Kyle Orgel
Introduction to Permaculture
Forest Garden Design Project
February 3, 2020

Forest Garden Design

This Forest Garden will build on my polyculture project. The existing plants will be complimented by plants that fit into the soil and fill available niche's at the site.

1. Ghost Gum (Corymbia Papuana)

   The "Ghost Gum" is native to Australia and is a smaller eucalyptus, reaching 66 feet. The trunk is smooth and snow white. It has gray green evergreen leaves that are tinged purple by frost. White flowers bloom in the summer. It tolerates drought but can be used in well-irrigated landscapes." UC Davis Climate Ready Trees

   "Tree to 15 m (or sometimes more).
   Flowering: Oct.
   A component of littoral woodland or low open grassy woodland, locally often dominant but very patchy in distribution.
   Conservation status: Not considered to be at risk." Australian Plant Index

   Works best in light-medium well-drained soils Useful Tropical Plants

   This tree's slender profile will fit well on the hill because it will still allow for the creation of a navigable path up and down the hill. It is drought resistant and although it is not native, seeds are accessible on the market.

2. California Poppy (Eschscholzia californica)

   Creating only a small abundance of ghost gum trees will allow room for the Poppy's to receive light mostly uninterrupted. They also grow easily in sandy (location close to the ocean) and well-drained poor to average soils (certainly is the case). Missouri Botanical Garden

Named the State Flower of California in 1908
California Poppys are best grown in full sunlight and enough water (I believe the hillside slope will assist with this and make up for the drought conditions). They can however grow in moderate sunlight competition, meaning that managing the site abundance of Ghost Gum trees will be very important. Also concerns about pests, including animals in the neighborhood, should not be an issue. Den Garden

Deep-rooted plant

Flowers respond prototropically to low light levels, closing at night and on cloudy days.
Plants with a perennial growth habit can produce flowers in the first year
Within its historical range, California poppy occurs across a number of habitats including coastal, valley, foothill and desert regions, at elevations below 7000 ft (the site meets this requirement.

"The California poppy has some direct wildlife value, with seed and seed pod comprising less than 5% of small mammal diets and providing minor cover for small birds. The importance of the species to mammals is likely increased in certain resource-limited environments. Indirect benefit to other animal species may be substantial as insect visitation and overall insect abundance may increase relative to the pollen-rich flowers. This floral resource, as a member of a diverse plant community, may serve as an important link in the food web." More research to be done on the possible medicinal uses of the root parts of the plant. UDSA Plant Guide - California Poppy

3. Junegrass (Koeleria macrantha)
   Tolerant of any shade amount
   Grows between 6 inches and 2 feet
   Good for butterflies, which fits into my effort to create wildlife habitat
   Does not require a lot of moisture

Use as an understory with Oaks (Quercus sp.) or other trees. Also useful in a meadow-like garden or rock garden with other native grasses, annual wildflowers, herbaceous perennials such as California Poppy(Eschscholzia californica), succulents such as Dudleya spp., and various cactus species." California Native Plant Society

Cold, heat, and drought tolerant, and commonly makes up 5% of an area – eg. A very successful plant USDA Plant Guide - Prairie Junegrass

4. White Oak (Quercus Alba)

   This hardwood tree is a staple of the eastern half of the United States. They have been documented as living up to 450 years, but typically last 200-300. In that time they can become enormous trees with a large canopy. The diameter can reach 50 feet with the height reaching 100 feet. Lower branches extend outwards parallel to the ground, making it typical for a White Oak to be as wide as it is tall.

   Ecosystem Profile:

   Soil Preference: coarse, deep, moist, well-drained, with medium fertility, and slightly acidic. Well adapted to heavier soils.

   Resistances: Ice breakage, shade but less in older age

   Sensitivities: Flooding, over-exposure to salt, fire injury, coal smoke, ashes on the soil surface, and "disturbances in their root zones caused by grading, soil compaction, or changes in drainage patterns; if severe, these disturbances can lead to mortality."

   A variety of insects exist in the canopy ecosystem including: leaf eaters, gypsy moth, orangestriped oakworm, oakleaf caterpillar, oak leaf tiers and walking sticks.

   Will persist in the understory because of its ability to outlast other plants. Reduction in understory and overstory growth will advance the progression of white oak.

   Male white oak will have greenish-yellow catkins, while the flowers of a female white oak will have reddish spikes.

