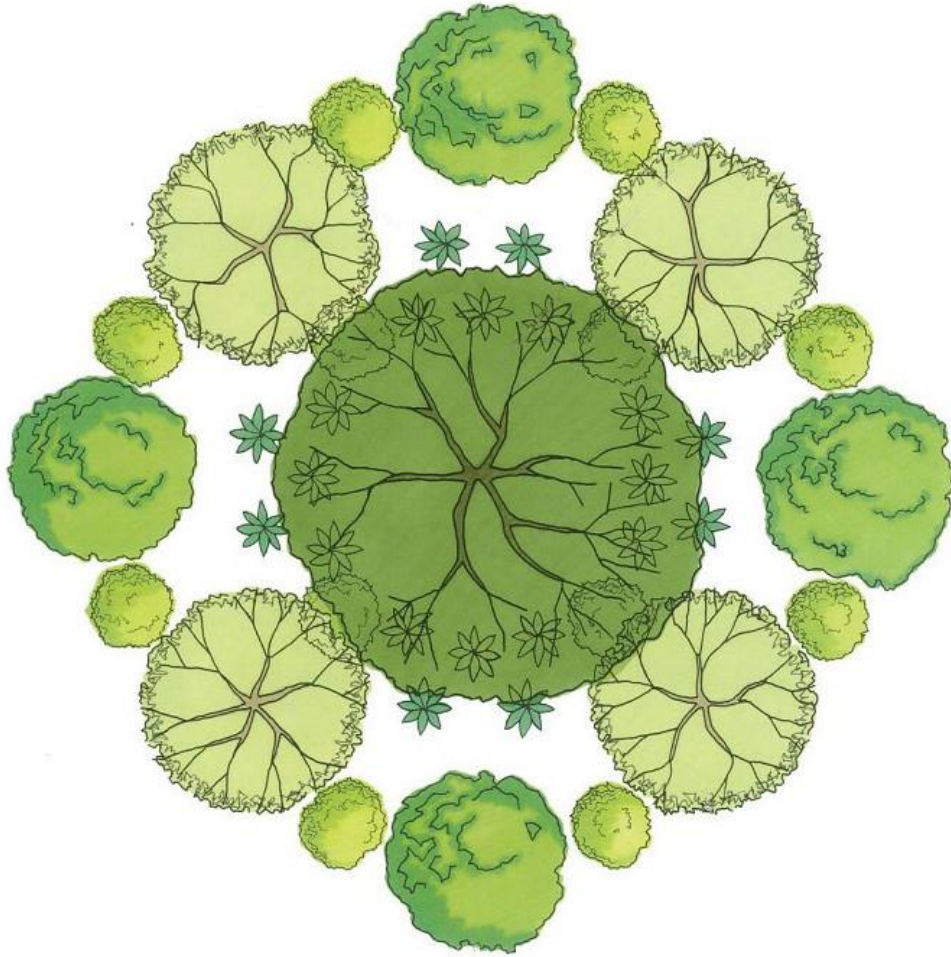


MIDWEST PERMACULTURE PRESENTS:



Plant Guilds

By Bryce Ruddock

Illustrations by Jesse Tinges

Forward by Becky Wilson

Editing and Layout by Milton Dixon

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Student Comments to our Permaculture Design Certificate Courses

"I'm so glad I took this training. It opened my eyes to what I was missing by just reading the books on permaculture & sustainability."

Al C. – Rockford, IL
(32 –Federal Aviation - Security)

"Everything we did at the course had a reason and tied back into the underlying concepts being taught. Each demonstration, each example was relevant."

Catherine K. - Central Illinois
(46 –University Prof./Writer/Farmer
Degrees from Yale, Columbia and Princeton
PDC Cert. from Midwest Permaculture... ☺)

"I never felt preached at, and always felt comfortable asking questions. I loved hearing Bill and Becky's personal stories. I think they really resonated and inspired all of us."

Susan P. – Doha, Qatar
(42 – Librarian)

"I enjoyed the nurturing environment that was provided that helped fuel the class' excitement. As instructors you are great encouragers and motivators; it's obvious that you understand and love what you teach."

Kenan G. – Colorado
(28 – Teacher/Rancher)

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Forward

As Midwest Permaculture grew, so did the number of requests from people looking for information and recommendations concerning what plants to add or combine to an existing tree on their landscape to create a useful plant guild. We referred them to Midwest Permaculture's "Official Plant Guy", Bryce Ruddock, who chairs the discussions of Plant Guilds on our networking site. Eventually, we asked Bryce to design some foundational guilds as every day examples that would help guide those who are new to permaculture. After he completed these we asked a PDC student of ours, Jesse Tinges, to use his landscape architectural skills to create the sketches.

We have been sharing these plant guilds with the students in our Permaculture Design Certificate Courses and they found these guilds to be so helpful and informative that we decided to make them available to the wider public with Bryce and Jesse's blessings. With the assistance of Milton Dixon's editing skills they are now in a public format that is easy to share on the internet. We hope that you find them practical, useful, and inspiring.

The team effort that emerged to create this booklet is actually a good example of how guilds, plant or human, really work together. The drawings and narratives seeped into the soil of our collective efforts and continued to germinate until they materialized in the form that you see here.

While the drawings in this booklet give a simple bird's eye view, know that in three dimensions we are filling in all the spaces and niches from the overstory or canopy tree (generally what the guild is named after) down to the soil. In addition, the plant guilds have root systems that cover every depth – mimicking that which exists above the ground, below, and include the incredibly important functions of the fungi and mycelia.

A successful plant guild will naturally evolve over time and will have diversity, interdependence and good relationships, as is needed in our human relationships as well. Resilience naturally occurs in such systems, strengthening the whole community.

Please use, experiment and enjoy!

Becky Wilson

Cofounder - Midwest Permaculture

March 2013

***Note: This publication is a gift from Bryce Ruddock and Midwest Permaculture.
You may share, print, and copy it freely with attribution. May this booklet serve the greater good.***

Editor's Note - About Plant Guilds

All plants naturally grow with other species in nature, rather than in single species groups. When a person enters into relationship with those plants by selecting which ones will be present, we call that a plant guild.

Plant guilds are a combination of form and function. The goal is to mimic the stacking and relationships found in nature while also providing useful resources to humans. Drawing from the idea of a food forest, we can generally identify at least seven layers that occur in an ecosystem:

Overstory	Groundcover
Understory	Vining
Shrub	Root
Herbaceous	

However, this can change depending how the guild is organized. For example, a plant that is usually in the understory, such as a semi-dwarf fruit tree, might be the tallest plant in a specific guild and in effect be the overstory.

The functions of a plant guild can be of benefit to humans, wildlife and the plants themselves. They are limited only by our imaginations and can include:

Edible fruit, vegetables, roots	Insectaries
Animal fodder	Pest control
Medicinal plants	Biomass for soil building
Nitrogen fixers	Raw materials for lumber, crafts, fiber
Nutrient accumulators	Fuel sources
Forage for pollinators	Etc.

Not all guilds will contain every function just as they may not contain every form.

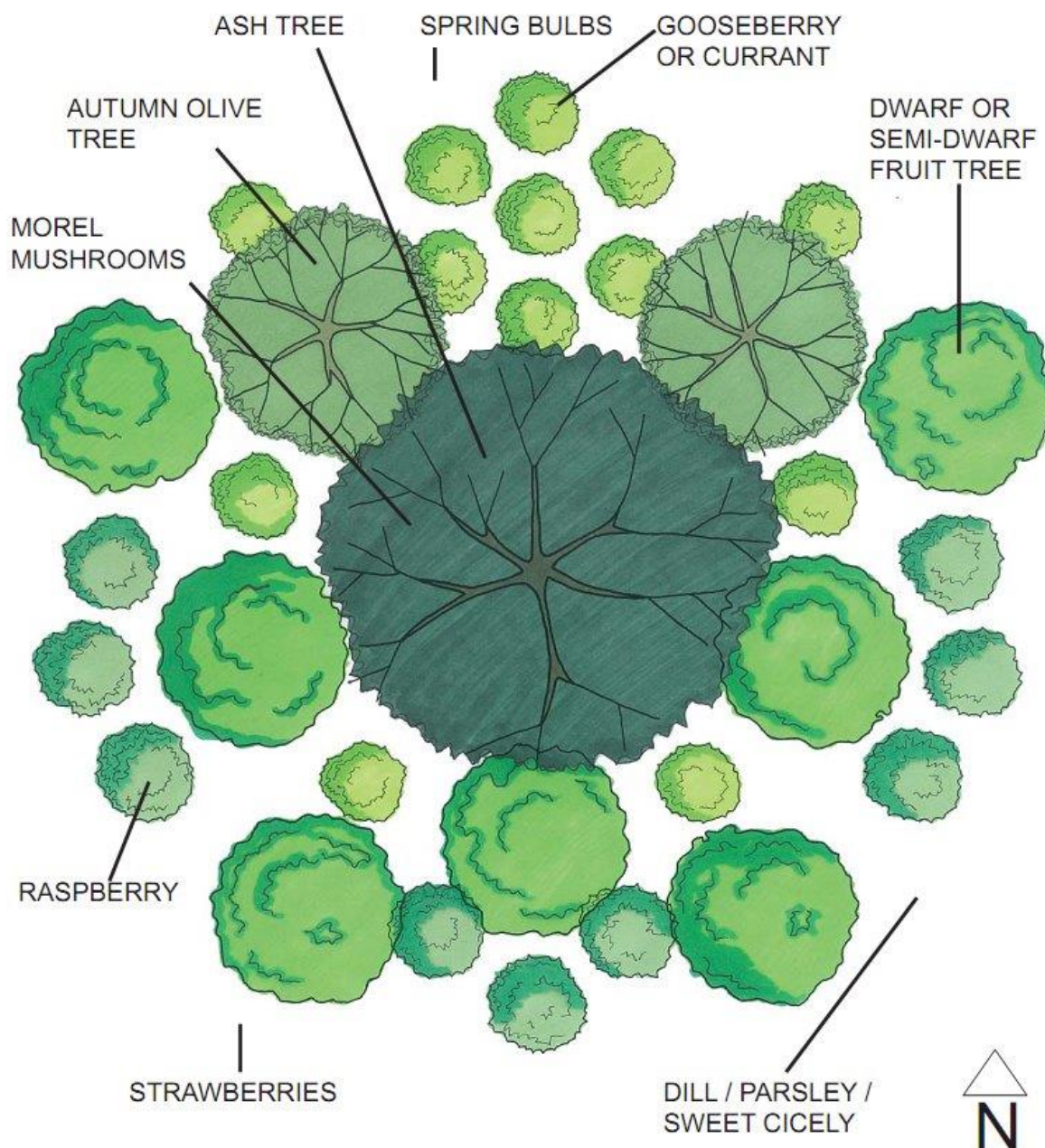
The original intent of some of these plant guilds was to show how to build a guild out from an existing tree. Others were intended to show how a guild could address a specific growing situation, such as wet ground or a small orchard. The spacing of any guild is dependent on the final size of the individual plants, which varies based on exactly which species are selected for the guild. Therefore, all of the spacing in these guilds is approximate and should be altered based on the final size of the plants selected. Also, these guilds are drawn in a circular pattern but the placement can be adjusted to any shape, including linear. We intend for this guide to be a starting point. You should feel free to make additions, subtractions and substitutions to create unique guilds of your own.

