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ECO-ORCHARDING

By Joshua Smith

FOOD FORESTS AND EDIBLE LANDSCAPES

There is no substitute for excellent design to maximize a food forests' self reliance, productivity, nutritional values, ease of harvesting, diversity of foods, minimal maintenance and breathtaking beauty. A simple but elegant ecological design can achieve good results. However, it's a greater challenge to design a complex, highly diverse ecosystem food forest. If the design and installation specifications are accurate and followed properly, an acre of this kind will produce far more food and other products, and will support a great many more people with little need of purchased inputs than almost any other kind of agriculture.

- Eco-orchard: feeds a village and/or a commercial operation and has a much more diverse plant selection, both of trees and understory plantings, than a standard commercial (mono-crop) orchard inter-cropped with grasses [which are allelopathic (toxic) to trees].

- Eco-edible landscape: feeds a single family, is diverse, ornamental (provides functions other than food production) and energy efficient with some eco-functions.

- Food forest or forest garden: maximizes food diversity and production, and yield in a relatively small area through multidimensional planting (an overstory, a vine and shrub mid-level and the understory).

All three can also yield fibres, medicinal plants, insulation materials, dyes and fuels.

SITING

Orchards can be adapted to some marginal lands not well suited to annual agricultural crops. Moderately sloping hillsides are an example, depending on soils and other factors. South to Southwest facing slopes have the longest growing seasons, and therefore the best exposure. Northern slopes in cold climates can be used for early flowering tree crops that are otherwise hardy, but would be subject to crop loss from late frost. Because the ground warms later, it delays the bloom. The North sides of buildings have the same effect. A heavy mulching in the fall will trap heat in the soil for winter. By spring, it keeps the soil cold, and should be removed to allow the ground to warm. Blooming can be delayed by leaving the mulch in place until late frost danger seems to be past.

Site orchards out of severe winds. Windbreaks, if designed well, can dramatically improve conditions in sites where high winds in the growing season will severely impact yields, fruit quality and crop health. Irrigation ability, precipitation catchments, drought tolerant crops, may be factors that all require consideration.

For terraces, look for gentle to moderate slopes, about 20 to 25°. On steeper slopes of 30° or more, which are harder to tend and harvest, use swales instead of terracing (see Water Management in Water section). The soil may need a lot of building up prior to planting to produce a vital soil ecosystem. To create a living soil, the topsoil is used as an inoculant and applied on top of the newly built terraces (or swales and berms) . Before grading, gently collect the upper two to

three inches of soil and set it aside in a shaded container or location. Cover if it's going to sit a week or more to prevent degradation and loss to wind and water.

On flat land or terraces, cut down all weeds at, or best before, flowering, then till them in. If the ground is hard and dry, water it deeply first, then wait a couple of days until the soil is moist but not wet to till. Always make each pass in a different direction to minimize the plow pan (compaction of the soil from the weight and blade of the plow). Water again, allowing the weeds to sprout from seeds turned up by the first tilling, then till again. Do this once more for maximum weed suppression. Add compost and till or turn in lightly, keeping the compost at a shallow depth in the soil, as nutrient accumulation occurs naturally at the soil surface where plants have adapted to make the best use of it.

At this point, after you've tested the soil for pH, you can mix in organic fertilizers. (See Gardening for a complete list of organic fertilizers.) It's often best to mix your fertilizers into the compost and apply them together at the same time. Once the ground has been graded and the compost has been turned in “Earth Magic” can be applied as a substitute for fertilizers. The best way to apply it over a large area is with a hydroseeder (a planting process which utilizes a slurry of seed and mulch). Now seed a cover crop that is used to build nutrients and minerals in the soil (see Gardening for Cover Crop information), and is turned in to increase organic matter in the soil, as opposed to a permanent ground cover crop. Rake lightly, topping lightly with “Earth Magic” if you're using it. You may need to mulch lightly with straw to help retain moisture and protect from predation. Keep the soil moist at all times until germination is complete and seedling vigor is strong.

IRRIGATION

There are four basic methods of irrigation (see Gardening for more information). For all methods, the site should be laser levelled first, as nearly level ground is important to provide an even distribution of water. Otherwise some areas will be

too dry and others too wet. The first method is to flood the entire field or orchard from irrigation canals. With this method, a planting consideration is to keep tree collars at or above the water level during flooding.

Another method uses overhead rainbird high pressure systems, which are expensive, but work best for cold climates or wherever there's a danger of late frost. They mimic natural rainfall and wash dust and nutrients off the leaves to be absorbed by the roots. Misters are also used for frost protection by coating plants with water, which then freezes and provides an insulating barrier to extreme temperatures. High pressure systems are installed before soil amendments such as compost are added, but after the initial grading.

A third method uses low pressure irrigation systems, which are very water efficient and versatile, offering drip, spray heads and many other options. They're installed after the amendments are added, just before seeding, but it's best to wait until just before planting your final permanent cover, after the cover crop has been tilled in. The main line however, can be installed after the initial grading, like a high pressure system.

The last method is used in dry climates, and offers the benefits of not resulting in soil salting or undue evaporation. It consists of burying numerous, leaky, canvas-like pipes connected to the main water line which sweat water into the surrounding soil. The depth and spacing of the pipes depend on the crop. Originally this system was designed for veggies, but could possibly work for orcharding. Unknown factors that should be considered include root and pipe interactions. The pipes are installed after the soil's been well cultivated.

PLANTING

After the last cover crop is turned in, it's time to do the final grade and then plant tree and shrub crops. Next are permanent cover crops, planted about three feet in all directions from the base of the trees, to prevent competition with young

trees. Mulch the trees the first year from about the end of September to early October, and start to harden off (reduce water) until after the first frost. Then water can be added as needed after the plants go dormant. Pull mulch off in spring after the last frost for two to three weeks to allow the soil to warm up.

Dig all planting holes wide to give surface feeder roots a good start, keeping the walls vertical. In heavy clay soils, you may need to score or rough up the sides of the hole to avoid creating a below ground 'pot' that limits the growth of the roots into surrounding soil. Both bareroot (plants that have no soil included with the rootball when bought) and container plants often need root pruning before planting, to remove roots growing upward above the root collar (the junction between the below ground root structure and the above ground stem), or stringy rootlets that are too long. For bareroot plants, a cone of soil is created in the bottom of the hole for the plant to sit on, spreading roots out evenly around it. This also boosts the plant to the correct height, where the base of the collar should be a few inches above grade.

Once the plant is at the right height in the hole, start backfilling with soil, stopping periodically to water the plants in. This helps the soil settle so there won't be air pockets, and keeps the roots nice and moist. If the bottom of the hole is dry, it should be watered prior to placing the rootball or bareroot plant. Back fill with soil only, without mixing with compost, to avoid 'pot bound' trees that won't grow out of the original hole. Compost belongs in the surface layers as it would in nature. Remember to take into account soil settling that may occur, which is why you locate the collar above soil planting height.