Needs	Provides	Intrinsic Values
Living at moderate elevation	Water and rot-resistant wood	Shade
Mainly a lowland tree	Wood for wine and whiskey barrels	Beauty
Fairly tolerant species overall	Wood for martial arts equipment	Ornamental Tree
Moderately acidic soil	Wood for musical instruments	Cultural symbol in US
Lack of forest fires	Food for the local wildlife	history and cinema

5. California Honeysuckle (Lonicera Hispidula)
   This vining plant, is native to Southern California and can grow up to 20 feet tall. It produces small, but bitter fruit, which resists deer. This plant is a valuable source of habitat and food for hummingbirds especially, who will fly in with the purpose of extracting the nutrients. California Vining Plants

   The stems of the plant are hollow, but have some stiffness to them, making them useful to the indigenous California people, the Pomo, as smoking pipes. Native American Ethnobotany Database

   Honeysuckle has been especially cultivated in native plant nurseries and is considered ornamental in conjunction with its functional purposes in a forest garden design.

   Drought-tolerant plants such as this are essential to adapting to a changing climate, especially in the Southern California region.

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   Useful Tropical Plants

2. California Poppy

   Missouri Botanical Garden

   Den Garden

   UDSA Plant Guide - California Poppy

3. Junegrass

California Native Plant Society

USDA Plant Guide - Prairie Junegrass

4. White Oak
   Lake Forest Quercus Alba Resource
   USDA White Oak Fact Sheet

5. California Honeysuckle
   California Vining Plants
   Native American Ethnobotany Database

Melissa Page

March 26th, 2020

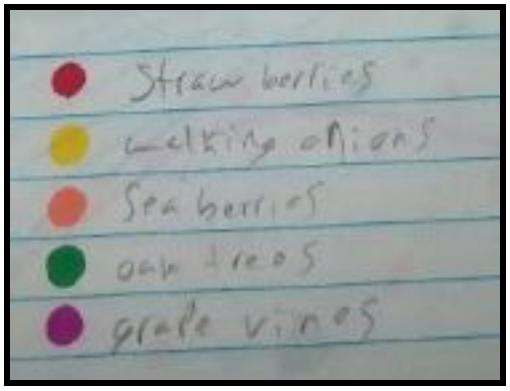
Steve Whitman

Introduction to Permaculture

Forest Garden Design

I chose strawberries, onions, sea berries, Grape vines, and northern red oak trees for my three plant Forest Garden Design. Strawberries, red oaks and onions grow well together because they thrive in similar soils. They can grow in loose, and rich in nitrogen soils. The soil can be compacted, rocky, or clay-heavy. Strawberries and grapes particularly like slightly acidic soil with a ph between 5.5 and 6.6. All of the plants like lots of sunlight.

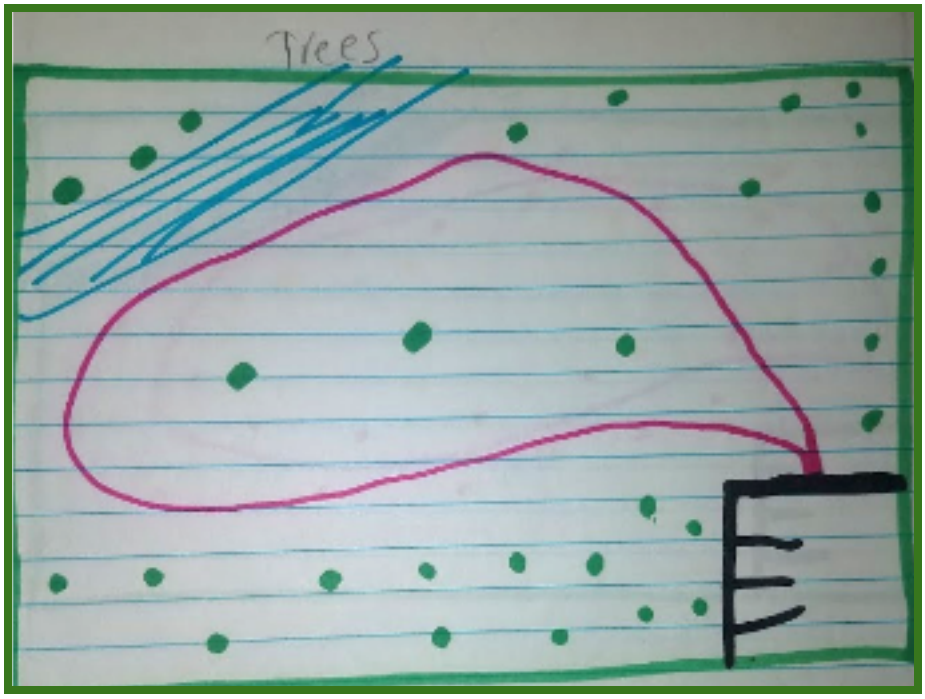
After watching the Inhabit film the sea berry plant was interesting to learn about. It was described to be great tasting and healthy. They also fix nitrogen in the soil around them because they take nitrogen out of the air and store it in their roots. The other plants I chose will thrive in the nitrogen rich soil. Oak trees provide shelter, food, and habitat to birds,squirrels, deer, ect. The ecosystem services this tree provides are essential. It provides shelter for bugs, birds and woodland creatures. It also provides food for bugs, birds, and woodland creatures. It captures carbon dioxide from the air and gives off oxygen. The tree has a large root system that soaks up water which is useful in heavy rain events to counter flooding and stagnant water.


