# Sun One Organic Farm Plant Systems Data/Discussion

50 Maddox Road Bethlehem, CT 06751

Abstract: This document aims to put Sun One in a Permaculture perspective. This particular perspective is related to identifying plant systems present on the property. The goal of the document is to provide deep information into the dominant plant systems and communities on the property and how they can be utilized to further goals of Permaculture design and conservation. There will be a discussion on the end with aim to provide appropriate parameters for Permaculture design on the property.

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## Plant Communities

### Wooded Areas

[Via Forest Stewardship Plan] "Stand 1 is a 16 Acre early succession stage forest. Red maple and black cherry were the main species observed here. Some large witch hazel and spicebush exist in this area, but are not abundant. Multi-flora rose dominates the understory here, making movement through the stand difficult. Many of the stems in this area were observed as either dead or dying, some possibly due to age. The southwest wooded area also contains a high density of invasive species with widely scattered hickories and oaks, mostly of large size. Cherries, maples, and junipers were all observed in the understory of this area, though not in large amounts. Many turkey and deer tracks were observed near the edges and within the stand."

"Stand 1 has approximately 30 square feet of basal area; red maple makes up one third of the basal area per acre."

"This is a suitable site for forest growth, with a site index of 72 for Red Oak. Dominant trees here are likely to be 100-120 years in age with some individuals being of a slightly older or younger generation. Invasive species are out-competing native regeneration here, preventing forest regeneration; without treatment, this trend will likely continue."

These quotations were derived from a forest report done by Uconn Extension. They detail what has been labeled on Google Earth as 'Wooded Zone 1'. This zone is two parted and is about 16 acres. Species composition as derived from the report is as follows:

- (Sapindaceae *Acer rubrum*) Red Maple
- (Rosaceae *Prunus serotina*) Black Cherry
- (Junglandaceae *Carya ovata*) [Shagbark] Hickory
- (Fagaceae) [**Species need to be identified**] Oak
- (Cupressaceae) [**Species need to be identified**] Juniper
- (Rosaceae *Malus domestica*) [**Varieties unknown**] Apple
- [**Species need to be identified**] Smaller Cherry
- [**Species need to be identified**] Smaller Maples
- (Rosaceae *Rosa multiflora*) Multi-flora Rose
- (Lauraceae *Lindera benzoin*) Spicebush
- (Berberidaceae *Berberis vulgaris*) Barberry
- (Hamamelidaceae *Hamamelis virginiana*) Witch-Hazel

This species list is far from exhaustive. If anything the list leaves much to be desired since there is no actual specific species identification. Through Wikipedia I was able to discern what kinds of species were present in Connecticut; luckily there were typically only one. I have also included family names because family is important to know as well. There are no doubt other herbaceous and groundcover species present in these wooded areas but there is no data on this at the moment. (**Mission needed**) Furthermore there are apple trees within the eastern wooded area of unknown variety but originate in orchard function.

Overall, the wooded areas are in need of some more observation and recording of data. The wooded area where the new proposed house will go has not been evaluated. Edge wooded areas on the north side of the property and along the East Spring Brook would also be helpful. In Permaculture Design by Aranya, Aranya suggests using the **DAFOR** framework for tree species. This stands for **D**ominant, **A**bundant, **F**requent, **O**ccasional, and **R**are.

The DAFOR for Wooded Zone 1 would probably look something similar to this:

- D- Red Maple

- A- Black Cherry
- F- Oak, Hickory
- O- Juniper, Pine, Apple
- R- Ash

Not entirely accurate but it gives a starting point for further work.

Midsuccession Areas

There are essentially four areas that are considered midsuccession on the site. One is the main growing field. The main growing field is midsuccession because the sunlight exposure is very high on most of the field. Towards the eastern part of the growing area there is a lack of sun in the morning until the sun clears the tree line and then there is full sun the rest of the day. This area is most susceptible to overuse and the fertility needs to be managed correctly in order to maintain the high level of organic matter and nutrients in the soil. Rough measurement of the field taken on October 9, 2014 provided insight into the amount of growing space we have been working on to grow vegetables. Currently we are growing on 96,780ft$^2$. About 59,400ft$^2$ is intensively cultivated while the other 37,380ft$^2$ is less intensively planted.

The second midsuccession area is between culvert 1 and the forested area in length and between the barnyard and the main growing field in width. This area has water flowing through it and is where the proposed pond would be situated. There are a lot of shrubs such as *Elaeagnus umbellate* (Autumn Olive) and *Rosa multiflora* (Multiflora Rose) and herbaceous perennials and wildflowers. Mint was also discovered. The mixture of shrubs and herbaceous plants and a few trees contributes to the designation of this place as a midsuccession area. Though it may just as well be in a pioneer stage.

The third midsuccession area is the zone surrounded by the riparian buffer area around East Spring Brook, the western growing field, and the wooded zone abutting midsuccession area 2.

## Existing Plant Species Chart

## Refer to Excel Document.

## Ecosystem Architecture

In forest gardening it is widely accepted that there are seven layers in the forest. These layers are canopy trees, sub-canopy trees, shrubs, herbaceous, groundcover, rhizome, and vining.

The ecosystem architecture section will use the succession zoning to provide detailed information on layers and density, patterning and diversity, resultant habitat conditions, light/shade, character and quality.

I have identified six different types of ecosystem architecture for this particular site as of 2014. Forest, oldfield, wetlands, riparian, cultivated, and field. Each area has different characteristics

## Forest

There are two different types of forest architectures going on here, one is full closed canopy forest and the other type is less dense forest with vibrant shrub and herbaceous layers. The full closed canopy forest has the layering of a typical deciduous forest. There are mostly tall trees with some smaller trees and herbaceous wildflower mixed in. There is a variety in trees here with conifers, oaks, maples, and more.

Closed Canopy –

- Layers & Density
- Patterning & Diversity
- Resultant Habitat Conditions
- Light/Shade
- Character
- Quality

The other two stand of forest (East and West low-density stands) are less dense and are detailed on the species report. These areas could use some management to disrupt the invasive takeover of the *Rosa multiflora*. In this particular scenario these plants are disrupting the potential of this stand. This is especially true in the eastern stand.

East stand –

- Layers and density
    - There exists here an upper canopy (high), lower canopy (high), vines (low, shrubs (low), herbaceous layers (low).
- Patterning and Diversity
    - (Mission)
- Resultant Habitat Conditions
    - Shady, cooler

- Light/Shade
  - Shady
- Character –
  - Walking through it tough to do but also leads to cool dense underbrush in places and moves down slope towards running water.
- Quality
  - High

West stand-

- Layers and Density
  - Layers in this stand are upper canopy (medium), lower canopy (medium), shrubs(high), herbaceous (high), vining (high), groundcover(medium).
- Patterning and Diversity
  - (Mission)
- Resultant Habitat Conditions
  - Very diverse amount of plants but not as diverse as it could be without the invasives. Water is available.
- Light/Shade
  - Lots of full sun is available here. Some shade cast by trees but not prohibitively so.
- Character
  - Very interesting to walk through, pockets of trees surrounded by shrubs and vines. There are spaces where the sun falls freely interspersed between the trees.
- Quality
  - High quality. Even though there are invasives here there is high biodiversity potential here and there is a lot of wildlife that finds refuge in this area.

Oldfield

The oldfield architecture has a predominance of shrubs (high) and herbaceous (very high) layers. Interspersed are some trees (very low).

- Layers & Density
  - Look above.
- Patterning & Diversity
  - Decent diversity,
- Resultant Habitat Conditions
  - Bird habitat created via shrubs and grassy herbaceous layer.

- Light/Shade
    - Many areas have access to full sun and are shaded out in the afternoon because trees are casting shade from the west.
- Character
    - It feels like a drop moving down a steep hill towards water. There is a higher pace quality to walking down this hill. This place shares an edge with a riparian buffer zone.
- Quality
    - T trees grow well and so do large shrubs. There are a number of autumn olives. Savannah type of quality. High quality.

## Wetlands

There are two areas than can be considered wetlands on the site. One area is up near the spring and potato field of 2014. The other is down south of field 9 and west of field 10.

- Layers & Density
    - In the first area, layers are limited to herbaceous (very high) to shrubs (very low). The first area has cat tails and sedges. This area has a lot of water stored inside of it.
    - The second area has herbaceous layer, there is a lot of Joe Pye Weed and sedges and other wetlands kinds of plants.
- Patterning & Diversity
    - Diversity is medium in the first wetlands and low in the second wetlands.
- Resultant Habitat Conditions
    - Plenty of habitat for butterflies and small rodents. Birds have habitat in tall herbaceous and sparse shrub layer.
- Light/Shade
    - Plenty of light, full sun most of the day.
- Character
    - Thick, hard to walk through in during warm seasons.
- Quality
    - Is a wetlands and as such has a nice amount of diversity and serves as good habitat. High quality.

## Riparian

There are two real riparian zones. One zone is surrounding the East Spring Brook, there needs to be at at least 100 feet between the water and any sort of development legally. It is wise to have a buffer zone in the riparian zones to keep water quality more pristine.

- Layers & Density
    - There layers present in these zones are upper canopy, lower canopy, shrub, herbaceous, and vining. There is a high density of plants near these areas because water is so plentiful and disturbance is rare.
- Patterning & Diversity
    - Patterns of scattered sycamore trees and autumn olive sparse on the slope. There exists a lot of shrubs and underbrush.
- Resultant Habitat Conditions
    - There is a lot of habitat for small animals, both flying and terrestrial.
- Light/Shade
    - Mostly shaded area, pockets of sun available.
- Character
    - Serene and an area of acoustic importance as well as water quality importance. Very low development possible. Limited to slower design projects. Zone 4-5 worthy.
- Quality
    - High quality with fertile soils. Area is nice to be around but testing should be done to get a baseline for water quality and surrounding soil quality.

Cultivated

- Layers & Density
    - Limited to underground, shrub, small tree, herbaceous layers. Density is medium on main growing field. Density is low around shrubs and trees.
- Patterning & Diversity
    - Straight patterns on main growing area. Beds are linear and attempt to match contour. Medium diversity.
- Resultant Habitat Conditions
    - Very sunny and growing conditions are favorable. Soil is good. Open. Supports many small birds when large herbaceous pioneers grow.
- Light/Shade
    - Very full sun area. Shade around perimeter most of daytime but in early morning and late afternoon there is shade cast on the main growing field. Same scenario towards the west with the blueberries and peach trees.
- Character
    - Great views and great visual depth. Open. Bears gifts.
- Quality
    - High quality.

## Fields

- Layers & Density
  - Mostly herbaceous layer. Very dense.
- Patterning & Diversity
  - Field patterns. Medium high diversity.
- Resultant Habitat Conditions
  - Great for species that require high grass. The connections being made at the edges of these fields are great and diverse.
- Light/Shade
  - Full sun most of day.
- Character
  - Expansive and easy to view. Medium quality hay produced.
- Quality
  - Agrarian imagery is evoked. High quality.

## Habitat Types

On the site there is a variety of habitats. The diversity in habitat is sparse studied on the site so far; however what has been studied is indicative of patterns occurring on the site. Habitat is derived from the latin word *habitare*, meaning 'it dwells'. By definition, 'it' could refer to anything that dwells. Sparse study has been conducted on certain manifestations of energy dwelling in particular locations on the site. Further directed study could go far to improve this section.

The habitat types here will de described via architecture. The reason for this is the scope of habitat types that exist on the site. This section will grow enormously with species-niche analysis and species-web analysis. Patterns and rates of change are important metrics for understanding how to accomplish tighter design.

Wooded areas – These habitats support a diverse array of species. Avian species live in the trees and shrubs, raptors also frequent the tall trees and fly around the property often. Mammalian species such as squirrels and chipmunks are present in the wooded areas. There exists many species of fungi, bacteria, insects, micro biota.

Oldfield areas – These habitats support a lot of small birds and small mammals.

Wetlands areas – These habitats support amphibian populations and small birds.

Riparian areas – These habitats support species with high water requirements and tolerances.

Cultivated areas – These habitats support a variety of tuber and herbaceous crops.

Field areas – These habitats support a variety of grasses and field animals.