Milton Dixon

Editor

ASH GUILD

DIAMETER UP TO 30'



Ash Guild

Both white ash (*Fraxinus americana*) and green ash (*Fraxinus pennsylvanica*) have been used for making furniture, baseball bats, sleds and snowshoes. The ash tree's leaves are among the first to drop in the autumn. With a high sugar and nitrogen content they decompose quickly providing rich humus for earthworms and other soil organisms. Their feeder roots grow at a depth of about 8 to 12 inches extending just beyond the drip line of the tree. One needs to be careful when digging to not sever any of these roots and damage the tree's ability to respond to physical stress from drought and disease.

Of concern recently is the emerald ash borer, which has the potential to devastate entire stands of ash trees across the Eastern and Midwestern states. Another pest is the native ash borer moth. Its larva burrows into the tree trunk at or below ground level. The wounds in the bark can leave the tree susceptible to diseases. This pest can be controlled by using light traps to catch the night flying moths and using clean cultivation beneath the tree from May through September. This allows for the predators of the moth to easily find and consume the eggs and larvae. These predators are chiefly birds but may include some parasitic wasps also. However, clean cultivation methods will also reduce the overall diversity of yields from the ash guild.

Needing only a half day of direct sunshine, autumn olive (*Elaeagnus umbellata*) is a nitrogen fixing dynamic accumulator tree that grows to 12 or more feet tall. This plant was planted extensively in the mid-twentieth century and is now considered invasive. However, we feel it is a useful species to use if it is already abundant in your area. Improved varieties grow in either tree or shrub form and have fragrant flowers in May, drawing pollinators followed by abundant tasty fruit in late September. These fruit are useful food to both the gardener and wildlife. A shorter relative is goumi (*Eleagnus mutiflora*), which grows to only 6 feet tall. The fruit ripens in July and is used like pie cherries.

Dwarf or semi-dwarf fruit trees are a good fit for areas just outside of the ash drip line. These could be apple (*Malus domestica*), pear (*Pyrus spp.*), or any of the members of the *Prunus* genus such as apricot (*Prunus armeniaca*), peach (*Prunus persica*), nectarine (*Prunus persica* var. *nucipersica*), plums (*Prunus domestica*), or cherry (*Prunus avium*). The shorter height of these trees is an advantage when pruning and harvesting. Again, be careful when digging the planting hole to ensure that you don't cut through an ash root.

Black and red currants (*Ribes nigrum* and *R. rubrum*) bloom very early and ripen over a two month period from July to early September, depending on the variety. Growing to a height of 4 to 5 feet they grow in partial shade or full sun. Very high in Vitamin C, their fruit is tasty dried or used as juice, pies, or preserves.

Raspberries (*Rubus idaeus*) and gooseberries (*Ribes uva-crispa*) both occupy the same height niche, about 2 to 5 feet tall, but the gooseberry will tolerate more shade than the raspberry and ripen the same time as currants do. Raspberries are available in both a summer bearing variety, fruiting once in

the summer, and everbearing types, which bear both in the summer and autumn. Depending on your location you may be able to harvest raspberries all the way into early December in a mild autumn.

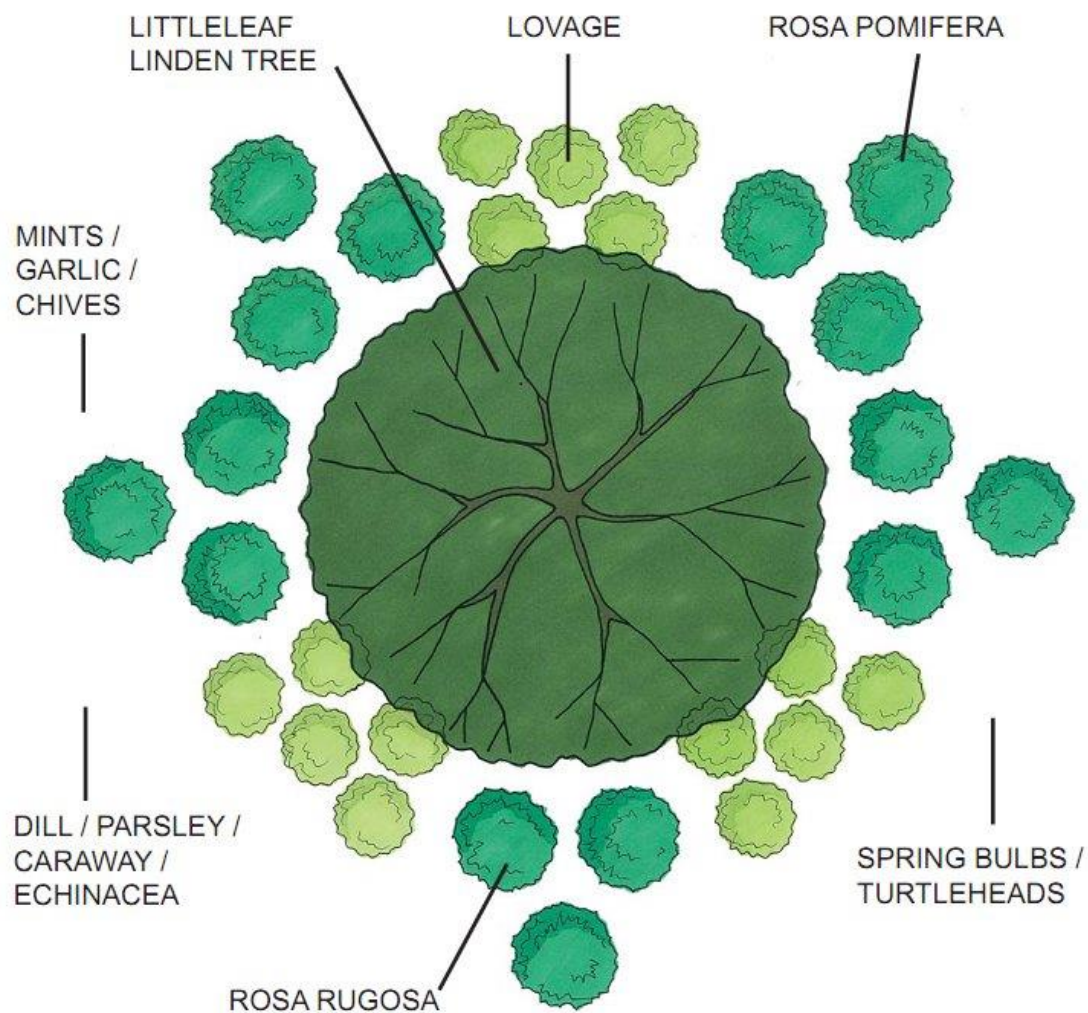
Spring bulbs (see appendix I) bloom early and then go dormant by summer. During the brief time that they are active they sequester nutrients that would otherwise wash off site during snow melts and spring rains. The trout lily (*Erythronium americanum*) is an ephemeral spring bloomer in our native woodlands that captures the phosphorous from spring runoff, transferring it to its leaves where it is held in storage until the plant goes dormant. The decaying leaves then release the phosphorous back to the soil where the nutrient aids the flowering of the other members of the guild. Trout lilies are therefore a living phosphorous sink. Other spring bulbs have similar properties of nutrient storage in their bulbs and leaves for later release and reuse.

