

ENVS 401.3

Growing Sustainability at the U of S

A public orchard proposal

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Photo credit: Sandra Panko

Executive Summary

This report serves as a proposal for a new public orchard at the University of Saskatchewan. The objective of this proposal is to provide the university community with a comprehensive plan to institute a public orchard on campus. The orchard would celebrate the University of Saskatchewan's fruit breeding program, promote local food security, raise awareness through education for sustainable initiatives on campus, and provide a catalyst for future community food developments on campus and within the City of Saskatoon.

A significant motivation for our vision has been drawn from the desire to further commemorate and pay tribute to the contributions of Cecil Patterson, and his various test plot locations before the establishment of Patterson Garden in 1966. This orchard will display not only the horticultural prowess of the University of Saskatchewan, but also place it within the discourse of food security and biodiversity. Our master plan includes a detailed design for the orchard that incorporates native plant species, naturally incorporated pathways, creative seating solutions, and welcoming gathering spaces. Our hope is that the orchard will come to be a valued and well known space on the University of Saskatchewan campus for years to come.

The challenges our proposal faces lie in the underlying bureaucratic issues revolving around our campus community. Stakeholder involvement and interests throughout both the city and campus community will be addressed and discussed in this report. Other examples of physical changes could include, but are not limited to future root system development and increased biodiversity through the introduction of additional plant species to an existing monoculture. Moreover, alternative sites for the development will also be considered and briefly identified in the latter portion of our report. Vouching for such a permanent change, although beneficial, faces challenges of delayed approvals and implementation processes. In presenting these resources and information, our hope is to set up a platform for this development to be further justified and understood by a wider community.

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Project Goals



Celebrate the fruit breeding program on campus



Landscape using native plant materials



Promote local food security



Create interesting natural corridors that draw people to the area



Increase ecological productivity



Commemorate the university's landscape history



Harness local biodiversity & further expand it



Reduce Island effect



Provide ecosystem education & recreation



Reduce air pollution



Improve wildlife habitat



Reduce sound pollution from local roadways

Our Plan

Opening Statement

Our project focuses on an opportunity for growth on a local scale in both a literal and theoretical sense. The aim of this project is to provide the University of Saskatchewan (U of S) community with a detailed plan to institute a public orchard on campus. The U of S has an internationally recognized fruit program that has bred various cultivars that thrive in harsh climates such as ours. Though it is internationally recognized, the local recognition of the program, and its products, is limited. The orchard would serve to better showcase the U of S fruit program, promote local food security, raise awareness through education for sustainable initiatives on campus, and serve as a catalyst for future developments. The proposal includes specific landscape designs for three potential sites: the education test plot, college quarters, and the sculpture garden. Each site offers unique opportunities to maximize public engagement and raise awareness of local sustainability issues. Despite the many merits of the proposed orchard, it will be challenging to bring it to fruition due to the complexities associated with land designations on campus and determining which individuals have authority over them. Further challenges include obtaining the initial and continued support of Facilities Management and acquiring funding for the various materials used for establishment, landscaping, and education. Our hope is that the orchard will add to the edible landscapes already present on campus and become a well-known and valued space in which to experience sustainability.

Problem

Food insecurity is a prevalent problem for both the University of Saskatchewan and the City of Saskatoon as a whole. There is a need for a public space that addresses this and other sustainability issues

Significance

In Figure 1 the locations of grocery stores across Saskatoon are geographically represented. There is a significant need for more food sources within the core neighborhoods in Saskatoon. These food deserts, along with the increased access to fast food restaurants in these areas is attributed to the increase in childhood obesity (Saskatoon Community Clinic, 2008). Areas with high volumes of fast food restaurants and convenient store locations, but no fresh food grocery stores are characterized as food swamps (Saskatoon Community Clinic, 2008). The effects of food deserts in a combination with food swamps are exacerbated when combined with areas of low income as they offer little to no incentives to grocers (Steeves, 2015). Speaking in terms of food security alone, the Saskatoon Regional Food System Assessment and Action Plan stated that there is a high need for such a space that provides access to fresh fruit and vegetables (Kouri, 2013). We believe this is also true and relevant for those community members situated in a unique institutional setting, such as campus. They state that the City of Saskatoon is booming, and as a result more and more financially stable households are relocating to the suburbs. This enables grocery store location around the outermost development of the city, and leads to store closures within its core (Steeves, 2015). This means that local needs are not being met, especially for those most at risk. In addition, new land is being designated for development, having untold environmental effects.

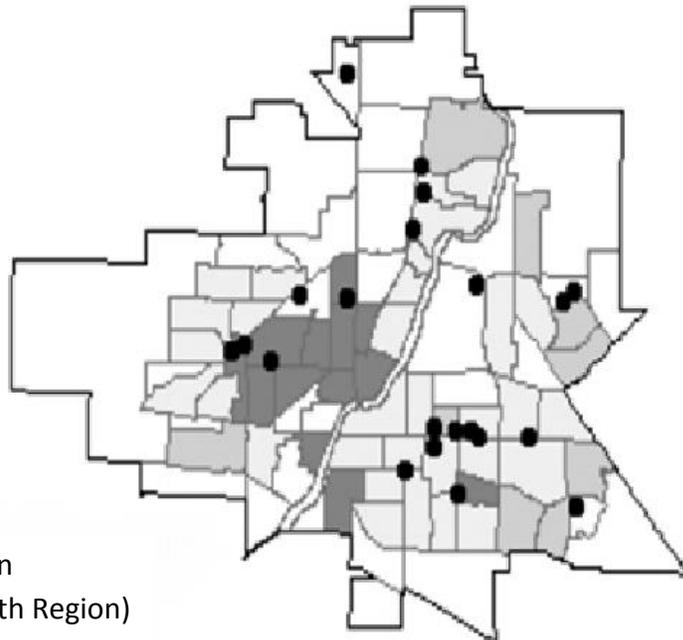


Figure 1. Supermarket locations in Saskatoon, 2008 (Saskatoon Health Region)

In many classes at the U of S, food security, food miles, and food deserts are discussed in detail, the courses cover ways to mitigate and solve these issues. This being said, the U of S campus is located in a food desert. Though issues such as food imports and food security are discussed, little is being done to address the underlying problem. Our orchard would provide an on campus example that would educate not only the campus community but also the greater Saskatoon community about sustainable regional food production and practices.

History of the Fruit Program

The origins of the fruit breeding program began in the 1920's when Cecil Patterson first started breeding hardier cultivars of well-known fruit species for production on the prairies. Cold hardy species had to be crossed with desired cultivars and each breeding cycle would take several years before another generation could be tested (approximately 7). Through several decades of selective breeding for genetic improvement the program has repeatedly made available hardy fruit cultivars suited for prairie ecozones. The programs cumulative progress to date is demonstrated by the successful release of over 50 apple varieties for prairie fruit production (Bors et al. 2003).

The U of S fruit program is best known for its sour cherry cultivars that were released in the 1990's (Bors and Sawatsky, 2007). The initial cherry breeding was not done at the U of S, but was begun in secret. In the 1940s, Dr. Les Kerr was working to develop shelterbelt trees for the government at the time. As a side project, he spent 40 years privately breeding cherries to increase their sweetness and hardiness. The results of his efforts were donated to the U of S fruit program. It is thanks to his pioneering efforts that the first series of cherries, named Romance, were developed in the next generation of breeding (Bors and Sawatsky, 2007).



Figure 2. (<http://www.fruit.usask.ca/dwarfsourcherries>)

Since 1999, the fruit program at the U of S has been under the supervision of Dr. Bob Bors. In that time not only were the sour cherry series released, but Dr. Bors, along with Horticultural technician Rick Sawatsky, also took over the development of Haskap, also known as Blue Honeysuckle, a well-known fruit in Japan and Russia. A wild variety is already native to the boreal areas of the prairie provinces, however many years were spent developing cultivars that had improved flavour and fruit structure to aid in commercial production (U of S Fruit Program, 2016).

A Brief Look at a New Orchard

We see this orchard serving not only as a usable public space in which individuals will be immersed within the essence of food security on campus, but also as a stepping stone for future projects. It is our hope that one day all the suggested sites will come to be developed and connect to pre-existing edible landscapes on campus to form a sustainability corridor.

Stakeholders & Current Strategies

The U of S is in itself made up of a very complex and diverse assemblage of stakeholders but when you place it within the larger context of the City of Saskatoon, we are presented with an even larger diversified group of Stakeholders. These stakeholders range from on campus decision-makers, students and faculty to community groups. For the purpose of this proposal we will review a few of the key stakeholder groups involved and attempt to place our public orchard proposal within the current environmental plans and policies of each. Moreover, we feel that the creation of an additional edible landscape on campus would serve to connect these stakeholder groups. This would be achieved by offering each a new and inviting space in which to educate members of the public on both the importance and feasibility of local and sustainable food sources. If implemented, our project would have a concrete and meaningful impact on both communities. Such ambitious changes might be difficult to gain consensus among the various campus management departments involved given the complex organizational structure of decision-makers on campus. One representation of this complex stakeholder is as follows:

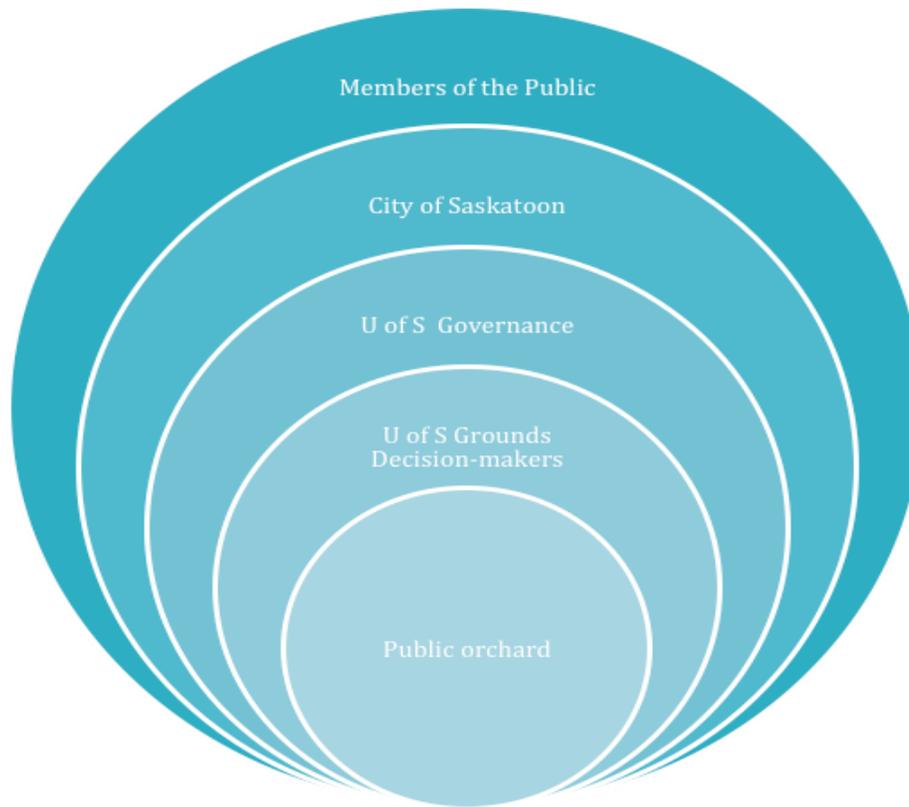


Figure 3. Stakeholder group spheres as they relate to the proposed Public orchard plan. This representation shows the public orchard (any of the proposed sites) nestled within a broadening context. Each circle, with exception of the public orchard circle represents the below listed stakeholder groups that will be addressed in this paper.

Stakeholder Group 1: U of S Grounds Decision-makers

Facilities Management is the predominant department in charge of both grounds related decision-making and implementation. This department includes various sub departments which all influence the decision-makers. Complicating grounds related decisions is the fact that many alumni have come to value the current aesthetics out of nostalgia. The resistance to change may prove to be a source of delay for on-campus groups, such as our own, when hoping to transform pre-existing areas into more sustainable landscapes.

Although it stands to reason that Facilities Management would be the main governing body for such a project, getting a hold of their master plan has proven difficult. Despite reaching out to several different individuals from various sub-departments within this stakeholder group, we were unable to get any detailed insight into their overarching plans for any of our proposed sites. Eventually we were informed that their current master plan was outmoded and therefore under review. This is exciting, as a new master plan has potential for incorporating new sustainable projects such as our own. We feel that our public orchard would fit nicely within the existing landscaping on campus and prove to require minimal upkeep for those directly charged with maintaining and beautifying the grounds.

The University of Saskatchewan's current strategy strives to address environmental concerns by reducing the amount of water used on irrigation, increasing xeriscaping and making use of on campus compostable materials (U of S, n.d.). These practices would easily be applicable to our public orchard and reinforce the University's current grounds related vision. This project is made more environmentally friendly by the fact that the three proposed areas are already set aside as natural and/or public spaces and will not require excessive energy inputs in terms of fuel for construction vehicles or physical materials.

Stakeholder Group 2: U of S Governance

Outside of Facilities Management, there is a plethora of other concerned parties within the U of S community. For the purpose of this report they have been aggregated into one stakeholder group, which includes all on campus groups, students, and faculty.

Group 2's current strategy can be summarized by looking at the U of S policy and climate related commitments. These commitments center on reducing greenhouse gas emissions and only lightly touch upon the use of public spaces and making use of regional food sources (U of S, 2012). We believe our proposal, as well as the other edible landscapes already in existence on campus would serve to strengthen the University's existing climate related plans; taking them from policy to action. Moreover, many universities around the world are

also a part of environmental ranking systems, which rate their environmental performance based on a variety of criteria. One such ranking system is STARS. As further outlined in the Education and Outreach section of this paper, the development of a public space we have identified would augment the University of Saskatchewan's STARS rating and place it on a more level footing with other universities of the same caliber (*see Education & Outreach page 33*). We feel that the educational and interactive nature of our proposal would help raise the University's ranking. This is equally identified as one of their Climate action plans (U of S, 2012).

For a more comprehensive list of the University of Saskatchewan's environmental commitments and policies read: <http://sustainability.usask.ca/about-us/policies-and-plans.php#CampusSustainabilityPlan>

Stakeholder Group 3: City of Saskatoon

Another key stakeholder group is the City of Saskatoon. This stakeholder group encompasses both the decision-makers involved in the governance of the city and the residents that live there. The city's current climate strategy is found within the Energy and Greenhouse Gas Management Plan. Within this climate related plan lies the B1-8 commitment titled:

Develop an outreach program that promotes local food and educates people about the availability and benefits of purchasing locally and regionally grown food products, and the amount of emissions that are created from imported foods. As part of this program, conduct workshops, and provide topsoil and plants to grow local food. The workshops will apply sustainable urban agriculture practices such as growing for oneself and growing for the local economy, and educate on water wise issues, composting and the trade-offs in emissions production.

This commitment would be directly met by our project. Not only would we be providing residents with locally developed and grown foods, we would also be educating them about the many benefits associated with them. Furthermore, according to the Saskatoon Community

Clinic (SCC), food security is achieved only by attaining three goals: market access, reasonable prices, and good quality nutritious food (SCC, 2008) (Fig. 4). Our orchard plan provides healthy food at no charge, thus fulfilling the last two requirements outlined by the SCC and eliminating the need for the first.

Food security means three things:

- **Market access:** Residents should be able to purchase groceries relatively close to home. Not all people, especially the poor and elderly, have access to cars for grocery shopping.
- **Reasonable price:** The food needs to be affordable. Saskatoon does have access to healthy food, but it can often be more expensive.
- **Good quality:** Food should be nutritious. Unfortunately, the word food is used for many products that are actually unhealthy. Food security is about healthy food.

Figure 4. Food security means market access, reasonable price and good quality (Saskatoon Community Clinic, 2008).

Stakeholder Group 4: Members of the Public

This stakeholder group is incredibly broad. The value of such a space as our public orchard naturally extends past the above mentioned stakeholder groups. The fact is this orchard would be situated in such an accessible area makes it a valuable public space. This combined with its capacity for providing users with free, local, and self-replenishing food while educating them on the importance of food security, biodiversity, and sustainability makes this space highly engaging. This is achieved not only by the use of the space by visiting members of the public, such as tourists or visiting academics, but also by the example it sets. The more notoriety our project collects the more it will come to influence others outside of both the University of Saskatchewan community and the City of Saskatoon. This will be achieved by inspiring other cities and university to undertake similar projects.

Stakeholder group 5: Non-Human Users

It is important to note that anytime a project looks to use or modify a natural space it will have a huge impact on the non-human inhabitants as well. This 5th stakeholder group therefore encompasses all animal users of the space. Each of the proposed sites acts as wildlife habitat due to the close proximity of the South Saskatchewan River. The river valley acts as a wildlife corridor that cuts through the middle of the city. Given this, the design of our public orchard makes use of native plants and links gradually into the pre-existing landscapes. Our hope is to introduce the new land-use in a non-invasive way that allows the space to better serve both its human and non-human users. Regardless of our success in this matter it is important to note that all natural spaces are areas where cohabitation between humans and animals. This coupled with the use of these areas as wildlife corridors amplifies the likelihood of human-animal conflicts (Ditchkoff et al., 2006). This should be taken into account when looking to integrate these spaces into the pre-existing animal management plans of both the University of Saskatchewan and the City of Saskatoon.

Many papers have highlighted the importance of city designs that look to avoid sprawl and instead re-develop pre-existing areas to better suit our growing needs (Jim, 2013; Ditchkoff et al. 2006). Our project capitalizes on this notion by identifying three underutilized natural spaces thus reducing environmental impacts and minimizing the occurrence of animal behavioural change within our city's many wildlife residents. In making this a safe and inviting space for all users we reduce the potential negative impacts of animal-human interactions, as well as the associated increased rates of mortality (Ditchkoff et al. 2006). Lastly, we have specifically chosen plant varieties that attract pollinators, as pollinators are both integral to the food production system and at risk in Saskatchewan (Agriculture Canada, 2014).

The Preferred Site: Education test plot

Our ideal location for this orchard will be featured alongside an often forgotten fragment of Patterson's many test plots. Immediately west of the Education Building's ravine is a row of neglected crab apple trees lining a pathway that separates the Education Building from Diefenbaker Place. Currently, the land features a number of trees and a section of manicured grass, known by few, and underutilized as is. Our proposed change would drastically alter the topography of the area, and increase its utility as a public space that fosters an engaged learning experience for all who visit.



Figure 5. Ground level view of Patterson test plots (Gabriel Churchill)



Figure 6. Aerial view with proposed orchard site outlined in blue (Gabriel Churchill)

The images (Fig. 5 and 6) are two sources of satellite imagery; one being a ground level view, and the other a bird's eye view. Taking a look at the existing piece of land, it is long and narrowed at both ends. The blue selection in Fig. 6 indicates the chosen area for development. The development would start at the foot of the walkway from the row of trees and span to the North West section of the plot.

Design

Our design is based on maximizing land use while also utilizing space to produce large quantities of fruit without overcrowding and overwhelming the development itself. The design pays specific attention to the contents of the orchard in combination with the best suited layout. The space will include an overarching representation of plants used throughout the lifetime of the orchard while also moving away from a grass monoculture to lessen maintenance and increase biodiversity. Fruit bearing plants will be grown alongside native grasses and perennial ground covers including edible plants and flowers. To avoid focusing on food security only through fruit produce, two other main sections of land will be reserved for medium sized vegetable gardens, that could be added to the Office of Sustainability's community garden program (U of S, n.d.). The layout of the site also includes a path that runs through the sections of tree varieties and vegetable gardens located at either end (Fig. 7).

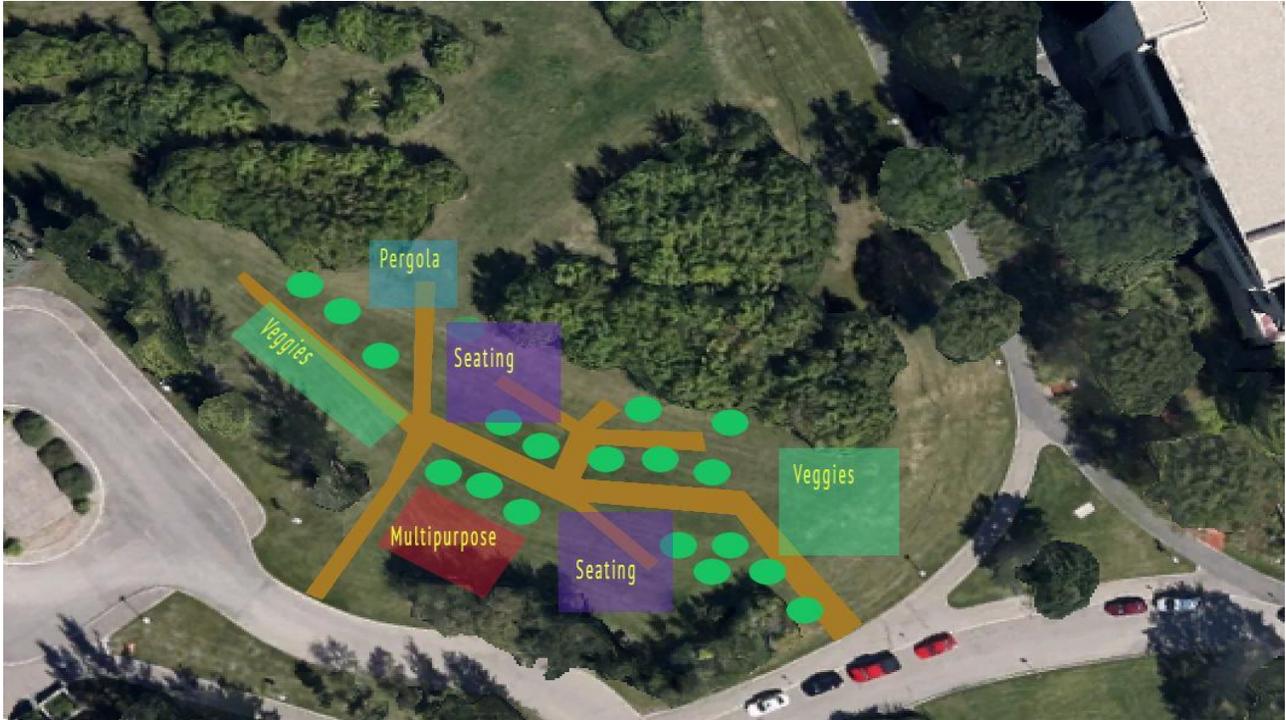


Figure 7. Aerial view of proposed orchard site design layout (Gabriel Churchill)

The path itself will be naturally carved out of the surrounding landscape, much like what is represented in Fig. 8. An integral aspect of the landscape design is to step away from the traditional asphalt sidewalks elsewhere on campus. The central winding path that connects each entrance and exit of the site could be made of cobblestone to allow native groundcover to grow in between stones over time, and therefore also require less maintenance. The thinner connecting paths could be made of various themed stepping stones connecting to each unique section of the site. Each branching path will provide stepping stone access off of the small paths to the main path, accommodating convenience, adventure, and safety. While the paths will be winding, they will easily provide connections to each featured section along the main path, whether you are wandering through, spending time, or in a school group exploring with the class.



Figure 8. Rendering of pathways (Gabriel Churchill)

Below, Fig. 9 and 10 are renderings of what details could possibly be featured in the site, including traditional raised garden beds, vertical growing apparatuses, naturally growing grasses and fescue, lattice structures to grow grapes, and uniquely designed spaces for seating.



Figure 9. (Gabriel Churchill)

Special consideration is given to a section of the site where Valiant, a grape cultivar will be able to grow. Such a unique setting on our campus could include seating in order to fully appreciate and enjoy the space.



Figure 10. (Gabriel Churchill)

The northern most section of the site will be south facing and brightly lit, therefore being best suited for comfortable seating areas within the orchard. The backside of this site also provides more tree cover and further through access to the Meewasin trail, leading to the river. Our plan strives to provide unique seating areas for people to enjoy their time in and around the space. Demonstrated below in Fig. 11, the pergola could also serve to grow vines or grapes on.



Figure 11. (Gabriel Churchill)

In Fig. 12 and 13 a vision is featured for what could become of the easternmost vegetable garden, which is situated off of the main walking path and parking loop of Diefenbaker Court directly connected to Campus Drive. This would be the first impression for most visitors and passerby's. The concept captured in Fig. 11 speaks to early designs of the site upon initial development, while the second image gives a more thorough vision of what the entire landscaped area of the site would look like with natural grasses and perennial ground cover once given a chance to grow into its surroundings. The site features, but is not limited to what is illustrated below: a row of haskap bushes along the pathway, a visitor's first look at some of the tree cultivars, a main path into the orchard, a simple design of a vegetable garden, all enveloped by the living natural landscape. As discussed, our plan looks at utilizing as much space as possible to produce large quantities of fruits and vegetables. The vegetable gardens can be arranged in a way to maximize growing space either through sectioned layers of ground soil, or through vertical growing techniques.



Figure 12. Eastern vegetable garden concept I (Gabriel Churchill)

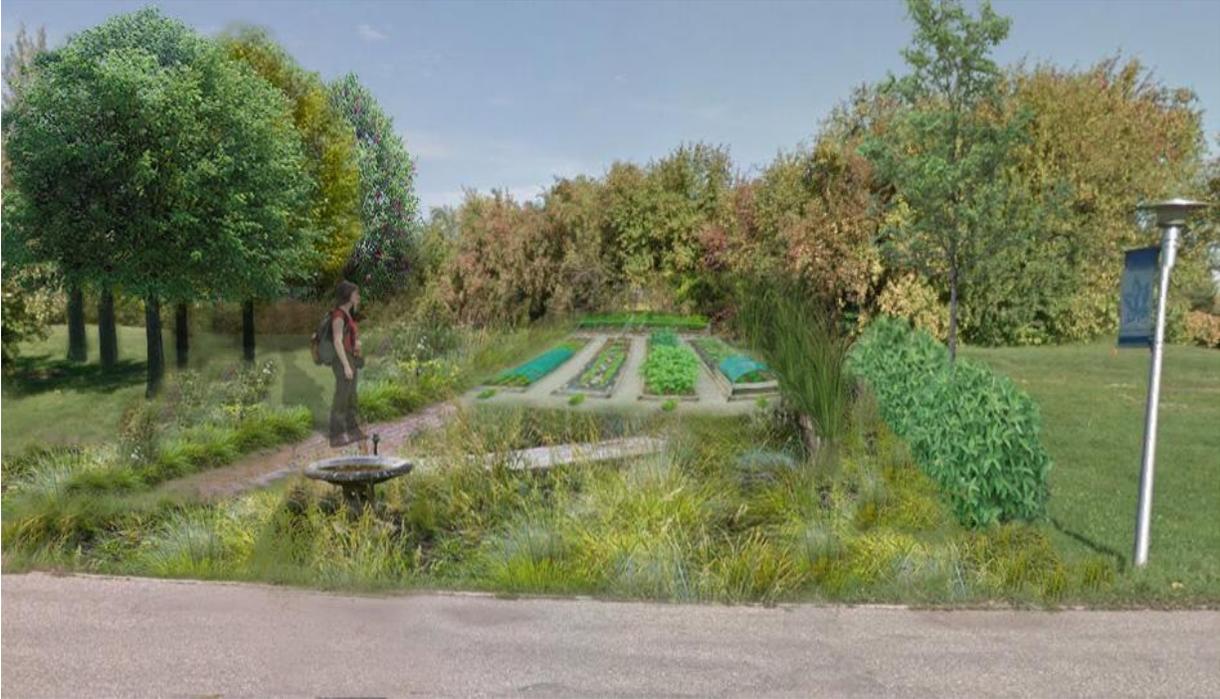


Figure 13. Eastern vegetable garden concept II (Gabriel Churchill)

Spacing & Initial Design

The initial design of the orchard space is important as it serves as the backbone upon which the future design of the site will be built. For commercial orchard operations there are species dependent spacing guidelines that are followed at planting that allow for ease of use of commercial harvesting equipment. As this is not a commercial orchard the spacing will be modified to allow for the other design elements that will be incorporated in the landscape and the number of plants used can be easily adapted to the location.

Fruits Types

Apples

In a commercial operation spacing is usually limited to 5ft between trees that have Ottawa 3 rootstocks. Rootstocks refer to the root that the apple cultivar was grafted onto. Most apples on the prairies are grafted onto cold-hardy rootstocks which increase the ability of the cultivars to survive the winter. The Ottawa 3 rootstock is a dwarfing rootstock and controls the



Figure 14. Apples (<http://www.fruit.usask.ca/apples.html>)

overall size of the tree limiting growth to around 10ft, making it easier to prune and harvest fruit by hand due to the smaller stature, eliminating the need for ladders. This rootstock also enhances the winter hardiness of the cultivar and has been used extensively on the prairies (Bors, 2007). For this project it is recommended that the spacing be expanded to 10ft between trees within a row to allow for ease of access for picking, as well as future design elements such as paths and seating areas.

Sour Cherries

Dwarf Sour Cherries are perhaps the most well-known of the releases by the U of S fruit program. They were developed with characteristics that are ideal for both commercial and small scale production. Fruit produced by the trees and shrubs in the public orchard will be harvested by hand, therefore spacing must reflect this. Spacing for dwarf sour cherries that are to be harvested by hand is recommended as 1.5 m between plants (Bors, 2004). Dwarf sour cherries are most commonly planted in rows, however, other designs can be implemented due to the shrub-like growth habit of the cultivars.

Haskap

Haskap, also known as Blue Honeysuckle or Honeyberry, is another product of the fruit program and new cultivars are continuously being developed. Breeding has been done around the world before the U of S began breeding for enhanced flavour and production capabilities. These plants are the smallest of the fruit types that will be planted with bushes rarely reaching

more than 3 ft. in height and are the earliest to fruit (Bors, 2004b). Haskap requires pollination by unrelated cultivars in order to bear fruit. Generally, one pollinizer will be able to pollinate 6 other plants and it is important to be aware of this when designing the other aspects of the orchard as this will affect spacing (Bors, 2004b). Spacings of 1 m are traditionally used to create hedges in commercial production scenarios, however, if spacing is 1.3 m or larger the plants will remain individual shrubs and both can be beneficial for the design and intentions of this project (Bors 2004b).

Saskatoon Berry

The U of S fruit program has not done much work with Saskatoon berries, as the wild variety (*Amelanchier alnifolia*) is highly productive throughout the Prairie provinces. Commercial operations do exist and generally two cultivars; Thiessen and Northline, are used for fruit size and structure which helps with commercial harvesting, although “U-pick” farms are most common. The fruit is a favourite of prairie inhabitants for its various uses though it is relatively unknown outside the Prairie provinces. Saskatoon berries can grow into a very tall shrub (10 ft.) and can get quite wide. It is recommended to grow Saskatoon berries in a hedge (Bors, 2007c).

Fruit varieties

Fruit Type	Variety	Description
Apple	Prairie Sensation	Ripe early-mid Sept. Large apple, requires little thinning of fruit, good for fresh eating and storage and is winter hardy
	Patience	Ripe mid Sept. Very rich sub acid flavor high in astringency, texture med firm very crisp and juicy with very good storage life
	Autumn Delight	Ripe late Sept. Medium sized apple, very sweet, crisp texture, excellent for storing
	Fall Red*	(*Developed by Ag Canada) 7-8cm diameter, ripe early Sept, great eating apple, can store until March.

Cherry	Crimson Passion	Dark Red Cherry, large fruit, excellent fresh eating or processing, highest sugar content of U of S cherries
	Juliet	Dark Red Cherry, large fruit, excellent for fresh eating, easy to pit, high sugar content,
	Romeo	Black Cherry, later than CJ, excellent fresh eating or processing, best juice cherry,
	Valentine	Bright Red Cherry, tart processing cherry, excellent for pies
	Carmine Jewel (CJ)	Black Cherry, slight suckering, high productivity, good eating or processing cherry
Haskap	Borealis	Large blue fruit, best flavour, can get mushy if not handpicked, best fresh eating
	Tundra	Large dusty blue fruit, firm, good processing berry
	Pollinizer: Honeybee	Pollinizer for borealis and tundra, good fruit set, early fruiting, tart berry
Saskatoon	Northline	Early season, large berries, good processing and fresh eating
	Thiessen	Early season, firm berries, good processing

Table 1. Fruit varieties developed and/or grown at U of S. (All information found at www.fruit.usask.ca)

Future Landscaping - Native Plant Species

The future landscaping of the area includes all those design features previously mentioned in this document that do not include the initial tree and shrub material. In particular it includes the native species that will be used to fill in between the fruit varieties, around the paths or other design elements, and garden plots. Below is a list of native species that would be appropriate for the site but is by no means an exhaustive list.

Common Name	Latin Name
Red Osier Dogwood	<i>Cornus stolonifera</i>
Creeping Juniper	<i>Juniperus horizontalis</i>
Golden Currant	<i>Ribes aureum</i>
Tall Buttercup	<i>Ranunculus acris L.</i>
Canadian Goldenrod	<i>Solidago canadensis</i>
Perennial Sow Thistle	<i>Sonchus arvensis</i>
Creeping White Prairie Aster	<i>Aster falcatus</i>
Fringed Brome	<i>Bromus ciliatus L.</i>
Blue Grama	<i>Bouteloua gracilis</i>
Agropyron spp.	Wheat grass <i>species</i>
Plains Rough Fescue	<i>Festuca hallii</i>
Sheep Fescue	<i>Festuca saximontana</i>
Hooker's Oat Grass	<i>Helictotrichon hookeri</i>
June Grass	<i>Koeleria macrantha</i>
Prairie Cinquefoil	<i>Potentilla pensylvanica</i>
Golden Bean	<i>Thermopsis rhombifolia</i>

Table 2. List of proposed native plant species to be incorporated

Post Establishment Timeline

Below is a brief overview of the foreseen stakeholder engagement throughout the lifetime of the project.

Phase	Undertakings	Stakeholder Engagement
Phase 1	Select and plant locally developed fruit trees. Do minimal landscaping such as temporary mulching around trees. Select and obtain native plant seeds, plan out future landscaping. Initial funding and material inputs.	Group 1: Facilities Management (grounds crew and planner) Groups 2, 3, and 4: Volunteers (students, faculty, community groups)
Phase 2	Begin phase 2 landscaping for the orchard. Add in native plants selected in phase 1. Add in seating and pathways. Perform general upkeep of pre-existing features such as pruning and or pest prevention. Minimal inputs required	Groups 1 and 2: Volunteers, Facilities Management (grounds crew). Groups 3, 4, and 5: Campus members (use of space). Members of the public (use of space). Animal habitats re-established
Phase 3	Include educational signage; expand plant varieties (perennial and annuals). Secondary funding inputs for signage	Groups 1, 3, and 5: Grounds crew or volunteers, Ag in the Classroom and Office of Sustainability (educational signage).
Phase 4	Add solar lighting, include orchard in local tours, and begin connecting it to existing edible landscapes on campus to form a sustainability corridor.	Groups 1, 2, 3, 4, and 5: Volunteers or Facilities Management. Local community and campus groups (use of space). Animal habitat and use of space as corridor fully established

*See stakeholder group descriptions under "Stakeholders and Current Strategies"

Table 3. The four phases of the post establishment timeline

General Care Requirements

Watering Program

The watering program for the orchard can be incorporated with the current watering program on campus. For the first few years of establishment, the trees will need to be watered on a weekly basis. Once the root systems are established, the trees will not require supplemental watering, except in extremely dry years. In order to make this venture more sustainable we can look to incorporate a rainwater collection system.

Pest & disease management

One of the main problems with fruit trees is girdling from deer and small rodents in the winter. To prevent girdling, the area around the trunk should be mowed in the fall to keep down tall grass which attracts mice. Preventative measures include mulch around the base of the trees and/or the installation of mouse guard to avoid damage. In spring and summer, deer tend to browse on new growth. If deer become a problem the orchard may need to be fenced, or individual trees caged for mitigation. Below is a list of fruit specific management issues.

Apples

Fireblight can be a problem with some apple varieties, especially the Ottawa 3 rootstock that is particularly susceptible to it (Bors, 2007). It is one of the most serious apple diseases and is caused by the bacteria *Erwinia amylovora*. The bacteria causes dieback of the shoot tips giving the leaves a burned appearance. Infected twigs develop cankers and peeling bark that can eventually kill the tree if left untreated. This disease is most prevalent in years with excessive moisture, especially during spring. The method used to remove fireblight from an infected tree is to prune out the infected branches. Pruning should be done when the humidity is low and the branches are dry, or when the tree is dormant such as in the fall after leaf drop (Zidack et al. 2010).

Haskap

The only reported disease problem on haskap is powdery mildew which has been reported to occur on haskap in mid-July, especially in areas where there is not enough air circulation around the plants. The presence of powdery mildew varies based on environmental conditions from year to year. The mildew does not seem to cause any production problems, but is unsightly as it causes the leaves to appear white and eventually turn brown. The U of S has been breeding for mildew resistant cultivars and have noted a wider tolerance in their varieties (Bors et al. 2009).

Birds such as cedar waxwings love to eat the berries, so mesh netting may be required if birds become a problem. It is recommended to use ½" netting as larger netting size such as 1" can trap birds and cause fatalities.

Cherries

There are relatively few diseases that affect sour cherries in Saskatchewan, mainly due to our cold climate. Girdling by mice and deer is the most prominent problem, which can be prevented as described above. There is also a cherry fruit fly which lays its eggs in the fruit which can be sprayed for if infestations become an issue (Bors and Sawatsky, 2007).

Saskatoon berry

One of the main diseases in Saskatoon berries is a fungal disease called entomosporium leaf and berry spot. Small brown spots develop on lower leaves which turn yellow, and can cause leaf drop. Infected fruits form grey lesions and become cracked and disfigured. The fungus overwinters on dead fallen leaves/twigs and reinfects Saskatoon berries under moist conditions like those experienced in the spring. To reduce the risk of this disease it is recommended to eliminate overhead watering in order to reduce water on the foliage. Another strategy is to leave enough space between plants to allow for open air flow. If a serious outbreak does occur, there are fungicides available to treat the disease (Ontario Ministry of Agriculture, 2006).

Material Inputs

Material Sourcing

Orchards require high initial inputs and some capital to establish. Their benefit is that after the start-up costs they remain productive over a long period of time. The size of the proposed orchard is not large and is designed to mediate start-up costs and provide opportunity to expand should more land and funding become available in the future. We recommend that all materials to be used for the orchard be locally sourced to support local businesses.

Mulch

Wood chips are the preferred material for orchard mulch as it takes multiple years to decompose and provides a reliable ground cover during initial establishment of the trees to retain water and impede weed growth. There is opportunity to obtain wood chips from the City of Saskatoon's tree removal program. If this is a viable option it is recommended that elm wood chips be avoided as a precaution to protect the elm trees on campus from possible Dutch Elm Disease transmission. We recommend that any trees chipped on campus be used as mulch for this project.

Plant Material

Fruit tree and shrub materials are to be sourced locally, as the varieties should be adapted to the prairie climate. It is possible to obtain seedlings from the U of S through Dr. Bob Bors who is head of the U of S fruit program, and can aid in choosing superior cultivars. It is recommended that Dr. Bors and others involved with the fruit program be consulted frequently for new species and cultivars as they become available.

Local nurseries

Local nurseries are also an option for obtaining the necessary plant material. Little Tree Nursery and Prairie Plant Systems are particularly good options for apples, cherries and haskap.

Potential Funding

As of yet, given the nature of this proposal, we have not secured any funding. That being said, there are many grants for which such an undertaking would qualify. Below is a list of resources that could be used to fund this project should it move forward:

EcoFriendly Sask: Action Grant (Amount varies based on need)

- Applications are taken all year-round by email ecofriendlysask@gmail.com
- Full details at <http://www.ecofriendlysask.ca/p/action-grants.html>

Tree Canada: Edible Plants Grant (Up to \$ 4000)

- Would directly help with the establishment of the orchard
- Deadline to apply is February 27th, every year.
- Details at <https://treecanada.ca/en/programs/edible-trees/how-apply/>

Office of Sustainability: Campus Sustainability Revolving Fund (CSRF)

- Must be a student group or faculty member

Office of Sustainability: Student Grant (max \$300)

- The application process involves an Online form, it can be obtained by visiting: <http://sustainability.usask.ca/initiatives-and-events/student-grant-application-form.php>
- More details at <http://sustainability.usask.ca/initiatives-and-events/student-group-grants.php>

Corporate Sponsorships: Open Funding Opportunities

- Corporations have funds set aside for community development developments every year. We believe our project would qualify for use of such funds towards achieving the orchards full potential.

We believe we are well suited for all of these grants. Common criteria between all of the above mentioned grants are as follows: project is well defined, project is educational, project will be beneficial to the community, project promotes sustainability, project is student run, and project is local. However, this list is not exhaustive.

Alternative Sites

Site B: College Quarter

College Quarter is in progress of future development with plans to incorporate shops, restaurants, apartments, a hotel, and other community services. In the final master plan there is a central pedestrian walkway, labelled “The GreenWay” (Fig. 15), which is the main walking path that runs North to South along the entire residence block (CQ Master Plan, 2010). This path is designed to link the various sections of College Quarter together and connect to the main campus (CQ Master Plan, 2010). This path is proposed to be lined with ornamental trees to create an aesthetically pleasing atmosphere. We propose they incorporate edible fruit trees and shrubs in substitution to some of the ornamentals. This will further enhance the “GreenWay” by providing additional functionality as well as visual interest. Instead of having a defined orchard “space”, the orchard will alternatively line the pathway substituting non-edibles with edible fruit varieties. There are many students and non-university users who will make use of this walkway. Given this, the edible fruit incorporated into the College Quarter landscaping will provide many benefits to the passerby. One of the obvious benefits is the readily available fresh fruit that will be in season from June to October depending on the fruit variety. In the spring, many of these fruit trees and shrubs will be in flower, creating a fragrant and visually pleasing walkway. Further benefits include what has been mentioned earlier including providing an example of prairie fruit landscaping and encouraging locals to better utilize their own outdoor spaces, showcasing SK fruit varieties from the U of S fruit breeding program, and promoting food security.

The sheaf has recently written an article about the College Quarter development mentioning the proposed buildings, new plans for the spring, and encouraging student involvement in the development process. Within the article, they state: “We want to reconfirm with the campus community through conversations with the students before we take further action” (Migchels 2016). This provides the perfect opportunity to involve students in the planning and design of the future of the College Quarter site.

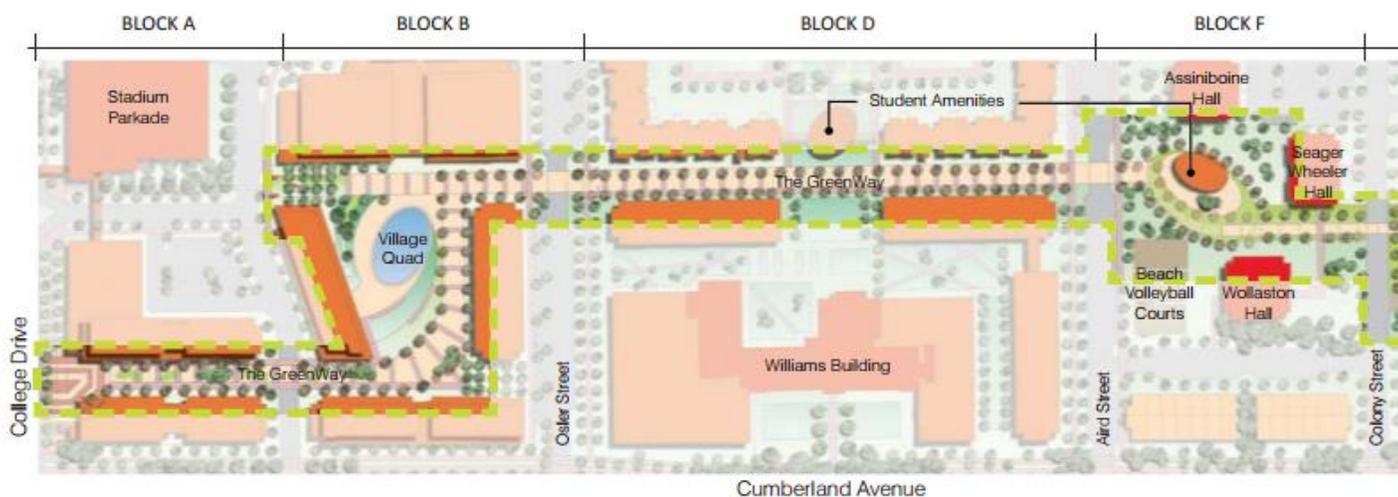


Figure 15. Campus Quarters master plan concept of the GreenWay (CQ Master Plan, 2010)

Site C: Sculpture garden

The idea for the sculpture garden was originally suggested by a staff member of the Office of Environment and Sustainability, Erin Akins. The sculpture garden is located just north of Site A and northwest of the Education Building, between Seminary Crescent and Meewasin Trail (Fig. 16). It is a fairly significant space, with dimensions of about 100 m x 75 m, and is currently the home of a variety of sculptures. Originally founded in 1993 as a sculpture symposium, the garden has been added to over the years and contains sculptures made of wood, metal and stone created by artists from around the world (Trembath, 2015).



Figure 16. Google maps aerial image of sculpture garden

Incorporating an orchard amongst the sculptures is a great way to make efficient use of space by blending the university's art with landscaping of perennial fruiting trees/shrubs and natural ground cover. The idea would include many of the same design principles as Site A, while integrating the sculptures amongst the trees. The orchard may have less of a linear design due to the scattered layout of the sculptures, and instead may be designed to draw attention to a particular art piece. This site and its design would create a very unique and one of a kind settings that would not only draw locals in, but perhaps visitors to the city. While the trees eventually grew around the sculptures, the landscape would drastically change, and although it might alter the view of the sculptures over time it would create a very interesting topic of discussion on campus and the surrounding community.

Education & Outreach

Out of Your Tree

Out of Your Tree is an active volunteer organization within Saskatoon and surrounding area. The premise of the organization is harvesting fruits and vegetables that would have otherwise gone to waste and donating a third of the harvest to charities. What happens with the other two thirds? Out of Your tree considers the fact that people are more likely to volunteer if something is in it for them. A third from each harvest by volunteers is then divided equally between the owner of the plants and yourself. The person doing the harvesting gets to take home a third of the bounty. Out of Your Tree was started in 2011 and has seen great success in recent years with an active Facebook page as the social media platform for members to communicate on. Last year in Warman alone, two women were picking all summer and fall after 25 families donated their backyard fruit trees. In the city of Saskatoon the group has 6 community coordinators covering allocated regions of the city staying in contact with volunteers and arranging meet ups with landowners who have donated their backyard produce to the cause.

With the implementation of an orchard in hopes of helping food security on campus there has to be a plan in place that ensures what is being produced is getting used and not

going to waste. Fruit trees and berry bushes produce throughout the summer when a large majority of students are not around which raises the question; who's picking? With Out of Your Tree there are several opportunities for collaboration that present themselves. In the summer time volunteers throughout the city would be able to aid in harvesting the produce, but there has to be a plan in place on where the food is going to be stored and utilized. On campus there has been recent experimentation of farmers markets which could provide income to student group(s) running them, but more importantly the third being donated could go towards the emergency food hampers at the USSU Food Center for those that cannot afford the proper food they need as a result of climbing tuition prices. These opportunities would have a positive impact on our campus community and with proper communication between student group(s) that can aid and coordinate in harvesting, this can become a reality.

Agriculture in the Classroom

Agriculture in the classroom (<http://www.aitc-canada.ca/en/>) is a national program made up of seven provincial organizations throughout Canada that are responsible for developing increased awareness for agriculture in our education systems. The Saskatchewan establishment of Agriculture in the Classroom is funded through government (provincial and federal) and several private and public entities which allows Agriculture in the Classroom to offer a diverse spectrum of learning tools that range from field trips to hands on classroom activities. For all levels of schooling there are resources available or that can be critiqued to suit changing curriculum requirements. The University of Saskatchewan already offers programs through the College of Agriculture and Bioresources for both elementary and high school students, but there still is room for improvement.

The location and resources the University of Saskatchewan offers for field trips makes it affordable and time efficient for school field trips. Nowadays the main attractions are the Little Stone Schoolhouse and the new Rayner dairy facility, but when classes come to campus,

teachers are always looking to maximize their experience and get the most out of their class budget. The College of Agriculture already offers programs such as Biotech Bust, I in Ag, and several summer camps. Biotech Bust is directed towards grades 7-8 students and one of the things they do is a greenhouse, but it lacks hands on activities. There is room for improvement in all programs offered where fruits and vegetables can be incorporated. The addition of hands on activities that students can be physically surrounded by would be met through the addition of an orchard on campus. The orchard can also act as an addition to existing programs or have its own curriculum activities.

STARS Rating

Currently the University of Saskatchewan has a STARS (sustainability tracking, assessment and rating system) rating of 43.88. The STARS program (<https://stars.aashe.org/>) is a tool used to measure, report, and grade the sustainability of participating colleges and universities around the world. The STARS rating creates a challenge between institutions because it is something they can be proud of and publicize. Sustainability is a hot topic in current events because it resonates with everyone. By having a good STARS rating an institution is symbolizing that it cares about achieving a sustainable campus which is attractive to prospective students and employees. At a STARS rating of 45 an institution is granted silver certification which means the U of S is 1.12 points away from achieving silver. A notable section contributing to the STARS rating is food and beverage purchasing, which would apply to an orchard on campus. The university is currently sitting at 0.20/4.00 with lots of room for improvement. On another front that could use improvement, this project could easily be adapted and used as part of the Campus Living Lab Program, wherein students and faculty are invited to work together on concrete environmental projects (U of S, 2012).

A brief description of the sustainable food and beverage purchasing program:

Currently local foods are brought in as opportunities present themselves. Upon completion of our inventory, we hope to develop a more comprehensive program to ensure we are optimizing opportunities in this regard.

- OP-6: Food and Beverage Purchasing; STARS

The implementation of a sustainable fruit orchard on campus is an opportunity representing itself in the words of the university. The margin for improvement in the score for this section is 95% leaving lots of room for ambitious ideas to capitalize on available points to achieve silver certification.

Moving Forward

Our vision

We hope to see any one of these three sites developed within the coming years. That being said, there is definite potential for all three to undergo development. This would not only strengthen both the city of Saskatoon's current climate action plan but also the ground's related vision outlined by the office of sustainability, and the underlying sustainability goals at the U of S. These public orchards surpass the base benefit of the average orchard and act as engaging educational space in which individuals will come to value regional food security.

Sustainability Corridor

Our overarching vision for the U of S, is a campus where these pockets of edible landscaping are connected into a central Sustainability corridor. This corridor would highlight the ingenuity of our faculty and students, making us leaders in sustainable landscapes and engaging public spaces. The incorporation of our locally developed cultivars, combined with other native landscaping, harmoniously into the pre-existing grounds framework will benefit all stakeholders and set our campus apart.

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