to the Western New York area and can provide excellent shrubbery for areas of your garden that are not appropriate for an accessible type of planter. These are perennials and may take a few seasons to blossom.

Butterfly Milkweed (*Asclepias tuberosa*) 

This native plant can grow in full sun to partial shade and in dry to moist soils. It will grow up to three feet high and attracts both butterflies and hummingbirds. Plant seeds in late May or after the last frost for a mid-summer bloom.¹¹⁵



Foamflower (*Tiarella cordifolia*) 

¹¹⁵ Image courtesy of <http://plantlust.com/plants/asclepias-tuberosa-deep-red-orange-form/>

This native groundcover bloom serves as an excellent groundcover for areas of your garden that are shaded. Foamflowers require full shade and moist rich soils. Plant seeds after the last frost or in mid-May for a bloom from June to July. This flower grows only to about 6-12 inches in height but spreads quickly to cover large amounts of garden space. Foamflowers provide a unique texture and attract local birds.¹¹⁶



New England Aster (*Symphyotrichum novae-angliae*)



This perennial requires moist soil and will grow in full sun and partial soil. The New England Aster grows between 3-6 feet when full grown and attracts local butterflies. If planted after the last frost, the flower will continue to bloom for multiple years in the late summer through early fall.¹¹⁷



Prairie Blazing Star (*Liatris pycnostachya*)







¹¹⁶ Image courtesy of http://www.bellewood-gardens.com/2010/Mt%20Cuba_2010-04_ground%20covers.html

¹¹⁷ Image courtesy of <http://nativeplantwildlifegarden.com/it-is-hard-to-see-the-new-england-asters-for-all-the-monarchs/>





This native perennial grows in dry to moist soil and full sunlight. Its beautiful flower heads provide a unique texture and attract both butterflies and pollinating bees. The flower grows to a mature height of 2-5 feet and blooms in late summer if planted from a seed in autumn to be ready for future bloom seasons.¹¹⁸



Wild Bergamot (*Monarda fistulosa*)    

This native perennial blooms from mid-summer into mid-fall. It requires full to partial sun and dry to moist but well drained soil. This versatile and hardy plant can grow up to 2-4 feet in mature height and attracts local birds, hummingbirds, and butterflies.¹¹⁹



Wild Geranium (*Geranium maculatum*)    

¹¹⁸ Image courtesy of http://stpaulphotos.com/?attachment_id=2156

¹¹⁹ Image courtesy of http://www.flowerspictures.org/flower-pictures/wild-bergamot_1.html

This native resilient perennial can be grown in partial to full shade in moist soil. It will grow up to 1-2 feet in height and will attract local birds and butterflies to your garden. Although this flower blooms beautiful pink and purple flowers in the late spring, it may not bloom until the second or third year after planting.¹²⁰



Wild Ginger (*Asarum canadense*) 






Wild ginger makes a beautiful groundcover in non-accessible ground areas of your garden. It requires partial to full shade and moist, rich soil. It grows up to 8 inches in height and will attract native butterflies to your garden when it is in bloom from April to June. It can also serve as a calming undertone to more vibrant areas of your garden.¹²¹



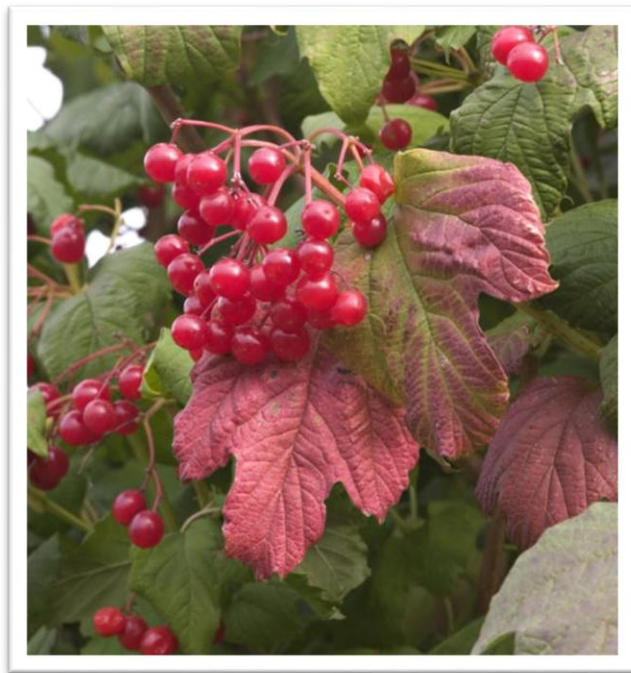
¹²⁰ Image courtesy of http://wimastergardener.org/?q=Geranium_maculatum