The best time to plant is in the early morning or late afternoon when temperatures are cooler to minimize shock to the plant. Plant bareroots in late winter or spring; when planting container stock (sold in a container that includes soil with the rootball) in mild winter areas, you can also plant in the fall. In cold winter zones, plant containers in early to mid-Sept only if you can't plant them in spring. Survivability will be higher with spring plantings where winters are cold.

Most conventional crops such as apples (Malus domestica), apricots (Prunus armeniaca), peaches (Prunus persica) and pears (Pyrus species) will come “bareroot” (without soil surrounding the roots in a container), as well as some unconventional crops like pawpaws (Asimina species) and honeyberries (Lonicera caerulea var. edulis), while other less conventional crops may be in containers. Many may need root pruning before planting. Also prior to planting, keep all plants in a shady cool spot; bareroot plants should be heeled in (temporarily planted in soft ground, like an amendment pile) or the roots mulched well, don't let them dry out. Check routinely to make sure moisture is getting through the mulch.

PLANT SELECTION

Tree and Shrub Crops:

Purchase cultivars (named varieties) bareroot one to two years old for the orchard or edible landscape. Selections must be hardy in your zone (USDA zone standard), although planting in protected areas such as courtyards or near walls can create distinct micro-climates that may be milder than the general climate otherwise. Look for frost resistant flowers or late bloomers in areas receiving late frost. The crop must be able to ripen during the length of your growing season. Look for high yield varieties, and high quality fruit and nuts. Find out if they can be dried, juiced, frozen, canned, etc, and the storage life in fresh condition. Look at whether they yield annually or biennially (every other year). Biennial trees can be made to fruit annually by thinning the fruit during their year of yield. Select for disease and pest resistance. You may want to check the age that the tree or plant will start bearing a crop, though this isn't important unless it's more than a decade. Find out if they need a pollinator, some varieties work better than, or with, others. Even self-fertilizers yield more with a pollinator present, particularly if wind pollinated. Pollinators should be planted upwind, though many wind pollinated plants also use insects.

Look into advantages and disadvantages presented by dwarf vs genetic dwarf varieties, semi-dwarfs and standard sized trees. Dwarf trees yield more per acre, but dwarf-grafted varieties require support ($), need more water and nutrients ($), and more labor than standard or semi-dwarf trees. One exception is genetic dwarfs, smaller versions of plants that spontaneously arise in nature. Genetic dwarfs and grafted semi-dwarfs are overall the most practical, but it's sometimes hard to find a genetic dwarf (many but not all genetic dwarfs are hardy only in mild winter climates) or sometimes even semi-dwarfs in the variety you want. Stack or tuck smaller fruiting shrubs just under the dripline of standard trees on the south side. The smaller fruiting shrubs are easier to prune and harvest than standards, genetic dwarfs, shrubs or semi-dwarfs, plus they often give higher yields per acre. Standards have the advantage of being less affected by frost and so are less likely to lose their crop to a late frost.

As a rule, vines require a trellis or arbor, though they are sometimes grown on large trees to improve air circulation. For example, grapes that are subject to fungal diseases are more resistant growing up trees.

Pollination:

Some fruits and nuts are self-fertile but best yields occur when two or more are planted together, or when cross pollinated by another variety, it depends on the crop in question. Some fruits and nuts are bee pollinated. Wild bees are often best, buy or make shelters for them; honeybees are an important back up. Some pollinators are males, which produce no fruit, but most have both male and female flowers (which are plants' reproductive organs) and so they also provide crop yields.

Permanent Groundcovers:

Forbs (herbaceous perennials) are planted as a permanent understory groundcover. Annuals that reseed themselves each year might also be used. You should not cultivate the soil, *ever*, after planting. Cultivation damages feeder

roots and can shock the trees, kills earthworms (soil's best friend), beneficial soil microbes, small soil fauna and damages essential fungi. It can create a crust on the soil surface resulting in poor water and air penetration. Lastly, cultivation disrupts beneficial insect habitat (bare soil is not natural). That said cultivation initially is generally appropriate to re-establish a dynamic living soil ecosystem, and to plant a food forest. It is discontinued after permanent groundcovers are planted. A light disturbance (a small shock) in spring can help get things moving, such as one very shallow pass with a tiller or ripper blade, which leaves most plants unharmed. Then nature races in to restore after the disturbance. However, this isn't necessary.

Select groundcover plants that fix nitrogen, accumulate minerals, harbor beneficial insects, are aromatic, or provide erosion control (see Soil for lists of nitrogen fixing, mineral accumulating and beneficial insect attracting plants). Many plants in these categories are also medicinal or culinary herbs, some are edibles, or may be a combination of these. Plant about 30% nitrogen fixers (no more); you can use nitrogen fixing shrubs instead of, or planted with, nitrogen fixing perennial herbs. Legumes or members of the buckthorn family (**Frangula or Rhamnus**) are the most widely known nitrogen fixers, but a few may be found in other families as well.

ORCHARD LAYOUT

Run your rows from North to South to maximize solar exposure, with lanes between the rows. Spacing varies by plant species, the rootstock used and variety. Figure the probable canopy diameter of each variety, some can overlap somewhat. An example might be for trees with a 20 foot diameter canopy, space eighteen to 20 feet apart, measured trunk to trunk. Make the lanes between rows 26 to 28 feet apart or more, also measured from trunk to trunk.
Plant the tallest crops to the North, the lowest to the South to avoid overshading smaller plants. Where there is partial shade, some plants still produce

satisfactorily, such as pawpaw (Asimina Adans.), saskatoon (Amelanchier alnifolia), elders (Sambucus species), honeyberries (**Lonicera species**), cornelian cherries (Cornus mas), viburnums (Viburnum lentago), flowering (fruiting) quince (Cydonia oblonga) and Chinese dogwood (Cornus kousa var. chinensis) in cold climates; and figs (Ficus carica), loquats (Eriobotrya japonica), Chilean guava (Ugni molinae), salal (Gaultheria shallon), evergreen huckleberry (Vaccinium ovatum), and others in milder climates.

Most crops will need training (pruning) for a strong framework, starting when they're planted and then annual pruning will be needed for good cropping. Exceptions may be some genetic dwarfs and shrubs, especially sub-tropicals, which need little or no pruning. In many places it will be necessary to protect the food forest from predators with deer fences or electric fencing for bears. Stake trees only if they have a good size canopy, most you will prune back so staking is not needed. Use stakes for the first growing season only, and for a maximum of six months. Once the orchard is established, the biggest job will be harvesting, and the second biggest job will be pruning.

PLANT BENEFICIAL INSECT HABITAT

Pest Control with Beneficial Insects

Insectary plants are those identified as harboring beneficial insects, which are insects that eat pest insects in the garden or orchard. Such plants supply beneficials with pollen (protein) and / or nectar (carbohydrates in the form of sugars). An abundance of such plants provide an essential food source for large numbers of these important insects. Some beneficials depend upon nectar and pollen for survival when bugs are not available, while parasitic species tend to survive on bugs exclusively. Where insectary plants are absent, beneficial insects will not be present.