Strawberries
walking onions
Sea berries
oak trees
grape vines


Small plants and shrubs
River
Path
Army


Small plants and shrubs
River
Path
Parking


Ground cover
River
Parking
Path



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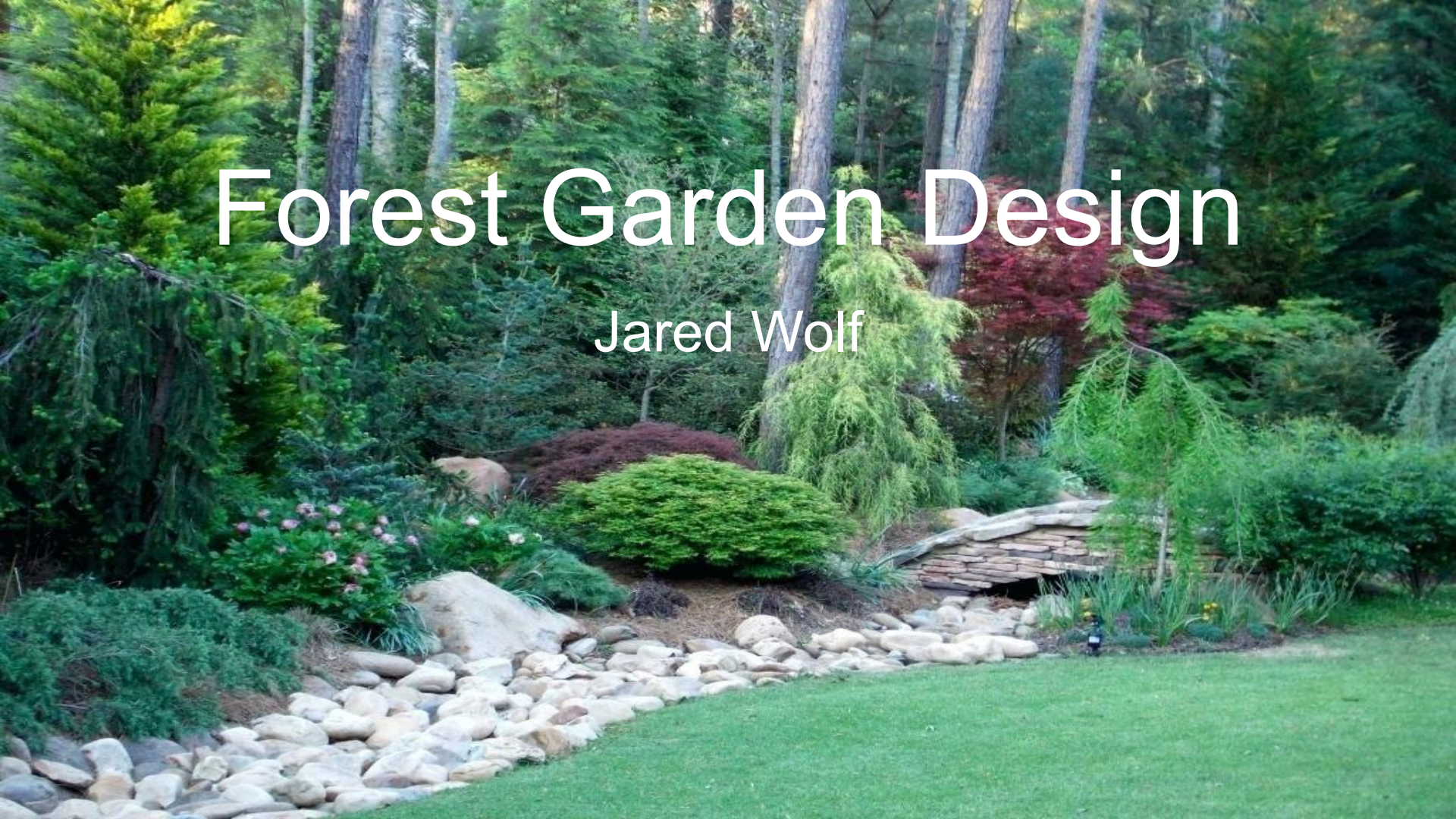
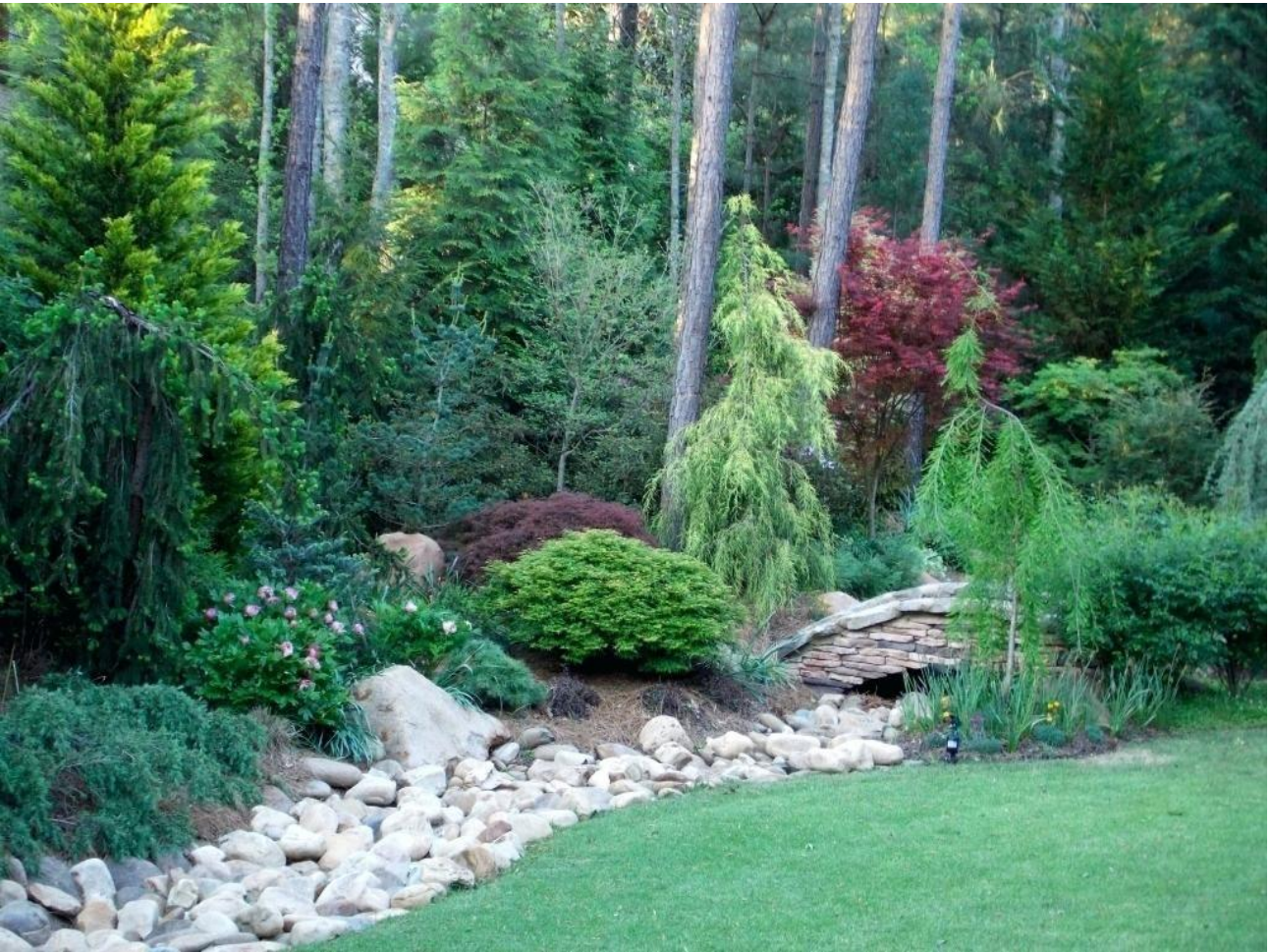