¹²¹ Image courtesy of <http://www.hortmag.com/featured/wild-ginger>





Native grasses and shrubs can also be used in areas without accessible planters because they are durable, easy to grow, and require less maintenance than non-native plants. Additionally, they will not need to be replanted every year like the decorative annuals or produce you use in your accessible planters. Like with any wild grass/shrub, the kinds listed below will need to be maintained so that they do not interfere with accessible walkways and so that they do not encroach on the spaces needed for other plants in your garden.

American Cranberry Bush (*Viburnum trilobum*)     

This native shrub grows best in partial shade and moist to wet soils. It grows 6-12 feet in height and about 10 feet in width. In the early summer it will bloom with white flowers and red berries and will provide your garden with colorful foliage in the fall. It will attract both birds and butterflies to your garden and its berries can be made into preserves.¹²²



¹²² Image courtesy of <http://www.thetreefarm.com/viburnum-american-wentworth>

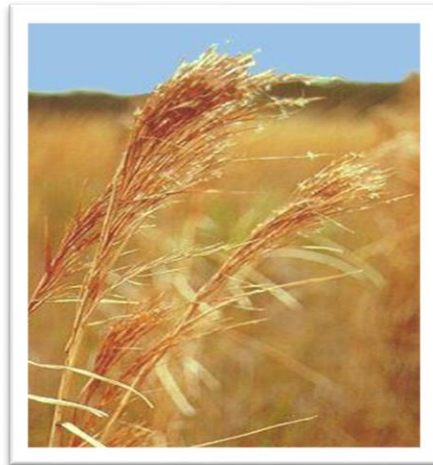
Bottlebrush Grass (*Elymus hystrix*)    

Bottlebrush grass is an excellent and hardy grass for your garden. It is easy to grow and can grow in full sun to partial shade and in moist or clay soils. It grows 1-3 feet in height and its tall-flat grass blades and green/silvery foliage attract local birds and butterflies.¹²³







Broom Sedge (*Andropogon virginicus*)    

This native grass can grow between 2-5 feet in height. It requires full sun to partial shade and moist to dry soils. Its unique texture and vibrant fall colors will attract local bird and butterflies to your garden.¹²⁴







¹²³ Image courtesy of <http://www.groen.net/Article.aspx?id=13492>

¹²⁴ Image courtesy of <http://www.hiltonpond.org/ThisWeek020108.html>

Christmas Fern (*Polystichum acrostichoides*)    

This native fern works to provide shelter and attract small wildlife to your garden. It is drought resistant but cannot thrive in clay soils or standing water. It needs moist well-drained soil and partial to full shade to grow. It will grow up to 3 feet tall and will remain green in the winter, providing a stark contrast to the snow in the winter months.¹²⁵







Indian Grass (*Sorghastrum nutans*)    

This versatile native grass can grow in full sun to partial shade and in dry to moist soils. It can grow up to 6 feet in height when it blooms in the fall and will spread quickly. Its grain blooms a beautiful reddish orange color and will attract butterflies to your garden.¹²⁶







¹²⁵ Image courtesy of <http://www.pbase.com/image/112724077>

¹²⁶ Image courtesy of <http://www.thebattery.org/plants/plantview.php?id=294>

Inland Sea Oats (*Chasmanthium latifolium*)    

