Polycultures and Guilds

(A Sample For Northeastern USA and possibly other areas)

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Introduction

You may have heard of food forests or forest gardens. These systems of life forms from all the kingdoms are usually tailored to the location, available resources, the goals of the gardener(s) and their management style.

In an effort to make the benefits of these systems easier to use by small scale gardeners, many people have developed, guilds, polycultures, and plant communities which "form healthy, interacting networks that reduce the gardener's labor, yield abundant gifts for people and wildlife, and help the environment."[1]

A few of these polycultures have been collected here, along with brief descriptions, as an introduction or quick reference guide for anyone interested.

It is highly suggested that the reader also get a copy of Plant Guilds by Bryce Ruddock. It is available for free at the Midwest Permaculture website. It is also highly reccommended that the reader continue researching the plants discussed in this text to gain a more complete understanding of their abilities, roles, needs and dangers.

Preparation

For any of these polycultures to work, the necessary resources must be available. Soil, sun and water must be on hand with the appropriate qualities.

It is higly suggested that the gardener have the soil tested and analyzed by a soil testing lab. The test(s) should include analysis to determine concentrations of lead, mercury, cadmium, and arsenic if possible. Compare the results of the soil test(s) to the requirements of the plants you intend to grow, as well as the maximum allowable concentrations of heavy metals as defined by the EPA and FDA. Information about regional testing labs should be available through: a Google search, your local Co-Op Extension Office if there is one, and/or the agriculture department of your local college.

The following are suggested chemical characteristics for a garden of annuals:
Soluble salts: Less than 2500 ppm
pH: 6-7
Organic Matter: 5-8%
CEC (Cation Exchange Ratio): 7-15 (Less than 5 is bad. CEC can be higher than 15, and that is okay.)
Cu: 0.8-1.2 ppm
Mn: 4-8 ppm
Fe: 6-10 ppm
Zn: 1-2 ppm
B: 0.5-1[2] ppm

1Gaia's Garden pg. 12

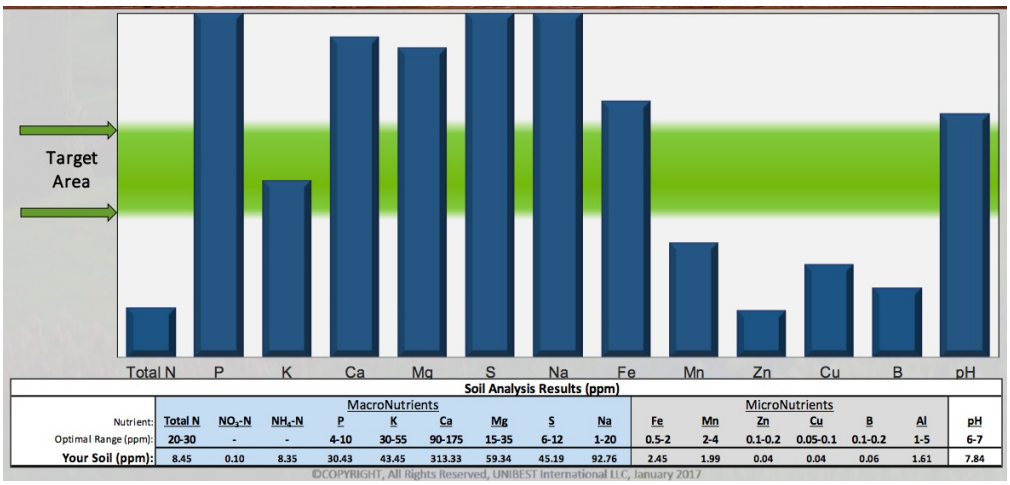
2The above recommended soil chemistry and concentrations of trace elements are derived from Stacey Murphy's Online Grow Your Own Vegetables gardening course. Enrollment is avaiable about twice a year at http://bkfarmyards.com/food-growing-essentials-online-course

Heavy Metal Concentration (*In Soil*) Limits Per The Clean Water Act Section 503.13

Table 3 of § 503.13 - Pollutant Concentrations

Pollutant	Monthly average concentration (milligrams per kilogram) [1]
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

Another set of recommended trace element concentration levels has been found. These guidelines appear to originate from a lab in Washington state, the caption references UNIBEST International LLC.



Soil Analysis Results (ppm)

Nutrient:	Total N	NO_3-N	NH_4-N	P	K	Ca	Mg	S	Na	Fe	Mn	Zn	Cu	B	Al	pH
	MacroNutrients									MicroNutrients						
Optimal Range (ppm):	20-30	-	-	4-10	30-55	90-175	15-35	6-12	1-20	0.5-2	2-4	0.1-0.2	0.05-0.1	0.1-0.2	1-5	6-7
Your Soil (ppm):	8.45	0.10	8.35	30.43	43.45	313.33	59.34	45.19	92.76	2.45	1.99	0.04	0.04	0.06	1.61	7.84

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Soil texture should also be analyzed so the gardener has an idea if other amendments are needed (e.g. plants that require a lot of water may die of dehydration in very sandy soil).

Polycultures of Annuals:

A Simple Companion Group

1. Carrots [65 DTM (days to maturity)]
2. Lettuce [28 DTM]
3. Onions [90 – 110 DTM]

DESCRIPTION: "In annual polycultures, filling root space and vertical space with different plants is seen as a way to get more use out of a particular volume of space. Since the onions grow taller than the carrots, they will not be shaded too much. Since the lettuce requires less light, being shaded by the carrots will not be a problem. The root systems of the three plants grow to different depths and so should not impede each other."[3]

Instructions: Plant these three vegetables together. Standard spacings: Onions: 4"-6" Carrots: 1"-2" Lettuce (leaf): 1"-3"

3Gaia's Garden pg. 142

Four Sisters

NOTE: This giuld works best when using corn, pole beans and squash varieties that can be stored for several months after harvest.

1.Pole Bean *(Phaseolus vulgaris*)**:**
Niche: nitrifier, annual vine.
Habitat: Disturbed earth, water: average water needs, sun: 8+ hrs.
Notable Products: Create edible beans.

2.Corn (*Zea mays)***:**
Niche: Annual, Herbaceous. **Habitat:** Enriched and disturbed soils. **Notable Products:** sweet corn, dent corn or a multistalked cultivar creates a trellis for the beans.

3.Sprawling Vine Squash (*Cucurbita*)**:**
Niche: Ground cover, weed prevention.
Habitat: Enriched and disturbed soils. Full - partial sun, water needs depends on type of squash grown.
Notable Products: Edible Squash

4.Rocky Mountain Bee Plant (*Cleome serrulata)*
Niche: nectary,insect attractant,
Habitat: 8+ hrs direct sun, drought tolerant, disturbed soil.
Notable Products: edible seeds, medicine, nectar, and dye.

Other Potential Companions:
Marigold – Beneficial aromatic.
Icicle Radish – Edible seed pods, said to prevents vine borer.
Amaranth – Said to be another companion to corn. Good chicken feed.
Ragweed – Ladybug attractant.[4] (plant sparsely. Do not allow it to set seed)
Tomatillos – Edible fruit. (Purple tomatillos have been successfully used as a companion in a three sisters garden in Michigan. See MiWilderness's youtube channel for more information)

Description: A synergistic combination of structures and applied ecology that can produce good yields. The corn provides a trellis for the pole beans. The sprawling squash shades the ground which supresses weeds and lowers ground temperature if it is planted at the correct time. The beans add nitrogen to the soil. The RMB Plant can be used a number of ways and attracts insects which will pollenate the squash and bean flowers. Thus increasing the squash and bean yield.

Some evidence indicates the four sisters may have been used to create food that can be stored over winter. If this is your intent, it is important to use a winter squash, beans that can be easily shelled, dried and stored; and dent/flint/flour corn.

Instructions: Almost any corn variety that is fit for your region will work. However, Gaia's Garden suggests using a multistalk cultivar, or corn that has a history of being used in this guild, such as Hopi White, Tarahumara, or Black Aztec. Plant vining squash with dent/flint corn. A bush type squash is suggested when growing sweet corn, sorgum or whenever the stalk crop will be harvested before the squash is mature.

Mounds of dirt can be used to help keep the corn seedlings warm and aid drainage. It is therefore suggested to plant the groups of kernals at least three feet apart. If this is your first time growing the 4 sisters, it maybe a good idea to give the groups even more space.

Plant several kernals, approximately 1" deep. To get a rough estimate of yield, it is suggested the gardener assumes a yield of 4-5 ears per group of kerels.

Once the sprouts are tall enough, start hoeing the soil into mounds around them but do not cover them completely. The mounds are meant to increase drainage and reduce the daily temperature swings felt by the young sprouts.

It is suggested to plant several kernals since the germination rate and number of stalks that grow from each group cannot be known beforehand. If more than three stalks grow from each group, cut the smallest ones

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4Other ladybug attractant plants include, but are not limited to: Garlic, Geranium, Dill, Bachelor's Button, Calendula, Sweet Alyssum, Cilantro, Parsley, Queen Anne's Lace (wild carrot), Tansy, Fennel, Yarrow, Coreopsis, Chives, Coneflower, Coriander, and Buckwheat

(pulling them will disturb the root system of the other seedlings).[5]

Two weeks after the corn, select a vining bean coated with the correct legume inoculant. To ensure enough beans germinate plant more than one bean per mound."

Plant squash or pumpkins between each mound whe you plant the beans. Only use a vining squash if you grow dent or flint corn. They have stronger stalks and are less likely to break if the squash grows up the stalk. Do not grow Zuchinni. Consider growing bush squash if you want to be able to walk within your garden before the squash is mature.

Other than that, grow the crops by following the suggestions that come with the seeds. After harvest, leave the plant matter to rot on the ground. This should return some fertilltiy to the soil and protect against erosion and desication.

NOTE: Leaving the plant matter on soil *may be a dicey move. Diseases that may have been present in the crops can reside in the detris for some time and possibly proliferate next year. Ultimately it is the gardener's decision. Other reasons to leave the plant matter on top of the soil include: reduced creation of hardpan, reduced temperature of surface soil in warm months.

***NOTE: If the gardener is unsure of how much nitrogen is available in the soil, it may be neccessary to cut 50% or more of the bean vines at the base just before they flower to ensure a large amount of accumulated nitrogen is available for the other plants. However, *other* sources indicate there will be nitrogen available even if the vines are allowed to fruit.**

Rocky Mountain Bee Plant (Cleome serrulata)

"Rocky Mountain Bee Plant has historically been used by humans as a nutritious food source , a medicinal treatment for many ailments , and as a dye for coloring fabric and pottery. All parts of the plant can be eaten raw, cooked, or dried. Drinking an infusion of the plant relieves stomach ache and reduces fever. Applied as a compress it soothes sore eyes. A yellow-green dye is made by boiling the leaves and a black dye is made by boiling the woody stems for an extended period of time."[6]

Bonus: A number of other plants have also been grown with the four sisters. It is suggested that the reader does their due diligence and research any companion(s) that they intend to add to the polyculture. Companions that may compete for nutrients, sun and root space may reduce yields.

5This is a planting/growing method described by Gaia's Garden. There are others. Please take into account your resources when deciding on a particular strategy. I have not found a detailed account of anyone's experience growing this guild using sorghum instead of corn. If you have grown the guild with sorghum, or know someone who has, please add it and the lessons learned and post the new document. Please give the appropriate attributions.

6United States Department of Agriculture NATURAL RESOURCES CONSERVATION SERVICE Plant Materials Technical Note No. MT-104September2014. https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mtpmctn12314.pdf

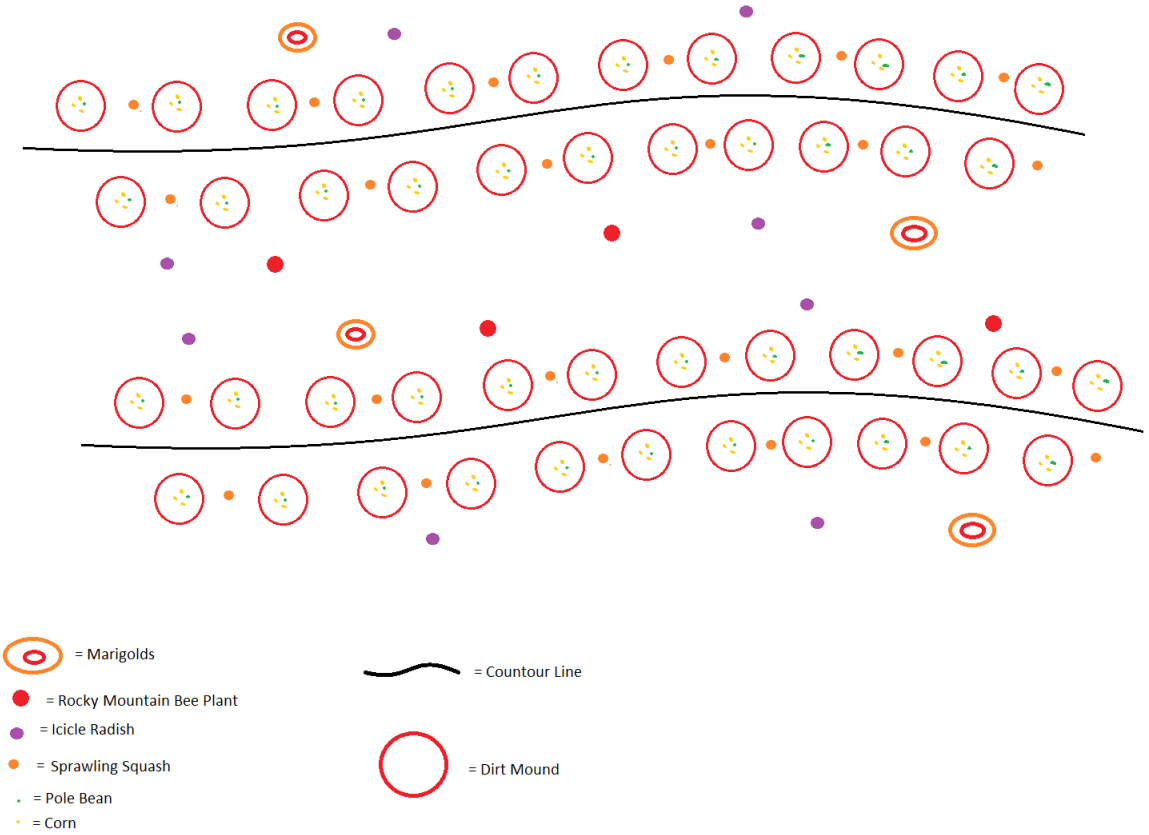

Illustration 1: A potential crop layout for the four sisters.

Ianto Evan's Polyculture of Annuals

Early maturing cabbage
Late maturing cabbage
Radish
Dill
Parsnip
Calendula
Lettuce (loose leaf and heat tolerant varieties)
Buckwheat
Bushbeans
Favabeans
Garlic cloves

Description: Ianot's polyculture is similar to natural succession in that the plants grow, ripen, bloom, set fruit, and drop seed at different speeds. The polyculture contains of plants of different sizes and shapes. These plants create a variety of habitats as they maure within the garden bed that aid in the developement of some of their close neighbors. The attributes of this polyculture include: harvestable material through several months of the growing season, reduced evaporation due to close spacing and broad leaves, pest control via the garlic, and attraction of beneficial insects via the dill and buckwheat.

Instructions: "Prepare approximately 20 square feet of garden bed for each person who consumes the harvested crops."

- *30 days before the last freeze, cover the bed with 1" - 3"*compost.
- *Approximately 14 days before the last freeze date:* Start five cabbage plants (in cold frames or green house) for every twenty square feet of garden plot. The cabbages will be transplanted into the holes left by the first radish harvest. To spread the cabbage harvest over a longer period of time, plant early- **and** fall-maturing cabbage.
- *Week One: (The week after the final freeze date in your area):* Plant parsnip, radish, dill, calendula, and lettuce seeds. For a long harvest season, select varieties of fast and slow maturing lettuce. A group of heat tolerant and loose leaf cultivars can lengthen the lettuce season into summer. Several varieties to consider include: romaine, butter, iceberg, Summertime or Optima. Broadcast each seed type separately over the entire bed. This should create a mixed planting. Aim for one seed for every 2"-3" square inches of space . Gently add a quarter inch layer of compost and water with a shower nozzle or other wide spread and low kinetic energy setting.
- *Week Four:* Harvest the mature radishes. Plant cabbage seedlings in the holes. Keep the seedlings approximately eighteen inches apart.
- *Week Six:* Begin harvesting the lettuce. The dense sowing of the different lettuce varieties should yield a blend of edibles when the plants are immature. Harvest the entire plant if you wish to make space for the other plants to grow. Assuming the correct lettuce cultivars were chosen and thinning continues, the remaining lettuce will continue to grow for several months.
- *Late Spring/Early Summer:* After the soil has warmed to 60 deg F, plant inoculated bush beans in the areas opened by the, now dead, dead early season lettuce. Plant buckwheat into any other openings develop in early summer (their young leaves are edible). The dill and calendula should be ready for harvest after the lettuce (blossoms of calendula are edible). Watch for early maturing cabbages. The beans may mature in this time period as well.
- *Fall:* Parsnips are mature or close to maturity. If they are left in the ground too long the root will become hard. So harvest them sooner rather than later. As autumn progresses, more space in the bed will become available. If your winter is mild, consider planting fava beans and garlic. [7][8][9]

7 The above polyculture is a paraphrased version of Ianto Evans polyculture as described in Gaia's Garden by Toby Hemenway. I have changed text and removed some warnings about alternate and inferior techniques. If you follow the directions, and water it adequately, the polyculture should grow successfully.
8 Could scallions or onions be over wintered as well?
9I'm not sure a mild winter is necessary for overwintering garlic.

Jajarkot's Polyculture of Annuals:

Cabbage
Cauliflower
Broccoli
Radishes
Chard
Lettuces
Carrots
Fennel
Dill
Coriander
Fava beans
Bush Beans
Alliums (onions, garlic, chives, leeks)
Mustard Greens Mix (Osaka, Purple mustard, tat tsoi, mizuna, garden cress, etc.)
Cool season Greens (arugula, garden purslane, and shiso). If Spring is warm, in the 80's F, also plant buckwheat.

Description:

This polyculture starts in the Spring with a thick cover of palatable greens interspersed with slower-maturing plants. As the greens are harvested, beans and other vegetables replace them. This polyculture can yeild food for 6-8 months of the year depending on the climate zone. In the northern climates, season extension devices can be used. Spun row cover, green house plastic over the bed, or cold frames can extend the productivity of the garden well into early Spring and late Autumn.[10]

Instructions:

• ***One month before the last frost:*** **"**Spread finished compost on the garden bed. Start a few seedlings of each cabbage, califlower, and/or broccoli indoors. Select a blend of varieties that will ripen over a long season."

• ***Week One*** *(at the last frost date in your region):*Create an edible ground cover by densely a mixof mustard greens (Osaka Purple Mustard, tat tsoi, mizuna, garden cress, and the like) and other cool season greens such as arugula, garden purslane, and shiso. In regions where spring is warm (May temps reach 80 degrees Fahrenheit), also sow buckwheat. Young buckwheat greens are delicious in salads and stirfry." Then add some salad crops. Lightly sow the seeds of radishes, chard, lettuces, and carrots among the previously sown seeds. Herb seeds go in next. Sow fennel, dill and coriander; somewhat more densely than the salad crops, since they don't seem to germinate well. Now add legume seeds to the mix. Push fava beans, bush peas or a blend of these, into the soil roughly one foot apart. Add some of your favorite alliums such as onions, garlic, garlic chives or leeks. Plant either seeds or start of these about 6 to 12 inches apart."

• ***Weeks Two Through Four:*** "Begin Harvesting the edible ground cover. Don't just trim the leaves; pull the whole plant to create openings. Take care not to disturb the young beans or alliums. Pull a few of the young herbs to thin them out; they'll make a tangy addition to salads and stews. In some of the resultsing gaps, plant cabbage, cauliflower, or broccoli seedlings about 18 inches apart."

• ***Late Spring/Early Summer:*** "When soil temperatures reach 60 degrees Fahrenheit, plant basil and bush beans in the openings. As the spring warms up, many of the greens will bolt. Speed up your harvesting of these to eliminate them before they set seed. Alternatively, if you want to naturalize these greens in your garden, let a few go to seed, then pull the whole plant and lay it on the soil to compost and reseed. Continue harvesting all the plants as they mature or crowd."[11]

10 Paraphrased from -Gaia's Garden pg. 146

11 Reprinted from Gaia's Garden, copyright Toby Hemenway, with the permission of Chelsea Green Publishing (www.chelseagreen.com)

Polycultures of Perennials:

Tree Polycultures:

Beach Plum Tree Guild:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier)

Beach Plum (*Prunus maritima*) This fruiting shrub can grow to over 12 feet (4 meters) and produces small, delicious plums.

Niche: deciduous shrub

Habitat: average water needs, Full to partial sun, Prefered soil types UNKNOWN (assume loamy soil is good?).

Notable Products: Edible fruit,

Green and Gold (*Chrysogonum virginianum*) This is a beautiful groundcover that attracts beneficial insects and can grown in partial shade and moist soils

Niche: Ground cover

Habitat: Requires consistently moist soil that drain, Full sun to partial shade,

Notable Products: Nectar

Dwarf Coreopsis (*Coreopsis auriculata nana*) This is another beautiful groundcover that attracts beneficial insects.

Niche: Herbaceous perennial

Habitat: Full sun, medium water needs, said to be native to open woods in South Eastern US, so it probably can survive in a variety of soil types.

Notable Products: Nectar, pollen

Ramps (*Allium tricoccum*) a.k.a. Wild Leeks, are early Spring vegetables and grows well in the shade.

Niche: Herbaceous perennial

Habitat: Shaded woodlands, average water needs, preferes wet and acid soils. Tolerats juglone.

Notable Products: Edible leaves and bulbs.

Camas (*Camassia quamash*) has edible bulbs and has flowers that attract beneficial insects.

Niche: Small Herbaceous Plant

Habitat: Full sun to light shade, prefers moist soil, pH**:** 5.1-7.5 (tolerates a wide range of soil conditions)

Notable Products:Nectar, pollen, edible bulb.

Notes: This is a polyculture with flowering plum and ground cover, edible Spring vegetables, and edible Camas bulbs.Also, I don't see a nitrogen fixer in this group.

Paw Paw Tree Guild:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier!!br0ken!!

Pawpaw (*Asimina triloba, perennial)*

Niche: Understory Tree

Habitat: Consistently moist soil, Full sun, prefers loamy and well drained soils.

Notable Products: Edible fruit, leaf matter every fall

Ramps (*Allium tricoccum)* a.k.a. Wild Leeks, are early Spring vegetables and grows well in the shade

Niche: Herbaceous

Habitat: requires atleast partial shade, can grow in sandy and loamy *soils*, medium water

Notable Products: Edible leaves , flowers, bulb.

Hog Peanuts (*Amphicarpaea bracteata)* have edible seeds and “roots” which are really seeds that develop underground, are shade-loving, climb up and sprawl out (smothering weeds), and fix nitrogen.

Niche: Vine

Habitat: Full sun to light shade, moist conditions, and soil containing sand or loam.

Notable Products: Edible beans, edible roots

Notes: Ramps will grow well under Pawpaws, and will die back just when Hog Peanuts are getting large. If you do

want to go through the trouble of harvesting the Hog Peanuts, there are no other actively growing plants in that layer during harvest time. The fruiting Pawpaw will benefit from the nitrogen produced by the Hog Peanut.

Apple Tree Guild:

(Terra Genesis International)

Apple tree (*Malus pumila*) (perennial)**:**

Niche: Overstory and understory tree (can grow and fruit in some shade).

Habitat: Soil: can survuve in a variety of soils with high nitrogen and potassium resources; average water needs, full sun

Notable Products: Fruit, wood, nectar

Dwarf Comfrey (*Symphytum Grandiflorum*)**:**

Niche: Dynamic Accumulator, Shelter for insects, nectary, Green mulch.

Habitat: Light: Prefers full sun Shade: Tolerates light shade (about 50%), moist but well drained soil. Moisture: Medium, some species can be a bit more drought tolerant pH: tolerates a wide range (6.5-8.5)

Notable Products: Sheep and chicken food.

Chickory (*Cichorium intybus*)**:**

Niche: Nectary, taproot, Insect shelter, Dynamic accumulator.

Habitat: Disturbed land, roadsides. Light: Prefers full sun Shade: Tolerates light to moderate shade Moisture: Medium moisture requirements pH: (4.5-8.5)

Notable Products: Edible roots and leaves (cooked and variety dependant)

Wild Chives (*Allium schoenoprasum*):

Niche: D. Accumulator, nectary, G. Cover, Aromatic

Habitat: Full-partial sun, pH**:** neutral – basic, average water needs, can grow in a limited variety of soils but does best in fertile loam.

Notable Products: Edible leaves.

Sweet Cicely (*Myrrhis odorata*)**:**

Niche: **I**nvertabrate shelter, nectary, aromatic.

Habitat: Full sun to partial shade. Neutral to basic pH.

Notable Products: Edible greens and roots.

Anisse hyssop (*Agastache foeniculum*)**:**

Niche: invertabrate Shelter, nectary, Aromatic.

Habitat: Full sun to partial shade, Neutral pH.

Notable Products: Flavoring for tea and a number of medicinal uses.

Yarrow (*Achillea millefolium*)**:**

Niche: nectary, invertabrate shelter, ground cover, D. Accumulator

Habitat: Light: Prefers full sun. Shade: Tolerates moderate shade. Moisture: Can tolerate dry to medium moisture soils. pH: (5.1 – 7.5)

Notable Products: Rumored to be an edible green. However, some people may have an allergic reaction to it.

Clover (*Trifolium repens*)**:**

Niche: nitrifier, nectary.

Habitat: Full sun to partial shade, acidic to neutral pH. Semidrought tolerant, grows in a variety of soil types

Notable Products: Leaves and flowers used in teas.

Red Alder Tree Guild:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier)

Red Alder (*Alnus rubra*):

Niche: Large Tree, nectary/Pollen Production nitrifier, Wind-break

Habitat: Prefers full sun to light shade, dry and wet soils, Prefers Nuetral pH

Notable Products: Wood

Chinese Yam (*Dioscorea opposita*):

Niche: herbaceous twining vine.

Habitat: Full sun – light shade. Moist soil. 6.1-7.8 pH
Notable Products: large edible tubers, smaller aerial tubers.

Birdsfoot Trefoil (*Lotus corniculatus*):
Niche: Ground cover, nitrifier, Insect attractant.
Habitat: Average water needs, full sun, can survuve in a variety of soil types
Notable Products: Nectar and nitrate nodules.

Elephant Garlic (*Allium ampeloprasum var. ampeloprasum*)
Niche: Herbaceous
Habitat: Direct Sun, Loamy soil, average waterneeds
Notable Products: Large, mild tasting bulbs

Kurrat Leeks (*Allium ampeloprasum*)**:**
Niche: Herbacieous Layer, prefers direct sun with well drained soil
Habitat: Woodland Garden Sunny Edge; Dappled Shade; Hedgerow NOT native to USA.
Notable Products: Flowers, Leaves, Bulb are all edible.

Ramps: (*Allium tricoccum*) a.k.a. Wild Leeks, are early Spring vegetable, grows well in the shade
Niche: Shade loving herbacieous perennial
Habitat: Rich woods and bottoms, preferring slopes and streamsides. Usually in beech and maple woods. Garden Dappled Shade; Cultivated Beds
Notable Products: Edible leaves and bulbs.

Camas (*Camassia quamash*)**:**
Niche: Herbaceous
Habitat: , direct sun, average to wet soil, can survuve in a variety of soil types
Notable Products: Edible roots, nectary

****NOTE:* The Red Alder is not native to New Jersey. If the user is in the east coast the Black Locust may be a good substitute. However, Black locust are prone to be killed by the black locust. So one could use a couple false indigo bushes instead.****

"NOTE: The Red Alder takes some time to grow as a living trellis for the Chinese Yam. For a few years before the Alder creates significant shade, the, inoculated, Birdsfoot Trefoil will make a good ground cover that puts nitrogen into the ground. The Elephant Garlic, Kurrat Leeks, and Birdsfoot Trefoil require full sun to grow well, so these are perfect initial plantings until the Alder grows. The Chinese Yams can take a few years to develop large underground tubers, but will produce aerial tubers right away, so there will be a small crop as the main crop is developing. As the Alder begins to produce heavy shade, the garlic and leeks will slow down production and the Ramps and Camas, which were already being harvested, will take over more since they are able to grow in the shade. As the Birdsfoot Trefoil dies back, the nitrogen production will continue with the ever growing Alder."

Mulberry Tree Guild:

(From “Perennial Polycultures” Ethan Roland & Mai Frank Forest Garden Immersion Course 2009.”)
http://www.slideshare.net/ethanappleseed/perennial-polycultures)

Black Mulberry (*Morus nigra*)

Niche: Food and coppicable branch and leaf matter

Habitat: Full to partial sun. Slightly acidic – basic soil pH.

Notable Products: Fruit, Leaves (leaves must be new and boiled for 20 minutes)

Seaberry (*Hippophae rhamnoides*)

Niche: Nitrogen Fixer (if inoculated with actinorhizal bacteria)

Habitat: Full sun to light shade. 5.5 - 8.5 pH, permenantly moist but well drained soil.

Notable Products: berries, nectary, charcoal, soap, dye.

Hardy kiwi (*Actinidia deliciosa, Actinidia arguta, and Actinidia kolomikta*)

Niche: Vine, produces fruit.

Habitat: Light: Full Sun (preferable)/Shade: Tolerates moderate shade /Moisture: Medium /pH: 5.1-8.5

Notable Products: Fruit. HIGHLY INVASIVE.

Russian Comfrey – *Symphytum × uplandicum* (Bocking 14): 6' – 8' root depth, spreads by rhizomes, sterile seeds. Russian Comfrey (Bocking 4): 8' – 10' root depth, spreads by rhizomes, sterile seeds.

Niche: Dynamic Accumulator, Shelter for insects, nectary, Green mulch

Habitat: Light: Prefers full sun Shade: Tolerates light shade (about 50%), moist but well drained soil. Moisture: Medium, some species can be a bit more drought tolerant pH: tolerates a wide range (6.5-8.5)

Notable Products: Sheep and chicken food.

Licorice (*Glycyrrhiza Glabra*)

Niche: N fixer, dynamic accumulator, insect nectary

Habitat: Light: Prefers full sun Shade: Tolerates partial shade. Russian Licorice tolerates more shade. Moisture: Prefers moist soils. American Licorice can tolerate more dry conditions once established. pH: 6.1-7.8 (see tcpermaculture.com for more details)

Notable Products: Edible shoots and roots.

Sorrel (*Rumex* acetosa**)**

Niche: Herbaceous Dynamic accumulator, nectar producer.

Habitat: Shade: Most species tolerate light shade, although some can tolerate moderate shade **Moisture:** Dry to medium-moisture soils pH: 3.5-8.5 (see tcpermaculture.com for more details)

Notable Products: Edible leaves(in the Spring), roots, flowers and seeds.

Gold star (*Chrysogonum virginianum*)

Niche: Ground cover. Flowers April-June

Habitat: Light Requirement: Part Shade Soil Moisture: Moist Soil pH: Acidic (pH<6.8) Soil Description: Moist, but well-drained, to drier soils.

Notable Products: Nectar, pollen

Sweet Cicely (*Myrrhis odorata*)

Niche: invertabrate shelter, nectary, aromatic.

Habitat: Full sun to partial shade. Neutral to basic pH.

Notable Products: Edible greens and roots.

King Strofaria – Niche: Fungi, consumes dead wood. Habitat: Forest Floor, wood chip beds Notable Products: Edible mushroom caps (cooked).

Mulberry Tree Guild #2:

Mulberry Tree (Morus nigra)**:**

Niche: Food and coppicable branch and leaf matter

Habitat: Full to partial sun. Slightly acidic – basic soil pH.

Notable Products: Fruit, Leaves (leaves must be new and boiled for 20 minutes)

Russian Comfrey: (*Symphytum × uplandicum)* (Bocking 14): 6' – 8' root depth, spreads by rhizomes, sterile seeds.
Russian Comfrey (Bocking 4): 8' – 10' root depth, spreads by rhizomes, sterile seeds.

Niche: Dynamic Accumulator, Shelter for insects, nectary, Green mulch

Habitat: Light: Prefers full sun Shade: Tolerates light shade (about 50%), moist but well drained soil.
Moisture: Medium, some species can be a bit more drought tolerant pH: tolerates a wide range (6.5-8.5)

Notable Products: Sheep and chicken food.

Dill (Anethum graveolens **):**

Niche: Herbaceous Annual, Insect attractant,

Habitat: Disturbed soil.

Notable Products: Aromatic herb. Used in soups, sauces and preserving cucumbers.

Nasturtiums (Tropaeolum)**:**

Niche: Perennial flowering herb.

Habitat: Gardens, disturbed soil, Full sun to light shade.

Notable Products: Edible flowers and young leaves.

Red clover (Trifolium pratense)**:**

Niche: nitrifier, nectary.

Habitat: Full sun – Partial Shade, acidic to neutral pH.

Notable Products: Leaves and flowers can be used in teas. Use caution.

Marigolds (Tagetes)**:**

Niche: Herbaceous beneficial aromatic

Habitat: Disturbed soil, sun:, water:

Notable Products: Flowers.-

Perennial Herbaceous Polycultures:

(Polycultures 1 – 3 are from "Perennial Polycultures Ethan Roland & Mai Frank Forest Garden Immersion Course 2009." A slideshow of which can be found at slideshare.net. The slides appear to be pictures of the polycultures that were grown in Toensmeier's and Bate's garden at Holyoke Massachuesetts at one time)

Herbaceous Polyculture 1:

Sweet Cicely (*Myrrhis. odorata)* is an erect, aniseed-scented perennial with bright green, 2- to 3-pinnate leaves and white flowers in umbels, followed by spindle-shaped fruits. Medium-size perennial vegetable with beneficial insect-attracting flowers. Tender green seed pods taste like licorice jellybeans. Great for snacking. Roots traditionally used as sweetener. Leaves used as sweet potherb. Seeds disperse widely, deadhead seeds before ripening. (Food Forest Farm)

Niche*:* aromatic pest confuser

Habitat: Full Sun to Partial Shade, pH: 6.1 – 7.8, average water needs, can grow in a variety of soil,

Notable Products: Nectar.

Turkish Rocket (*Bunias orientalis*) Invasive. Robust, long-lived plant. Spreads by seed, roots will sprout when damaged. Beautiful yellow flowers, young broccolis are much like broccoli raab - nutty and mustardy. (Food Forest Farm)

Niche*:* *Herbaceous, perennial*

Habitat: Full sun to partial shade, grows in many soil types. Drought tolerant.

Notable Products: Edible leaves (cooked), edible buds are similar to broccilli.

Good King Henry (*Blitum bonus-henricus)* Good-King-Henry has been grown as a vegetable in cottage gardens for hundreds of years, although this dual-purpose vegetable is now rarely grown and the species is more often considered a weed. (Wikipedia)

Niche: *Herbaceous, Perennial*

Habitat: partial shade, many soil types, prefers moist soil.

Notable Products: Edible leaves. Contains saponins. Eat carefully

Russian Comfrey (*Symphytum × uplandicum)* (Bocking 14): 6' – 8' root depth, spreads by rhizomes, sterile seeds. Russian Comfrey (Bocking 4): 8' – 10' root depth, spreads by rhizomes, sterile seeds.

***Niche*:** Dynamic Accumulator, Shelter for insects, nectary, Green mulch

Habitat: Light: Prefers full sun Shade: Tolerates light shade (about 50%), moist but well drained soil. Moisture: Medium, some species can be a bit more drought tolerant pH: tolerates a wide range (6.5-8.5)

Notable Products: Sheep and chicken food.

Welsh onion (*Allium fistulosum)* This perennial scallion forms clumps, which can be thinned for harvest once or twice a year. Mild flavor with just the right amount oniony zing.

Niche: *Perennial, Herbaceous*

Habitat: Full sun to partial shade, average water needs, does well in fertile soil

Notable Products: Edible bulbs, Aromatic

Herbaceous Polyculture 2:

Honeyberry (*Lonicera caerulea*)
- **Niche**: Produces edible berries. Nectar source.
- **Habitat:** Full sun, moist soil, acidic to neutral pH.
- **Notable Products:** Berries. **NOTE:** Honey berry do not self pollenate.

Prostrate Birdsfoot Trefoil (*Lotus cornicuatus*)**–**
- **Niche**: N fixer, insect attractant, ground cover.
- **Habitat:** lightly acidic soil. Tolerates low and moderately fertile soil.
- **Notable Products:** Nectar, cover for birds, edible greens for wildlife.

Sweet cicely (*Myrrhis odorata*)
- **Niche**: Herbaceous , invertabrate shelter, nectary, aromatic pest confuser[12].
- **Habitat:** Full sun to partial shade. Neutral to basic pH.
- **Notable Products:** Edible greens and roots.

Anise Hyssop (*Agasfache foeniculum*)
- **Niche**: invertabrate Shelter, nectary, Aromatic.
- **Habitat:** Full sun to partial shade, Neutral pH.
- **Notable Products:** Flavoring for tea and a number of medicinal uses.

Herbaceous Polyculture 3:

Siberian Pea Shrub (*Caragana arborences*)
- **Niche:** Bush**,** nitrifier, nectary**.**
- **Habitat:** Shade: Full Sun. Soil: Sandy/Loamy soil, acidic-neutral-basic pH.
- **Notable Products:** Flowers, Seed pods, leaves

Sunchoke (*Helianthus tuberosus* - L)
- **Niche:** Tall Herbaceous , invertabrate Shelter, nectary.
- **Habitat:** Shade: Full sun. Soil: 6.6 to 7.5 pH
- **Notable Products:** Edible tuber.

Water celery (*Oenanthe javanica*)
- **Niche: Aquatic Herbaceous**
- **Habitat:** High water demand. Bog soil. Full sun to partial shade. (can be invasive).
- **Notable Products:** Edible greens.

Dutch White clover (*Trifolium repens*)
- **Niche**: Ground cover, nitrifier, nectary.
- **Habitat:** Full sun – Partial Shade, acidic to neutral pH, fields, disturbed soils.
- **Notable Products:** Leaves and flowers used in teas.

12To my knowledge, this has not been proven yet.

Herbaceous Polyculture 4:

(Edible Forest Gardens Vol. 1 pg.325)

Milkvetch (*Astraglus glycyphyllos*)**:**

Niche: Nitrogen Fixer, Beneficial Insect Shelter, Ground Cover

Habitat: Cultivated Beds, loamy soil, direct sun

Notable Products:

Seakale (*Crambe maritima*)**:**

Niche: Herbaceous , General nectary.

Habitat: Full sun, moist soil, drought tolerant.

Notable Products: Edible roots, shoots (like asparagus), leaves (like kale, cabbage, or spinach), and flowers/buds. Note: Do NOT eat in large quantities.

Dwarf Comfrey (*Symphytum grandiflorum*)

Niche: Dynamic Accumulator, Shelter for insects, nectary, Green mulch

Habitat: Light: Prefers full sun Shade: Tolerates light shade (about 50%), moist but well drained soil. Moisture: Medium, some species can be a bit more drought tolerant pH: tolerates a wide range (6.5-8.5)

Notable Products: Sheep and chicken food. (If allowed to set seed, it may spread quickly), All parts of this plant are poisonous if ingested.

Perrenial Ground Cherry (Physalis heterophylla and subglabrata)**:**

Niche: Ground cover, herbaceous , fruit producing,

Habitat: Dry open woods. Rich soils, especially where the surface has been disturbed.

Notable Products: Edible cherries.

Egyptian Onion (*Allium proliferum*)**:**

Niche: Herbaceous, bulb**,** nectary

Habitat: Cultivated beds. Prefers a sunny position in a light well-drained soil. Can withstand slightly acidic to slightly basic soils

Notable Products: Edible bulbils

Herbaceous Polyculture 5:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier)

Jostaberry (*Ribes × nidigrolaria / x culverwellii*) complex-cross in the Ribes genus, involving three original species, the Black Currant *R. nigrum*, the Coastal Black Gooseberry *R. divaricatum*, and the European Gooseberry *R. uva-c*rispa. This is a fruiting shrub with fruit larger than a currant, smaller than a gooseberry. They taste like gooseberries but have no thorns! They grow 5-6 feet tall.

- **Niche**: Bush
- **Habitat**: Average water needs, full to partial sun
- **Notable Products**: attractive to bees, butterflies and/or birds, edible berries

Hog Peanuts (Amphicarpaea bracte*ata*) have edible seeds and "roots" which are really seeds that develop underground, are shade-loving, climb up and sprawl out (smothering weeds), and fix nitrogen.

Niche: Vine, nitrifier, ground cover, annual, re-seeds easily.

Habitat: Partially shade tolerant, soil

Notable Products: Edible roots and seeds.

- *Notes: The Hog Peanut will suppress weed growth under the Jostaberry, and the Jostaberry is tall enough not to be overgrown by the Hog Peanut. The fruiting Jostaberry will benefit from the nitrogen produced by the Hog Peanut.*

Herbaceous Polyculture 6:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier)

Sunchokes (*Helianthus tuberosus*) have edible tubers, emerge early, grow fast, reach 8 feet (2.4 meters), used as a trellis for vining plants such as poloe beans and groundnut.

