



Final Report

Permaculture Design Certification

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For the Sustainable Project Fund

1. On the project itself:

- *Summary of the project*

The Permaculture Certification Project comprised two components: a pure theoretical part and a second more hands-on, concrete one. The common main goal of those parts were to give McGill students the opportunity to get accessible education about permaculture as well as to create a space for them to apply their knowledge on campus. The first component was achieved by the facilitation of a Permaculture Design Certification (PDC) course in Montreal, with a discount rate for students. The second part, by the construction of a demonstrational permaculture site on one of the Mac Campus field at Senneville, for the MacDonald Student Run Ecological Garden club (MSEG). Both projects stemmed from the observation of a growing interest at McGill, and especially Mac Campus, about permaculture, as well as of a lack of education about it for the student body in universities, and finally from the belief that permaculture could help our university to improve its leadership in a new domain of sustainability.

The PDC was taught on alternative week-ends through the Winter 2015 semester. The normal cost of \$800 was lowered to \$400 for the nine McGill students that participated thanks to the SPF funding. This 72-h certification allows its graduates to become permaculture consultant and to pursue a diploma to become a permaculture teacher. The class comprised several hands-on projects, one of them being the surveying and design of a yoga retreat center in the Sutton area, and another one being the design of the Food Forest for McGill. The teacher helped us surveying the land, establishing the goals and the method for the design. Then three of the students got involved in creating a layout for the garden, contacting nurseries to know which species were available and coordinating tree deliveries.

The idea to create a food forest at one of the McGill Senneville field came from different objectives. First of all, to establish an educational demonstration garden as an answer to the growing interest



in permaculture and organic agriculture at Mac campus. Second, to revitalize a piece of land at Senneville which was going to be left unproductive by the MacDonald Student Run Ecological Garden (MSEG) group, due to a shifting of their activities elsewhere. The field available also presented a few challenges: a steep north to south slope causing an accumulation of water in most of the land, and heavy clay soil. Natural predation due to the proximity of the forest also induced drawbacks for growing edible products. The goal of the food forest was therefore dual: both to create a productive ecosystem in a challenging environment, and to promote ecological farming education on campus. Although the long-term management of the food forest was attributed to MSEG, revenue making from this field was not an incentive nor an obligation for this forest to be born. Overall the project was a great success: we had an attendance way above our expectations and the large amount of donations allowed us to purchase more material for the spiral garden. More than a 100 trees were planted in the half-acre land available, and cover cropped with different ground covers to prevent weed sprawl. Thus, the remaining of the budget for this project was the purchase of tree seedlings, seeds, and material for the construction of the food forest.



The field before construction

- *Opportunities created*



For the students involved in the design and creation of the food forest, this experience was a very enriching concrete application of the course they have been following in the Winter and gave them insight on real-life challenges of permaculture projects.

For MSEG, creating this food forest to be integrated in their activities created a new market niche in their production. Fresh fruits could be great addition to their baskets and few vendors at the Ste Anne market offer a diversity of local fruits.

For the other farmers around and general public interest, this garden is a demonstration of an original way of production, which will evolve in the coming years towards a productive landscape, potentially commerciable. Visits and tours were given to Jardin Carya, Zephyr and Santropol, revealing great curiosity and interest from their side.

For the Mac Campus community and school, the food forest can be used as an illustration of an additional production technique at Mac Campus, with regards to the Hort Center, the MacDonald Farm and MSEG. Volunteers from school were welcomed in the construction time to learn and help.

- *Directly and indirectly impacted stakeholders*

The primary stakeholder targeted was the nine students which received their PDC diploma at the P3 Permaculture Organization. We also involved more than expected the Montreal and West Island community, by attracting people beyond the McGill circle and different background for volunteering in the construction of the food forest. Lastly, MSEG, the student run farm on campus was our last stakeholder impacted, by the creation of a new component for their production.

- *Changes in budget, if any compared to the original budget*

The budget was respected and increased through an amendment to compensate for some underestimated costs. The final allocated budget was \$8,419.

- *What is next for this project*

To further spread the permaculture movement at Mac, tours of the food forest could be given in the next few years, to students, academics as well as groups from different organizations. A management plan was provided to the future care-takers of the food forest (the new MSEG team). In the Fall 2015, a conference featuring Stefan Sobkowiak from a permaculture farm called Miracle Farm will be facilitated at Mac Campus and include a presentation of the Food Forest at Senneville.