A diversity of insectary plant species that bloom at various times through the growing season is most desirable. In this way, when beneficials have consumed available pests, they will have floral food sources to turn to. Beneficials prefer environments that are sunny rather than areas of deep shade. Many of them like to breed in thick, moist mulches. In one study of a single plant from the umbellifera family, 168 species of insects were counted visiting the plant to collect pollen and nectar. Most of these were beneficial parasitic wasps. Most pest insects recognize the plants that are habitat for their enemies and avoid them. Plant a variety of flowers that harbor beneficials in order to ensure that some are flowering at any given point in the growing season. When pests become plentiful in the garden, cut back all insectary plants in bloom at the time and beneficials will move to tree canopies and into the garden, where pests are congregating. It is critical that insectary plant populations are high enough to support beneficials, or after pests are controlled the beneficials will leave in search of greener pastures (more reliable food sources). It is well documented that this system is as effective as, or more effective at pest control than commercial pesticides.

There are two basic kinds of pest controlling beneficial insects. Predatory beneficials such as lace wings, ground beetles, big eyed bugs, lady bugs and praying mantis, utilize pests as an alternative food source. While parasitic beneficials like tachinid flies, hover flies and parasitic wasps lay their eggs on the eggs, larvae, pupae or adults of less desirable bugs, using the pests as an egg host. Once the eggs hatch, the next generation uses the living host as a food source. Once the pest dies, the beneficials reach adulthood and abandon the carcass and the cycle repeats itself. For parasitic beneficial insects, reproduction is as important as food.

Spiders and some ground beetles are also pest predators that will effectively control them. These beneficials require a different type of habitat. Clumping grasses are their favorite habitat. Equally important is high ground. Spiders and

ground beetles need sites that are drier. Berms one or two feet high are ideal, when planted with clump grasses.

Many grasses are allelopathic to young woody plants. For this reason, grass should be grown outside the canopy drip line of woody plants. Once woody plants are well established, grasses will probably have little effect on them. Feel free to plant some flowering herbs on the berm as well. One such berm near the center of a plot of ground can offer control for the whole area. You shouldn't cut the grass. Indeed, once established you need do nothing more than occasionally water the grass in the dry season. Spiders and ground beetles need no further encouragement to control pests.

See the Beneficial Insect Habitat Table at the end of Eco-Orcharding for more information.

Masanobu Fukuoka, father of natural farming, grows such a habitat as ground cover everywhere on his farm, with soil building plants as permanent covers. He may hoe up a patch of ground cover and plant some vegetables, then lets some mature to seed, and the following year the vegetables may spring up on their own. Often these naturalized vegetables are more flavorful, more self-reliant and are more nutritious.

MAINTENANCE

To protect the trunks of young trees from rodents and rabbits use tree wrap, which also protects trunks from sun scald. In winter, remove it for the growing season. Until young trees develop a good canopy to shade their trunks, they will need protection during the growing season too. Often white latex (water based) paint is used for this purpose.

Mow or weed-eat groundcovers for ease of harvest if needed. Manage micro-livestsock for weed and pest control as well as fertilizer. Multi-species micro-

livestock management will maximize edge effects (the more diverse micro-environments found at borders) because they graze at different levels. Observation is important, keep an eye on things, don't overstock animals or leave them on site too long. Document all your orchard observations, watch for patterns, needs and preferences of tree crops, ground covers, etc. Examples would be watering preferences, nutrient deficiencies, pest populations, amount of control by beneficials (leave some pests if possible so beneficials have food next year) (See Plant Beneficial Insect Habitat in Gardening for more information). If birds are stealing your crop, netting can prevent crop damage or loss. Be sure to attach it tightly at the bottom so birds can't get in underneath.

When pest outbreaks show signs of becoming serious, mow down the plants in flower. This will drive the beneficials to seek food elsewhere and the pests are the logical choice. Take care not to act too hastily, if pest populations are too small, the beneficials will make quick work of them and then leave the food forest in search of more food. This is why it's good to have something blooming throughout the growing season.

Initial training (pruning) is important to establish structure. A little work while the trees are young saves much time and effort later on.

EQUIPMENT AND HARVESTING

In addition to good pruning methods, you'll need good equipment: hand pruners (secators), manual or power pole pruners, loppers (big & small), a small chainsaw, two hand saws- a large and a fold-up model, and three legged orchard ladders.

Equipment for harvesting includes tarps for nut crops (the most efficient tarps have draw strings), carts, small buckets or bins to strap on for harvest collection while on a ladder which are then emptied into larger bins that can be loaded on a flat bed truck. Facilities include walk-in coolers for cold storage and drying, pickling facilities with shade and good air circulation for drying, and a certified

kitchen for finished products.

UNDERSTORY HERBS AND GROUNDCOVERS FOR ORCHARDS

Perennials

Alfalfa (Medicago sativa). Makes a permanent cover that can be mowed and walked on once established. Do not plant under tree canopies, except when trees are nearly full size, because its strong root system may inhibit the root growth of young trees. Be sure to inoculate seed with its bacterial associate to allow maximum nitrogen fixation. Plant in spring or late summer at the rate of one pound per 1000 square feet, cover seeds ½ inch deep. Plant in open areas receiving full sun.

Known in agriculture as the king of soil improvement, alfalfa has been cultivated for about 4,500 years. Due to its mutualistic bacterial partnership, it supplies 200 to 250 pounds of available nitrogen per acre annually to the soil; few other nitrogen fixing plants can match it in this regard. Alfalfa is also a dynamic mineral accumulator that mines phosphorous, potassium, calcium, magnesium, iron, copper, cobalt and in some cases, manganese and zinc. It also accumulates boron, a non-metallic element. In addition, it's a first class insectary plant, harboring such pest enemies as assassin bugs, big eyed bugs, damsels, ladybugs, minute pirate bugs and parasitic wasps. Alfalfa is very important habitat for pollinating insects including the honeybee. For the production of honey, alfalfa is the most important plant west of the Missouri river. An average size hive, foraging exclusively on alfalfa yields about 125 pounds of honey. Larger hives have produced up to 300 pounds of surplus honey. Grown continuously on the same ground, it eventually reduces wire worm populations.

Alfalfa contains a fatty acid compound called triaconatal that promotes plant growth. It releases triaconatal into the soil where it benefits its plant associates.

Alfalfa has a deep, aggressive root system that is highly effective for controlling erosion. This root system could be detrimental to establishing young woody plants, and for that reason it is recommended to be planted outside what will become the mature drip line of fruit and nut trees in a new orchard.