This grass can provide a unique texture and color contrast to your garden. It requires partial to full shade and moist or clay soil. It has large seed pods that attract local birds, bees, and small animals.¹²⁷







New York Fern (*Thelypteris noveboracensis*)    

This green fern grows best in moist well-drained soil with partial to full shade. It offers shelter and attracts small wildlife and provides the gardener with a unique texture contrast and calming green contrast. It can be grown in drier soils if necessary.¹²⁸







¹²⁷ Image courtesy of http://www.efloras.org/object_page.aspx?object_id=47717&flora_id=1001

¹²⁸ Image courtesy of <http://www.crowdognativeferns.com/Distribution.html>

Ninebark (*Physocarpus opulifolius*)    

The Ninebark is a versatile native shrub that grows from full sun to full shade in dry to moist soils. It will grow between 6-10 feet in height and spreads quickly to 4-6 feet in width. Its uniquely textured white flowers and seed buds will bloom throughout spring and summer and will attract birds to your garden.¹²⁹







Northern Bayberry (*Morella pensylvanica*)    

This native shrub grows best in partial shade and sandy, moist, and clay soils. In the spring and summer it attracts birds and butterflies to your garden with its yellow flowers and in the winter it blooms with white berries. This shrub will grow between 6-12 feet when mature.¹³⁰

¹²⁹ Image courtesy of http://www.wildflower.org/plants/result.php?id_plant=PHOP

¹³⁰ Image courtesy of <http://www.carolinanature.com/trees/mope.html>



Redosier Dogwood (*Cornus sericea*)    

This hardy shrub can grow in full sun to partial shade in moist, well-drained soil. It will grow to be between 5-10 feet in height and will spread to 10 feet in width if not trimmed. The Redosier Dogwood provides the garden with year-round beauty. It blooms a white flower in the spring, white drupes in the summer, and has bright red branches that remain in the winter to provide a stark contrast to the winter snow. The shrub will attract birds and small animals to your garden.^{131 132}

¹³¹ Image courtesy of <http://www.leafninjas.ca/salix-interior-sandbar-willow-erosion-stabilization>

¹³² Image courtesy of <http://science.halleyhosting.com/nature/gorge/4petal/dog/creek.html>

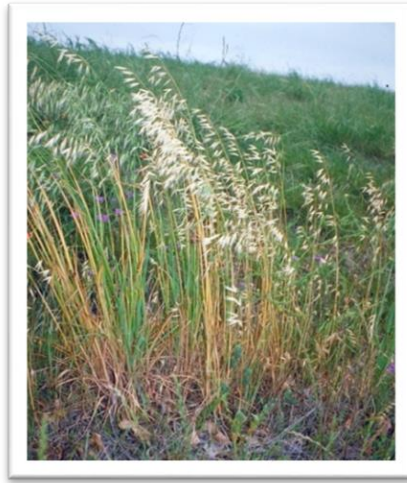


Side Oats Gamma (*Bouteloua curtipendula*)



This native grass is unique in that it can withstand the harsh Buffalo winters and so will provide your garden with color in the fall and winter months. It requires full sun to partial shade and well-drained soil. It grows up to 3 feet in height and attracts both local birds and butterflies.¹³³






¹³³ Image courtesy of http://www.wildflower.org/gallery/result.php?id_image=17226



St. Johns Wort     

This beautiful yellow blooming shrub grows in full sun and dry soil. It grows between 2-3 feet and makes an excellent border plant. Its yellow flower clusters provide a unique texture to your garden and will attract both birds and butterflies. It will bloom every summer and tends to spread rapidly.¹³⁴



Witch-hazel (*Hamamelis virginiana*)     

A native Buffalo shrub, this aromatic plant can grow in partial to full shade and dry to moist soil. It can grow between 6-12 feet in height and up to 15 feet in width. It blooms with fragrant branches and bright yellow flowers. Witch-hazel will attract birds to your garden.¹³⁵

¹³⁴ Image courtesy of <http://njaes.rutgers.edu/deerresistance/?search=per&submit=Search>