- *Ownership plan: who will take care of this now that the SPF part of this project is completed*



The MSEG team will take care of the maintenance of the food forest for the next years. Two of the new team members (Anna Lyon and Mathieu Ouellet) are part of the 2016 team and are committed to integrate the maintenance of the permaculture field into the main clubs activities.

- *Recommendations for the future of this project (and, if applicable, for its future managers)*

Create connections with external groups and people as much as possible as permaculture is a fairly new and extremely popular theme which could yield projects and further implementation at Mac Campus. Continue creating educational opportunities at school, through workshops or conferences, at low costs to maximize attendance and further increase interest in the student body.

2. On the project's planning and management and on your SPF experience:

- *Success and challenges from a project planning and management perspective*

One of the first important challenge faced during this project was the lack of information and resources available to help us make our decisions. Our teacher was the main support that we found for the theory part, but for all the rest (choosing nurseries and equipment, or general field related work), we had to follow a lot our instinct and personal appreciations. Finding volunteers was not a challenge since we were mostly working on week ends and a lot of people from the downtown area would drive down to come and help. Although a facebook page and a profile for the project on the global permaculture institute database have been created (Worldwide Permaculture Network, 2015), we realize we didn't make enough time to document and outreach more about the project. This is fortunately a mistake that can be corrected in the near future, which involves a better compilation of our pictures and a SketchUp map of the field. An early mistake that was also done was to rent the machinery without telling exactly what the work consisted of. The rental company was suggested by our teacher, but the actual machine was not adapted for the type of work required, and it took more time than expected to accomplish the swales. It is recommended that an excavator with a rotative bucket would be used, and would save a lot of operating costs. In term of trees survival, we observed a few deaths due to several reasons. First of all, due to competition with the cover crop, the goji berry trees all died. They were indeed the youngest obtained and were rapidly suffocated under the cover crop. Therefore it will be recommended to purchase older trees if a cover crop with tall species would be planted, or chop and drop more frequently around the trees. Important death rates for the blueberries were observed (15 plants out of 60 planted), but no individual cause have been identified. Some of them did very well and produced fruits in July, but some others had a stunted growth and wilted rapidly. A potential cause could have been the acidity of the soil, which was not high enough, so we added more moss at the beginning of August. Plum trees were more vulnerable to insect disease: 5 out of 20 were eaten by caterpillars as seen in the following picture.



Caterpillars on prune tree

The maintenance of the cover crop was a challenge in the sense that it was very time and labor intensive. However, doing it more regularly before the grass gets too tall would be certainly more efficient and better for the trees.

- *Lessons learned from a project's planning and management perspective (project development, HR, budget, timeline, monitoring, etc.)*

As a personal first experience in leading a project by myself, I found this experience very enriching for a wide range of reasons. Dealing with communications, finances, planning, volunteers and taking decisions for all parts of the project was an interesting freedom but quite stressful sometimes and helped me identify my weaknesses in different domains.

- *Feedback on the SPF experience: provided SPF support/processes/tools*

The SPF staff is always very kind and available – but clearly too much administrative work is requested compared to the amount of time actually spent on working for the project. I think some of the deliverables should be facultative for example the video.

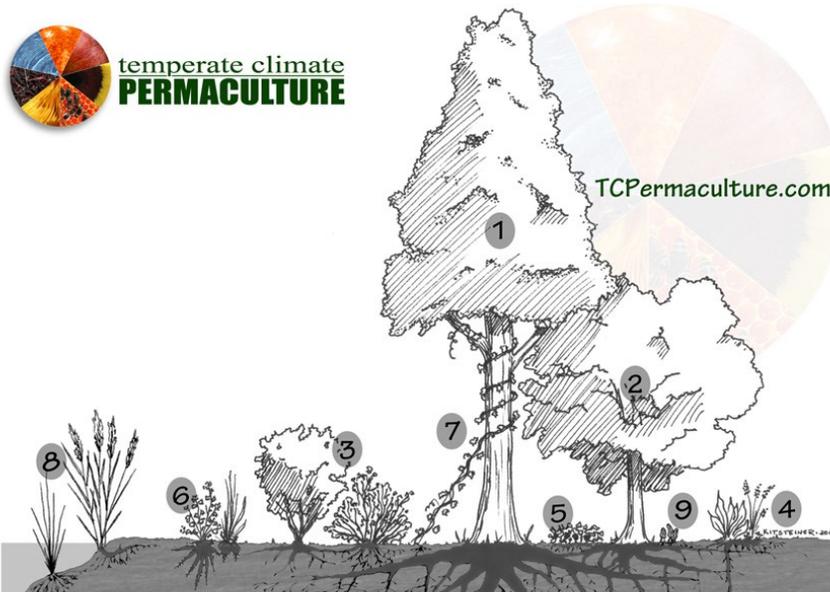


Volunteers during the site surveying



Appendix A: Detailed Species List

PERMACULTURE FOOD FOREST AT SENNEVILLE SPECIES DESCRIPTION 2015



Nine Layers of the Edible Forest Garden

- | | |
|---------------------------------|---------------------------|
| 1. Canopy/Tall Tree Layer | 6. Underground Layer |
| 2. Sub-Canopy/Large Shrub Layer | 7. Vertical/Climber Layer |
| 3. Shrub Layer | 8. Aquatic/Wetland Layer |
| 4. Herbaceous Layer | 9. Mycelial/Fungal Layer |
| 5. Groundcover/Creepers Layer | |



1. Subcanopy (10-30 ft or 3-9 m)

-elderberry

-pears

-plums

2. Shrub (up to 10 feet - 3 m)

-blueberry

-saskatoon

-pea shrub

-sea buckthorn

3. Herbaceous

-mix cover crop

4. Groundcover

-sweet potatoes, pumpkins

5. Climber layer

-kiwi

6. Fencing

-black locust

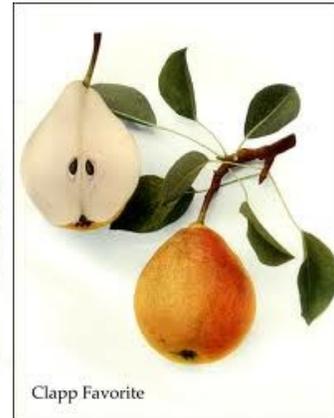
-hawthorn

-pea shrub



1. Subcanopy (10-30 ft or 3-9 m)

PEAR *Pyrus communis*



- how much was planted (14 from different varieties 2 and 3 years old: 10 Clapps, 2 Shinseiki, 2 Bartlett), all grafted
- description

USDA Hardiness Zone: 4-9; some varieties into Zone 3

Plant Type: Small Herbaceous Plant (from 8 -18 inches tall)

Leaf Type: Deciduous

Forest Garden Use: Underground Layer, Herbaceous Layer

Pollination: European Pears traditionally require cross-pollination, although a few varieties are self-fruitful. This requires two different varieties of European Pear. Some Asian Pears (*Pyrus pyrifolia*, *P. ussuriensis*, and *P. x bretschneideris*) will cross-pollinate European Pears. Because there is such a wide variety of pears and cross-pollination variations, it is best to get cross-pollination information from the nursery or catalog company you are purchasing your pears. Pollinated by insects.

Flowering: Late Spring to early Summer (May-June); susceptible to late frosts

Life Span:

Years to Begin Bearing: 3-10+ years depending on the variety and rootstock



Years of Useful Life: 50-75 years. Dwarfing rootstocks live shorter lives

- growing guide (specificities from varieties)

-plant full sun

-well drained soil

-15 feet between plants

-plant in a hole 18 inches deep and 28 inches large and fill bottom with a bit of compost

-leave grafted point 2-4 inches above ground

-compact soil and water well

<http://www.starkbros.com/growing-guide/how-to-grow/fruit-trees/pear-trees/planting>

- specific management needed

-**harvest:** Late Summer to Autumn (August-October), but can vary based on variety and location. Pick when fruits slightly change color. Pears are one of the few fruits that are harvested unripe. Pears on the tree will ripen from the inside out, so if they are left on the tree, the interior would be overripe (brown mush) when the outside is ripe. But when harvested underripe, the Pears will ripen equally from the inside and outside at the same time. There is a skill (and learning curve) to knowing when is the best time to harvest Pears.

-keep mulch at the base of the tree

-protect trunk against animals during the winter

-remove first fruits so that the trees will not spent all its energy producing fruits but growing bigger

-prune every 2-3 years in late winter/ early spring



PLUMS *Prunus Prunus* species



Toka

Kahinta (sweeter and more juicy)

- how much was planted (10 kahinta variety and 10 Toka variety, 1.5 and 2 years old)
 - description
- reach 18 feet at maturity

- growing guide
- plant in well drained soil, full sun, 18 feet apart
- bury the grafted point

-high moisture demand: clay or loamy sand

- specific management needed
- pruning in spring or summer: thinning of old wood and above new buds

<https://www.rhs.org.uk/Advice/profile?pid=339>

-On established trees apply a mulch of well-rotted farmyard manure in mid-spring to help retain soil moisture, keep down weeds, and provide nitrogen. This can be supplemented with a top-dressing of dried poultry pellets or non-organic nitrogen fertiliser such as sulphate of ammonia. Add a top-dressing of sulphate of potash in late winter

-harvest: Plums develop their best flavour if left to ripen on the tree. If they feel soft when gently squeezed, they are ripe. Trees will generally need picking over several times

-can be susceptible to diseases, check leaves for white dots and trunk for black knots



ELDERBERRY *Sambucus species*



- how much was planted (about 20 from cuttings)
 - description
- native from North America
- fruits after 3-4 years
- 2 to 4 meters wide/high
- growing guide
- tolerates light shade, prefers wet soil
- properties
- berries are prized for jams and juices - flowers are edible (popular fried into fritters)
- insect and bird nests
- specific management needed
- harvest: Flowers - pick on sunny days when shedding pollen. Fruit - harvest in Late Summer (August-September) when in full color. Many people will either use a berry picker/comb or snip off whole heads and pick off at home.
- fruits don't last long: drying is recommended
- never eat immature fruits and leaves as they are poisonous
- few maintenance, can remove suckers



1. Shrub (up to 10 feet - 3 m)

PEA SHRUB *Caragana arborescens*



- how much was planted (+/- 30 from seeds and 5 transplants)
- description

C. arborescens is a medium to fast growing perennial shrub. A species of legume. Leaves are alternate and compound with small leaflets and can be light to dark green. Small, yellow fragrant flowers bloom in early summer with pod fruits, containing many seeds, ripening in mid summer. Both the seed and seed pods are edible. Medicinal Uses include: Cancer; Emmenagogue. Other uses include: Dye; Fibre; Hedge; Oil; Shelterbelt; Soil stabilization; Hedge.

- growing guide

growing to 6 m (19ft) by 4 m (13ft) at a fast rate.

It is hardy to zone (UK) 2 and is not frost tender. It is in flower in May, and the seeds ripen in September. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees. It can fix Nitrogen.



It is noted for attracting wildlife.

USDA hardiness zone : 2-7

Suitable for: light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil.
Suitable pH: acid, neutral and basic (alkaline) soils and can grow in very alkaline soils.

It cannot grow in the shade. It prefers dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

- properties

-seeds are edible when cooked and contain high amount of protein and fatty acids. Can be used as a spice

- specific management needed

pruning - harvesting

BLUEBERRIES



Blueray
fruits)

Northland (very productive) Patriot (self-fertile, earlier

- how much was planted (20 Patriots, 20 northland, 20 blueray)
- description

Blueray

Midseason, productive. Plants are vigorous, erect and fairly hardy. Fruit clusters are small and tight; berries are medium to dark blue, very large, firm, aromatic, with good flavor. Blossoms are reddish and fall leaf color is a medium dark red.

Northland



Early midseason, very productive. Plants are slightly short, bushy, moderately spreading, and very hardy. Fruit clusters are long and loose; berries are medium to dark blue, medium-small, moderately firm, with good flavor. Very good ornamental value.

Patriot

Early midseason, productive. Plants are small to medium sized, vigorous, upright and very hardy. Fruit clusters are tight; berries are medium blue, very large, slightly flattened, firm, with very good flavor. Good ornamental value.

- growing guide

-plant 4 feet apart - don't put compost - don't mound soil around trunk

-well drained soil (patriot can bear heavier soils)

-plant in a mix of $\frac{2}{3}$ sphagnum moss and $\frac{1}{3}$ compost well humidified - mulch with acidic mulch (resinous tree spines except pine): Spread the mulch in a band 60 cm wide, with 30 cm on each side of the plant row. Add mulch to a depth of 5 to 10 cm

-need a lot of water and organic water but doesn't stand saturated conditions

-ideal pH is 4.2 - 5.5

- properties

-height: from 1.5 to 3 meters tall (5 feet)

- specific management needed

-prune in March or early April -> First, prune out any dead, broken, injured or diseased branches. Next, remove any canes that are spindly or growing near or along the ground. Finally, cut off at ground level canes low in vigour, canes older than 5 years, and any canes larger than 5 cm in diameter. Keep 4 to 6 vigorous mature canes per bush, plus any strong new shoots. If winter injury is not severe, select 1 or 2 of the new shoots to keep and remove the remaining young shoots. These new shoots will eventually replace the older canes. When pruning, cut out entire shoots at the base; do not prune tips off the remaining branches

-cut flowers first year to enhance growth

-harvest fruits when turn blue and full of sugar content

-protect against birds with light netting

-cankers can develop on the bark -> check for red, brown color and cut off infected stem 10 to 15 cm below



AMELANCHIER (Saskatoon) *Amelanchier alnifolia*



- how much was planted (20 saskatoon 18" tall)
 - description
- height: 6-8ft, width 1.5m
- fruit after 4 years
- self fertile
- sweeter than blueberries
- growing guide
- full sun
- plant 4 ft apart
- can bear different soils
- properties
- use fruits in jams, wine, cooking
- leaves in teas



-attract birds

- specific management needed

-harvest beginning of July

-minimal maintenance needed - watch birds

GOJI *Lycium barbarum*



- how much was planted (20 trees, 1 year old)
- description

-comes from China but grown for a long time in the UK

-2-3 years before bearing fruits

- growing guide

-full sun, prefer sandy soils (hot and dry preferable conditions)

-self pollinated



<http://blog.gardenharvestsupply.com/2011/05/20/how-to-grow-goji-berry-plants/>

- properties
- dried berries -> high market value
 - juice from fresh fruits (very rich in antioxidants)
 - cooked leaves are edible
- specific management needed
- harvesting: Pick when ripe; typically mid-Autumn (harvest before the first frost); many people just shake the plant, and the ripe fruit will drop (lay out a sheet under the plant first)
 - storage doesn't last long
 - low maintenance crop: prune when become too big

SEABERRY (or Sea buckthorn) *Hippophae rhamnoides*



- how much was planted (16 females and 5 males)
 - description
- originate from Eastern Europe and Asia
 - large to very large shrub (3-6 m high)



-plant 5 meters apart

- growing guide

-need inoculation with Frankia bacteria

-pollinated by wind: need 1:8 males to female ratio

-bear fruits after 2-3 years

-prefers full sun, dry conditions

-can tolerate slightly acidic soils

- properties

-very rich in Vit A

-can eat berries, juice, jams

-N₂ fixing plant

- specific management needed

-harvest: Late Summer-Early Autumn. Pick when the berries are bright orange and just starting to soften. The fruit does not fall off the plant until it is past its prime. The thorns can make harvesting difficult (i.e.painful!), so go slow. Some people will even clip berry-laden branch, stick it in the freezer for a few hours, and then easily shake the frozen berries off into a bucket.

-storage: not long but can be frozen

-prune for shape or to increase production

-spread very easily from sucking

1. Herbaceous
2. Groundcover
3. Climber layer

KIWIS *Actinidia arguta*



- how much was planted (15 Arguta females, 5 arguta males; 1 year olds)
- description

-hardiness zone 4b

-sweet and productive, will produce after 6 years

-growing vine

- growing guide

-plant 6 to 12 feet apart in full sun, well drained soil

-need a 1:6 ratio male to females

-plant just enough to cover the roots

-cut stems off to one growing trunk

-attach to bamboo stick but don't allow to wrap around

- properties

-can be eaten with the peel and stored for 3 months

- specific management needed

-summer and winter pruning: in summer (during the growing season), cut back the terminal growth to four to six leaves beyond the last flower. Also remove watersprouts (vigorous shoots originating from older wood) and shoots from the trunk, as well as vines that become entangled. In the dormant season (december to march), remove canes that fruit last year (still have flowers). As much as 70% of the wood may be removed

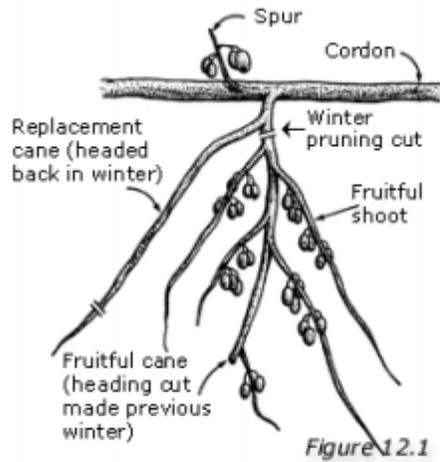


Figure 2: A fruiting branch of hardy kiwi. (To simplify the figure, leaves are not shown.) Fruits are produced on shoots growing from last year's growth. Winter pruning cuts are show by //. (Courtesy Oregon State University)

