

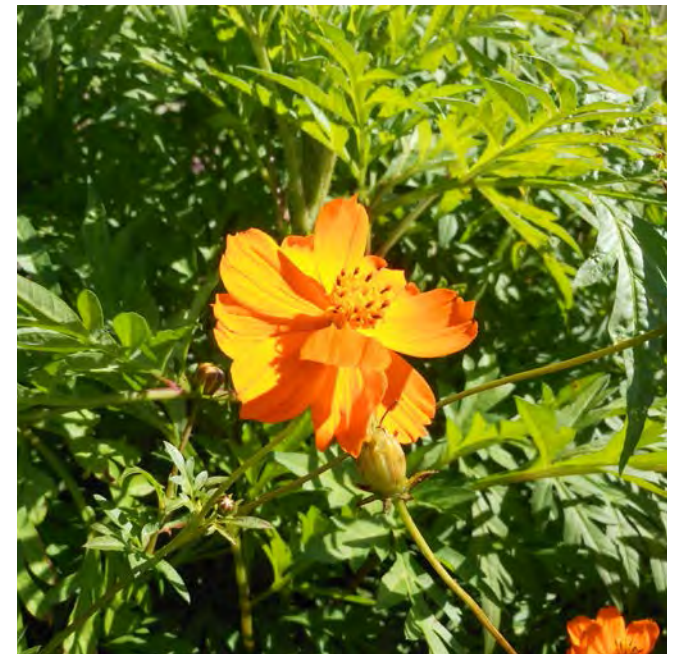
# Section 1: Research and Precedents

*“In 2012, 15.9 million children under 18 in the United States live with food insecurity-unable to consistently access nutritious and adequate amounts of food necessary for a healthy life.”  
(Feeding america.org)*



## Project Introduction

Lake Region Takes Root (LRTR) was started to help people in need in Fergus Falls achieve optimum health through access to affordable fresh produce. The idea behind the community garden is spearheaded by Lake Region Healthcare in an effort to provide quality and nutritious food to those that have limited access, limited resources or who can not afford it. Through the first year of operation, Lake Region Takes Root supplied 313 families with fresh produce. Working with other community organizations like, *Women and Infants and Children's* program, *Fergus Falls Community Food Shelf*, *Matthew House* and *A Place to Belong*; the garden was able to reach a broader range of people in need.



Lake Region Takes Root is dedicated to getting better and more efficient at providing fresh produce to those in need. This summer of 2014 LRTR received funding from the Northwest and Central Regional Sustainable Development Partnerships to support a research and design team from the University of Minnesota-Twin Cities. Their role was to develop a comprehensive plan and to introduce sustainable practices to make the garden productive for many years to come.



The goal of LRTR is to achieve optimal health and social cohesion through the use of community gardening. The people in our Fergus Falls region need access to fresh and affordable produce. By running a community garden, LRTR brings people together to share and learn from one another, while providing healthy foods that are one of the more important resources in protecting ones health. (Lake Region Healthcare, 2014)



## Project Purpose



### LRTR Community Goals

- Maximize production; up to 25,000+ pounds of food a year
- Compost on-site; become environmental stewards reducing landfill waste
- Collect rainwater from surrounding buildings and use on site
- Create an educational experience to teach community members of all ages how to garden
- Create a community service that reflects highly within the community
- Create social cohesion within the community

The project focused on strategies for the most efficient way to garden in the form of maximizing garden space and layout, rainwater harvesting, storage and distribution systems, composting strategies and creating an overall master plan of the garden.

Future phases and ongoing infrastructure projects such as a packing and receiving shed and handicapped accessible gardening spaces were considered as were strategies such as square foot gardening, composting, raised planter garden, rainwater harvesting, irrigation systems, volunteer programs.

### Methodology and Process

The project used a participatory approach. A Planning Team was established with members from the community and funders that met weekly by conference call for feed back and decision-making as the project's research and design evolved. A site visit was conducted in September 22nd 2014 with a focus group session with volunteers. An interim presentation of research and design ideas was held on November 6th that involved work in small groups. A final presentation of the final design and recommendations was made on December 18th to the community with additional community input gathered.

### LRTR Garden Goals

- Plan a packing shed for distribution
- Increase accessibility of the garden
- Create a wind and sun break for volunteers
- Design a hoop house orchard
- Develop a crop rotation schedule
- Plan a rainwater harvesting system

#### Additional needs

- Refrigeration option/cold cellar
- Plan for drip irrigation to maximize efficiency with watering techniques
- Create a solar energy farm
- Address need for a bathroom

## Urban Agriculture Research



“Urban Farming is uniquely powerful tool for change, in that it can simultaneously reshape the places where we live and the way we eat.”  
(Rich, 2012)

According to the USDA, 15% of the world’s food is grown in urban farms.

The power behind the urban agriculture movement has been building since the 1950s. Today, it is an enormous power of change and can help reshape and develop communities. The importance of urban agriculture lies not only in the production of food, but also in the development of community values, the development of skills, nutrition and health lessons and the development of self-sufficiency. (Rich, 2012)

Community gardens, the most notable form of urban agriculture, promote healthy communities and sustainable use of otherwise unused space.

Many community gardens use whatever material they can to develop and grow produce. Despite being recycled, these systems work really well to promote creativity and are as effective in producing agricultural food as other more traditional practices of farming. Examples include pallets, recycled wood planks, kiddie pools and many more household items. (Gorgolewski, Komisar, Nasr, 195)





colourfulpalate.com

## Square Foot Gardening

Square foot gardening is a process in which small manageable beds are planted very densely. The reasoning is to grow as much food within the limited space as possible, while limiting weeds and excessive fertilization. (Bartholomew, 2006)

A 4'x4' box is the typical size used in sq ft. gardening and it produces enough food for one meal, for one person a day. It is important to keep 3 feet between the boxes to create accessibility and room to garden.



blogspot.com



faculty.yc.edu

## Cold Frames

Cold frames can be added to the raised box planters to lengthen the growing season.

Cold frames consist of an empty bottom box that is covered with either a glass or some kind of transparent material lid. The covering of the glass acts as a greenhouse does and protects plants from hard frost.

Within the cold frame boxes, the garden plants will think they are 1.5 zones warmer than the rest of the garden. (Coleman, 1996)

Care must be taken to keep boxes to approximately 60 degrees Fahrenheit, otherwise they become hot boxes and cook the produce. (Coleman, 1996)

## Vertical Gardening

Vertical Gardening is the act of growing plants in a vertical or upward fashion. Most commonly done in vegetable gardens to increase the yield produced. There are a few ways that vertical gardens are overall better gardening techniques and higher yield producers.

- With the upright growth, yield per square foot is increased.
- Controlling pests is easier when seeing the entire plant.
- Harvesting is an easier task than traditional gardening because of lack of bending over.
- All produce gets harvested because it can't be missed under excess foliage.
- Increases accessibility for all gardeners.

(Vertical Gardening, 2014)

## Key Elements

While vertical gardening is very successful in growing higher yields of produce it is important to remember that when growing plants on vertical structures, the structures should be anchored into the ground properly. It is recommended that anchor poles be placed 24 inches into the ground to prevent tipping over in the wind.

It is also important to locate vertical gardens on the north end of the plots. Because these gardens grow vertically, they will cast a shadow that may or may not effect other plants growing around them.



## Typical Vertical Growing Plants

Plants that work best for vertical gardening are veiny or sprawling types. Non-bush varieties need to be used because their size does not get to what is needed to be effective growing vertically.

Ideal plants include:

- Tomatoes
- Peas (Non-bush varieties)
- Cucumbers (Non-bush varieties)
- Pole beans
- Gourds
- Melons
- Squash
- Pumpkins



“Inter-cropping is the agricultural practice of cultivating two or more crops in the same space at the same time”  
(Andrews & Kassam, 1976)

## Inter-cropping

Inter-cropping is a style of organic gardening that allows for multiple species of plants to be planted next to each other in close proximity. This allows for greater diversity within the garden and overall higher produce yields.

It is important to understand how each plant will react with the other species around it. If a species does not like its neighbor, there is risk that neither plant will do well and won't produce the expected yield.

## Benefits

- Better use of growing area
- Increased resilience from pests and disease
- Increased yields per area grown
- Better long-term soil health
- Increases soil microorganism activity
- Increased weed suppression

## Disadvantages

- Confusing which plant is which for new gardeners
- May get confused with what really is a weed
- If not maintained can sometimes overgrow
- Can produce limiting yield

(Inter-cropping, 2014)





## Inter-cropping Plant List

### Crop

### Inter-crop with

Asparagus	Tomato, Parsley, Basil
Bush Beans	Potato, Cucumber, Corn, Strawberry, Celery, Summer Savory
Pole Beans	Corn, Summer Savory, Radish
Cabbage Family	Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard
Carrots	Radishes, Lettuce, Rosemary, Onion Family, Sage, Tomato
Celery	Onion, Cabbage Families, Tomato, Bush Beans, Nasturtium
Corn	Potato, Beans, Pumpkins, Cucumber, Squash
Eggplant	Beans, Marigold
Lettuce	Carrots, Radish, Strawberry, Cucumber
Onion Family	Beets, Carrots, Lettuce, Cabbage Family, Summer Savory
Parsley	Tomato, Asparagus
Potato	Beans, Corn, Cabbage Family, Marigolds, Horseradish
Pumpkins	Beans, Corn, Marigold
Radish	Carrots, Nasturtium, Lettuce, Cucumber
Spinach	Strawberry, Beans
Squash	Nasturtium, Corn, Marigold
Tomato	Onion Family, Nasturtium, Marigold, Asparagus, Carrots, Parsley, Cucumber
Turnip	Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard

(Inter-cropping, 2014)

## Crop Rotation Strategies

- Ideally, rotate crops on a 2-3 year rotation but the most critical issue is to not put the same plant or related plant in the exact same area. As long as plants are 10' from their previous site it will not compromise the soil or be at risk of disease.
- Crops that take a lot of nitrogen like peppers, tomatoes, corn should be followed up with legumes like peas & beans or a legume based cover crop to naturally re-feed and fix the soil.
- Remove smaller crops like carrots and beets out of the field and put them into the raised beds as they are more difficult to weed. Consider inter-cropping practices.
- Grow a variety of crops but concentrate more on staples (tomatoes, potatoes, beans) and nutrient dense foods like kale, squash.

*Source: Jenni Brause, Master Gardener*



[blog.mcallenedc.org](http://blog.mcallenedc.org)

## High Tunnels

High tunnels are structures usually covered in plastic or some sort of screen. High Tunnels can range in height from about 7-10 feet tall, used for growing high yielding produce within a confined space. By growing the produce, such as orchard trees, under a high tunnel they are better protected from disease and damage from the weather.

A study done at the Schulstad Farm in Northern Minnesota by the University of Minnesota Extension, yielded great results. After the first trial there were no signs of many common diseases associated with the apple, cherry and berry bushes they had planted. No leaf diseases, no scab, no mites and the leaves were healthier. Production soared with almost 2 pounds of strawberries per plant.



## High Yield Sustainable Practices

### Low Tunnels

Low tunnels function very similar to the high tunnels. The primary function of low tunnels is to add protection to hardy plants during the cold season. This helps to extend the growing season for summer grown plants and allows the early growth of spring plants.

Low tunnels are very easy to assemble. What you will need include 12' PVC pipe and a polyester cover preferably 15 gauge. Next, insert the ends of the PVC pipe into the ground about 1 foot bending it so it makes an arch over the planting row. (roughly 30-36" wide rows) Immediately upon completion of setting up the frame, drape the plastic over the arches and weigh down the edges to prevent the wind from taking the plastic. If the low tunnel is going to be used to house plants through the winter into spring, another covering layer must be added in November. This second covering should be of greenhouse quality. (English, 2014)



## Urban Agriculture Precedents



### The Garden O' Feedin'

The Garden o' Feedin' provides fresh vegetables and produce to hundreds of families for ten years in Boise, Idaho. The garden is part of the Vineyard Ministry created in part to help the needy and to run in conjunction with the Ministry's food pantry.

Started in 1998 by Pastor Tri Robinson, the garden originated with six raised beds growing the staples, lettuce, carrots and beans.

In 2009 the garden was able to produce an astonishing 31,000 pounds of food on only two thirds of an acre. *"It all sort of came together. Our organic garden was an expression of our attitude towards creation in many ways. We realized we could actually connect these two worlds, especially when it came to our responsibility to the poor."* - Pastor Tri Robinson

\*\*Conference call held with Deb Mason, The Garden O' Feedin', see appendix for more information\*\*

### "Back to Eden" Method

This film stars Paul Gautschi and documents his process to get back to a more simple, productive and sustainable way of farming. Simply by using wood chips as cover, Paul has eliminated the need for watering, fertilizer and weeding. This old, yet new, form of organic farming is creating fresher and tastier produce than anyone could have imagined in Washington. View the full movie at [www.backtoedenfilm.com](http://www.backtoedenfilm.com).

## Earthworks Urban Farm

Started in 1997 with the mission to feed the hungry and care for the poor, Earthworks Urban Farm in Detroit Michigan has become a poster child of sorts in the expanding effort to get involved in community gardening.

From 2001 through 2008, Earthworks was working inside a market strategy to bring the food to people in need. This strategy was successful in the idea that people sometimes had difficulty getting to the area of production to pick up produce directly.

In 2008, Earthworks shifted most of its food distribution away from markets and into meals at their soup kitchen. By doing this Earthworks was better able to introduce healthy foods and new recipes to the community.

“Earthworks has always been a labor of love, founded on the Franciscan vision of universal sister and brotherhood of all creation.” (About Us, 2014)



## Seattle P-Patch Program

The City of Seattle’s Department of Neighborhoods (DON) operates the P-Patch community garden program in cooperation with the nonprofit P-Patch Trust. The program has been supplying 68 gardens with a total of 1900 individual plots on more than 23 acres for thirty plus years.

The DON helps to locate and secure lots that are suitable for community agriculture. This makes it simple for new gardens to continue to pop up and for mature gardens to thrive.

The gardens in these communities have been valued as a foundation for community building, stress relief, education, recreation, crime reduction and most importantly, food production. (CSBR Report, 2013)

## Composting

There are many reasons to compost. One is that landfills are quickly coming to capacity and that space is becoming valuable. It is estimated by the EPA that about one quarter of the food Americans buy ends up being thrown out before it can ever be used. Two thirds of the waste are fruits and vegetables, milk, grain products and sweeteners. (Ladner, 2011) (CSBR Report, 2013)

Composting is a valuable resource that can be used to treat nutrient deficient soils and to help conserve the environment by not filling landfills. When waste product breaks down it becomes a highly organic material full of nitrogen and other plant nutrients. When added to soil, it creates an environment suitable for extensive root growth and development, while giving plants the opportunity to absorb much needed nutrients. Organic matter also helps to retain water in the soil longer, allowing plants to persist through times of drought.

*Note: LRTR Community Garden currently has amended their field plots with over 100 cubic yards of organic compost. This has helped transform the thick clay soil into a soil that will better allow oxygen and water to access the plant roots.*



[exmouth.wa.gov.au](http://exmouth.wa.gov.au)



[ecohusky.uconn.edu](http://ecohusky.uconn.edu)

## The Basics

There are two types decomposition used in composting.

The first being **anaerobic**. Anaerobic composting does not require oxygen, resulting in a much more odorous smell. However this can be managed if contained within a container, however this can be viewed as an eye sore. (Hirrel, Smith, Riley, 1993)

The second being **aerobic**. This process requires oxygen and water and is typically faster and less odorous. Products of both forms of decomposition include: nutrient rich compost, carbon dioxide, heat and water. (Hirrel, Smith, Riley, 1993)

During the decomposition process, the temperature in the pile of compost will increase. Temperatures between 70-100 degrees F allow the most effective bacteria to grow. Temperatures between 90-140 degrees F signify rapid decomposition. Due to the process containing living microorganisms, it is important to make sure they have adequate oxygen and water to continue to live. It is vital to turn or flip the compost pile every two weeks to get a fresh supply of oxygen. This also opens the pile up to the elements and rain water is allowed to reach places it couldn't before. By flipping the pile, the microorganism activity increases speeding up the process of decomposition. (Hirrel, Smith, Riley, 1993)

## Healthy Compost

As most microorganisms, the ones decomposing your compost pile require carbon (C). The carbon is used as energy while the nitrogen (N), they digest is the protein source. The ideal C:N ratio within a compost pile is 30 parts of C to 1 part of N. It is important to get the mixture right so that the organisms are as effective as possible. Frequently you will find yourself adding certain materials either to raise the C or N levels of the piles. Below are lists of a few items that are excellent for increasing the values of each nutrient.

Material	C:N Ratio
<b>High N Values:</b>	
Vegetable Waste	12-10:1
Coffee Grounds	20:1
Grass Clippings	12-25:1
Cow Manure	20:1
Horse Manure	25:1
Chicken Litter	13-18:1
<b>High C Values:</b>	
Leaves	30-80:1
Corn Stalks	60:1
Straw	40-100:1
Bark	100-130:1
Paper	150-200:1
Wood Chips and Sawdust	100-500:1

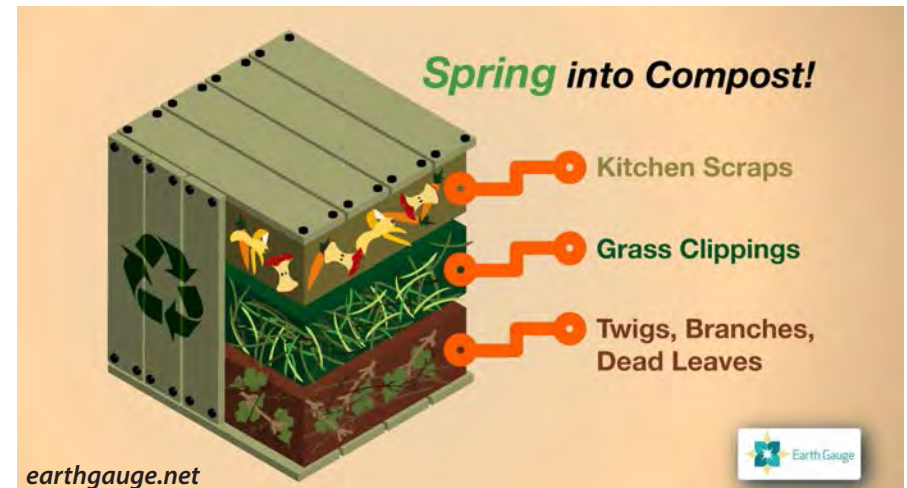
(Hirrel, Smith, Riley, 1993)  
(CSBR Report, 2013)

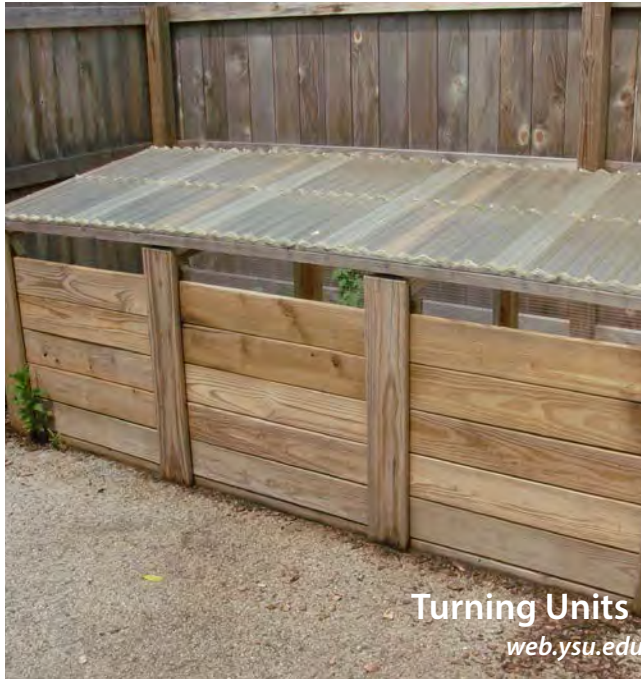
## Compost Doctor

Issues with compost piles can arise, here are a few symptoms to monitor and amendment techniques.

Symptom	Problem	How to Fix it
Pile is wet and smells of an obnoxious odor	Not enough air is getting to the pile, or it could have too much N and water	Turn the pile, and add some C heavy items like wood chips or sawdust
Pile isn't heating up	Pile is too small or dry	Make pile larger, and add water
Pile is damp and sweet smelling but will not heat up	Not enough N	Add sources of N like grass clippings
Center is dry and contains tough materials	Not enough water	Add water and turn over
Pile is attracting animals	Meat and animal product has been added	Keep meat and other products out of the pile and enclose pile with hardware cloth

(CSBR Report, 2013)





Turning Units  
web.ysu.edu

## Turning Units

Turning units typically consist of three or more bins. To be successful, there must be one bin left empty for turning the other compost piles. The other two bins, in a three bin system, hold compost piles at two different stages in the decomposition process. Bins can range in sizes depending on the size of the operation. Dairy farm bins can be up to 15 feet deep, 10 feet wide by 7 feet tall. Small home bins can be between 6 feet by 6 feet or smaller.

*Note: Earlier we mentioned that heat was crucial to the success of a compost pile. The larger the pile the more heat that is generated.*

## Vermiculture: Worm Composting

Compared to other types of compost, vermicompost can be the richest in nutrients. There are two types of vermiculture systems. With 50,000 worms, approximately 40 pounds of food waste can be processed a day. The horizontal system has layers of compost material in a vertical container, in which the worms work their way to the top. Once they turn a layer into compost, that layer is shifted out by a crank handle to the bottom of the container.

The horizontal system uses larger bins divided into equal sections. When one side is ready to be composted it is covered. This allows the worms to do their work. When it is ready to flip sides, cover the other side. Because the worms do not like the sunlight it is easy to manage what side is getting composted. This also allows for removal of the composted material and the introduction of new uncomposted material.



Vermiculture  
gardening.ktsa.com

## Composting Examples



At Home Units  
sheknows.com

## At Home Techniques

One of the most popular at home techniques of composting is the crank-style home composter. Typically dark in color, this allows the composting material to heat up faster than open air composters. Like the name might imply, these systems are equipped with a crank handle that allows them to be turned over and mixed up to increase oxygen levels and to mix in new materials. Typically, the average home does not create as much food waste as say a restaurant or community garden, so the size of these systems are small holding only about a total of 50 pounds of compost. These systems also have to be small if they are to be located in a backyard.



## Rainwater Harvesting

Rainwater harvesting is a practice that dates back to the 1800s. Many ancient cultures, such as the Greeks and the Native Americans across North America relied on rainwater harvesting to survive. In fact, according to Senior Research Fellow Richard Strong, many of the older homes in Minneapolis still have cisterns located beneath their lawns. Many of the homeowners are unaware that these systems even exist. (Strong, 2014) Despite being around for hundreds of years, there are a few practices today that have become very popular. Permanent ponds and water tanks can hold upwards of thousands of gallons of water for weeks at a time. (Ferguson, 1998) This allows the water to be saved and used for irrigation during times of drought.

**At-home:** Rain barrels are the most popular at-home collection system. The barrels are connected to the downspouts allowing them to fill during a rain event. These systems can be expanded with more barrels and PVC pipe when on 55 gallon barrel becomes too small.

**Commercial:** Larger commercial tanks can be re-purposed to collect larger amounts of water. These tanks can range as small as a few thousand gallons to 40,000+ gallons. These systems are mainly utilized in commercial farming and large urban farm projects.

## Cost Projections

If using smaller 55 gallon plastic tanks, most businesses are willing to donate these barrels. Additional costs include PVC pipe and fittings.

Estimated total cost for 15 barrel system (if barrels are donated): **\$100**

Larger more permanent rain barrels can get expensive. 1500 gallon tanks range in price from about **\$500-\$1000** and underground tanks (cisterns) exceed **\$2500** when factoring in the labor burying them. Prices vary depending on geographic location and can be found from many on-line dealers.



# Rainwater Harvesting Precedents



## 17th Ave Resident Hall, U of M

In 2013 the University of Minnesota completed construction on its newest resident hall. In the planning phase of the project, it was decided that the University wanted to implement sustainable practices within the building. A 38,000 gallon rainwater collection system was installed. It was decided that the water collected would be used for a non potable source such as flushing toilets.

Before being used in the toilets, the water is filtered to remove debris and bacteria is killed. Dye is added as an educational factor to let students know when they are using rainwater vs. city water. Because of the success of this system, many future and current development projects are looking to it as an example of what can be done in way of sustainable practices.

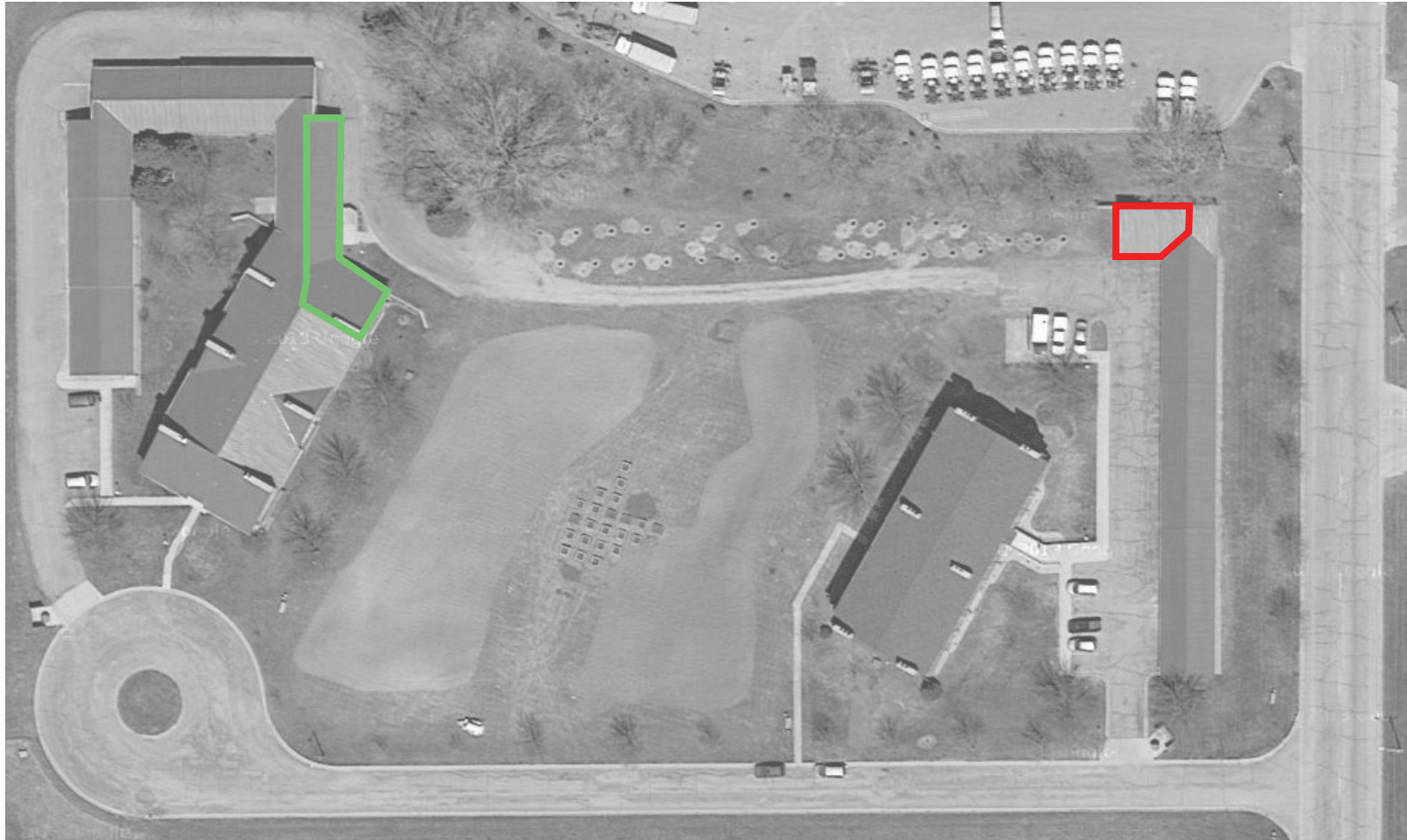
## Chicago Center for Green Technology

The Chicago Center for Green Technology is the most comprehensive green design educational resource in the Midwest. It has achieved double LEED Platinum status for both building footprint and operational status.

Currently the Center collects thousands of gallons of water in above ground water tanks, many of which are hidden by vegetation. The water is then stored and used in the irrigation of their green wall vegetation and the rest of the landscape. The CCGT is a great example of how sustainable practices can be implemented to limit the impact we have on the environment.



# Opportunities for Rainwater Collection



## Area 1 Calculations

Equations:

$$WQV=(P)(Rv)$$

WQV=Water Quantity Value  
P=Rainwater event in inches  
Rv=Runoff coefficient

$$Rv=0.05+0.009(I)$$

I=Percent of the surface that is impervious

Calculations:

$$Rv=0.05+0.009(100)$$

$$Rv=\mathbf{0.95}$$

$$WQV=(1.25'' )(0.95)$$

$$=\mathbf{1.1875 \text{ inches}}$$

Then convert to cubic feet

$$1.1875\text{in}/12\text{in}=\mathbf{.0989 \text{ ft}}$$

Multiply by the square footage of the surface

$$(.0989\text{ft})(875\text{sqft})=\mathbf{86.5 \text{ cubic feet of water}}$$

Convert cubic feet to gallons (7.48 gallons per cubic foot)

$$(86.5 \text{ cubic ft})(7.48 \text{ gallons})$$

$$=\mathbf{647.02 \text{ gallons of water in a 1.25'' rainfall event}}$$

## Area 2 Calculations

Equations:

$$WQV=(P)(Rv)$$

WQV=Water Quantity Value  
P=Rainwater event in inches  
Rv=Runoff coefficient

$$Rv=0.05+0.009(I)$$

I=Percent of the surface that is impervious

Calculations:

$$Rv=0.05+0.009(100)$$

$$Rv=\mathbf{0.95}$$

$$WQV=(1.25'' )(0.95)$$

$$=\mathbf{1.1875 \text{ inches}}$$

Then convert to cubic feet

$$1.1875\text{in}/12\text{in}=\mathbf{.0989 \text{ ft}}$$

Multiply by the square footage of the surface

$$(.0989\text{ft})(2,315\text{sqft})=\mathbf{228.95 \text{ cubic feet of water}}$$

Convert cubic feet to gallons (7.48 gallons per cubic foot)

$$(228.95 \text{ cubic ft})(7.48 \text{ gallons})$$

$$=\mathbf{1,712.57 \text{ gallons of water in a 1.25'' rainfall event}}$$

## Additional Areas of Collection

If a solid tin roof is added to the pergola, an additional **240** gallons will be generated that could be used for irrigation. This number can be found by using the principles from the equation on the previous page of this report.

With the possible construction of a new receiving and packing shed, rain water can be harvested off of this structure and used for irrigation as well. Another **295** gallons of water will be harvested. With the small amount of water runoff from these structures, these areas would be a perfect location for smaller barrel systems such as 55 gallon drum system.



## Hand spray Irrigation

While hand watering may be the cheapest form of irrigation, it wastes the most water. Materials needed are a garden hose, sprayer attachment and a water source. Unfortunately what you get with hand watering irrigation is an uneven distribution of water amongst the plants. Water not placed near the root system dries up before it can be used in the plant. Water that gets on the leaves of the plant never truly makes it into the plants system before evaporation takes over. While effective, hand watering irrigation is not a sustainable practice.



## Drip Irrigation

The most efficient way of irrigating crops, drip irrigation is 90% efficient where as sprinkler systems are in the range of 50-70%. Drip irrigation is effective in that it drips water directly on a plants root system. The idea behind this technique is to limit the amount of water wasted through evaporation and inefficient placement. Unfortunately the cost of installing a drip irrigation system is higher than most other irrigation techniques. This is mainly because of the special systems required, from timed water sources to the drip valves.



### Packing and Distribution Shed

As mentioned earlier about collecting additional rainwater we have called out a location for a packing and distribution shed to be constructed. This was an idea brought to our attention by many garden volunteers that there currently is no building that allows efficient packing space and practices. In addition to the lack of space, there is no set produce washing station which is a necessity if the produce is being given away for human consumption. While there is never enough room, our recommendation for the size of the shed based on what LRTR's goals are is a structure 10 feet by 22 feet in total size. 10 feet by 10 feet of the space will be covered with a roof but have open walls allowing air flow. This area of the building will be used for packaging the produce containers and also contain a washing station for the food. The other 10 feet by 12 feet will be enclosed structure that will be used for the storage of materials for packaging and also the storage of food for the short term. Located behind the shed area will be a parking spot for a refrigeration trailer that could be used to store food for longer periods of time and/or to do deliveries of the produce. The overall cost of this structure will range from **\$3500-\$5000**, all depending on the materials used.

The cost of the refrigeration trailer can vary significantly. There is the option to build your own, known as a CoolBot trailer. By adding an air conditioner and additional insulation to an enclosed trailer, you can make your own traveling refrigerator. An estimated cost for this project is about **\$3800**. Directions on construction can be found at <http://www.evergoodfarm.com/trailerbuild.html>.



“We found that outdoor play spaces that contain materials that children could manipulate -- sand, water, mud, plants, pathways and other loose parts -- offered more developmental and play opportunities than spaces without these elements” -Canada.com

### Rocks and Logs

Research has shown that children that play in playgrounds made of natural materials tend to be more active in these environments than on traditional playground equipment. (ScienceDaily, 2012) With a more diverse playground, children become more imaginative and find more creative ways to exercise. This not only helps physical development, but intellectual as well. During a study at the University of Tennessee at Knoxville, it has shown that children, while increasing mental and physical abilities, started to utilize motor skills as well.

Natural playgrounds are starting to become increasingly more popular around the country. Between the benefits to the children and the use of natural and sustainable products, naturalized playgrounds are leading the trend to return “playtime” to the outdoors.

### Materials Needed

Multiple rocks of different sizes and colors. The larger the rocks the more sturdy they are for use as a jungle gym. Large sturdy logs will also be used for climbing on. These need to be extra strong and free of rot. Although rotting of the logs will occur over time, it is best to use rot free logs to extend the lifetime of the playground.



## Rain Garden Research



### What is a Rain Garden?

Rain gardens are designed to be aesthetically pleasing gardens that act as a filter to collect rainwater from hard impervious and turf areas. Typically, these gardens are planted with water-loving and water tolerable plants. Examples of these plants include dogwoods, daylilies and certain types of landscape grasses. All of these plants can be found naturally around river and pond banks.

Besides helping collect excess runoff, rain gardens help to keep water sources clean of pollutants. Rain gardens typically act as the first line of defense to remove sediments and chemicals such as nitrogen and phosphorus from water bodies.

### Plant Species

Species typically used in rain garden plantings are water-loving species. Other species that do exceptional well in rain gardens are natives. Natives are effective because they are adapted to absorbing large amounts of water. Below are just a few species typically used in rain gardens.

- Daylily
- Landscape Grasses
- Dogwood shrubs
- Coreopsis
- Blue false indigo
- Liatris

(Danko, 2006)

## Connecting With The Arts

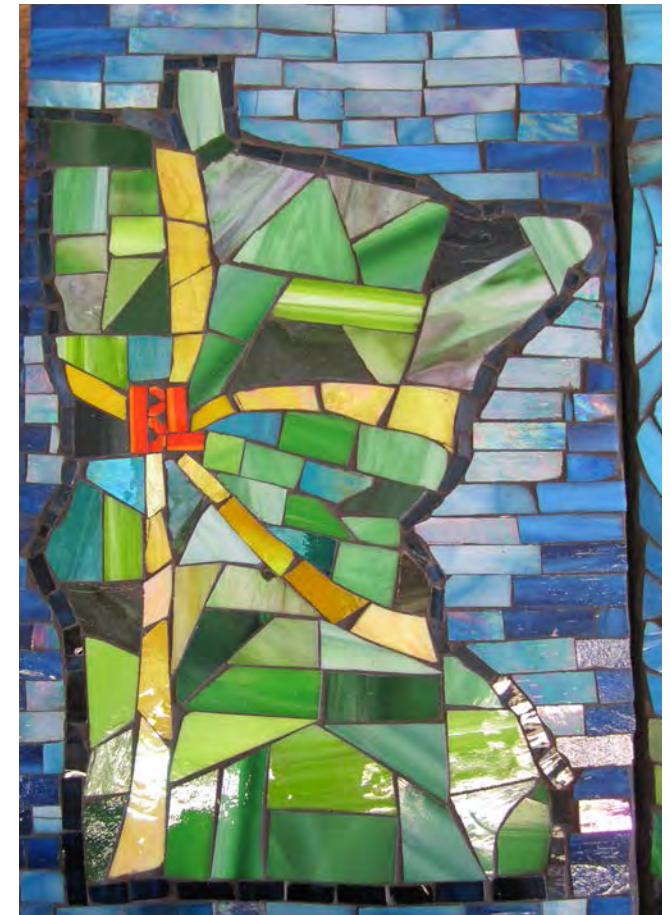


### Complete Streets, Battle Lake, MN

Wanting to increase art appreciation in the community, Battle Lake decided to move forward with a community art project along Lake Avenue. The goal was to get 300 people to participate in what would be the creation of mosaics made of colored glass. The glass mosaics would be installed into tree benches along Lake Avenue. Each of the benches reflects a different theme, natural habitat, agriculture and recreation. Set to be completed in May 2014, so far the project can be deemed a success.

### Local Artists

There are many opportunities to showcase art within the LRTR community garden. Some of the ways discussed could be sculpture pieces, mural walls and artistic planter boxes.







### Solar Power

For much of the history of our planet, energy has been created and used in the form of fossil fuels. It is estimated that the United States uses 105 quadrillion Btu (Patel 2006). With this number expected to increase in the future, it has become increasingly evident that we need to look for more sustainable power sources with the concern of carbon emissions and the threat of global warming.

Within the past 10 years, there has been a significant growth in the use and installation of solar powered energy sources. (Patel, 2006) Besides being cleaner and more environmentally friendly than traditional fossil fuel, solar energy requires less infrastructure than more traditional energy sources. Because solar panels generate the electricity near the source of need, there are minimal wires or intensive infrastructure needed such as transformers and large utility lines. (Patel, 2006)

### Cost Projections

Many types of solar power systems have become very expensive. For a typical system to be installed on a residential unit, prices can vary from **\$15,000 to \$30,000**. For individual solar panel kits, 250 watt solar panels cost about **\$1000** while 7000 watt panels cost approximately **\$14,000**. For a system like the CoolBot trailer running a standard window air conditioner using 880 watts, LRTR would need four 250 watt solar panels. This puts the cost projection of infrastructure for the trailer and solar panels around **\$7800**. While this might be a steep number, it will be more sustainable and efficient in the long run.