¹³⁵ Image courtesy of <http://www.uky.edu/hort/Common-Witchhazel>



Please see the *Western New York Guide to Native Plants for your Garden* by the Buffalo Niagara RiverKeeper for more information on perennials, grasses, ferns, and shrubs that are native to the Buffalo area and so require less maintenance than non-native plants. It is available online at <http://bnriverkeeper.org/nativeplantguide/>



Garden Accessibility Checklist

Entryways

1. Are entryways easily operable?
2. If there is a door/gate, what type of handle is used?
3. Can the door be opened with little force using the closed-fist method?
4. Is the height of the door handle between 34 and 48 inches from the ground?
5. Is the doorway at least 32 inches wide when the door is open?
6. Is there at least 60 inches of maneuvering clearance before the door and at least 18 inches of maneuvering clearance beyond the handle of the door on the entry side?

Paths

1. Are paths at least 36 inches wide?
2. Are there at least two turning points in the garden with a diameter of 60 inches?
3. Are paths at a safe grade (less than 1:12)?
4. Are manmade paths level/even so that they do not pose a risk to safe walking?



5. Are paths free of obstructing objects and encroaching plants?
6. Are paths slippery?
7. Is the path wheelchair accessible? To determine this, answer these questions: Could a person easily ride a narrow-tired bicycle across the surface? Could a folding stroller with small, narrow plastic wheels containing a small child be pushed easily across the surface?

Ramps

1. Is traveling on stairs necessary to access the garden? Is there a ramp option?
2. Are ramps at an appropriate slope of 1:12?
3. Are ramps sturdy and safe to travel on for all users?
4. Do ramps support the weight of all users?

Railings

1. Is railing height between 34 and 38 inches?
2. Does the railing positioned so that it does not interfere with the 36 inch width of the path?



3. If the handrail is circular, is the gripping surface between 1 ¼ inch and 2 inch diameter?
4. If handgrip is non-circular, is the perimeter of the handgrip between 4 and 6 ¼ inches?

Water

1. Are watering containers at an appropriate height of no more than 40 inches from ground?
2. Are there lightweight watering options available (less than 15 pounds)? Are these watering options accessible (are they at a height so that they can be used by someone who is either standing or sitting—approximately 40 inches in height)?

Garden Beds

1. Are there raised flower bed options?
2. Are the raised bed between 20 and 35 inches in height?
3. If raised beds can only be accessed from one side of the bed, are the beds less than 2 ½ feet wide in diameter? If raised beds can be accessed from two sides, are the beds no more than 5 feet wide in diameter?
4. If beds are meant to allow for wheelchair access underneath, are the beds at least 34 inches in height with 27 inches of free space underneath?

Tools: There are no requirements to check off for tools but if tools are visible in the garden, we suggest using ergonomically designed hand tools or tools that reduce strain and discomfort for users. Also, be sure that tools are stored so that they do not pose a threat to movement within the garden.



Vertical Gardens

1. The height of vertical gardens may vary (no specific dimensions) but should be accessible to people who are both sitting and standing. Are there vertical gardens present? If so, what type?
2. Are vertical gardens safe for use? Heavy objects like ceramic pots and large planters should not be placed at a dangerous height where they have the possibility of falling on a gardener. Heavy portions of your vertical garden should be kept no higher than 35 inches from the ground.

Sensory Gardens

1. What kinds of plants are most present in the garden? Notice features of plants and which sense are being stimulated by each plant.

Where has the garden incorporated the 7 principles of Universal Design listed below? What aspects still need work in incorporating these principles into the garden?

8. Equitable use: The design is useful to people with diverse abilities
9. Flexibility in use: The design accommodates a wide range of individual preferences and abilities
10. Simple and intuitive use: Use of the design is easy to understand, regardless of user's experience, knowledge, language skills, or current concentration level
11. Perceptible information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities



12. Tolerance for error: The design minimizes hazards and adverse consequences of accidental or unintended actions

13. Low physical effort: the design can be used efficiently, comfortably, and with a minimum of fatigue

14. Size and space for approach and use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility