# 0History of the Gibbs House Site

## Early History

## History with the Office for Sustainability

## Goals

# Food Forest

## History of our Food Forest

## About Permaculture

## About the Plants

## Goals

# East Field

## History of the East Field

## Growing Food

A majority of the food grown in the east field are annual crops. Annual crops need to be replanted every year as opposed to perennial plants that regrow every year in the same spot without being replanted. However, there are some perennial locations such as three strawberry beds (two located between hoop house 2 and the east most fence and one located in hugel bed 5) and all of the hugel beds. The following subsections will go over the general information on what you need to know to plan, begin, maintain, and harvest the crops that you will grow.

### Scheduling for the growing season

Every year, a basic outline of the upcoming year’s growing schedule should be made in an Excel document. A first draft of the schedule should be completed by mid-February so the team has enough time to edit the schedule and to purchase seeds. There are example schedules for the east field, the raised beds in the food forest, and the hoop houses in the share folder. Please refer to these previous schedules for more information and examples on how organize them. Most of the time when making a schedule, you can copy and paste the plants that you grew last year if you want to grow that specific plant again. It is a good idea to move around the location each plant as to not deplete the soil. However, if you cover crop and add compost when needed, the soil should remain healthy. A growing schedule must include:

* The plants you want to grow.
* A general area of where you want to put those plants (e.g. Area 1 in the east field or HH2 row 5. Refer to the map in Figure 1 to see where each area is located and refer to Figure 2 to see the rows in the hoop houses.)
* Approximately how many seeds of each plant you want to grow.
* What week you would like to direct seed/seed transplants.
* For the plants you are transplanting, include the week that you would like to transplant them into the ground.
* Approximately when each plant should be ready to harvest.

The information on when to direct seed/seed transplants, when to transplant, and approximately when to harvest is already in previous schedules. If you are choosing new plants to grow, this information should be on the website where you are purchasing the seeds and/or on the seed packet itself.

When scheduling for the growing season, it is also import to know what plants are cold season crops and what plants are warm season crops. Cold season crops typically have a quicker growth schedule, therefore warm season crops can be rotated into the spots that cold season crops used to be in after the cold season crops have been harvested. However, garlic is one of the more unique plants that we typically grow since it does not fall into either category. It is unique because garlic is usually planted right before the first frost, grows just a little bit before going dormant all winter, and then finishes its growing schedule in the spring. This is because garlic has a fairly long growing schedule and may not reach full maturity if not planted in very late fall. Refer to a how to guide for planting garlic that is in the share drive. Refer to Table 1 on examples of cold and warm season crops normally grown at the Gibbs site.

Table 1: List of some cold and warm season crops.

|  |  |
| --- | --- |
| Cold season | Lettuce, kale, scallions, cilantro, beets, turnips, carrots, radishes, cabbage, spinach, chard, arugula, and other most other herbs or salad like greens |
| Warm season | Tomatoes, peppers, squash, potatoes, melons, cauliflower, broccoli, onions, corn, beans, and peas |

### Transplanting

Transplanting is when you move plants from one growing location to another. Normally when you want to transplant annuals, the seeds will be planted in some tray for a few weeks and then transplanted to some permanent location for the rest of the growing season. Usually the transplants are kept inside under a grow light or in a greenhouse. The OfS usually starts transplants in the greenhouse located on main campus, but also has a grow light that we use as well. Most plants do not need to be transplanted, but there are several benefits to transplanting such as starting earlier in the growing season while it is still be cold outside as well as keeping younger plants inside away from pests and diseases. Many suggest exposing your transplants to the outdoors as to not stress them out when moving them from a completely controlled environment to the outdoors. This is known as hardening off your transplants, and that means you should take them outside a couple times over the course of 1-2 weeks before you transplant them to expose them to slightly cooler conditions. Right before you transplant, it is a good idea for the plant to spend a majority of its day outside [1-2]. Sometimes we have skipped the hardening off step, but it should be a part of our best practices and should be done from now on.

The following is a list of plants that we typically grow that can be transplanted (approximately how long they can be seeded before being transplanted, and how big the tray block should be is in parenthesis):

* Peppers (6-8 weeks, large)
* Tomatoes (6-8 weeks, large)
* Lettuce, herbs, and other greens (2-5 weeks, small)
* Cabbage (5-6 weeks, medium)
* Cucumber (4 weeks, medium to large)
* Corn (3 weeks, medium to large)
* Melon (3 weeks, medium to large)
* Cauliflower and broccoli (4 weeks, medium to large)
* Squash (3 weeks, medium to large)
* Eggplant (5-7 weeks, medium to large)

### Direct seeding

Direct seeding involves planting seeds exactly where you want them to grow in your garden. Direct seeding’s benefits include preventing the disturbance of the root system of plants while transplanting, avoiding the need of harden off the plants, saving time and labor, and preventing root bound plants (where roots aren’t allowed to expand past the containers they are in). However, direct seeding can also cause problems such as cold snaps killing your plants in the early stages, pests or pathogens damaging the seeds or vulnerable sprouts, or weed competition. Shielding the seeds with some sort of row cover can help deter pests, and planting early season direct seeds in the hoop houses can prevent problems from cold snaps.

Some plants are better off being transplanted and some are better off being directly seeded. Most root plants such as beets, carrots, onions, radishes, and turnips should be directly seeded. Plants such as beans and peas grow fairly quickly, so they are often directly seeded as well. Lettuce, herbs, and other greens can also be directly seeded (but can be transplanted) since they are a winter crop and grow fairly quickly [2-3].

### Tending to the plants

One of our number one jobs during the growing season is weeding around our plants. Mulch is one of the easiest ways to avoid weeds while keeping to organic practices. Some examples of mulch that can be used include wheat straw, cardboard, landscape fabric, hay, compost, leaves, and wood chips. Other tips for weeding include:

* Get weeds when they are small
* Cover cropping (see more details in a subsection below)
* Add compost to keep soil healthy (see composting section)
* Moisten the soil first
* Avoid tilling – weed seeds can germinate if they are brought into the light or broken open
* Find the right tools for the job
* Mow areas that can/need to be mowed before the weeds go to seed
* Use a weed whacker if they get really bad
* Learn about the individual type of weed that keeps growing and how to prevent them (for example, read the 2-pager report about thistle for more information)

For more information about organic weeding, see source [4].

It is also important to look out for pests while tending to our plants.There are several ways that to control pests organically including:

* Encouraging good, natural predators (e.g. ladybugs and lacewings) by growing plants that they like or purchasing them
* Using row covers (these are also useful in the cold months to protect from frost)
* Cover cropping (see more details in a subsection below)
* Apply compost to encourage good insects
* Apply diatomaceous earth that is harmful to insects, but beneficial and safe for plants
* Learn about the individual type of pest that keeps showing up and how to prevent them

For more information about organic pest control, see source [5].

Controlling diseases organically in your plants is similar to controlling pests organically. Pathogens that cause diseases can will either be fungi, bacteria, or viruses. Pathogens thrive in hot, humid environments with lots of rain fall. These preventative measures should be taken every year:

* Keep your soil healthy (see paragraph below)
* Allow good airflow between plants by spacing them out and weeding
* Give plants the proper amount of water (not too much or too little)
* Buy disease resistant plants or seeds
* Avoid touching several plants with hands or tools if you suspect some may have diseases
* Keep garden clean of decaying materials (weed, leaves, etc.)
* Cover cropping (see more details in a subsection below)
* Rotate crops
* Figure out and learn about the pathogen hurting or killing your plants

Some common fungal diseases include mildews, septoria, and fusarium. Some common bacterial diseases include early blight, soft rot, bacterial wilt, and scab. Some common viral diseases include aster yellows and cucumber mosaic virus. To learn about these pathogens, what they look like, how to prevent them, and more, visit [6].

Soil health is another crucial condition that must be addressed during the growing season.Soil particles are general categorized into 3 different types (from largest to smallest particle): sand, silt, and clay. Healthy soil will have a good balance of these three types. The number one way to improve the health of your soil is to feed it organic matter, usually in the form of compost (see the composting section below for more information. Other ways to increase the organic matter in your soil is through the use of livestock manure, cover cropping, mulching, and refraining from tilling. Increasing the organic matter and keeping the soil healthy will improve the soil food web. The soil food web is the wide range of organisms that live in and around the soil. It includes microorganisms such as bacteria and fungi, macroorganisms such as insects and earthworms, and even some small animals such as birds. The soil food web is made up of several beneficial organisms that will help the soil through their life and death. By feeding the soil organic matter, it will help those beneficial organisms and then they will be able to outcompete the harmful organisms. To learn more about growing your soil see [7] and the videos about the soil food web from [8].

### Harvesting

Prior to harvesting the food, you should wash your hands and any tools (if they were not washed before being put away) that you may need. There are different harvesting techniques depending on the plant that you are harvesting. Some crops should be cut off with a snipping tool in order to avoid breaking the stems or disturbing the root system: peppers, herbs, lettuce and other similar greens, melons, cucumbers, squash, beans, and others. Some crops can be simply pulled off like most berries, tomatoes, corn, apples, and others. However, some tomato varieties are prone to splitting open near where they break off the step, so be careful while harvesting these. Do not donate the food that splits open as it will rot quickly and ruin the rest of the food that is donated with it. Lastly, harvesting root crops may require loosening up the soil around the crop in order to pull it out of the ground. You can pull one out of the ground to see if the crop is ready to harvest. Root crops are more tender when younger and more tougher when older. You can harvest them when they are older. You can keep them in the ground until late in the fall to spread out the harvest time, if desired [9].

Another important thing to know is when you should harvest the crop and what it looks like when it is ready. Make sure to know which crops have flexible harvesting dates. For example, this is common in many peppers where they can mature from green to red. This means you can spread out the harvesting schedule. Additionally, know which crops should be harvested right away. Many herbs and greens will start to go to seed or bolt, and when that happens the leaves will begin to taste bitter. Other crops, like tomatoes and berries, will begin to rot if they are not picked at the right time. Furthermore, crops like squash and cucumbers will grow very large if you do not pick them at the correct time and that will cause them to get rough and loose there flavor. Lastly, try to pick crops as close to the time you want to donate them as possible. The goals of harvesting are to waste the least amount of food and get the best tasting, most nutrient rich crops possible [9-10].

Other tips include:

* Picking most plants as soon as they are ripe is often best since it encourages more growth
* Daily harvesting during peak growing season is usually needed to keep up with everything and it is a good way to check on plants for diseases or pests
* Herbs should be pruned throughout growth. Doing this will allow more leaves to sprout
* With plants such as lettuce and other greens, you can harvest the leaves that grow longest at the earliest part of their growing season and then continuously come back as more leaves come in. You can harvest these greens all at once though.
* Make sure to harvest winter crop before the heat gets too unbearable for them and harvest summer crop well before the ground begins to freeze
* Learn about the individual plants from the information on the seed packet and/or online

For more information about harvesting practices, see source [9-10].

After picking the food, some of the crops will be washed. Some crops will be washed in bins and some will be washed on spray tables with a metal screen and wooden frame. We should either build or buy a vegetable washing station. Make sure to follow the “Gibbs House: S.O.P. Washing Produce” that is found in Teams or the share drive.

Another important step in our harvesting process is weighing and packaging the food. We like to collect the data to track how much food we have been growing and donating from year to year. This can be reported in a project brief or end-of-the-year presentation. Make sure to wash your hands before starting. There should be a scale, clean packaging materials, and printed harvest logs ready beforehand. Each line in the harvest log will have a separate crop type. Each line should include the date the type of plant was harvested, the location (HH1, HH2, east field, food forest), the crop type, how much it weighs, where the food is going (usually the invisible needs project), and employee initials. Weighing the food is usually done in light blue paper berry baskets, plastic bags, or other containers for the food and then placed in larger yellow plastic bins for delivery. The harvest log can be found in Teams or the share drive. Additionally, refer to the “Weighing, packaging, and donating food at Gibbs House” SOP for more information. After everything is weighed and packaged, make sure to follow the “Cleaning and Sanitizing Surfaces, Tools, and Equipment at Gibbs House” SOP that is also found in Teams or the share drive.

Most of the food that we harvest is donated to the invisible needs project (INP) located on main campus. The INP is a food bank that is free to all for all students at WMU. Since much of the funding for the OfS comes from the Student Sustainability Fee, we like to give most of our food back to the students.

### Cover cropping

Cover cropping is when you grow plants to help restore and protect your soil. These plants are not for eating, but they prevent soil erosion, return nutrients to your soil, fight off weeds, control pests and diseases, attract helpful pollinators, improve water retention in the soil, and increase biodiversity. Most of the time, we will plant cover crops at the end and possibly the beginning of the growing season. However, cover cropping during the summer season should also be considered either in between a change from cold season to warm season crops or in a place that we are not growing that year. The ground is best if it is covered by beneficial plants at all times, so that those beneficial plants can outcompete the weeds. When selecting what cover crops to use, the following questions are important to consider:

* How quickly do you need the cover crops to grow?
* What season is it?
* What are you grow afterwards?
* How will you kill the cover crop?
* How quickly do you want the cover crop to decompose?
* Do you need to add nitrogen and/or phosphorus to your soil?
* Are you worried about a certain pest(s)?
* Do you mainly want to suppress weeds?
* Are you looking for a cover crop to provide biomass?
* Do you want to attract beneficial pollinators/insects?
* Do you want to conserve soil moisture?
* Do you want to reduce soil erosion?
* Do you want to break soil compaction?

Many cover crops can achieve multiple goals. Additionally, you can plant multiple cover crops in the same area (known as cover crop cocktails or mixtures) in order to achieve more than one goal at a time. Common cover crops include buckwheat, clovers, alfalfa, ryes, oats, brassicas, phacelia, cowpea, hairy vetch, sudangrass, mustards, alyssum, bishop weed, radish, wheats, sunn hemp, peas, canola, sunflower, and lupines. Advantages of these cover crops, recipes for cover crop cocktails, and other information can be found in sources [11], [12], and [13].

### Hugel Beds

## Hoop Houses

Hoop houses are made up of a steel frame with a heavy-duty sheet of plastic. It is a type of solar greenhouse that allows you to grow directly into the soil. It allows for a year around growing seasons in locations with cooler climates. Cold weather crops are able to be grown in the winter in some places, and warm weather crops can be put into the soil earlier in the year. When the soil does freeze in the winter, the plants will go dormant and continue growing when the soil warms up again.

There are two hoop houses at the Gibbs site in the east field (see Figure 1). The current layout of the hoop houses can be seen in Figure 2. We try to plan out the hoop house’s growing schedules to use the dedicated rows every year (see more information about how to schedule in the “Scheduling for the growing season” subsection above). HH1 has some space that has been dedicated to some experiments throughout the years, such as the black soldier fly larvae experiment (see more information about this in the “Composting” section below). Currently that space is dedicated to a sink, storage for compost buckets and tools, and an outdoor vermicomposting bin.

The hoop houses were bought from and built in. They have exhaust vents that are automatically opened and closed to control the temperature and humidity throughout the day. During the winter months, the flaps on the short ends can be zipped down and the flaps on the long ends can be rolled down manually. During the summer months, the flaps on the short ends can be strapped up with velcro and the flaps on the long ends can be rolled up manually when the temperatures get too hot. During the early spring and late fall when it is hot during the day and cold during the night, you may need to close up the flaps before leaving so the plants stay warm enough at night. The hoop houses should be checked yearly and undergo some simple maintenance if needed. Some of this upkeep and maintenance may include:

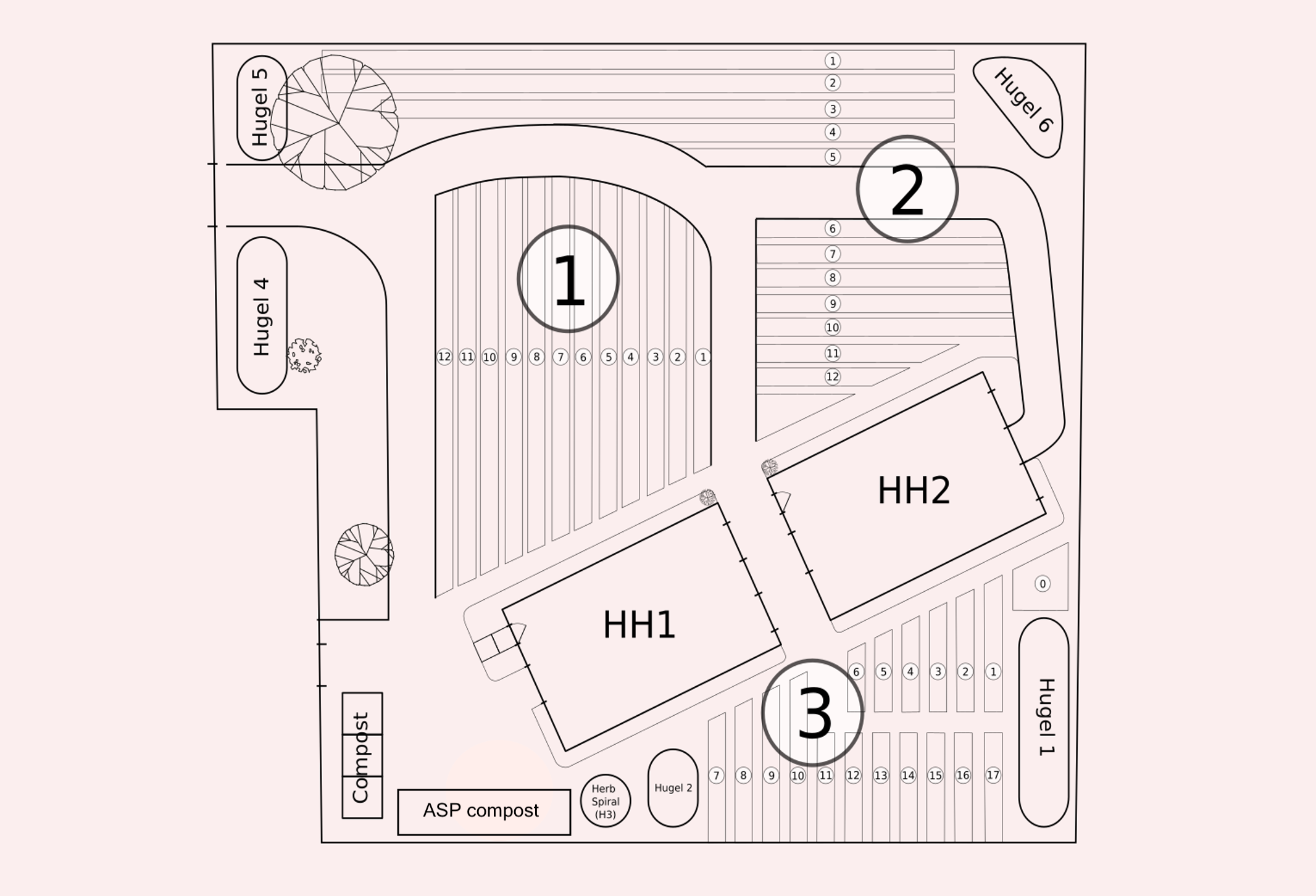
* Filling in dirt between the boards along the bottom of the hoop houses and the ground in order to make sure there are no gaps near the ground.
* Replacing the wind rope thats on the outside of the long ends of the hoop houses.
* Replacing the clips that keep the plastic on the poles that role up the long ends of the hoop houses.
* Replacing, patching, or covering some of the plastic that tears. This is especially needed for the plastic zip-up flaps that are on the short ends of the hoop houses. In the winter these need to be closed and if they cannot close, they need to be covered with a large sheet of plastic and secured in place using wiggle wire.
* Take care of the water spigots. Turn them off before you leave. Do not leave hoses on them in the winter. It is best to keep them off during the coldest part of winter and to put hay barrels around the hoop house near them to keep the area around them well insulated.
* Put hay barrels around the hoop house in the winter especially in areas that have gaps like by the zip-up flaps that are on the short ends of the hoop houses and around the vermicompost bin to keep the worms warm. These hay barrels can be put on the inside and/or the outside of the hoop houses.
* Check the main door to see if it is opening and closing properly and to see if it is secure. It could be something as simple as needing to replace a screw or bracket.
* Check the fans and vents to see if they work properly. Electrical may need a specialist.
* Check the poles or anything that is holding up the structure.
* Contact a specialist if the maintenance needed is too advanced.

