LAKE REGION TAKES ROOT COMMUNITY GARDEN

Maximizing Sustainable Food Production

Final Report
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We thank our Planning Team for their participation and contributions and extended project partners for their support. We also thank Lake Region Takes Root staff, Lake Region Healthcare staff volunteers and participants in the community meetings for their valuable input during the process, many of whose names are included below.

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Lake Region Takes Root
To achieve optimal health, people in our region need access to affordable fresh produce. This project is exploring a means of achieving a healthier community.

Access: Lake Region Healthcare along with other community partners is growing foods to improve access to fruits and vegetables for families having the greatest difficulty with access.

Education: It is a place where people of all ages can learn the value of foods, importance of nutrient dense foods and experience a variety of growing methodologies aimed at inspiring residents to grow a portion of their own foods.

Social cohesion: The initiative works to solve an identified community need by bringing people together through collective partnerships.

Community Health: Eating healthy foods such as fruits & vegetables is one of the most important things people can do to protect their health.


Lake Region Healthcare and Lake Region Healthcare Foundation
Lake Region Hospital Foundation’s mission is to develop partnerships and resources for improving health and wellness in our region for generations. With the work of over a century gone by, Lake Region Healthcare continues its rich legacy of caring and planning for the future; focusing on providing the best possible access and scope of services for patients; clinical and service excellence; and maintaining a highly qualified and dedicated workforce.


PartnerSHIP 4 Health
PartnerSHIP 4 Health is a collaboration of community and public health partners in Becker, Clay, Otter Tail and Wilkin Counties working to prevent chronic disease through sustainable changes that increase physical activity, healthy eating and reduce tobacco use and exposure. PartnerSHIP 4 Health works with schools, worksites, communities, health care, child care and human service organizations.

http://www.partnership4health.org/

Northwest and Central Regional Sustainable Development Partnerships
The Regional Sustainable Development Partnerships (RSDP) connect greater Minnesota communities to the University of Minnesota in order to help solve problems and take advantage of new opportunities. As a part of University of Minnesota Extension, RSDP brings together local talent and resources with University of Minnesota knowledge and seed funding to drive sustainability in four areas: agriculture and food systems, tourism and resilient communities, natural resources, and clean energy.

Design for Community Resilience program, Center for Sustainable Building Research

Design for Community Resilience (DCR) is a program/service within the Center for Sustainable Building Research that transforms civic challenges into sustainable opportunities through design. DCR works with communities across Minnesota to solve pressing problems (issues that encompass social, equity and environmental factors) through sustainable place-based solutions.

Working with communities, local governments, non-profits and other organizations research staff from CSBR and students from the College of Design work to address pressing problems while turning them into opportunities to make sustainable decisions for the community/organization’s and the planet’s future.

Our guiding principles for this work are:
• Integrated solutions that address a variety of issues and scales based in the state-of-the art sustainability research
• Holistic and dynamic problem solving
• Broad-based definition of sustainability that includes economic, social and environmental dimensions
• Grassroots, user-focused approach
• Working within our clients economic constraints
• An approach that goes from big picture to carefully addressing the details

http://www.csbr.umn.edu/research/dcr.html

The Center for Sustainable Building Research (CSBR) is a research and outreach center in the College of Design, University of Minnesota-Twin Cities campus. CSBR’s work and researches focuses on the following six areas:

Energy and Climate Change: provide tools, expertise and research to support energy independence, security and climate neutrality for the state, nation and planet.

The Water Cycle: understand the water cycle and its relationship to the built environment in the provision, capture, use, reuse and recharging of water in local and regional watersheds and global water cycle.

Sustainable Materials for a healthy built environment: A regenerative built environment will need a renewable source of materials that create healthy long-lasting environments.

Value and Benefits of regenerative designs: develop metrics to track the full range of value created by sustainable and regenerative designs.

Equitable Designs to provide sustainability for all: Investigate building solutions to provide sustainability to all communities.

Creating Regenerative and Resilient Communities: Our communities must become regenerative and resilient not only to be sustainable, but also to respond and adapt to stress and change in a dynamic global environment.

http://www.csbr.umn.edu/
Additional Partners include:

- Anderson Land Surveying
- Bluebird Gardens
- Butler Cat
- City of Fergus Falls
- Country Store
- Cullens Home Center
- Dakota Storage Bldgs
- Delzer Construction
- Elizabeth Lions Club
- Feel Good Gardens
- Fergus Falls Community Food Shelf
- Fergus Falls School District
- Fergus Falls Fish & Game Club
- Forget Me Not
- Gardening Matters
- Hanson’s Plumbing
- Harold Stanislawski
- Home Depot
- Hutchins Tree Service
- Jeff & Renee Legge
- Kiwanis Club of Otter Risers
- Larry & Diane Krog
- Larry & Mary Jo Schulz
- Otter Electric
- Otter Tail Power
- Outdoor Renovations
- Pat Melkert
- Pedogenesis
- RDO Equipment
- Richard & Brooke Barsness
- Sertoma Club
- Signworks
- Swedberg Nursery
- The National Gardening Association and Mantis Tiller 2014 donor
- Volden Construction
- West Otter Tail County Master Gardener Association
- West Otter Tail Soil & Water Conservation District
- WOTC Master Gardeners
- Otter Tail County Women Infants and Children's Program
- Battle Lake Food Shelf
- Fergus Falls Area Food Shelf
- Underwood 4-H Club
- Underwood Boy Scout Troop
- Girl Scout Troop 306547 Fergus Falls
- Ag Country Farm Credit Service
- Lake Region Healthcare Operations Council
- Bethlehem Church Fergus Falls
- Grace United Methodist Youth Group
- Boy Scout Troop 304 Fergus Falls
- Hillcrest Lutheran Academy Mission Class
Planning and Research Team

Planning Team

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Project Highlights

- LRTR is a **1.5 acre** community garden located in Fergus Falls, Minnesota.

- The garden was founded in May 2013 by Lake Region Healthcare as a way to get the community access to fresh produce. By providing fresh produce, overall community health is expected to increase.

- In 2013, **313 families** in need were helped with the efforts of the garden.

- In 2014 **4,500 pounds** of food have been produced so far and have all gone to families in need of fresh and nutritious produce. Additionally 3313 individuals were affected by the produce of the garden.

- **21 types** of vegetables were grown and **9 types** of fruit were grown in 2014.

- LRTR is a volunteer-based organization and is always looking for excited community members and partners to help with the efforts.

Partners and Design Team

Funded by **NW and Central Regional Sustainable Development Partnerships** through January 2015.

- CSBR’s Design for Community Resilience program working on a Master Plan for LRTR, including future phases and ongoing infrastructure projects such as a packing and receiving shed and handicapped accessible gardening spaces.

- Sustainable practices considered are:
  - High Yield Sustainable Practices
  - Composting
  - Raised Planter Gardening
  - Rainwater Harvesting
  - Irrigation Systems
  - Volunteer Programs

- The goal has to provide Lake Region Takes Root community garden with a sustainable plan to help keep LRTR successful for many years to come.
LRTR Background

Lake Region Takes Root (LRTR) community garden was started in 2013 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.

Project Focus and Approach

This 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.

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 feedback 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.

Research

Research topics included existing urban gardening operations and the techniques that they utilize to maximize their yield. Square foot gardening, vertical gardening and cold frames were a few of the techniques looked at to help LRTR increase yield in the garden. Inter-cropping and crop rotation were also part of the urban gardening research to identify how to plant particular species. Other areas of research included composting basics and how to achieve healthy compost, rainwater harvesting for irrigation purposes and rain garden creation and composition. Additional areas of non-gardening research included alternative energy sources such as solar energy, finding a connection to local artists and natural playgrounds for visiting children.

Community Input

Community members were engaged throughout the entire process of the project, indicating what they thought would work and offering suggestions for improving the design. Community feedback sessions were held on November 6th and December 18th. These sessions were integral in the process of the project to engage community members and help develop the vision together.

Design Implementation

Design elements for the garden included the following: Fields, Raised Bed Gardens, Sensory Garden, Distribution Shed, Perennial Garden, Natural Playground, Compost Zone, Tool Shed, Traditional Orchard and a High Tunnel.
Below are recommendations for the project based on research, design and community input. Priority levels are suggested with Level 1 being of highest priority.

**Priority Level 1**

1. Create four fields in the garden to allow for better crop rotation, cover planting and better garden management.
2. Increase compost zone in current location by constructing 4 10’x10’ bins with maximum depth of 3’ to allow manual turning of the units.
3. Construct a packing shed (10’x22’) that will meet the needs for produce handling, washing and storage before distribution.
4. Introduce canvas roof for pergola, lattice walls and an information board to the south and east walls of the pergola. Install a grill that could be used in cooking demonstration and educational events.
5. Install a rainwater collection system and large storage to collect rainwater from identified zones of adjacent condominium roofs for use to irrigate crops.
6. Introduce Square Foot gardening plots for maximized production and use some of plots for season extension with low tunnels.
7. Introduce a nature-based playground north of the pergola that uses natural materials to engage children in play.
8. Plant a “pizza” style garden that is utilized for growing of pizza and salsa ingredients.
9. Create a sensory garden that includes textures and smells by using herbs and perennial flowers.
10. Implement “Back to Eden” technique of using wood chips as cover crop for planting and observe and document the results to inform future action.
11. Implement a crop rotation schedule that helps to remediate soil conditions.
12. Make recruiting and training of garden workers an ongoing priority. Contact youth groups, churches and other after school programs in an effort to get children interested in volunteering at the garden.
13. Establish regular communication, in-person and online, between key garden volunteers and commit time for ongoing garden management.
14. Draw planting plans for each year, communicate them visibly to volunteers in display areas on the pergola structure and proposed packing shed. Observe, document and share the results of each year to inform future action.

**Priority Level 2**

15. Install a refrigeration trailer used for refrigerating produce and distribution.
16. Introduce rain barrels for rainwater collection from the proposed packing shed and pergola roof.
17. Install drip irrigation to better manage water quantities being used on crops.
18. Enhance existing perennial garden around the entry sign in southeast corner.
19. Increase amount of raised bed gardens to help with maximizing production and increased accessibility for all.
20. Host taste-testing events to get the community members of all ages involved with the garden.
21. Organize garden events around holidays such as Arbor Day and Memorial Day.

**Priority Level 3**

22. Host an educational series on how to garden at home, promoting healthy eating and food production within the community.
23. Implement a solar field that generates electricity with solar panels that can be used to power the refrigeration trailer and other garden systems.
Section 1: Research and Precedents
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.

“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)
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)
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 feedback 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.
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)
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.

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 veiney 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

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

<table>
<thead>
<tr>
<th>Crop</th>
<th>Inter-crop with</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparagus</td>
<td>Tomato, Parsley, Basil</td>
</tr>
<tr>
<td>Bush Beans</td>
<td>Potato, Cucumber, Corn, Strawberry, Celery, Summer Savory</td>
</tr>
<tr>
<td>Pole Beans</td>
<td>Corn, Summer Savory, Radish</td>
</tr>
<tr>
<td>Cabbage Family</td>
<td>Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard</td>
</tr>
<tr>
<td>Carrots</td>
<td>Radishes, Lettuce, Rosemary, Onion Family, Sage, Tomato</td>
</tr>
<tr>
<td>Celery</td>
<td>Onion, Cabbage Families, Tomato, Bush Beans, Nasturtium</td>
</tr>
<tr>
<td>Corn</td>
<td>Potato, Beans, Pumpkins, Cucumber, Squash</td>
</tr>
<tr>
<td>Eggplant</td>
<td>Beans, Marigold</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Carrots, Radish, Strawberry, Cucumber</td>
</tr>
<tr>
<td>Onion Family</td>
<td>Beets, Carrots, Lettuce, Cabbage Family, Summer Savory</td>
</tr>
<tr>
<td>Parsley</td>
<td>Tomato, Asparagus</td>
</tr>
<tr>
<td>Potato</td>
<td>Beans, Corn, Cabbage Family, Marigolds, Horseradish</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>Beans, Corn, Marigold</td>
</tr>
<tr>
<td>Radish</td>
<td>Carrots, Nasturtium, Lettuce, Cucumber</td>
</tr>
<tr>
<td>Spinach</td>
<td>Strawberry, Beans</td>
</tr>
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<td>Squash</td>
<td>Nasturtium, Corn, Marigold</td>
</tr>
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<td>Tomato</td>
<td>Onion Family, Nasturtium, Marigold, Asparagus, Carrots, Parsley, Cucumber</td>
</tr>
<tr>
<td>Turnip</td>
<td>Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard</td>
</tr>
</tbody>
</table>

(Inter-cropping, 2014)

High Yield Sustainable Practices

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
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.

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 and 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’ Feeding’ 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.
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)

Urban Agriculture Precedents

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 Research

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.

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.

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

(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.

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

(CSBR Report, 2013)
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, verminicompost 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.

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 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:

\[
Rv = 0.05 + 0.009(100) = 0.95
\]

\[
WQV = (1.25\text{"})(0.95) = 1.1875 \text{ inches}
\]

Then convert to cubic feet

\[
1.1875\text{in}/12\text{in} = 0.0989 \text{ ft}
\]

Multiply by the square footage of the surface

\[
(0.0989\text{ft})(875\text{sqft}) = 86.5 \text{ cubic feet of water}
\]

Convert cubic feet to gallons (\textbf{7.48 gallons per cubic foot})

\[
(86.5 \text{ cubic ft})(7.48 \text{ gallons}) = 647.02 \text{ gallons of water in a 1.25" rainfall event}
\]

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:

\[
Rv = 0.05 + 0.009(100) = 0.95
\]

\[
WQV = (1.25\text{"})(0.95) = 1.1875 \text{ inches}
\]

Then convert to cubic feet

\[
1.1875\text{in}/12\text{in} = 0.0989 \text{ ft}
\]

Multiply by the square footage of the surface

\[
(0.0989\text{ft})(2,315\text{sqft}) = 228.95 \text{ cubic feet of water}
\]

Convert cubic feet to gallons (\textbf{7.48 gallons per cubic foot})

\[
(228.95 \text{ cubic ft})(7.48 \text{ gallons}) = 1,712.57 \text{ gallons of water in a 1.25" rainfall event}
\]
Irrigation Research

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 plant's 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)
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 Research

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.
Section 2: Community Input

This section compiles information generated by the community in three volunteer panels.
Group 1: Volunteer Opportunities

Group Members
Marion Kerschner, Kim Blank
Jason Bergstrand, Abby Volden
Bev Norlin

November 6th Community Input

Comments on Design
- Like the 4 separate fields
- Keep one of the 4 fields always in a cover crop
- Like the idea of pole beans compared to bush beans

Volunteer Suggestions
- Companion plant in raised beds
- Add grill to lure community groups
- Generate themed gardens to draw interest
- Hoop houses might be too labor-intensive
- Contact church groups to recruit volunteers
- Education series might draw in helpers
- Juvenile court could use volunteer hours
- Community education program to engage adults
- Taste-testing for kids to learn about eating healthy
- Organize events around holidays such as Earth Day
Group 2: Food Distribution
Group Members
Teresa B., Linda B.,
Janet L.

Comments on Design
- Like the 4 separate fields
- Likes the traditional orchard
- Likes the sensory garden
- Kids natural area is great idea
- Look at incorporating large art projects to get people to visit the garden
- Keep the compost behind shed out of sight

Food Distribution Suggestions
- Create events to get families involved
- Distribution bags to pick produce up in
- Cooler to extend shelf life
- Have food-shelf volunteers come pick up produce creating awareness of the garden
Group 3: Client Engagement
Group Members
Mary Matteson, Kristin Schultes
Jackie Larson, Manda Tumberg

November 6th Community Input

Comments on Design
- Like the sensory garden
- Natural play area is a good idea to keep kids entertained

Client Engagement Suggestions
- Having a walled off pergola will help to create a space for community events
- Have a harvest event, where people can learn how to harvest, when to harvest and what to do with the harvest.
- Tying into the harvesting event, having some sort of cooking demonstration with fresh produce.
Group 4: Horticulture Issues
Group Members
Jenni Brause, Craig Winters, Melissa O’Donnell

November 6th Community Input

Comments on Design
• Keep compost away from Apartments
• No hoop houses
• 4 Fields make crop rotation easier
• Put sensory garden in this plan
• Natural playground is a good idea

Horticulture Suggestions
• More companion planting
• Limit amount of melons grown
• Use pole beans to increase yield
• Use row covers to prevent pests and weeds
• Limit heirloom tomatoes
• Use of cold-frames will extend growing season
November 6th Community Input Pictures
December 18th Community Input

Comments on Design

- Softer structures in playground area to provide a safer play set for children
- Use low tunnels for strawberries
- More water may be needed for vertical gardening plant species
- Consider raised beds in a 4’x12’ size. Allows for more space to grow particular plant species.
- Native plants could be used instead of rain gardens around the pergola
- Jr. Master Gardener program for getting children involved
- Create specific areas in the garden
December 18th Community Input

Comments on Design

• Use rainwater for watering trees and raised bed gardens
• Plastic mulch over mounded rows with irrigation may be an option for the fields
• WIC families liked kale, peppers, tomatoes, sweet potatoes, carrots, squash, yellow squash and zucchini.
• Engage Master Gardeners in teaching techniques at the garden
• Dehydration and canning classes could be taught at the garden
December 18th Community Input

Client Engagement Group Members
Melissa O’Donnell, Marion Kershner
Noelle Harden, Mary Matteson
Linda Bowhall

Comments on Design

- Bathroom is needed
- Increase the publicity of the garden within the community
- Promote the LRTR garden at the library
- Conduct an open house with vendors to get people involved with the garden
- Adopt-a-row. Have companies and organizations adopt a row and have them manage that row from weeding to watering. Could make it a competition where they compete with other organizations to have the best row in the garden.
- Advertise the amount of food given away and produced, people want to be part of a successful project.
Section 3: Design
Master Plan

Legend

1. Field #1
2. Field #2
3. Field #3
4. Field #4
5. Raised Bed Gardens
6. Sensory Garden
7. Distribution Shed
8. Perennial Garden
9. Natural Playground
10. Compost Zone
11. Tool Shed
12. Traditional Orchard
13. High Tunnel
14. Square Foot Gardening Plots
15. Rainwater Barrel
16. Pergola
17. Rain Gardens
18. CoolBot Trailer
19. Pizza/Salsa Garden
20. Solar Field
21. Bathroom
Master Plan Details

Fields
1-4. The two main fields have been divided into four smaller fields. The reasoning for this was to allow for proper and easier management of a crop rotation cycle. Currently there is no way of telling what plants were planted in what areas of the garden. By making four fields, it becomes easy to single out a field and not repeat plant in that field. Additionally, when dividing the fields this allows easier walk ability throughout the garden.

Raised Bed Gardens
5. The raised bed gardens would increase in number and a few would be placed along the new packing shed. These raised beds allow for easy accessibility and help to generate high yield, less work produce.

Sensory Garden
6. The sensory garden is located near the entrance to the garden. This garden is supposed to give off a pleasant smell and attract butterflies and birds. While most of the community garden is in food production, it is important to have beautiful perennials and aromas wafting through the air.

Distribution Shed
7. The new distribution shed is located near the southeast corner of the garden. This allows easy access to the road for picking up of deliveries. The location of this new shed was also determined as not to affect any views from the condo residents next door. This location of the shed does not interrupt any views overlooking the garden or farm fields.

Perennial Garden
8. This area is a new and extended perennial garden similar to what already exists. With the construction of the packing shed, landscaping flowers and flowerbeds can be enhanced around the new structure.

Natural Playground
9. This is the area set aside for a natural playground for children. Currently children of LRTR have no place to play while their mothers are volunteering in the garden. Natural playgrounds are quickly getting popular and consist of rocks and logs making them a very sustainable feature of the garden.

Compost Zone
10. The compost zone has been hidden around the back side of the tool shed. This is done to hide much of the compost from condo residents.

Tool Shed
11. This is the existing tool shed that is located at the LRTR garden.

Traditional Orchard
12. Much of the traditional orchard remains intact. A small portion of it will be converted to an experimental high tunnel in the future.

High Tunnel
13. This is the first of three possible high tunnels. By locating it in the upper corner of the garden it remains out of view. Currently the plan calls for one high tunnel because the creation of more would require more of the donated orchard to be changed.
Square Foot Gardening Plots
14. Square foot gardening plots have been laid out in the plan. These are designed spots that are meant to be used for square foot gardening techniques.

Rainwater Barrel
15. Rain barrels are going to be implemented to capture and use rainwater for irrigation. The locations were chosen for ease of access to the sheet steal roofs of the condo buildings. Rain barrels will also be used to capture water off of the new packing shed and pergola roofs.

Pergola
16. This is the current location of the pergola on site. There will be a few changes to the pergola including a solid canvas roof and lattice walls that will block additional sun and wind from the volunteers. This also allows for the pergola to be used as an outdoor classroom.

Rain Garden
17. Two rain gardens will be installed to help with horrible drainage within the garden. One of the areas is located on the side of the pergola and the other is on the southwest corner of the garden.

CoolBot Trailer
18. The CoolBot trailer is a enhanced and retrofit trailer that has refrigeration capabilities. Not only can this trailer keep produce fresh longer but it can be used to make deliveries to people unable to pick up produce themselves.

Pizza/Salsa Garden
19. The pizza and salsa garden is an area where children can be experimental within the garden while growing many foods that children find delicious. Who can turn down a delicious pizza anyway?

Solar Field
20. The solar field is intended to supply power to the garden, while also offering opportunities to earn money through a buyback program with power companies.
Recommendations
Recommendations

Below are recommendations based on project research and community input. Priority levels are suggested with Level 1 being of highest priority.

Priority Level 1
1. Create four fields in the garden to allow for better crop rotation, cover planting and better garden management.
2. Increase compost zone in current location by constructing 4 10’x10’ bins with maximum depth of 3’ to allow manual turning of the units.
3. Construct a packing shed (10’x22’) that will meet the needs for produce handling, washing and storage before distribution.
4. Introduce canvas roof for pergola, lattice walls and an information board to the south and east walls of the pergola. Install a grill that could be used in cooking demonstration and educational events.
5. Install a rainwater collection system and large storage to collect rainwater from identified zones of adjacent condominium roofs for use to irrigate crops.
6. Introduce Square Foot gardening plots for maximized production and use some of plots for season extension with low tunnels.
7. Introduce a nature-based playground north of the pergola that uses natural materials to engage children in play.
8. Plant a “pizza” style garden that is utilized for growing of pizza and salsa ingredients.
9. Create a sensory garden that includes textures and smells by using herbs and perennial flowers.
10. Implement “Back to Eden” technique of using wood chips as cover crop for planting and observe and document the results to inform future action.
11. Implement a crop rotation schedule that helps to remediate soil conditions.
12. Make recruiting and training of garden workers an ongoing priority. Contact youth groups, churches and other after school programs in an effort to get children interested in volunteering at the garden.
13. Establish regular communication, in-person and online, between key garden volunteers and commit time for ongoing garden management.
14. Draw planting plans for each year, communicate them visibly to volunteers in display areas on the pergola structure and proposed packing shed. Observe, document and share the results of each year to inform future action.

Priority Level 2
15. Install a refrigeration trailer used for refrigerating produce and distribution.
16. Introduce rain barrels for rainwater collection from the proposed packing shed and pergola roof.
17. Install drip irrigation to better manage water quantities being used on crops.
18. Enhance existing perennial garden around the entry sign in southeast corner.
19. Increase amount of raised bed gardens to help with maximizing production and increased accessibility for all.
20. Host taste-testing events to get the community members of all ages involved with the garden.
21. Organize garden events around holidays such as Arbor Day and Memorial Day.

Priority Level 3
22. Host an educational series on how to garden at home, promoting healthy eating and food production within the community.
23. Implement a solar field that generates electricity with solar panels that can be used to power the refrigeration trailer and other garden systems.
References


Bartholomew, Mel. All new square foot gardening. Cool Springs Pr, 2006.


Strong, Richard. Adjunct Assistant Professor and Senior Research Fellow, Center for Sustainable Building Research. University of Minnesota-Twin Cities. 2014.

Appendix
Conference Call with Deb Mason

Vineyard Boise Garden Coordinator

Deb Mason
Garden Coordinator
Vineyard Boise, Boise Idaho

Others on the call

Virajita Singh
Alexander Thill
Jason Bergstrand
Teresa Brause

Conference Call Notes

Deb said that they discontinued weighing of the food because it took time and labor. She also reiterated that it’s not about how much they produce but how many people they can help. This showed us that it’s more about the act of growing and helping and not keeping records of yield each year.

They had a few problems this year that affected overall yield of the garden. The first was that there was a drought and ineffective watering took place. Without water the plants don’t get as full and lush with produce. The second problem was there was a vine weed infestation. Viney weeds are very difficult to combat when they are choking out produce. Dilemma is do you pull weed and risk pulling produce up as well? Deb told us that overall yield is truly dictated by Mother Nature and the growing season, not just planting techniques and practices.

Things that Vineyard Boise Garden O’ Feedin’ has learned:

1. Timing (know when produce should be planted and harvested to get maximum yield from all crops)
2. Have consistency in watering (without water the garden does not produce, make a schedule and stick as closely as you can to it)
3. Utilized raised planting boxes (helps to control weeds and allows for greater accessibility when gardening)
4. Broadcast planting worked well (not practical at LRTR because volunteers already expressed concerns regarding ground plantings)

Vertical gardening should be utilized if looking to increase production. Also keep in mind the values brought forth by the video Back to Eden.
Pros
- 3 Fields allow for easy crop rotation
- Combined washing and Packing Station
- Hoop houses allow for extended season
- Compost area is designed to be efficient with man power only
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Cons
- Most of existing orchard would need to be changed
- Packing shed is larger (10’x20’)
Design Scenario #2  Divided Garden

Legend
1. Field #1
2. Field #2
3. Field #3
4. Raised Bed Gardens
5. Sensory Garden
6. Distribution Shed
7. Perennial Garden
8. Natural Playground
9. Compost Zone
10. Packing/Tool Shed
11. Traditional Orchard
12. Hoop Houses
13. Rainwater Barrels
14. Underground Cistern
15. Pergola
Design Aspects

Pro
• Separated Washing and Packing shed keeps work and distribution separate
• Traditional orchard preserves donated trees
• Compost area set back from activities to keep bugs and possible smells away
• Natural play area utilizes large natural objects for kids to enjoy

Con
• The produce will need to be hauled from back to the front of the garden
• Packing shed may be too small (8’x10’
Lake Region Takes Root Community Garden: Maximizing Sustainable Food Production

November 6th, 2014 Presentation

Lake Region Takes Root Community Garden: Maximizing Sustainable Food Production

Afforded an Opportunity
NW & Central Regional Sustainable Development Partnership
Long-term master plan for LRTR

UMN Design Team
Alex Thill
Virajita Singh

Objectives

1. Design Presentation
2. Small Group Discussion
3. Feedback to Design Team
4. Next Steps

Lake Region Takes Root Community Garden: Maximizing Sustainable Food Production

Winter 2013
Vision

Building a healthier population by engaging community partners to create a sustainable local food system that provides education for all ages and opportunities to increase access to local fruits and vegetables.

Critical values of the community garden

- Increased Access to Fruits & Vegetables
- Community Education Garden Methods Food Preservation
- Mentorship
- Good Work Ethic Recipient Participation
- Nutrition Education Value of foods
- Soil integrity to create nutrient dense foods
- Promote Biking Walking to LRTR
- Use of arts
- Sustainable water source
- Composting Variety of horticulture practices
- Use of arts
- Wildlife Birds, helpful insects
- Education around Seasonality
- Improving Aesthetics & value of neighborhood
- Spirit of community service volunteerism
- Integrated Land use Ag/Condos
- Innovation Creativity
- Increase physical activity
- Social cohesion
- Creating a replicable model
- Engaging all abilities all ages
- Engaging all abilities all ages
- Improved community and individual health
- Improve mental health connecting with nature
- Increase physical activity
- Hand powered tools vs. fossil fuels
- Sustainable water source
- Use of arts
- Sustainable water source
- Engaging all abilities all ages
- Improved community and individual health
- Improve mental health connecting with nature

260 Kennedy Park Circle

Spring 2014

November 6th, 2014 Presentation
 Volunteers making the difference

Early stages

Cover cropping

Young families

The children

RDO breaking ground

Caterpillar

Repurposing the Otter Garden

Harold Stanislawski tilling

Wolden Construction prep education center

Noon Rotary Volunteering

Installing the pavers

Home Depot Donation

November 6th, 2014 Presentation
November 6th, 2014 Presentation

- Wolden Construction prep education center
- Noon Rotary Volunteering
- Installing the pavers
- Home Depot Donation
- Spring 2014

- Ag Country Credit Services
- Volden Construction
- Hillcrest Academy
- Girl Scouts

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- Ag Country Credit Services
- Volden Construction
- Hillcrest Academy
- Girl Scouts
Food donations

1. Women’s Infants and Children’s (WIC) program
2. Fergus Falls Community Food Shelf
3. Battle Lake Food Shelf
4. Pelican Rapids Food Shelf
5. Matthew House

Impact

<table>
<thead>
<tr>
<th></th>
<th># Produce Donated</th>
<th># People Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1,600</td>
<td>313 families</td>
</tr>
<tr>
<td>2014</td>
<td>4,500</td>
<td>3313 Individuals</td>
</tr>
<tr>
<td>2019</td>
<td>25,000 ?</td>
<td>5,000 Individuals</td>
</tr>
</tbody>
</table>

Long Range Plan Will Help Guide Our Future Efforts

Who we are

Virajita Singh  
Senior Research Fellow at the Center for Sustainable Building Research

Alexander Thill  
MLA candidate 2016 at University of Minnesota Twin Cities
Who we are

Regional Sustainable Development Partnerships

The Regional Sustainable Development Partnerships (RSDP) connect greater Minnesota communities to the University of Minnesota in order to help solve problems and take advantage of new opportunities. As a part of University of Minnesota Extension, RSDP brings together local talent and resources with University of Minnesota knowledge and seed funding to drive sustainability in four areas: agriculture and food systems, low- and middle-income communities, natural resources, and clean energy.

Goals

Community Goals brought forth by LRTR
- Maximize production; up to 25,000+ pounds of food a year
- Compost onsite; becoming environmental stewards reducing landfill waste
- Collect stormwater from surrounding businesses and use on site
- Create an educational experience to teach others how to garden
- Create a community service that reflects highly within the community
- Generate social cohesion within the community

LRTR Program needs
- Packing Shed for distribution
- Increased accessibility of the garden
- Wind and sun break for volunteers
- Hoop house orchard
- Crop rotation schedule
- Rainwater harvesting system

Additional needs
- Refrigeration option/cold cellar
- Drip irrigation to maximize efficiency with watering techniques
- Lack of bathroom

Sustainability Frameworks

- Place
- Water
- Energy
- Materials
- Health and Happiness

Precedents: The Garden O’ Feedin’

- Started in 1998, the garden now provides hundreds of families with fresh produce and vegetables.
- Located in Boise, Idaho
- Part of the Vineyard Ministry created to help the needy in their community.
- In 2009 the garden produced 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 Robins
Precedents: Earthworks Urban Farm

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

- Started in 1997 under the mission to feed the hungry and care for the poor
- Located in Detroit Michigan
- Has become a poster child of sorts in the expanding effort to get involved in community gardening.
- Since 2008, Earthworks has switched its practices from distribution of whole foods to distribution of cooked foods through The Capuchin Soup Kitchen.

“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)

Connection to the Arts

Complete Streets, Battle Lake, MN

- Wanted to increase art appreciation in the community
- Project took place along Lake Avenue.
- Decided that glass mosaics would be installed into tree benches
- Benches reflect different themes, natural habitat, agriculture and recreation

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.

Precedents: Composting

- Landfills are quickly coming to capacity, space is becoming valuable.
- Composted material can be used to treat nutrient deficient soils helping to grow stronger crops.
- Full of nitrogen and carbon.
- When added to soil, helps to promote extensive root growth and development.
- Compost also helps to retain water in the soil longer, requiring less irrigation.

Urban Agriculture Techniques

Square Foot Gardening

- Small manageable beds are planted densely together
- Able to grow lots of food with limited space
- Limits weeds and excessive fertilization

Sizing

- Typical box size is 4 ft by 4ft
- It produces enough food for 1 meal, for 1 person for 1 day
- Keep 3 feet between the boxes to create accessibility and room to garden

Cold frames

- Can be added to raised box planters to lengthen the growing season.
- Consist of an empty bottom box that is covered with either a glass or some kind of transparent material
- The covering acts as a greenhouse does and protects plants from hard frost and maintains a constant temperature

Precedents: Composting

Turning Units

- At Home Units

Vermiculture

- At Home Units

November 6th, 2014 Presentation
Precedents: Rainwater Harvesting

17th Ave Resident Hall, U of M
- Total volume is 38,000 gallons converted.
- System is used as a sustainable way to flush toilets in the new residence hall.
- Currently being looked at for a project in St. Paul involving a baseball stadium.

Chicago Center for Green Technology
- Double LEED Platinum status for both building footprint and operational status.
- Collects 1000’s of gallons of water in above ground water tanks.
- Many are hidden by vegetation as you can see in the pictures.
- Used in the irrigation of green wall vegetation and the landscape.

Opportunities for Rainwater Collection

Area 1 Calculations
Equations:
\[ WQV = (P)(Rv) \]
\[ WQV = \text{Water Quantity Value} \]
\[ P = \text{Rainwater event in inches} \]
\[ Rv = \text{Runoff coefficient} \]
\[ Rv = 0.05 + 0.009(I) \]
\[ I = \text{Percent of the surface that is impervious} \]
Calculations:
\[ Rv = 0.05 + 0.009(100) \]
\[ Rv = 0.95 \]
\[ WQV = (1.25)(0.95) \]
\[ WQV = 1.1875 \text{ inches} \]
Then convert to cubic feet
\[ \frac{1.1875 \text{ in}}{12 \text{ in}} = 0.0989 \text{ ft} \]
Multiply by the square footage of the surface
\[ (0.0989)(875 \text{ sq ft}) = 86.5 \text{ cubic feet of water} \]
Convert cubic feet to gallons (7.48 gallons per cubic foot)
\[ (86.5 \text{ cubic ft}) \times (7.48 \text{ gallons per cubic ft}) = 647.02 \text{ gallons of water in a 1.25” rainfall event} \]

Area 2 Calculations
Equations:
\[ WQV = (P)(Rv) \]
\[ WQV = \text{Water Quantity Value} \]
\[ P = \text{Rainwater event in inches} \]
\[ Rv = \text{Runoff coefficient} \]
\[ Rv = 0.05 + 0.009(I) \]
Calculations:
\[ Rv = 0.05 + 0.009(100) \]
\[ Rv = 0.95 \]
\[ WQV = (1.25)(0.95) \]
\[ WQV = 1.1875 \text{ inches} \]
Then convert to cubic feet
\[ \frac{1.1875 \text{ in}}{12 \text{ in}} = 0.0989 \text{ ft} \]
Multiply by the square footage of the surface
\[ (0.0989)(2,315 \text{ sq ft}) = 228.95 \text{ cubic feet of water} \]
Convert cubic feet to gallons (7.48 gallons per cubic foot)
\[ (228.95 \text{ cubic ft}) \times (7.48 \text{ gallons per cubic ft}) = 1,712.57 \text{ gallons of water in a 1.25” rainfall event} \]
Design Aspects

**Pros**
- 3 Fields allow for easy crop rotation
- Combined washing and Packing Station
- Hoop houses allow for extended season
- Compost area is designed to be efficient with manpower only
- Play area is centralized for easy viewing of children

**Cons**
- Most of existing orchard would need to be changed
- Packing shed is larger (10’x20’)

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**Design Scenario #2 Divided Garden**

Legend
- Field #1
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- Pergola

Your Input

5:30 – 6:00 Small Group Discussion
6:00 – 6:30 Feedback to Design Team
6:30 – 6:45 Wrap Up and Next Steps
Your Input

Group 1
Volunteer Recruitment
How might we move this forward?

Group 2
Food Distribution
Who is involved and how?

Group 3
Client engagement
Help with growing food and education?

Group 4
Horticulture Issues
Suggestions like organic pest control, crop rotation, companion planting, higher yields?

Group 5
Fundraising
Ideas for fundraising?

Your Input

Step 1:
Each group take 5-10 minutes to review design scenarios and add your input individually on post-it notes and add to flip chart paper.

Step 2:
Each group think about your topic of focus and propose ideas individually and collectively on post-it notes and add to second sheet of flip chart paper.
Thank You for your participation!