Like other pioneer species, alfalfa populations will decline once the soil has become sufficiently rich. Lab studies indicate that alfalfa contains allelopathic substances that inhibit the germination of peas, oats, soybeans and corn when they are planted on ground previously occupied by alfalfa. These substances may indicate alfalfa's success at controlling weeds when grown as a weed smothering crop. Alfalfa is grown commercially on well drained soils because it is far less productive on heavy soil. However, its aggressive roots can fracture hardpans and open heavy soils so they are more porous (providing they are not too wet or the water table too high), thus increasing air and water penetration. On coarse soils, alfalfa is a good biomass producer, adding an abundance of nutrient dense organic matter for soil building. Alfalfa dislikes very acid soils, and a poor showing could be expected on such sites.

This plant is very important forage or fodder for domestic livestock. However, it can cause deadly bloat, like other legumes, if it is not mixed with other forages in the diet. Forage legumes should be avoided entirely when wet in spring, or laden with morning dew. The tender new leaves, flowers, seeds and sprouted seeds have all been used as food, and leaves and stems for tea. Super nutritious, alfalfa is an excellent source of protein (up to 25%), essential and non essential amino acids, is very rich in vitamins A, B2, B3, B6, C, D, E, K and U, and also is a source of vitamins B1, B5, B7, B9, and B12. It is low in fats, high in crude fiber, and supplies an abundance of minerals and other beneficial substances like flavonoids and enzymes, which are potent antioxidants.

In clinical animal studies where animals were fed on high fat diets, after alfalfa meal was added to their diet, their blood serum lipid levels fell by 25%. This seems to confirm its folk use for reducing blood cholesterol. Taken in folk

medicine as a blood tonic, alfalfa contains various properties that are known to benefit the circulatory system. Those benefits include thickening the intima, the innermost layer of artery walls, promoting arterial elasticity, helping clot bleeding wounds- even severe hemorrhages, a healing influence on inflammations of the arteries and blood vessels (as well as the sinuses), and helping reduce blood sugar levels to normal.

Alfalfa is regarded as a preventative and healing agent for peptic ulcers. It has an anti-ulcer protein, as well as being very rich in betacarotene, which build and strengthen cells of the stomach and mucous membranes. In the 1950s, Dr. Garnett Chaney, a Stanford University food scientist, identified what he named as vitamin U in alfalfa. His published research showed that vitamin U healed 80% of the peptic ulcers it was used to treat.

The antibacterial properties in alfalfa have successfully treated salmonella typhi, the cause of typhoid fever. Its fiber strengthens and detoxifies the cells and has been shown to regulate the colon's flora. It also contains digestive enzymes, which seems to confirm its folk reputation as a gentle laxative. The phytoestrogen compounds of the herb give it value for women in menopause, among other things. Laboratory studies of animals showed that phytoestrogens possess potent tumor inhibiting abilities in breast tissues. If further research ever receives funding, one day phytoestrogenic herbs like alfalfa may be prescribed to treat and prevent both benign and cancerous breast tumors. Alfalfa also gives a diuretic action that promotes complete urination and increased flow. This helps eliminate excess body fluids and toxins.

Among its numerous health benefits, alfalfa's plethora of anti-oxidants and cofactors stand out. They are vital to a strong immune system response to disease and aging, particularly of value against potentially fatal diseases like cancer, strokes and heart attack. Just one of its antioxidants, glutathione, an amino acid that is part of the triple enzyme system, appears to possess extraordinary benefits for the health of the human organism. For one thing,

glutathione is credited with providing greater longevity to vitamin C and E in the body, thus increasing their anti-oxidant benefits through a process akin to recycling. Glutathione binds organic toxins and heavy metals in the body and eliminates them through urination. It is a cofactor with vitamin E in warding off free radical damage to cell membrane lipids throughout the body. It helps expel rancid cholesterol from the arteries, repairs damaged liver tissue, offers protection from radiation poisoning, defends against physiological harm from stress, and prevents the formation of cataracts. In short, glutathione is an anti-carcinogen, anti-viral, anti-bacterial, which lends a significant boost to the immune system and slows the aging process.

WARNING: If you or members of your family have a history of systemic lupus erythematosus (SLE), you should not consume alfalfa in any form. In two documented cases, eating alfalfa sprouts triggered a recurrence of SLE. Eating large quantities of alfalfa seeds has been linked to reversible blood abnormalities. Alfalfa sprouts have caused salmonella and E. coli outbreaks, most likely due to contamination by grazing cattle or irrigation water containing manure residues. Only organic, untreated seeds should be used. Always rinse sprouts thoroughly before you eat them, and keep them under refrigeration at all other times.

Marshmallow (Althea officinalis). Plant starts in spring, 1½ to two feet apart for a solid patch. Flower stems reach four feet tall and spread three feet, looks like its cousin the hollyhock and can be divided in autumn. Prefers a location where it receives full sun. It is a first class soil builder and dynamic mineral accumulator that is a good source for a host of essential elements for soil fertility. “Erfurter” is an improved variety extra rich in mucilage. Instead of white flower typical of the species, erfurter has showy pink flowers with reddish purple anthers.

This herb is a rich source of vitamin C, minerals and dietary fiber when eaten. The flower buds can be eaten cooked, or the petals of opened flowers can be used in salads or brewed for tea, and young leaves can be used for cooked

greens; but the most commonly consumed part of the plant is the rootstock. The mucilaginous roots form the base of the original marshmallow (mixed with egg whites, sugar and gum Arabic from the sap of acacia trees), by simmering in water until they gel. They can replace egg whites for cooking purposes such as meringue or chiffon pies. Marshmallow rootstocks are also commonly boiled, sliced or fried with onions or garlic.

Medicinally, the high mucilage content, most abundant in fall and winter roots, is soothing to inflamed mucous membranes and is used to treat coughs and sore throats. Also helps for chapped skin, minor wounds and chilblains (a condition with similar symptoms as frostbite). Provides some relief for infections of the urinary tract and the skin. While the roots are most dense in beneficial mucilage, it is found in all parts of the plant. Additionally, stem fiber shave been used to make paper.

Wild Yarrow (Achillea millefolium). Plant up to one quarter of the expected mature tree canopy area with wild yarrow. Sow seed in early spring, do not cover seeds except with a light, loose open mulch, as the seeds need light to germinate. Germination occurs in about eight days when the soil is warm. Plant in sun or part shade conditions.

This is one of the most important groundcovers under tree crops as a dynamic mineral accumulator, mining phosphorous, potassium, calcium, silicon, sulfur, copper, chromium and other elements from the substratum. It is also fire resistant, good for controlling erosion and provides habitat to hover flies, ladybugs and parasitic wasps that control a host of insect pests, while furnishing forage for honey bees and other pollinators. The aromatic foliage is a good source of protein and minerals, also rich in vitamin C, B1, B2 and choline. The flowers and seeds appear to be equally nutritious, and are dried for brewing tea or to use as a seasoning or a base for broth or soup.