Herbs such as sweet cicely (*Myrrhis odorata*), dill (*Anethum graveolens*), parsley (*Petroselinum crispum*), and others in the Apiaceae family, will attract butterflies both for nectar and larval foods. They also attract many wasp and beetle pollinators and insect pest predators. Planting the herbs in sunnier locations at the edges of the guild will bring more diversity of both pollinator and predator species to the total guild system. Strawberries (*Fragaria x ananassa*) and white clover (*Trifolium repens*) in the sunny areas and wild ginger (*Asarum canadense*) in the shadiest places fill in the available niches as groundcovers.

Below the ground, hyphae of the morel mushroom (*Morchella spp.*) assist with the breakdown of annual buildup of organic matter into humus while providing a yield of valuable and versatile food. Damaged or dying ash trees support the ash bolete (*Boletinus merulioides*) an edible mushroom and turkey tail (*Trametes versicolor*) a colorful banded fungi with a long history worldwide, both edible and medicinal.

BEE GUILD

DIAMETER TO 30'



Bee Guild

This is a guild conceived and designed to attract pollinators. At its center is the little-leaf linden (*Tilia cordata*). A related tree is the American linden (*Tilia americana*) or basswood. The young leaves of the linden are edible and the tree can be coppiced to allow a near continuous yield of leaves. The flowers of all lindens are a bee attractant and premium nectar source for delicious honey. The American linden can be used to make dugout canoes and its inner bark is useful as cordage. Coppice wood of all the lindens can be used in charcoal production or as fencing material.

Around the linden tree, at a distance of at least 10 feet or more, can be planted hip bearing shrub roses like rose apple (*Rosa villosa*) or rugosa rose (*Rosa rugosa*). The flowers and leaves have uses as cosmetics and as teas, while the hips can be used for syrups and Vitamin C supplements. The flowers of roses are also attractive to bees and wasps. The rose apple grows to 10 feet tall while rugosa roses are variable in height from 2 to 8 feet tall. Additional rose species such as Damascus rose (*Rosa x damascena*) and French rose (*Rosa gallica officinalis*) are fragrance sources in the cosmetics and essential oil industry.

Very useful plants for attracting pollinators are members of the Silphium genus. The cup plant (*Silphium perfoliatum*) holds water in its leaf axils hence its common name. It is also a source of an antitussive medicinal. Other members of the Silphium genus include compass plant (*Silphium laciniatum*) and rosinweed (*Silphium integrifolium*). One desirable aspect of Silphiums is their ability to form a seasonal hedge along a property line. All Silphiums attract nearly every kind of bee and pollinating wasp as well as several species of butterflies. When the seed has set goldfinches work in joyous abandon to harvest their fill.

Lovage (*Levisticum officinale*) is a deep taprooted accumulator of subsoil minerals. It is an excellent perennial substitute for celery. Its leaves when dried are a source for flavor in soup stocks and its seeds can be used in place of celery seeds. The roots are a medicinal specific for the common cold and are also a substitute for the Chinese herb dong quai, a source for a proestrogenic tonic. The flowers are attractive to many beneficial predatory wasp species.

Lower growing perennials in this guild include the members of the Echinacea genus, like purple coneflower (*Echinacea purpurea*), which draw bees and are sources of potent immune system enhancing tonic medicinals. Many Echinacea are also tap rooted dynamic accumulators. Comfrey (*Symphytum officinale*) is a bee attractor that can draw pollinators like little else. It is also a deep rooted dynamic accumulator of soil minerals and an excellent compost additive.

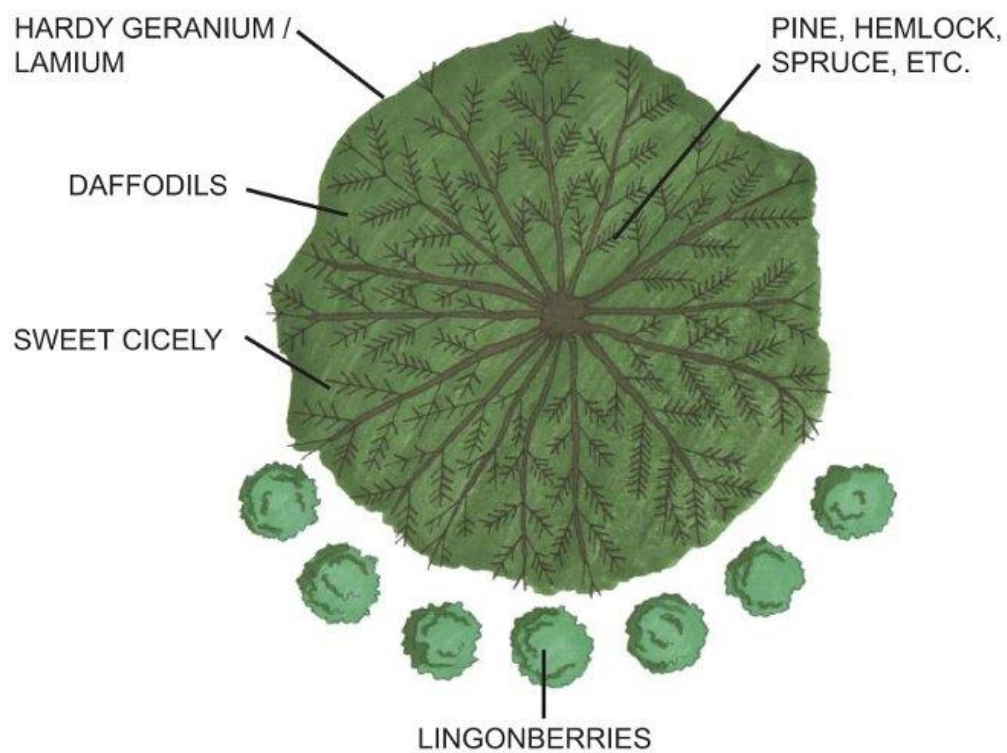
Turtleheads (*Chelone spp.*) have an herbal medicine application as laxatives. At the same time they are veritable classrooms for children on the subject of pollination. Bumblebees are the only pollinator species that can push their way into the flower and their antics doing so are of great interest to young people!

Spring bulbs (see appendix I) are a source of early season pollen for insect species and often sustain them until other plants with choice pollen bloom. There are late blooming plants including sages (*Salvia spp.*), and 4 o'clocks, (*Mirabilis spp.*), which can attract bees, butterflies, and several moths late in the blooming season. The 4 o'clock roots are also edible.

Mints (*Mentha spp.*) can be used as both a ground cover and attractant for bees. They also are excellent for flavoring foods, teas, and for plant based medicines. Dill (*Anethum graveolens*), caraway (*Carum carvi*), parsley (*Petroselinum crispum*), and fennel (*Foeniculum vulgare*) all serve as host plants for butterflies and beneficial insects, and as food for humans. All of them will self-sow if allowed to set seed.

EVERGREEN GUILD

DIAMETER UP TO 30'



Evergreen Guild

An existing coniferous tree of pine (*Pinus spp.*), spruce (*Picea spp.*), hemlock (*Tsuga spp.*), or fir (*Abies spp.*), because of its year round needle canopy, allows a multitude of plant and animal relationships. During the winter, many species use the cover for shelter from ice, wind, and snow. The survival of chickadees, sparrows, and mourning doves as well as other species of birds is directly connected to whether there is a large evergreen tree nearby during the colder months that can be used for both shelter from severe weather and predators.

The needles of pine, hemlock, and spruce can be made into a tea to treat symptoms of scurvy. Early explorers of North America were treated by Native Americans with these teas and thus survived vitamin deficiencies caused by seasonally restricted diets.

Many of the coniferous trees will raise the pH of the soil but it should be noted that hemlock will have the greatest effect upon the soil pH beneath it. This can make for a very challenging site as few plants can adapt to the high acidity levels of the soils beneath the hemlock.

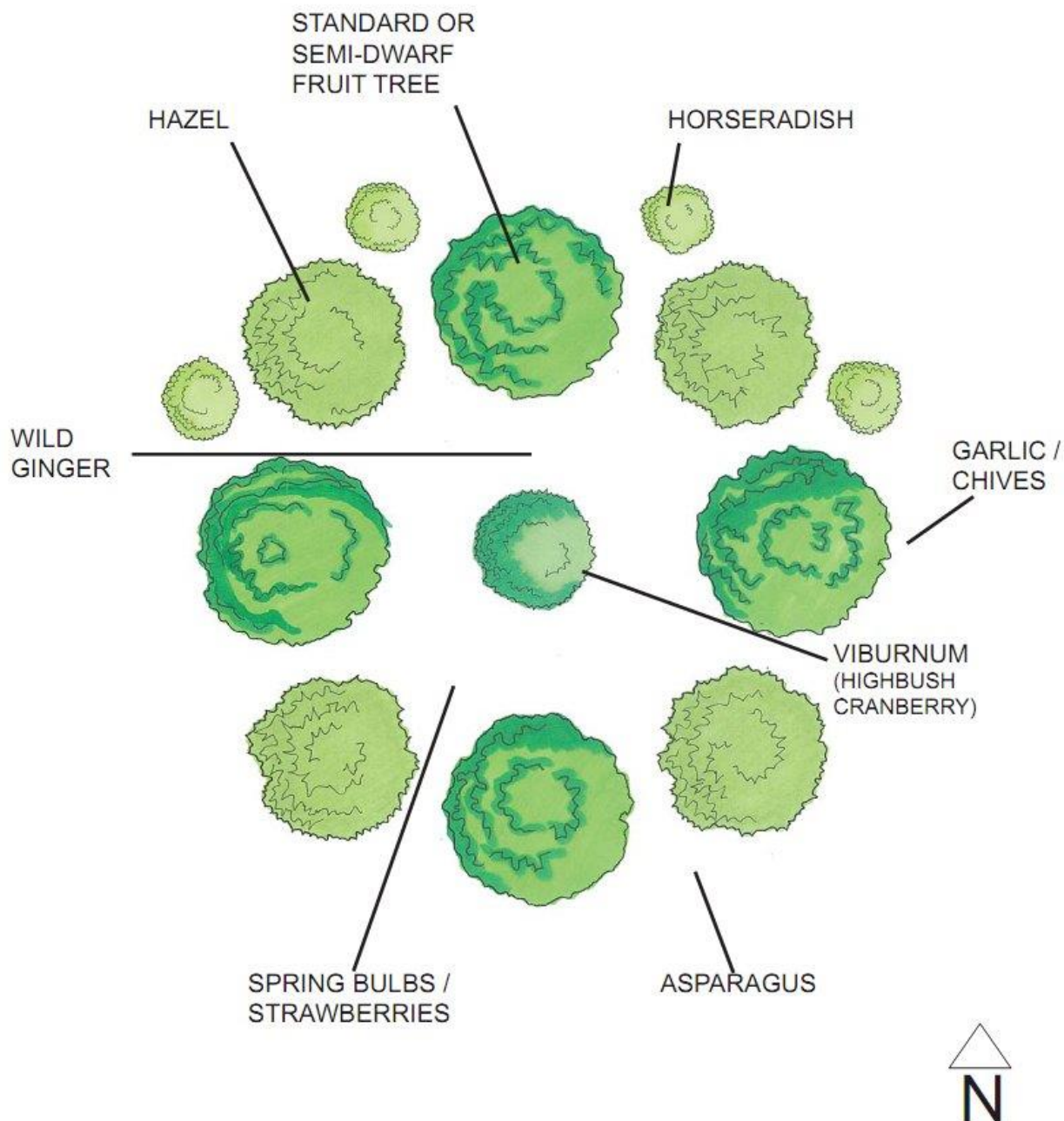
Daffodil (*Narcissus spp.*) and lily of the valley (*Convallaria majalis*) are two spring bulbs that are adapted to acidic soils and do well there. Another plant is wild geranium (*Geranium maculatum*), a hardy species which has medicinal use as an astringent.

Sweet cicely (*Myrrhis odorata*) is a European herb naturalized in North America that has edible anise flavored leaves, seeds, and roots with uses both culinary and medicinal. The roots can be used as a vegetable or to treat the flu, while its seeds are used as a topping for baked goods.

Pruning an evergreen tree allows enough light to reach acid soil lovers such as lingonberries (*Vaccinium vitis-idaea*) and blueberries (*Vaccinium corymbosum*). Blueberries come in sizes of 6 inches high to 6 feet tall. Lingonberries are related to cranberries but grow only to 12 inches tall and do not require wet soils.

FRUIT TREE GUILD

STANDARD OR SEMI-DWARF TREES OF APPLE, PEAR, APRICOT, PEACH, NECTARINE, OR CHERRY. DIAMETER FROM 20' - 60'



Fruit Tree Guild

There are at least two plant species to use at the center of this fruit tree guild. One is to use a shade tolerant *Viburnum* species such as highbush cranberry (*Viburnum trilobum*). It grows to 12 feet with an 8 foot spread and is shade tolerant. Its fruit are used similarly to the common cranberry but the plant can grow in ordinary garden soil instead of a bog. The other option is to use a standard size fruit tree at the center of this guild, which can grow to as much as 50 feet tall. Surrounding either of these are dwarf or semi-dwarf fruit trees of varying species such as apple (*Malus domestica*), pear (*Pyrus spp.*), apricot (*Prunus armeniaca*), peach (*Prunus persica*), nectarine (*Prunus persica* var. *nucipersica*), plums (*Prunus domestica*) or cherry (*Prunus avium*). Using a diversity of fruit tree species can minimize insect predation and disease in the orchard.

Hazels (*Corylus spp.*) produce edible nuts rich in oil and provide a rich source of nutrients for wildlife such as squirrels, chipmunks and pheasant. They can be coppiced after eight years to stimulate higher nut yields and for a yield of coppiced wood for everything from charcoal to garden fencing.

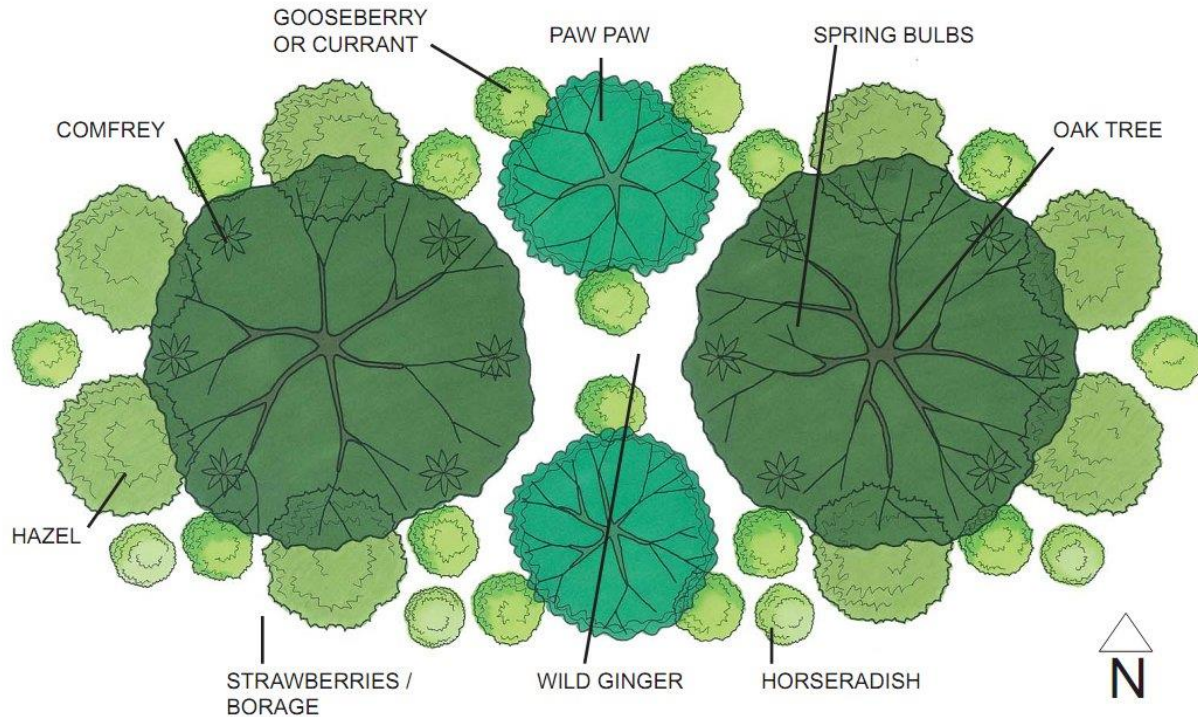
Spring bulbs (see appendix I), especially trout lilies (*Erythronium americanum*), can hold nutrients that would otherwise wash away during spring runoff. Tap rooted plants, such as horseradish (*Armoracia rusticana*), comfrey (*Symphytum officinale*), evening primrose (*Oenothera biennis*), and milk vetch (*Astragalus spp.*), all dredge subsoil minerals from the soil making them available for uptake by the fruit trees. Garlic (*Allium sativum*) and chives (*Allium schoenoprasum*) can be used as culinary herbs or as insect repellent sprays in the orchard.

Strawberries (*Fragaria x ananassa*) can be used in sunny areas while wild ginger (*Asarum canadense*) can be planted in shady spots. Wild ginger can be used as a common ginger substitute. Asparagus (*Asparagus officinalis*) at the edges brings a delicious spring harvest of its shoots. Shallow rooted, it can allow for planting of some less dense later yielding herbs such as lemon balm (*Melissa officinalis*) and even garden greens like lettuce (*Lactuca sativa*), mustard (*Brassica nigra*) and kale (*Brassica oleracea*).

Including flowering herbs such as dill (*Anethum graveolens*), coriander (*Coriandrum sativum*), fennel (*Foeniculum vulgare*), and yarrow (*Achillea millefolium*) along the sunny edge can attract pollinators and insect predators.

OAK GUILD

DIAMETER COULD BE FROM 50' - 400' DEPENDING UPON SPECIES AND AGE OF THE OAK TREES



Oak Tree Guild

Oaks (*Quercus* spp.) are central tree components in many yards. Bur oak (*Quercus macrocarpa*) and white oak (*Quercus alba*) both yield tasty acorns, needing minimal processing to make an edible nut flour. Other oak species will also yield acorns but they need more processing to make them edible.