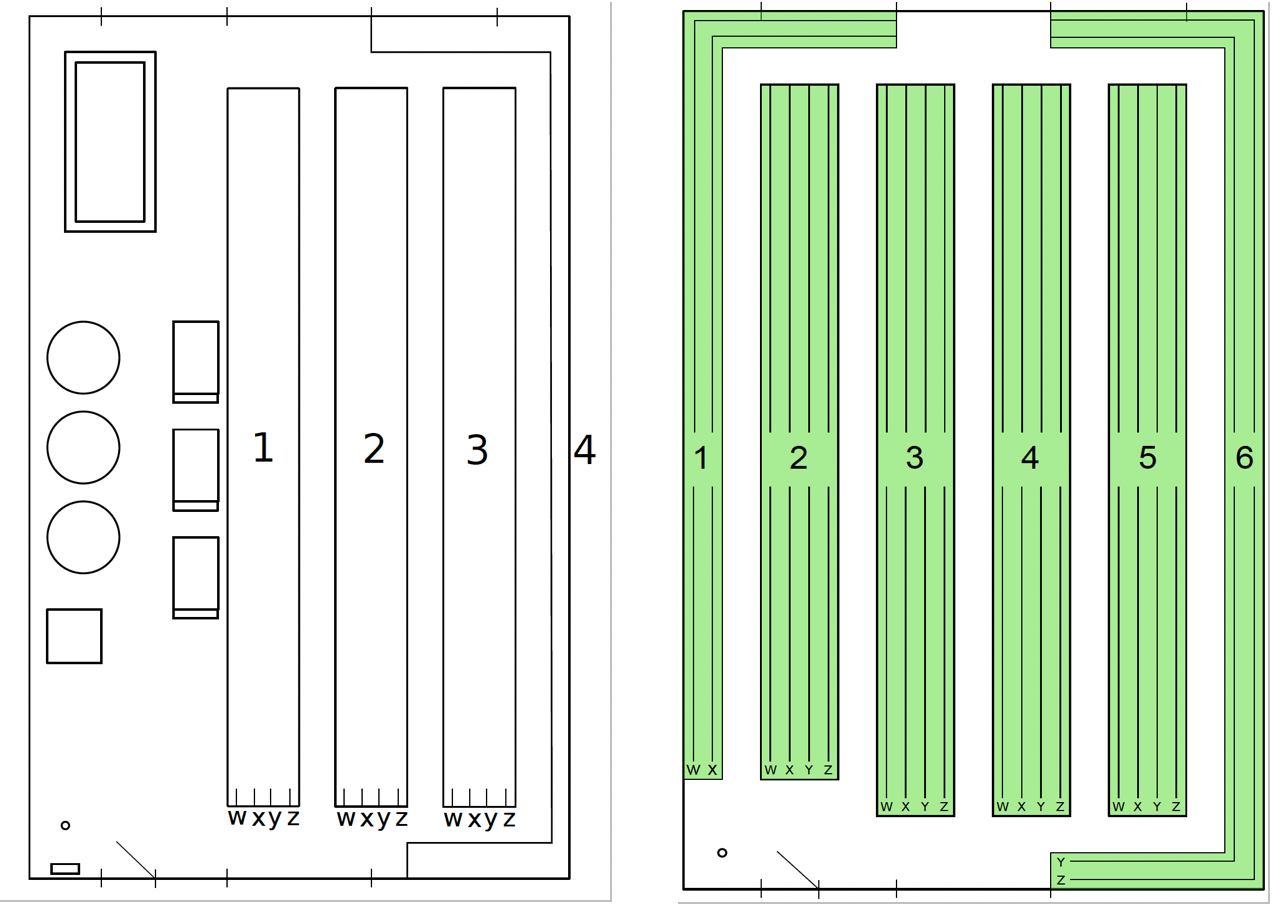
In 2019, we attempted to compost in HH1 all year around. Although we were able to produce some compost, we decided the hoop houses would be put to better use if we kept them as growing locations and made a large outdoor composting system. As of the summer of 2021, we grow crops in both hoop houses. We are trying to build up our soil to grow healthy crops since covid-19 caused us to take the 2020 growing season off and much of the hoop houses were taken over by weeds.

## Goals

The primary goals relating to the east field include:

* Growing food for students and the community to help relieve some food insecurity.
* Reduce food waste by producing compost.
* Use compost, cover crops, and other means to improve soil health and thus, improve the health of our crops.
* Control weeds, pests, and invasive species to the best of our abilities and using eco-friendly/organic practices.
* Maintain the hoop houses, outside fence, compost bins, hugel beds, walking paths, tools, and grow beds in working and presentable conditions.
* Host volunteers, students, community members, and others to educate the community.
* Host research projects in order to learn more and educate students and the community.
* In everything that we do, think about helping the community and the planet.

Figure 1: Map of the east field.

Figure 2: Layout of the rows in HH1 (left) and HH2 (right).

Vermicomposting

Sink

## References

[1] <https://www.motherearthnews.com/organic-gardening/transplanting-seedlings-how-to-do-it-correctly-zbcz1702>

[2] <https://organicgrowersschool.org/gardeners/library/seeds-vs-transplants/>

[3] <https://www.johnnyseeds.com/growers-library/tools-supplies/direct-seeding-guidelines.html#f>

[4] <https://organicgrowersschool.org/gardeners/library/organic-weed-control/>

[5] <https://organicgrowersschool.org/gardeners/library/organic-pest-control/>

[6] <https://organicgrowersschool.org/gardeners/library/organic-disease-control/>

[7] <https://organicgrowersschool.org/gardeners/library/growing-your-soil/>

[8] <https://www.soilfoodweb.com/resources/animations-videos/?vID=372925873>

[9] <https://www.burpee.com/blog/article10387.html>

[10] <https://greencitygrowers.com/blog/tips-for-harvesting-fruiting-crops-at-the-right-time/>

[11] <https://organicgrowersschool.org/gardeners/library/basics-of-cover-cropping/>

[12] <https://www.sare.org/resources/cover-crops/>

[13] <https://www.sare.org/wp-content/uploads/Cover-Cropping-for-Pollinators-and-Beneficial-Insects.pdf>

[14]

# Composting

## About Composting

## Different Composting Methods

## History of our Composting Program

## Goals

## References

# Sign-in information

* Gibbs House code to access keys: See Brianna McCain or Jeff Spoelstra
  + This code may change while you are working here. Brianna McCain or Jeff Spoelstra will let you know when it changes.
* Temperature sensors for compost system:
  + Website: [https://quanturi.app](https://quanturi.app/)
  + Username: Sust-wmich-gibbs
  + Password: %vdZ5SmJ@P26w9
  + Email: [sust\_info@wmich.edu](mailto:sust_info@wmich.edu)
* Moisture sensors for compost system:
  + Website: [https://www.ecowitt.net](https://www.ecowitt.net/)
  + Username: [krystalyork1696@gmail.com](mailto:krystalyork1696@gmail.com)
  + Password: \*#atJB98&EsHwGD8
  + App links:
    - Apple: <https://apps.apple.com/us/app/ws-view/id1362944193>
    - Google: <https://play.google.com/store/apps/details?id=com.ost.wsview&hl=en_US&gl=US>
* Blink camera system:
  + Email/username: [Sust\_info@wmich.edu](mailto:Sust_info@wmich.edu)
  + Password: haAsP2aHE#2NhLx&hm
  + App links:
    - Apple: <https://apps.apple.com/us/app/blink-home-monitor/id1013961111>
    - Google: <https://play.google.com/store/apps/details?hl=en&id=com.immediasemi.android.blink>
* Goal Zero (for solar panel/battery system):
  + App links:
    - Apple: <https://apps.apple.com/us/app/goal-zero-yeti/id1369567573>
    - Google: <https://play.google.com/store/apps/details?id=com.goalzero.YetiApp&hl=en>
  + Website: <https://www.goalzero.com/>
  + User guide for battery: <https://www.goalzero.com/media/files/yeti-1500x-user-guide-147-100a.pdf>
  + Material safety data sheet for battery: <https://www.goalzero.com/media/files/msds-yeti-1500x-150-c85a.pdf>
  + Solar panel user guide: <https://www.goalzero.com/media/files/boulder-200-briefcase-user-guide-47-b7bd.pdf>