In the Old World, this species has been used medicinally since antiquity from Europe to China for a broad spectrum of disorders. In the New World, native wild yarrow is known to have been used medicinally by 58 tribes for numerous ills, often remarkably similar to usages in the Old World. Yarrow is a potent blood purifying tonic and can help reduce high blood pressure or stem bleeding inside and out. It is antispasmodic, anti-inflammatory, analgesic (pain reducer), diaphoretic (increases perspiration), decongestant, antipyretic (fever reducing), hemostatic (slows bleeding), emmenagogue (stimulates blood flow through the pelvis & uterus) and a stimulant. Yarrow's rich chromium content is an anti-aging agent. As we grow older, our chromium levels can fall dangerously low. Chromium is essential for the maintenance of the circulatory system, the thyroid gland, and the spleen.

Wild yarrow is a popular ingredient of commercial hair and skin products. Reputed to prevent hair loss, a soothing balm for the skin, a refreshing and relaxing addition to bath water, all of which suggest why it is so esteemed for these products. Native American tribes used it make incense, perfumes, cologne and bath powders.

White Dutch clover (Trifolium repens). Along with yarrow, this is the most important cover under tree crop canopies, and should be planted over a quarter of the total area cover cropped. Mix clover with yarrow to cover half the canopy zone, or plant them separately in patches in roughly four quadrants of the canopy zone. Be sure to inoculate the seed with their rhizobia bacterial associate (or buy pre-inoculated), and plant at a half pound of seed per 1000 square feet, in full sun or part shade. Cover seed ½ inch deep with soil.

A nitrogen fixer and phosphorus accumulator, it also supplies nectar and pollen to lady bugs, beneficial parasitic wasps, honeybees and other pollinating insects. Leaves are edible raw or cooked, and are a good source of protein, B vitamins and minerals. Flowers are dried for tea, or powdered for an additive to hot dishes. Native Americans ate the root nodules on native clovers.

WARNING: Daily use is not recommended as it may cause photosensitization or damage to the mucous membranes. Pregnant women should avoid it, though it is generally harmless when consumed irregularly.

Horseradish (Armoracia rusticana). Plant container grown horseradish in spring, or root cuttings in the fall or spring. A valuable cover under tree crops as a living fertilizer, it responds well to rich, well manured soil by increasing root growth. Plant in good sun exposed areas, or maximize the solar exposure by planting on the southern side of trees in an orchard.

To achieve the highest overall yield, it is not harvested until the fall of the second year following a spring planting. If the whole crop of roots is harvested, it is not uncommon for the starchy (22%) root fragments left behind to sprout and keep the patch going indefinitely. To assure a perennial harvest, however, a few widely spaced roots can be left in the ground at harvest time. Leaf mulching horseradish patches in spring two feet deep will yield an abundance of very tender finger sized roots, rather than the larger, coarser, tough roots that are typical. Store roots under cover in a cool, unheated space in dry or slightly moistened sand.

The seeds are most often sterile, though the plant has been propagated and spread around the world for 2000 years by root division. Owing to an ability to spread quickly by root offsets, it has naturalized in some parts of North America and Europe. It is a first class dynamic accumulator, collecting phosphorous, calcium, potassium, magnesium, chromium, manganese, zinc and sulfur. Sulfur accumulators like horseradish, garlic and onions, when planted in 15% of an orchard are considered a valuable disease prevention measure. A foliar spray (directed at the leaves and not the soil) of horseradish tea is used to control fungal diseases infecting fruit trees. It is also thought to repel blister beetle pests, with the exception of potato beetles.

The fresh roots of horseradish are used to prepare the popular condiment horseradish sauce. It is made by combining the fresh grated root with cream or vinegar (apple cider vinegar being the most healthful), or by substituting yogurt for cream. Sometimes salt or oil is added. In Poland, grated beets or beet juice are mixed with horseradish. Germans may prepare and serve the roots as a vegetable by cutting them into slices and boiling them until tender. Tender young leaves are a spicy treat in salads or steamed greens, or to flavor pickles. In addition to being super rich in minerals, horseradish is very rich in vitamins A, C, and the B vitamins niacin and riboflavin. It is also high in protein and a good source of fiber.

Horseradish is an effective expectorant that promoted the expulsion of mucous secretions. It is quite helpful when stuffed up with a cold, flu or allergies like hay fever to clear the sinuses and restore free breathing. For sinus inflammations like sinusitis, it clears clogged breathing passages and may help reduce inflammation. Sinusitis is usually a bacterial infection. Horseradish's antibiotic properties act to treat throat and upper respiratory infection, giving it a dual role in healing sinusitis. Laboratory studies have demonstrated that horseradish kills the influenza virus in test tubes and in studies with animals suffering with this virus, horseradish was shown to mitigate its impact. Another study suggests that the essential oil of horseradish, which was shown to act as a bactericide on the microbes responsible for urinary tract infections, may effectively treat this disorder if the extract is taken internally (not the pure essential oil). The high antioxidant content of this herb makes it a potent immune system stimulant that promotes white blood cell count.

In herbal folk medicine, horseradish is regarded as a digestive aid, an anthelmintic agent helps exterminate parasitic worms in the body, and a diaphoretic herb that promotes copious perspiration. As a diuretic that increases the flow of urine, it has been particularly applied to generalized edema characterized by swollen body tissues containing an abnormal volume of fluid. Used topically on irritated nerves and arthritic joints, relief apparently results from

the action of glycosides in horseradish that rushes blood to the location where it is applied. The isothiocyanates in horseradish that are responsible for its pungent taste are considered responsible for much of its therapeutic value. To liberate the isothiocynates for both its flavor and medicinal action, the roots must be crushed or grated.

Horseradish is excellent for massage oils, being soothing to muscle pain and rushing blood to the surface where it may help push out accumulated toxins and dead cells. As massage oil, it is also reputed to bring some relief to lung congestion. As a hair rinse, horseradish vinegar is said to stimulate the scalp. It also serves as a beneficial cosmetic.

WARNING: People with hypothyroidism, kidney disorders, ulcers or children under the age of four should avoid consuming horseradish.

California poppy (Eschscholzia californica). Sow seed in the desired location in spring, will germinate in six to twelve days. Can be planted in sunny to partly shady locations.

It has a history in folk medicine, as well as being edible. According to the USDA Range Plant Handbook published in 1937, the foliage was reputed to have been eaten by native peoples who boiled or roasted them, then rinsed in water before eating them. In the 19th century, Dr. Sturtevant who extensively researched the edible plants of the world reported that the Chinese ate a plant from the genus Eschscholizia as a cooked green and as a seasoning, but the species was not identified. This is odd because all eight or so species in this genus are native to the western United States.

Used medicinally, it contains a small amount of alkaloids similar to morphine that can help relieve headaches and insomnia. It sometimes is recommended for pain relief for individuals with a sensitive constitution, apparently due to its reputation for being safe and mild. Regarded as an effective calming agent for agitation,

and an old remedy for toothaches. To play it safe, avoid its use when on prescription drugs.