The space beneath the wide spreading branches of the oak is an excellent place for the growing of shade tolerant species. One possibility is paw paw (*Asimina triloba*), the only temperate climate relative of the tropical custard apple. Paw paws, also called custard bananas, grow to a height of 12 to 15 feet with the fruit ripening in the fall. Paw paws can sometimes sucker to form a thicket, which gave rise to the old song phrase “way down yonder in the paw paw patch”. Pollination can be a challenge with paw paws often requiring hand pollination for the tree to set fruit.

The edge areas near the drip line afford enough sunlight for other species such as quince (*Cydonia oblongata*), and hazels (*Corylus* spp.). Open areas with dappled light are niches for shrubby fruits such as gooseberries (*Ribes uva-crispa*) and currants (*Ribes nigrum* and *R. rubrum*).

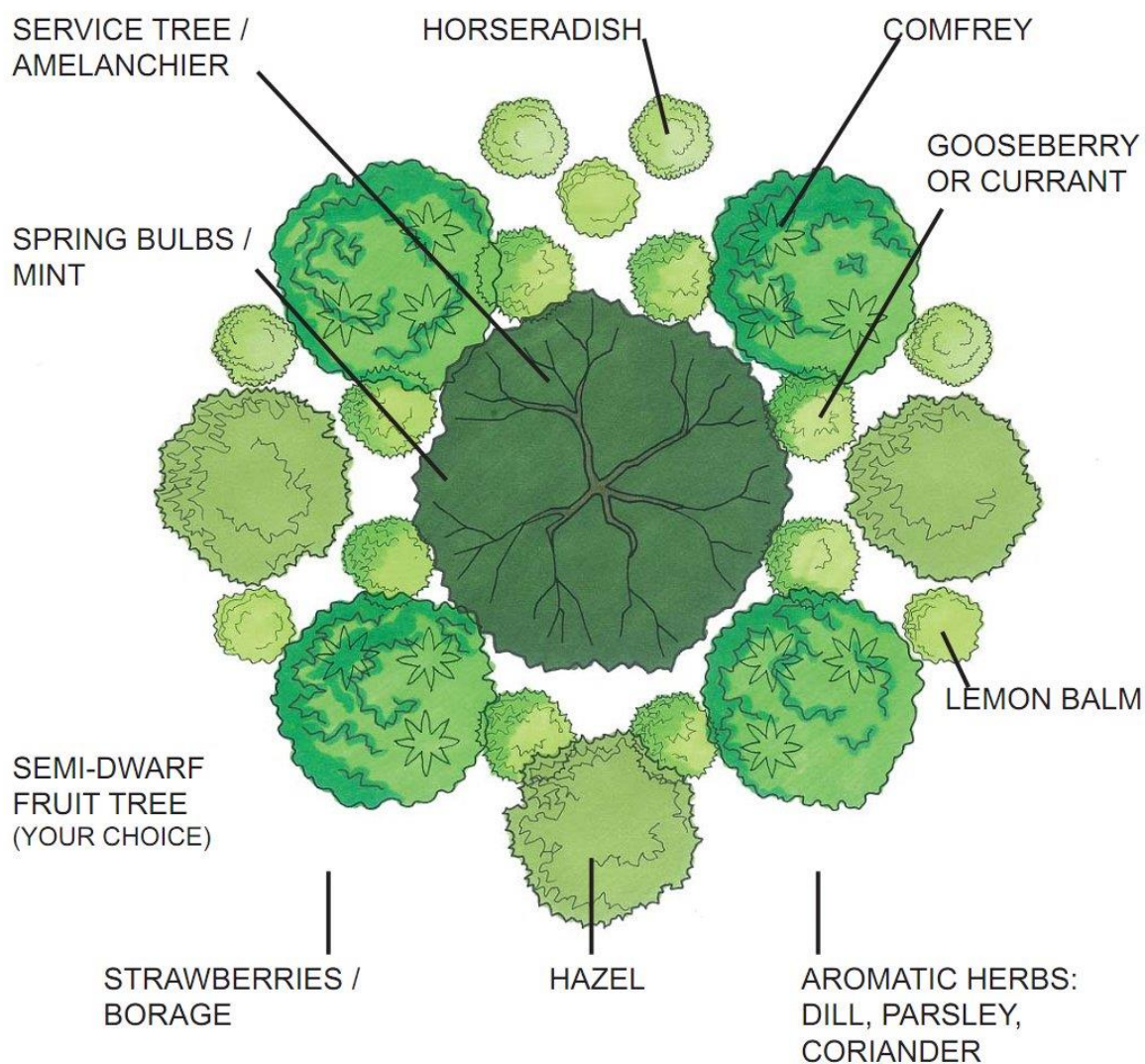
Comfrey (*Symphytum officinale*) and horseradish (*Armoracia rusticana*) as deep rooted perennials can, after composting of the leaves, yield up the subsoil minerals they have bioaccumulated. Side dressing this compost around the shrubs and trees will yield the best effect. Of course, comfrey has both medicinal and livestock feed uses and horseradish makes a wonderful condiment.

Borage (*Borago officinalis*) is a bee attractant which has a beneficial effect on strawberries. The borage flower is a bright blue and is edible with an agreeable cucumber flavor. Its seeds are a source of nutritionally beneficial GLA fatty acids. Borage also self-sows, so you can plant it once and move the seedlings around the following year.

Strawberries (*Fragaria x ananassa*) as a groundcover can fill in the remaining sunny spaces. A substitute for strawberries could be arctic raspberry (*Rubus arcticus*) which will only grow to a height of 1 foot. For the shaded areas where strawberries and raspberries would not do well, wild ginger (*Asarum canadense*) will grow.

SERVICE TREE GUILD

DIAMETER FROM 20' - 50'



Service Tree Guild

At the heart of this guild is the early blooming and early yielding serviceberry (*Amelanchier spp.*). This species has multiple other names including: sarvisberry, deerberry, shadblow, saskatoon, and juneberry - the last is a reference to the month when it is ripe for picking. It is a beautiful plant when in bloom during April. There are numerous species ranging in height from 3 feet to nearly 60 feet, with a spread from 3 feet to 30 feet. They can sucker to form a thicket but can be controlled by mowing. They do not require an acid soil and will grow in most situations, from damp soil to clay or sandy loams. Because of its ability to thrive in both full sun and semi shade, the serviceberry can grow beneath semi dwarf and standard fruit trees.

The fruit of the serviceberry looks like a blueberry but there the resemblance stops. The berry is low in vitamin C but does have high amounts of protein, fat, and fiber. It is also high in pectin. When the berries ripen the fruit draws robins, cedar waxwings, and chipmunks; so be ready to harvest or you won't get any. Or you can just sit back and watch the wild kingdom show at your doorstep.

Examples of overstory fruit trees for this grouping would include apple (*Malus domestica*) or pear (*Pyrus spp.*), on the semi dwarfing rootstock of your choice. Tall or semi dwarf stone fruits such as apricots (*Prunus armeniaca*), peaches (*Prunus persica*), or plums (*Prunus domestica*) are also good choices as long as the variety of serviceberry used does not shade them. Hazels (*Corylus spp.*) could be used as an intermediate layer between the fruit trees and shorter serviceberry species. Shorter yet, currants (*Ribes nigrum* and *R. rubrum*) and gooseberries (*Ribes uva-crispa*) can also be grown beneath the serviceberry.

Climbers that can be used to grow into either the fruit trees or the serviceberries are runner beans (*Phaseolus coccineus*) or ground nut (*Apios Americana*). Ground nut is a vine varying in length from 5 to 30 feet. It produces an edible root and also fixes nitrogen, benefiting neighboring plants. The ground nut, like the serviceberry, is much more tolerant of damp soils than are most fruit trees, so when planting the serviceberries in a damp site using ground nut vines can be a plus. There are rootstock types for many fruits that are adapted to damp soils so it is possible to use the fruit trees in some of those wetter sites as well.

In the understory, comfrey (*Symphytum officinale*) and horseradish (*Armoracia rusticana*) can be used as deep rooted pumps to bring subsoil nutrients to the upper root zones of the other species. Lemon balm (*Melissa officinalis*) is a semi woody short shrub with both culinary and medicinal antiviral uses and can grow along sunny edges.