Niche: Tall (under optimal growing conditions), Herbaceous

Habitat: average water needs, full sun, does well in fertile soil

Notable Products: nectar, edible tubers (clean thoroughly, soil can stick in the folds and ridges

Hog Peanuts (*Amphicarpaea bracteata*, *annual*) have edible seeds and "roots" which are really seeds that develop underground (see photo above), are shade-loving, climb up and sprawl out (smothering weeds), and fix nitrogen

Niche: Vine, nitrifier, ground cover, annual, re-seeds easily.

Habitat: Partially shade tolerant, soil

Notable Products: Edible roots and seeds.

- *Notes: Hog Peanuts can grow fast and can overwhelm shorter plants which make it a great groundcover. Sunchokes grow tall enough to avoid being overgrown by Hog Peanut. Sunchokes need to be harvested by digging. While the Hog Peanuts are sometimes not worth the trouble of harvesting because they are so small, if we are digging for the Sunchokes, then it is worthwhile to grab the Hog Peanuts as well.*

Herbaceous Polyculture 7:

(Polycultures: Permaculture Activist Magazine February 2013, Eric Toensmeier)

Comfrey (*Symphytum officianale*) This classic plant almost does it all: dynamic accumulator, attracts beneficial insects, groundcover, and forage plant for animals

Niche: Herbaceous , dynamic accumulator, insect shelter, nectary, ground cover, forage

Habitat: Partial Shade, average water requirement

Notable Products: Nectar, Green Mulch, dynamic accumulator, spike root with multiple apendages.

Mint (*Mentha* species) Amazing flavor, attracts beneficial insects, aromatic pest confuser, groundcover, and dynamic accumulator

Niche: disturbed and bare soil

Habitat: full sun to partial shade, minimal water needs, tolerates dry to medium moisture soils

Notable Products: nectar, green manure, invasive, ground cover

- *Notes: This is a classic combination for use as a tall groundcover under trees and large shrubs. The Comfrey will block out most weeds and can be used as a living mulch. The Mint will snake its way in and around the Comfrey to assist goundcover duties while providing its own additional benefits.*

Insect Support Group of Flowers:

A number of organizations and people are spreading a message that greater support for insects that rely on plants for pollen, nectar, and shelter is needed. Several polycultures or groups of plants that support these needs have been proposed. Some time ago, I received a seed packet of one such group. The label indicates it is from 7 Acre Wood Farm in Burnsville, Virginia (Bath County). Here are the seeds it contained:

Lanceleaf Coreopsis (Coreopsis lanceolata):

Niche: Herbaceous Perennial

Habitat: Full Sun, Sand Loam, Dry to Medium soil.Climate Zones: 3-9, Bloom: April - June

Notable Products: Nectar,

Yarrow (Achillea millefolium):

Niche: **N**ectary, invertabrate shelter, ground cover, Dynamic Accumulator

Habitat: Light: Prefers full sun. Shade: Tolerates moderate shade. Moisture: Can tolerate dry to medium

moisture soils. pH: 5.1 – 7.5

Notable Products: Rumored to be an edible green. However, some people may have an allergic reaction to it. Perennial

Maximillian Sunflower (Helianthus maximiliani): (Perennial)

Niche: Herbaceous, nectary

Habitat: Prairie, moist clay-like soil, full sun,

Notable Products: Food, oil, dye, thread

Common Evening-Primrose (Oenothera biennis): (Biennial)

Niche: Herbaceous, nectary

Habitat: Full to Partial Sun, Medium-Wet, Medium, Medium-Dry, Dry Soil,

Notable Products: nectarym bloom time depends on climate zone: June – November.

Queen Cleome/Spider Flower (Cleome hassleriana): (Annual)

Niche: Herbaceous annual 3'-4' tall, 1'-2' wide

Habitat: Full sun, loamy soi, drought tolerant, wide variety of pH

Notable Products: Nectary, bloom time can depend on climate zone. Said to blooms in June - September

Orange Cosmos (Cosmos sulphureus): (Annual)

Niche: Herbaceous annual

Habitat: Average moisture, well-drained and dry soil, full sun, tolerates poor soil.

Notable Products: Nectar for butterflies

Purple Coneflower (Echinacea purpurea): (Perennial)

Niche: Herbaceous

Habitat: Full sun, low water, chalk, loam and sandy soil,

Notable Products: Nectar for insects, deer resistant foliage.

Red Mexican Sunflower (Tithonia rotundifolia): (Annual)

Niche: Herbaceous

Habitat: Full sun, low water, loam and sandy soil

Notable Products: Nectar , foliage that deer do not eat.

Yellow Mexican Sunflower (Tithonia diversifolia): (Annual)

Niche: Herbaceous

Habitat: Full sun, low water, loam and sandy soil

Notable Products: Nectar , foliage that deer does not eat.

Nicotiana (Nicotiana alata): (Annual)

Niche: Herbaceous

Habitat: Full sun to partial shade, average water needs, prefers loamy soil

Notable Products: Nectar, blooms mid-summer to early fall, can self sow

Dandelion (Taraxacum): (Annual and Perennial)

Niche: Herbaceous

Habitat: Full to partial sun, nearly any soil, low water needs

Notable Products: Pollen, nectar, edible greens (variety dependent)

Goldenrod (Solidago): (Annual)

Niche: Herbaceous

Habitat: Full sun, low water needs, sandy soil

Notable Products: nectar and pollen producer, deer resistant.

Other Sources of Polycultures:

1. Bryce Ruddock's Plant Guilds (https://midwestpermaculture.com/eBook/Plant%20Guilds%20eBooklet%20-%20Midwest%20Permaculture.pdf)

2. https://apiosinstitute.org/

Sources:

- www.pfaf.org
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- http://www.slideshare.net/ethanappleseed/perennial-polycultures
  -The slideshare file used is associated with Terra Genesis International whose website is www.terra-genesis.com
- Gaia's Garden by Toby Hemenway
- Edible Forest Gardens Volume 1, 2: Design and Practice, by Dave Jacke
- Joe Murray & Anne Bryan, 7 Acre Wood Farm, Burnsville, VA 7acrewoodfarm.com
- https://davesgarden.com/
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