California poppy is native throughout most of Lane County, Oregon (where Eugene is located). Garden varieties made up of plants principally found in California have escaped cultivation in many places and naturalized locally. In agriculture, California poppy is valued for controlling harmful nematodes, as well as providing habitat for honey bees and other pollinators. It is also fire resistant.

Peppermint (mentha x piperita). Plant starts in spring under the expected canopy of mature tree crops. Requires sun to part shade conditions.

A dynamic accumulator of phosphorus, potassium and magnesium, peppermint also provides habitat to predatory wasps, honey bees and other pollinators. Due to fungicidal compounds, it can be used to treat plants thus afflicted by disease. Also contains insecticidal compounds that have been used effectively against Colorado beetles. Although as yet unresearched, traditional farmers and gardeners report that it's repellent to ants, aphids, flea beetles and cabbage butterflies.

Foliage and stems are a very rich source of beta-carotene, thiamin (B1), riboflavin (B12), niacin (B3), phosphorous, magnesium and potassium, with moderate amounts of vitamin C and some trace elements. Popular for millennia as an aromatic flavoring, or for a refreshing warm or cold tea.

The active ingredient of mints, menthol, is regarded as their primary healing influence. Peppermint is much richer in menthol than other mints, with the exception of corn mint. The plants' chemistry is extremely complex. It has been shown to kill or inhibit more than 30 pathogenic microbes responsible for such ills as Asian flu, pneumonia, sore throats, scarlet fever, mumps, rheumatic fever, vaginal yeast infections, cold sores and impetigo (a superficial skin infection related to step throat bacteria). Peppermint is particularly beneficial for gastrointestinal disorders and strengthens the nervous system. It is also a good

tonic for relief of anxiety, nervous tension, hysteria, and other forms of stress. Peppermint is used in the treatment of many disorders. No wonder those mint juleps are so good, but choose a designated driver if you plan to imbibe a quantity of that healing nectar.

Fireweed (Epilobium angustifolium). This is a perennial herb that dynamically accumulates the minerals phosphorous, magnesium and potassium. It supplies nectar to honeybees and other pollinators including beneficial insects over a long blooming period of up to three months.

The young leaves and immature flowers stalks are eaten in salads, leaves are steamed or boiled for cooked greens, or steeped in boiling water for tea. New spring shoots are cooked and served like asparagus. Mature stalks are peeled and the pith is used to season other dishes, or added to soup or stews as a thickening agent. Both an ale and vinegar can be made from the pith. Fireweed is very rich in protein, vitamin A, vitamin C, phosphorous, magnesium, potassium and flavonoids like myricetin.

As a medicinal herb, fireweed is a gentle anti-inflammatory, slow acting but effective. It can be used to treat sore throats, mouths, hemorrhoids and stomach upsets. The herb can provide some benefit to the prostrate and will serve as a tonic for the colon.

Pacific Northwest tribes used the outer stem fibers to make twine. The seed fluff was used for weaving and padding, or mixed with animal wool to weave clothes and blankets. Blankets were made with the seed fluff stuffed with duck feathers; mattresses were made similarly. The seeds along with the fluff are produced in great abundance. Oddly, the seeds have a low viability (21.5%), and the plant spreads primarily by creeping roots. Don't cover seeds with anything but wood ash when sowing.

Coneflower (Echinacea purpurea). Plant starts or container plants in spring in tree crop canopy understory area. Tolerates sunny to partly shaded conditions.

Harbors beneficial insects, supplying nectar and pollen to hover flies and lacewings. A widely used medicinal plant, particularly used to boost the immune system against colds and flu. All parts of the plant are used medicinally, but the rootstock is considered most potent. The sweet rootstocks have been reportedly used as a food as well, imparting a tingling sensation to the mouth that has been used as a cure for frigidity.

Garlic (Allium sativum). This is a dynamic soil building accumulator of minerals and other important substances, rich in phosphorous, sulfur, fluorine, chromium, iodine and selenium. It is a good source of calcium and silicon, with a fair amount of potassium and depending on the soil, zinc.

The Henry Doubleday Research Association studied garlic's insecticidal potential for eight years. They conclude that garlic (the distilled essential oil) is as effective as commercial organo-phosphorous or organo-chlorine insecticides, yet is non persistent and is non toxic to people and animals, even in high concentrations. Garlic oil has been used to control borers, Japanese beetles and plum curculio. Garlic's plant juices were first used by the Chinese to control aphids and mites. Other garlic based insecticides are used to control or repel thrips, white flies, scale, leafhoppers, coddling moth, grasshoppers, caterpillars and grubs. Grown with onions, it can reduce damage by onion flies. Like alliums in general, garlic repels rabbits. Garlic is a potent bactericide and fungicide that effectively controls diseases of stone fruits and nuts, like brown rot. Research at the University of California showed that garlic is also as potent against downy mildew, scab, rust, anthracnose, early blight, bacterial blight and angular leafspot.

Virtually all parts of garlic are eaten. The Chinese have been cultivating it for food for about 6000 years. In the culinary world, recipes including garlic could fill an encyclopedia. It is rich in minerals, protein and vitamins C, B1, B2 and B3. It's the compound called alliin, one of garlic's 75 sulfur compounds which acts as a catalyst for its health benefits. Alliin is locked up until a clove is cut or crushed and the action of oxygen converts alliin to allicin. Once liberated, the allicin

combines with various other components to form many compounds, also giving rise to its characteristic aroma and much of its nutritional value.

The use of garlic as a medicine dates back about 5000 years, as documented in Sanskrit accounts, or even as far back as 6000 years in ancient Sumeria. A medical papyrus about 3500 years old found in Egypt speaks of numerous disorders that garlic treats. By 1996, over 1,800 medical scientific studies of garlic had been made, making it one of the most researched of all medicinal plants. Unfortunately, some of these studies appear to be significantly flawed or biased, causing some controversy on a few of its healthful qualities. Most of these questionable studies that challenge garlic's medicinal efficacy have been conducted in recent years and are considered by most scientific researchers of garlic as scientifically unreliable.

Much of garlic's potent healing influence requires it be consumed raw or enteric coated tablets be used. Cooked garlic, however, will lower LDL blood cholesterol (the bad) and raise HDL serum cholesterol (the good), although not as dramatically as raw garlic or enteric tablets. A National Cancer Institute study of citizens of India concluded that those who eat garlic (and other alliums) in large quantities were nearly twelve times less likely to get gastric cancer than those who ate little or no garlic or onions. Research suggests similar protection against colon cancer. Cooked garlic can also help prevent strokes by thinning the blood and regulate the mucus membranes, act as a decongestant, promote cough relief and serve as a preventative to bronchial disorders. Raw garlic or some forms of concentrated enteric coated supplements contain garlic's full array of potent medicinal extracts.