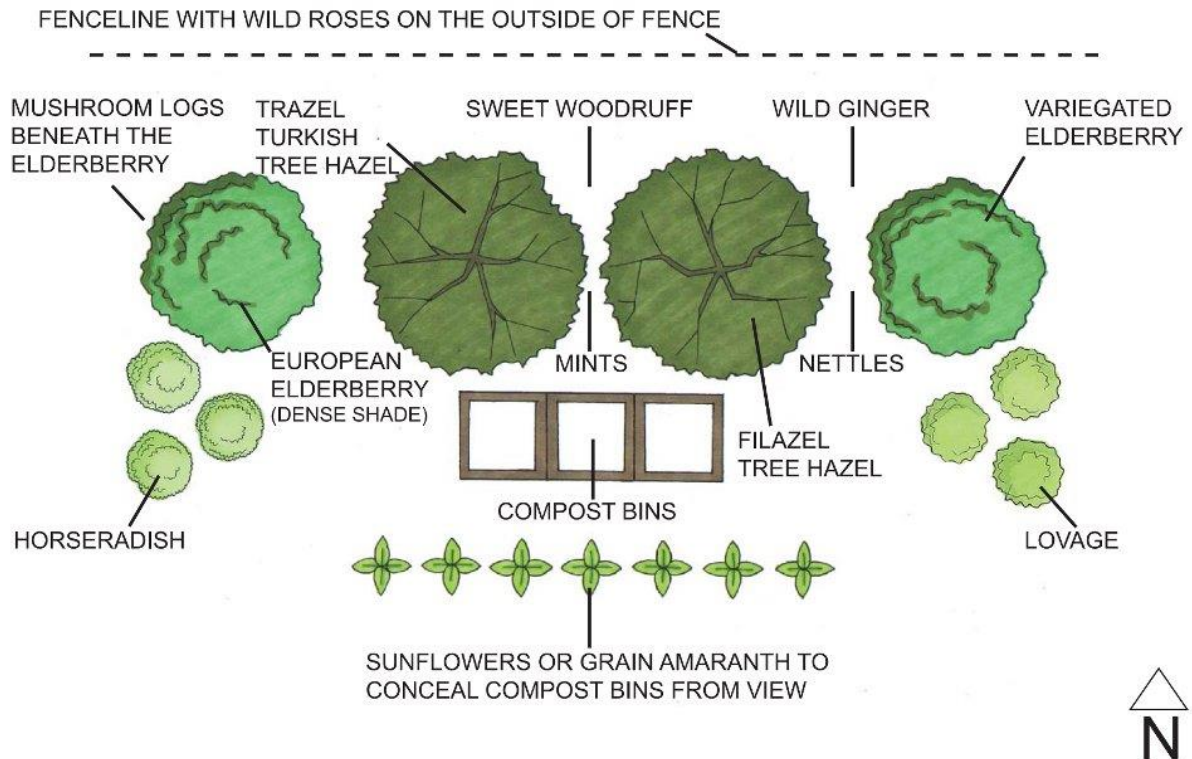
Spring bulbs (see appendix I) can be used to fill the empty spring spaces beneath the guild before trees and shrubs have leafed out. Trout lilies (*Erythronium americanum*) are a native spring ephemeral, leafing out early, then as summer approaches they shed leaves and go dormant, like many other of our common spring bulbs. The trout lily bioaccumulates phosphorous in its leaves at a time of the year when heavy rain and snow melt can wash nutrients off the site, it then releases it back to the soil when the plant goes dormant in June.

White Clover (*Trifolium repens*) acts as a ground cover to hold soil on slopes from eroding. It accumulates nitrogen through beneficial bacteria relationships. It attracts both honeybees and other pollinators. Mints (*Mentha spp.*), wild ginger (*Asarum canadense*), and comfrey are all useful to provide bee nectar and can form the foundation for a nearby apiary guild. Taller and later blooming shrub species that can contribute to additional nectar are summersweet (*Clethra alnifolia*) and everbearing raspberries (*Rubus idaeus*).

Attracting insect predators can be done by growing dill (*Anethum graveolens*), caraway (*Carum carvi*), parsley (*Petroselinum crispum*), and fennel (*Foeniculum vulgare*). Many beneficial wasps depend upon these plants. Butterflies, especially swallowtail species, use these plants as their larval food sources. Onion related species such as garlic (*Allium sativum*), chives (*Allium schoenoprasum*), leeks (*Allium ampeloprasum*), and ramps (*Allium tricoccum*), as well as other ornamental alliums can all help ward off plant pests when used as either foliar sprays or as companions.

TREE HAZEL GUILD

NEED TWO FOR POLLINATION. CAN BE COPPICED TO CONTROL HEIGHT. DIAMETER UP TO 20'



Tree Hazel Guild

Hazels (*Corylus spp.*) are shrubs that grow as low as 4 feet tall, short trees, or even large timber producing trees over 40 feet in height, depending on the species grown. Filberts (*Corylus maxima*) and American hazels (*Corylus americana*) are two different hazel species, however the two names are often used interchangeably. All *Corylus* species can cross with each other and hybridize to produce new varieties. There are at least 14 different species of *Corylus* worldwide, the major agricultural yield of the nuts being from filberts.

The common hazel (*Corylus avellana*) is a cultivated filbert brought from Europe a hundred years ago and grown commercially in Oregon. It is susceptible to eastern filbert blight while American hazels are resistant to that disease. Crosses of the two species at research farms at Oregon universities and at Rutgers University, as well as by independent growers, have given hybrids that have the larger nuts and

yields of the filbert types with the disease resistance and hardiness of the native species. Some of the crosses also have used native beaked hazels (*Corylus cornuta*) and Turkish hazels (*Corylus colurna*).

This guild is originally designed to grow with European hybrid hazels, tall shrubs that can grow to about 20 feet tall with an 8 foot spread. They can be substituted with American hazel hybrids, which are usually about 6 to 12 feet tall with an 8 foot spread, but the spacing must be adjusted accordingly. The examples given here will be with trazel (*Corylus x hybrids*) a cross of hazel and Turkish hazel and filazel (*Corylus x hybrids*) a hazel and filbert cross. Both trazel and filazel are tall shrubs, mostly upright growers, and sucker somewhat less than the shorter hazels do.

All *Corylus* species will become less vigorous yielders after about 8 years. The remedy for this is to stimulate new growth by cutting the tree/shrub back to 4 inches height every 8 years. This is called coppicing and the remaining stump is known as a stool. Coppicing is done in late winter or very early spring. By the autumn of the first year the plants will have regrown to about 8 feet in height. By the end of the second the growth has reached nearly 12 feet tall. The third year they will flower and begin to yield nuts again. It is best to grow at least four so that there are always at least 2 plants flowering, as they are only somewhat self-pollinating and a better crop is achieved with cross pollination. Otherwise be sure to coppice both plants at the same time if only growing 2. The coppiced wood can be used for garden fencing and plant supports. Traditional uses in Europe included charcoal and furniture. The taller hazels in this example are good for those uses, yielding a very hard wood that lasts a long while when used for fence posts and outdoor furniture.

The tree and shrub layer will provide both food and shelter for birds. To get a nut crop before the squirrels and chipmunks eat them all, pick as soon as the critters start. Let the nuts finish ripening in paper bags. Putting this off will result in no crop of nuts as once the squirrels start their harvest they'll only stop when it's dark and resume at sunup the next day. Sharing is okay but if you delay they will take it all.

The shade of tall hazels can be used for growing either serviceberries (*Amelanchier spp.*) or black elderberries (*Sambucus nigra*). Black elderberry is a high bearing annual producer of fruit used for pies, preserves, wines, dyes, and an anti-viral medicinal syrup. The syrup is used as a preventative and treatment for the common cold and flu and is made by mixing the thickened juice of elderberry with wild flower honey. The flowers of the elderberry are used as a cosmetic, food, wine, and medicinal. They can be used fresh or dried. Black elderberries grow to a height of 10 feet with a spread of 10 feet in fertile soil. Another advantage of the elderberry is that it has an ability to loosen the soil beneath itself and when mulched regularly a very fertile soil will appear after a few years.

The elderberries will be harvested by some birds, though robins do not seem fond of them. Cedar waxwings show no such fussiness and will eat until the berries are gone. The period of ripening for the berries is over 3 weeks in mid-September. When using the elderberries do not consume them raw. Intestinal cramps will result when drinking a cup of raw elderberry juice. Raccoons also have the same problem when eating the berries and can be very vocal in their discomfort. Whatever the constituent of the berries is that gives a digestibility issue it is removed by cooking the fruit prior to use.

Adding a thick layer of straw beneath elderberries allows the planting of mushrooms, such as wine caps (*Stropharia rugosoannulata*), or oyster (*Pleurotus ostreatus*), so that every time it rains in late summer and early fall they will give a delicious crop. Using logs instead will give an opportunity to grow shiitakes (*Lentinula edodes*). Other uses for the deep shade area can be to grow wild ginger (*Asarum canadense*), goldenseal (*Hydrastis canadensis*), or spring bulbs (see appendix I).

Substitutions of other shrubs for the elderberries can be made but will not provide as deep a shade for growing either medicinal goldenseal or mushrooms. Examples are any of the currants (*Ribes nigrum* or *R. rubrum*) or gooseberries (*Ribes uva-crispa*). These would all be good choices if using shorter species of hazels. Short types of serviceberries can also be used instead of currants. If desired, runner beans (*Phaseolus coccineus*) can be used as a climber in the hazels; in addition to their edible flowers and beans, they have a tolerance to shade, fix nitrogen, and attract hummingbirds.