-training: this should be done the first 2 years of the lives of the tree to ensure optimal growth. Lateral branches should be removed down to 2 buds per plant

-harvest: can be harvest riped or unriped

-fertilization can be applied the second year to support fruiting

<http://www.fruit.cornell.edu/mfruit/kiwifruit.html>; <http://www.rodalesorganiclife.com/garden/kiwi-fruit-growing-guide>



1. Fencing

BLACK LOCUST *Robinia pseudoacacia*



- how much was planted (+/- 30 from seeds)
- description: the Legume, Pea, or Bean family

Black Locust is native to the southeastern United States, and is a great overstory tree as it allows a lot of light through to the understory. Black Locust is a prized as a timber tree, firewood tree, and honey plant (bees love them!). It is also well-known for fixing nitrogen into the soil. Black Locust is one of the most useful and ideal trees for a Temperate Climate farm or homestead.

[USDA Hardiness Zone](#): Zone 3-9

Plant Type: Large Tree

Leaf Type: Deciduous

Forest Garden Use: Canopy Layer. 50-80 feet (15-24 meters) tall and 35-50 feet (11-15 meters) wide with trunk diameter of 30 inches (80 centimeters); however, Black Locusts have been known to grow to 170 feet (52 meters) tall with diameter of 5 feet (1.6 meters)!

Cultivars/Varieties: There are a number of varieties available.

Pollination: Self-fertile. Pollinated by bees.



Flowering: Spring to Summer (April-June)

- growing guide

Light: Prefers full sun

Shade: Tolerates light shade

Moisture: Grows well in dry to moderate moisture soils.

pH: 5.1-8.5 (tolerates a wide range of soil conditions)

- properties

-edible flowers (can be fried) or used in tea

-general insect plant (bees, hummingbirds)

- specific management needed

-need to manage suckers (will send up new plants from underground runners)

-Living Fence: see specific section

HAWTHORN *Crataegus oxyacantha*





- how much was planted (7 trees)
- description

-originates from temperate climate in Europe and Asia

-small variety: don't grow more than 6feet

-self fertile

- growing guide

-Prefers slightly acidic well-drained soil, but can tolerate slightly alkaline soil

-propagated by cuttings

-can take heavy clay soils

-mulch when planting with compost and give plenty of water - then water every week

- properties

-edible berries, raw cooked or dry, (medicinal for digestion and lowering blood pressure and cholesterol levels)

-attract wildlife

-thorny

- specific management needed

-flowers can be harvested in the summer and berries in the Fall

-Living Fence: see specific section

-how to propagate from cuttings: <http://www.sowandso.com/hedge-hawthorn-blackthorn/>

living fence ideal spacing 4-6 feet apart



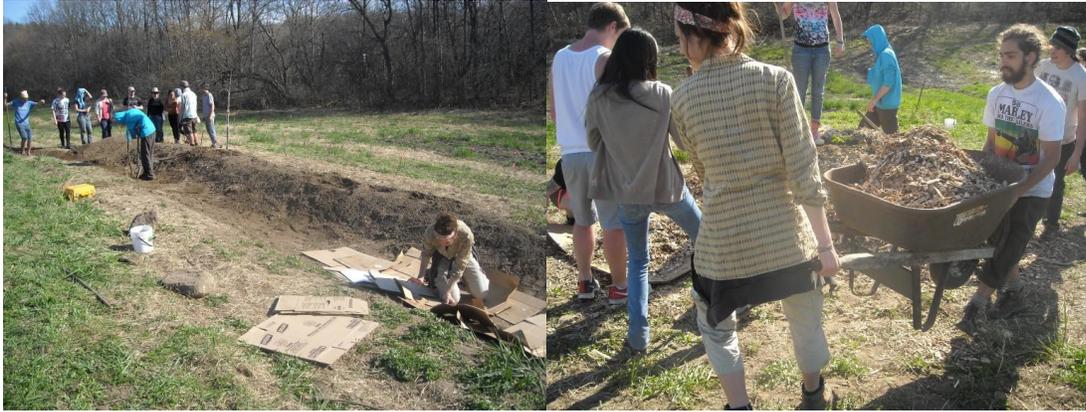
Appendix B: Picture timeline



Step1: Measuring contours



Step2: Digging the swales



Step3: Create pathways



Step4: Seeding cover crop



Step5: Building Kiwi trellis



Step6: Tree planting



And more tree planting...



Step7: Installing protection around trunks



Step7: Watch things growing