Allicin, garlic's primary active constituent, is responsible for much of its healing potency. Allicin is very unstable, and it is lost quickly when dried, cooked or aged. The antibiotic properties of garlic are destroyed by cooking. For this reason, fresh garlic or extracts made from fresh garlic are most effective medically. Garlic supplements that standardize the allicin content are those that

are most reliable. The amount of alliin and allicin potential should be clearly labeled. The daily dosage should contain at least 8 mg of alliin, or 4,000 mg of total allicin potential. Read the label. If it states, usually in very small print, that total allicin potential is very high at time of manufacture, this means there is little or no alliin present in the product. Enteric coating is important because without it, pills break down in the stomach and acids destroy the allicin. Once in the small intestine, the pills dissolve into the bloodstream in the form of various beneficial compounds. For many, the most attractive thing about enteric coated garlic supplements, other than their healing potency, is that the decidedly antisocial aroma of raw garlic is not present.

Garlic is a broad spectrum antibiotic that is antibacterial, antifungal, antiparasitic, antiprotozoan and antiviral, and is known to control 72 different infectious diseases. These include botulism, Candida albicans (the fungus responsible for many types of yeast infections), diarrhea, dysentery, streptococcus [bacteria responsible for causing strep throat, many cases of meningitis, bacterial pneumonia, endocarditis, erysipelas and necrotizing fasciitis (the 'flesh-eating' bacterial infections)!], tuberculosis and typhoid. At a concentration of just one thousandth of one percent, allicin suppresses numerous species of harmful amoebas, bacteria, fungi, and protozoa that attack people.

Garlic is more effective at lowering LDL serum cholesterol than the pharmaceutical drug clofibrate. LDL cholesterol fell an average of 9% by eating one clove daily. It is more potent than vitamin E at repairing liver damage and is a powerful detoxifier of a variety of liver toxins. In addition to lowering cholesterol, garlic benefits the cardiovascular system by lowering high blood pressure and offers resistance to hardening of the arteries (arteriosclerosis) and preventing blood platelets from abnormal bunching, thus keeping blood clotting from triggering strokes.

Chinese research showed garlic reduced the risk of prostate cancer. The Nutrition Advocate reported that studies indicate garlic extracts may inhibit skin

cancer (melanoma) cell growth as much as 50%. Japanese scientists found that fresh garlic completely destroyed breast cancer in mice. Experiments in the US found that garlic was more effective than some cancer vaccines at combating bladder cancers. The Nation Cancer Institute rates garlic's sulfur compounds near the top of their list of natural anticarcinogenic substances. A study by a Florida hospital research center found that raw garlic and garlic extract destroyed up to 159% more tumor cells than the white blood cells of those who consume no garlic. Research identifies garlic as an inhibitor of nitrosamines, highly carcinogenic compounds that develop during the digestive process. Garlic stimulates natural killer (NK) cells that consume cancerous cells, cold and flu viruses, and harmful bacteria. In addition, garlic promotes macrophages that are scavengers of the circulatory system that seeks out and destroy pathogens, old worn out cells, aberrant cells and cellular debris. Macrophages are essential to appropriate immune system response and the increase NK cell effectiveness. Within 24 hours of consumption, garlic doubled NK cells' ability to kill one cancerous cell lineage (YAC-1).

WARNING: Some individuals are allergic to garlic, symptoms may include stomach upset, indigestion, diarrhea or intestinal gas. Dermatitis prone individuals may experience inflammations such as blistering from handling garlic. Some garlic supplements use a solvent to extract garlic that deactivates allicin, garlic's active base medicinal constituent.

Ground ivy (Glechoma hederacea). Plant one foot apart for quick cover. Leaves are aromatic and a good source of vitamin C, young leaves and shoots are steamed or boiled or added fresh to salads although slightly bitter. Also can be added to soups, sauces and vegetable dishes as a flavoring. A cold summer drink called “gill tea” is brewed from the leaves, once used extensively as a medicinal herb, generally replaced by more potent herbs today. The tea can be taken as a blood cleanser and it is also possibly beneficial for other organs and systems of the body. Once prescribed as an antidote for lead poisoning.

Lemon balm (Melissa officinalis). Plants starts or divided sections in spring under tree crop canopies. Will tolerate full fun to full shade.

Rhubarb (Rheum officinalis). Plant starts in the spring, in tree crop understory areas. Plant in the sun to partly shady areas.

Coreopsis zagreb (Coreopsis verticillata). Plant container plants in spring or sow seeds in place. Plant in the understory of tree crop canopies, in the sun or part shade.

Edible mum, Ju hua (Chrysanthemum x morifolium). Prefers sun to partly sunny locations and moist soil. Flowers from August to October. Supplies beneficial hover flies and lacewings with pollen (protein) and nectar (carbohydrates). Aromatic leaves are used for tea or added to fritter batter. Flower heads are pickled, added to tempura better or dried for spicing up soups or for a tangy tea. A sweeter tea is brewed using only the flower petals, often added to black or green tea. This mum is a Chinese medicinal herb used for millennia as an antibacterial and antifungal agent. Very effective use in China for angina pectoralis (chest pains) and for stabilizing the central nervous system, as well as treating a variety of other conditions.

Stella d'oro daylily (Hemerocallis species). An easy to grow ornamental that has large, showy, fragrant flowers. The new shoots can be used as a steamed veggie or in stir-fries. The large flower buds are considered a delicacy in China, used fresh in salads or added to stir-fries, steamed, pickled, and used fresh or dried in soups, or as a seasoning for other dishes. Immature leaves are also eaten steamed or boiled. The leaves have also been used to weave mats.

WARNING: The rootstock is often recommended as a delightful edible, however they are generally quite toxic. The toxins (colchins, rhein, hemecallin and likely others) accumulate, and protracted use can cause respiratory arrest, blindness and other disorders. In modern Chinese medicine, one species is used to treat

tuberculosis and blood flukes, but it is far too dangerous to use for self medication.

Other Shade Tolerant Groundcovers:

Wood sorrel (Oxalis oregana), sweet violets (Viola odorata), goutweed (Aegopodium podagraria).

Annuals and Biennials

Dill (Anathum graveolens). A biennial (completes its life cycle in two years) herb that acts as an annual where winters are cold, and is best grown from starts or seed sown in spring when the soil temperature is about 60°. Cover seed lightly with soil, germinates in ten to 30 days. Dill reseeds readily if the seed heads are allowed to mature. It prefers full sun conditions.

A dynamic mineral accumulator, dill enriches the soil with potassium, calcium and sulfur. Dill provides protein in the form of pollen and carbohydrates through nectar to beneficial hover flies, ladybugs, parasitic wasps honey bees and other pollinators, as well as the flowers providing important beneficial insect habitat. Generations of gardeners recommend planting dill around garlic and onions, claiming it exerts a beneficial influence on them, as well as other crops like arugula.