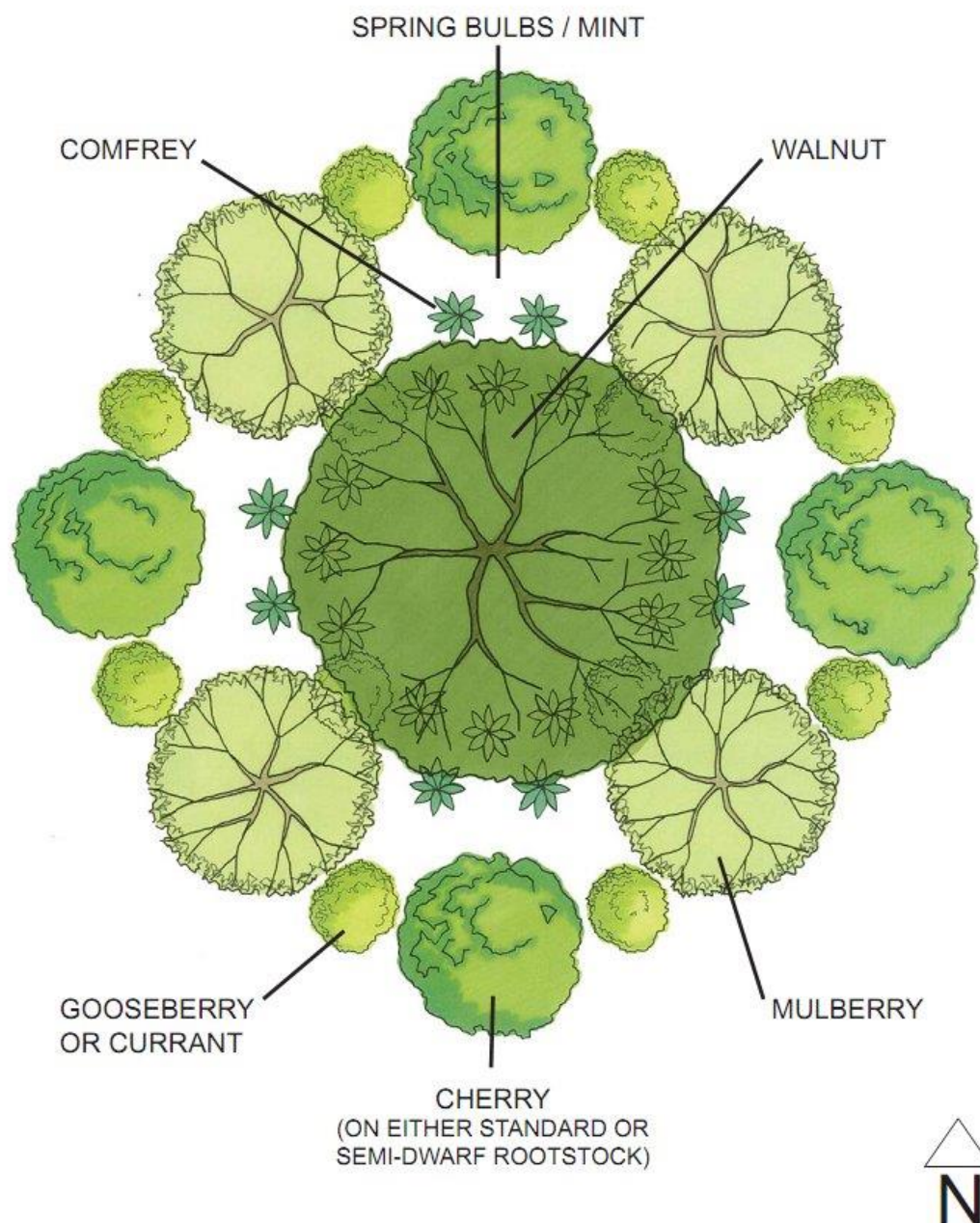
An added benefit of growing hazels and elderberries together is the screening effect along a property line. Seasonally it can obliterate the view of a back alley and cut down on traffic noise as well as provide security.

The outer edges of the guild where more light is available are a good place for lovage (*Levisticum officinale*), comfrey (*Symphytum x uplandicum*), and horseradish (*Armoracia rusticana*) all deep rooted plants that will bring subsoil nutrients up to the shallow root zone. Lovage is a little known herb with a strong celery taste to its leaves and seeds. The stems can be blanched and eaten as a vegetable and the roots can be used as a potent medicinal. It grows to 3 feet in height before flowering. With the seed stalk it reaches a height about 6 feet. The seeds are dry by midsummer and can be used in any recipe calling for celery seed.

Groundcovers for the edges include all mints (*Mentha spp.*), and sweet woodruff (*Asperula odorata*), which can be used to make May wine. The north outer edge of this guild can support wild shrub roses (*Rosa spp.*) as a hedge and groundcovers of mint or clover (*Trifolium repens*).

WALNUT GUILD

APPLIES TO WALNUT, BLACK WALNUT, BUTTERNUT, HEARTNUT



Walnut Guild

There are many types of walnuts, including black walnut (*Juglans nigra*), English walnut (*Juglans regia*), heartnut (*Juglans ailantifolia*), and butternut (*Juglans cinerea* x *Juglans* spp.). Hickories (*Carya* spp.) and pecans (*Carya illinoensis*) are also close relatives and share some of the same guild limitations regarding compatibility with other plants. In the northern Midwest an excellent substitute is the butternut (*Juglans cinerea*).

In this version of the guild we've used black walnut because it is commonly found and has the widest range. It's a tall growing tree that yields edible nuts and oils with a high nutritional value for both humans and wildlife. The whole fruits are useful as a medicinal vermifuge when tinctured in alcohol or vinegar. The wood is valuable in carpentry. The shells have been used as an industrial abrasive. An added benefit is the plentiful squirrel crop that the black walnut tree encourages.

With all these great qualities for walnut there is one thing to consider. Black walnut roots exude a chemical called juglone which inhibits the growth of many other species of plant. This reduces competition for nutrients in favor of the walnut. The leaves and the fruit husks of black walnut also contain juglone, although in lesser amounts. The chemical's influence extends to roughly an additional 50% beyond the drip line of the tree. A use for the fruit husks that takes advantage of its juglone levels is as herbicidal mulch for problem areas where plants have become invasive. This works best on plants with a shallow root system such as ground ivy (*Glechoma hederacea*) or bishop's weed (*Aegopodium podagraria*).

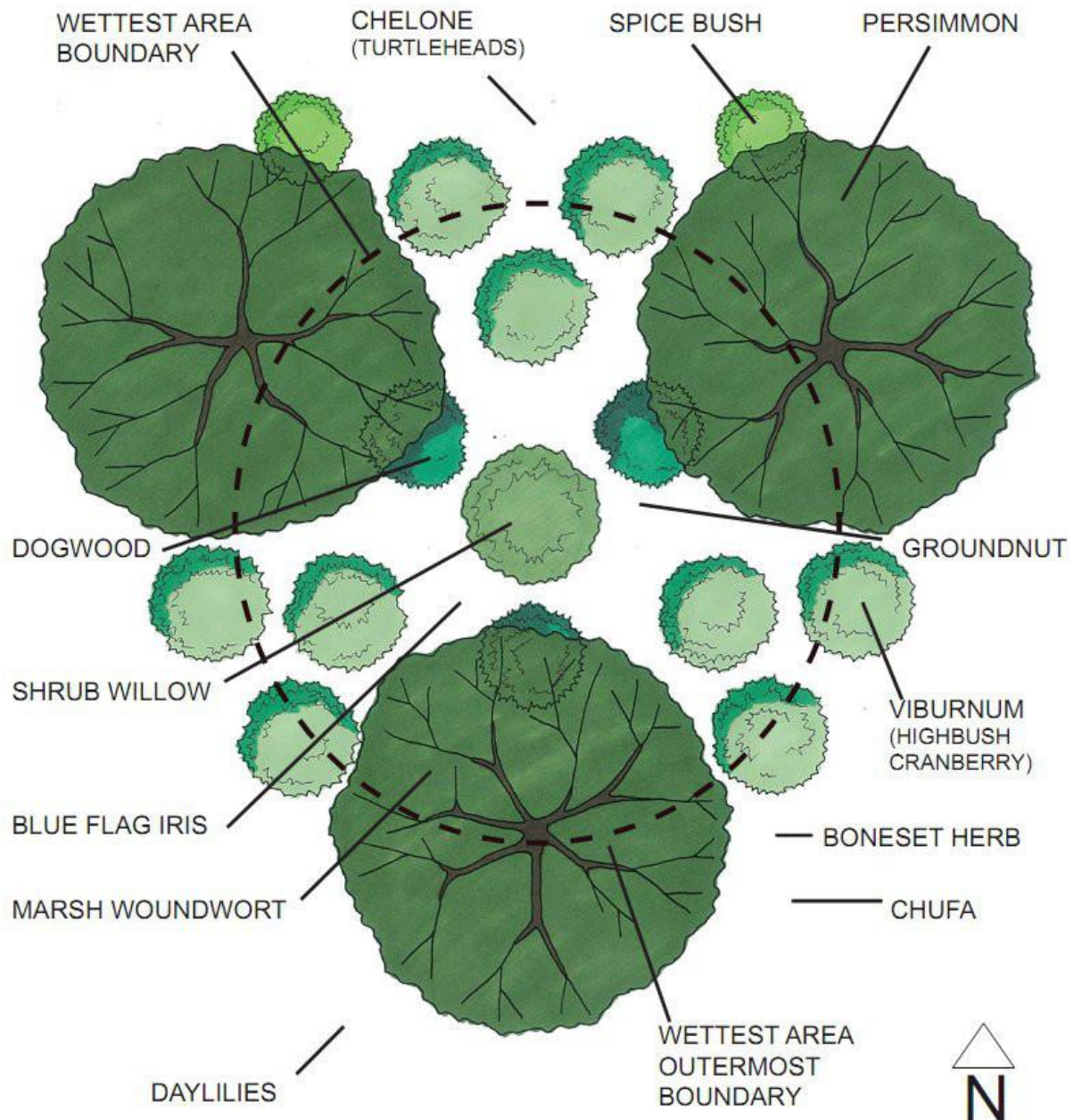
Mulberry (*Morus rubra*) can reduce the growth restricting effects of walnut trees when planted at the drip line between the walnut and a susceptible tree such as an apple. Mulberries yield an edible fruit similar in appearance to the common raspberry. It is harvestable starting in late spring and for weeks thereafter.