In Europe and the US, dill is a popular seasoning. Dill is an alkalizing herb, rich in chlorophyll, a source of complete protein (16%), carbohydrates (55%), rich in minerals and a source of vitamins A and C. Research begun in the 1980s showed that limonene may inhibit pancreatic and colon-rectal cancer development. Animal research showed that limonene suppressed the formation of tumors and can also shrink existing tumors. Other animal studies suggest that limonene prevents breast cancer by blocking access to protein by cancerous cells. Additional medical investigations determined that dill can help reduce high

blood pressure, ease uterine cramps, and acts as a bactericide. In folk medicine, dill has a variety of applications, the most common being for gastrointestinal disorders. In ancient Rome, wreaths of dill were used as air fresheners. Today, dill is an ingredient in various commercial cosmetic products.

Parsley (Petroselinium crispum). A biennial or short lived perennial, grown from starts. Flowers in its second year. If flowers are promptly removed each year, it can be grown as a perennial. Some should be left to flower to provide beneficial insect habitat. Italian parsley (with larger flat leaflets) is more productive, hardier and faster growing than common parsley (with curly foliage). Parsley prefers partly shaded conditions, but can be grown in full sun. Useful planted under the canopies of fruit and nut trees as a living fertilizer.

It is a dynamic accumulator of phosphorous, potassium, calcium, magnesium, boron, iron and iodine. It supplies beneficial insects with protein and carbohydrates. As a food, parsley has been largely reduced to a garnish that often goes uneaten despite the fact that it is probably by far the most nutritious part of the meal. Up to 25% protein, super rich in vitamins A, C, B2 and B3 and a source for vitamin K, as well as numerous other minerals and beneficial substances like essential amino acids and flavonoids.

Being rich in antioxidants and other nutrients, parsley is a respected longevity herb. Herbalists recommend parsley for male reproductive health, and due to its diuretic action it can give some relief to men suffering from an enlarged prostate. For such purposes, the volatile oil pressed from the seed is the agent used.

Parsley also contains phytoestrogen, no doubt largely due to its high boron content. Just three milligrams of boron can double blood levels of the body's estrogen. It may be prescribed for painful menstrual problems, and its diuretic influence can relieve breast tenderness. It also acts as a uterine stimulant that may tone the uterus muscles (parsley should not be consumed during pregnancy). A rich source of the essential amino acid histidine, which has been

shown to inhibit tumor formation, parsley is reputed to stimulate the circulatory system and so is considered a specific treatment to balance low blood pressure.

In folk medicine, parsley has been used to treat a variety of conditions. The tradition of using it as a garnish originated from its ability to aid digestion and sweeten the breath. In garden lore, parsley is grown with asparagus and tomatoes to improve their vigor. Also reputed to repel rose beetles, cure sheep and goats suffering from foot rot, and eliminate dragon breath in dogs. Foliage with stems attached is used in floral arrangements.

Sweet alyssum (Lobularia maritima). An annual easily grown from seed. Sow in place in April to May when soil temperatures reach 55° or warmer. It reseeds prolifically and returns each year if weeds or other plants don't invade its territory. Once it's gone to seed and died back, mulch it until it starts to germinate again, then remove the mulch promptly. Tolerant of sun or part shade conditions, it can be grown under fruit trees.

German chamomile (Matricaria recutita). An annual sown in place in early spring. Cover the seeds very lightly with soil; germination takes place in one to two weeks. In most cases, it will reseed itself each year. Keep the area free of other plants and it should come back lavishly, or collect the seed and plant in a new location. Allow at least ¼ of the plants to flower and go to seed for reseeding and to feed beneficial insects. Plant in full sun or part shade.

A good ground cover under fruit tree canopies as a living fertilizer. A dynamic accumulator of phosphorous, potassium, calcium, magnesium, and sulfur, but particularly phosphorous and magnesium. In addition, chamomile is an insectary plant that harbors beneficial insects. It can be used as a natural fungicide by decocting and spraying on infected plants. It is believed to be effective for healing other plant diseases as well. Grown as a companion to other plants, it's reputed to increase their health and vigor, while also improving the flavor of culinary herbs and alliums like onions and garlic. It is additionally regarded as a

pest repellent. Along with yarrow flowers, it is a component of biodynamic compost starter preparation #502 that speeds decomposition and increases the potency of compost.

The flowers are dried for use as a calming tea or as a food seasoning. In addition to being rich in minerals, German chamomile flowers are also high in vitamin B2 and B3 and other beneficial substances.

German chamomile is well regarded for strengthening the immune system. The medical benefits of this plant have largely been confirmed by scientific investigation, and are considered safe enough to consume daily for life. Gastrointestinal and respiratory tract inflammations and irritations often yield to German chamomile's healing influence. Inflamed or irritated gums (including gingivitis), hemorrhoids, mucous membranes, and those of the epidermis are relieved by floral treatments of German chamomile. It is a tonic to the nervous system and overactive emotions, promoting a calming, soothing, influence. A good herb to ease nerve pains and aches and pains generally, including menstrual cramps. Taken internally, it stimulates pancreatic functions and the flow of bile; thus it promotes digestion and eases stomach pains and intestinal gas, including colic.

In laboratory research, chamomile demonstrates anti-tumor properties. German chamomile acts as a preventative as well as a remedy for peptic ulcers. It is a gentle sedative or sleep aid for children experiencing insomnia, or restlessness, and it is relaxing for those afflicted with hyperactivity. The herb can help asthmatics breath freely, and it promotes the development of new liver and kidney tissue. This regenerative action is important for these organs to purge toxins. Many of the active compounds are more soluble in alcohol than water, so alcohol tinctures and extracts are more potent than tea.

German chamomile is excellent when used for massage oil due to its ability to soothe sore muscles and strengthen tissue. It is a great addition to cosmetic

creams and lotions as it softens and erases wrinkles and stretch marks, leaving the skin soft and radiant. Indeed the lotions can benefit sun and wind burns, rashes (including diaper rash), sore nipples, eczema and scaly skin. Chamomile is also of value for shampoo and hair rinses, particularly for blondes, because it lightens hair color.

Dwarf essex mustard (Brassica napus). An annual or biennial commonly grown as an orchard winter-spring cover crop that is planted in the fall. Sown in place in spring and allowed to go to seed it may return each spring from reseeding; some plants will winter over as well. Fall plantings live over winter, bloom in spring and set seed. My advice is to plant some in spring and some in fall and stand back and see what happens. A rapid growing 'cut and come again' crop for young succulent cooked greens. Cut down the foliage, or turn it in, or leave it alone to nourish the soil. A quarter pound of seed covers 1000 square feet, cover seeds ¼ inch deep with soil. Will tolerate sun or part shade conditions.

RECOMMENDED READING:

Harlan, Michael and Linda. Growing Profits: How to Start and Operate a Backyard Nursery. Moneta Publications, 1997.

Sturdivant, Lee and Tim Blakely. The Bootstrap Guide to Medicinal Herbs in the Garden, Field and Marketplace. San Juan Naturals, 1988.