Another fruiting tree for this association is the cherry. Black cherry (*Prunus serotina*) and sour cherry (*Prunus cerasus*) work well as both can tolerate being a neighbor to walnuts. The black cherry produces a small, edible fruit. Also its bark has been used to make a medicinal tea. It is a larval plant for the caterpillar of swallowtail butterflies and an early spring nectar source for pollinating bees and wasps.

Shrub plants that are useful growing with walnuts are currants (*Ribes nigrum* and *R. rubrum*) and gooseberries (*Ribes uva-crispa*). Another berry shrub useful here is raspberry (*Rubus idaeus*).

Plantings of comfrey (*Symphytum officinale*) as a bioaccumulator also produce loads of bee attracting flowers in late spring to early summer. Comfrey is also known as the medicinal knittbone, and is used to treat sprains and broken bones. Spring bulbs (see appendix I) are very useful, especially daffodils (*Narcissus* spp.) as they seem immune to walnuts. Daylilies (*Hemerocallis fulva*) with their edible bulbs grow well here too. Hostas (*Hosta* spp.) will also work and produce tender edible leaves in spring and tasty flower buds and flowers in the summer months.

WET MEADOW GUILD



Wet Meadow Guild

Wet areas following the spring thaw or heavy rain events are an opportunity to grow species that in their native habitats are tolerant or even thrive in conditions damp or even wet soils.

Willows (*Salix spp.*) transpire excess water on a site and will help to dry out excess soil moisture. They can be grown in either tree form such as weeping willow (*Salix × sepulcralis*) or as a bush form like the tall pussy willow (*Salix discolor*) or the shorter willows used in basket making. Shrub willows have some shade tolerance and their coppiced wood can be used for construction and craft materials. Additionally the rendering of willow coppice to charcoal can sequester CO₂ and yield a fine charcoal used for drawing and art work. The bark scrapings from coppiced willow are also a source of salicylin, a natural aspirin. Birds feed on the catkins in early spring and squirrels eat the buds during the winter. And at least for the shrub willows the species has some shade tolerance.

Viburnums are another wet tolerant genus that grows to a height of 12 feet with an equivalent spread. The fruit of the highbush cranberry (*Viburnum trilobum*) is relished by birds and there is usually enough to share with them. The nannyberry (*Viburnum lentago*) yields a fruit sweet enough to be eaten right off the bush. All viburnums have tolerance to shade.

Dogwoods (*Cornus spp.*) vary in height from the groundcover bunchberry (*Cornus canadensis*) to the 30ft tall flowering dogwood tree (*Cornus florida*). Bunchberry, at a height of about 9 inches, yields a bland tasting berry best used mixed with more flavorful fruit. Cornelian cherry (*Cornus mas*) grows to 10 feet and produces a tasty berry when ripe. Additionally other dogwoods are used for wildlife plantings and crafting work. Good examples include red osier dogwood (*Cornus sericea*) and Siberian dogwood (*Cornus alba* var. *sibirica*). All dogwoods are both wet and shade tolerant.

The American persimmon (*Diospyros virginiana*) varies in size from a large shrub to medium sized tree and yields an autumn fruit that is astringent until fully ripe. The leaves are also used for tea. The tree attracts butterflies when in flower and possums when the fruit is ripe. While the tree has a tolerance for a wet site in spring its roots do not do well if sodden during the growing season so it is best used outside of the wettest area of the guild.

The spicebush (*Lindera benzoin*) grows to 8 feet in height with a similar spread. It has lemon scented flowers in early spring before the leaves open. A tea that is both astringent and stimulating can be made from leaves, twigs, and bark. The dried powdered fruits minus the seeds were a popular substitute for allspice in Colonial days.

Non woody species in this guild include daylily (*Hemerocallis fulva*) with edible flower buds, chufa (*Cyperus esculentus*) which is a sedge with edible tubers, and groundnut (*Apios americana*) which yields an edible tuber and fixes nitrogen in the soil. Additional species include marsh woundwort (*Stachys palustris*) which is both medicinal and a potherb, turtleheads (*Chelone spp.*) which are used medicinally and as a late season pollinator attractant, and blue flag iris (*Iris versicolor*) which is used medicinally as a liver tonic. It can be used for determining acidity and alkalinity in pH tests.

Appendix I- Spring Bulbs

From <http://urbanext.illinois.edu/bulbs/selection.cfm>

Early Spring (weeks 1-4)

Snowdrop (*Galanthus nivalis*)
Winter Aconite (*Eranthis hyemalis*)
Danford Iris (*Iris danfordiae*)
Crocus (*Crocus* spp.)
Glory-of-the-Snow (*Chionodoxa luciliae*)
Siberian Squill (*Scilla siberica*)
Striped Squill (*Puschkinia scilloides*)
Grecian Windflower (*Anemone blanda*)
Common Grape Hyacinth (*Muscari botryoides*)
Early Daffodils (*Narcissus* spp.)
Netted Iris (*Iris reticulata*)

Midspring (weeks 4-8)

Checkered Lily (*Fritillaria meleagris*)
Species Tulips (*Tulipa* spp.)
Early Tulips (*Tulipa* spp.)
Early Alliums (*Allium* spp.)
Hyacinths (*Hyacinthus orientalis*)
Summer Snowflake (*Leucojum aestivum*)
Medium-Cupped Daffodils (*Narcissus* spp.)

Late Spring (weeks 8-12)

Dutch Hybrid Iris (*Iris* hybrids)
Midseason Tulips (*Tulipa* spp.)
Late Daffodils (*Narcissus* spp.)
Late Tulips (*Tulipa* spp.)
Alliums (*Allium* spp.)

Appendix II – Selected Nurseries

Nurseries with native or disease resistant stock.

Oikos Tree Crops - <http://www.oikostreecrops.com>

Raintree Nursery - www.raintreenursery.com

One Green World - www.onegreenworld.com

Horizon Herbs - www.horizonherbs.com

Fedco Trees - www.fedcoseeds.com

Weston's Antique Apples - www.westonapples.com

Chief River Nursery - www.chiefrivernursery.com

Miller Nurseries - www.millernurseries.com

Brambleberry Farms - www.brambleberryfarm.org/

Southmeadow Fruit Gardens - <http://www.southmeadowfruitgardens.com/>

St. Lawrence Nurseries - <http://www.sln.potsdam.ny.us/>

Appendix III - Rootstocks

Here is a listing of the various rootstocks currently in use for grafting of fruit trees. Dwarf, semi-dwarf , and standard are the most common sizes of the grafted final tree.

Apple Rootstocks:

Emla 27 - Used to maintain a height of 4 to 6 feet in container grown plants. Needs to be staked.

Budagovsky 9 - Very dwarfing rootstock to maintain height of 6 to 10 feet. Hardier than Emla 9 but still requires staking.

Emla 26 - For a very dwarf tree from 8 to 14 feet tall. Hardy to -40 F and requires staking on windy sites. Induces early fruiting.

Emla 7 - For a semi-dwarf tree 11 to 16 feet tall. Does well on wet soils and begins bearing in 3 to 4 years. Remove suckers yearly. Hardy to -35F.

Geneva 30 - Good resistance to crown rot and fire blight. Trees will grow 11 to 16 feet tall Similar to Emla 7 but has better anchorage and higher production. Stake for the first few years.

MM 111 - Gives a 20 foot tall semi-dwarf tree heavy bearing and fast growing. Fibrous rooting it does well in most soils. Hardy to -35F.

Antonovka - Suckerless standard rootstock giving a 25 to 35 foot tall tree and is hardy to -50F.

Plum , Apricot , and Peach Rootstocks:

Marianna 2624 - Gives a semi-dwarf tree 10 to 15 feet tall and is tolerant of wet soils.

Krymsk 1 - Also known as VVA 1 and does well in heavy soils. It is a dwarfing rootstock.

Lovell - Intolerant of wet soils and gives a tree of standard height.

St. Julien - Vigorous semi-dwarfing and hardy to -30 F.

Myrobalan - Standard size tree.

Prunus Americana - Another standard height rootstock.

Cherry Rootstocks:

Mazzard - Shallow spreading root system and does not do well in poorly drained heavy soil.

Colt - Semi-dwarfing to 80% of standard size tree and is widely adapted to most soils. Trees can grow to 12 to 15 feet tall.

Krymsk 5 - Trees can be maintained at 15 feet height. Non-suckering and encourages vigorous growth.

Pear Rootstocks:

OHxF 513 - Tree can be kept at 15 feet tall, it induces early fruit production.

Quince BA 29C - Makes a semi-dwarf tree and tolerates wet soils.



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