Forest Garden Design

Jared Wolf

Canopy Trees will contain Douglas Fir



The average height of a Douglas fir is around 200 feet in height. It's a long lasting durable conifer that is strong. It's resistant to weather elements. It's wood is also resistant to fungi, and any insect intruders. It provides great canopy, but also air circulation for smaller shrubs to get their sunlight in terms of a forest garden underneath.

http://www.musterkiste.com/en/holz/pro/1028_Douglas-fir.html

Image Source→ https://www.pinterest.es/pin/206602701640857962/

Medium Sized Garden Trees and Shrubs

Blue Spruce→ Will be planted as a lower lying tree, and will be a shorter evergreen for additional forest cover for my garden. **Size Medium tree** (25-40 feet). **Width:** 10-20 feet. **Light Exposure:** Full sun (6 hrs direct light daily), Partial sun/shade (4-6 hrs light daily). It likes soils that are moist and drain water well. It keeps it's needles yearound.

Arborvitae (Pyramidal Form) → A type of evergreen shrub or brush that's normaly used in landscapes, commonly used as a hedge for privacy. Medium tree (25-40 feet), Small tree (15-25 feet), Compact tree (10-15 feet), Medium shrub (5-8 feet), Small shrub (3-5 feet), Low-growing shrub (under 3 feet. Some of the yellow plants are **Cypress brush** which is lower lying evergreen shrub tolerant to the cold. It has soft fern-like needles, and many of them grow in a pyramid shape. These shrubs exist between 3-5 feet. **Light Exposure**: Needs a minimum of 6 hours of sunlight daily. Uses moist and soil that drains well.

Shrubs & Bushes

Arborvitae (Pyramidal Form), False Cypress, Juniper brush, spruce bush, blue spruce brush on right. Boxwood is another that will be implemented into the design.

Azalea are the pink flowers shown at the bottom. They grow in the early spring with colors such as pink, peach, coral, purple, or white. They're typically best planted on a hedge. It's an evegreen shrub that's not a deciduous, and will maintain it's flowers yearound.

- Small Azalea shrub (3-5 ft).
- Low growing shrub(under 3 feet).
- Azalea blooms its flowers mid-spring, late spring, and early summer.
- Grows in moist and well drained soils.

Boxwood

Tiny rounded leaves that keep their dark green color through the coldest dark months, make boxwood a great plant for landscapes, and most are used for a hedge, ball form, or it will grow on a more natural landscape. Maintains its foliage yearound, small shrub is usually 3-5 ft while a low growing shrub grows under 3 feet. Minimum light exposure is at least 6 hours of light, or partial sun/shade from around 4-6 hours daily.

Rhododendron

This flower has grows with dark green but shiny leaves, and grows flowers that are brilliant purples, pale pinks and snowy whites pop up. They once only grew in warm climates but they've now also became cold tolerant. They prefer a lot of shade, but are a nice hedge flower. It falls under the category of an evergreen flower shrub. **Landscape Uses:**

- Foundation,
- Border
- Patio, backyard or sidewalk,

Size Range:

- Medium shrub (5-8 feet),
- Small shrub (3-5 feet)

Light Exposure:

- Partial sun/shade (4-6 hrs sun daily),
- Full shade (4 hrs or less of light daily)

Soil Preference:

- Acid soil,
- Moist, well-drained soil.

Season of Interest:

- Mid spring,
- Late spring

Flower Color & Fragrance:

- Pink

Shape or Form:

- Mounded

Growth Rate:

- Fast

Porcelain Vine

- Exists in the grape family.

Soil Preference: Flexible with either two conditions below

- Dry soil,
- Moist, well-drained soil

- Usually grows in late summer and early fall.
- Growth rate is rather fast.
- Size is more than 24 inches, and a single vine can grow out to 25 feet long. Full sun is best for fruit production, so I would pick the sweet spot in my garden where it would get the maximum sunlight for best growing grapes.

Moist, well drained soil

Evergreens, conifer trees, bushes, shrubs, and all flowers chosen live best under moist, and well draining soil conditions. A bucket full or two of compost mixed well into the soil helps the soil retain moisture while also having enough air circulation to drain excessive amounts of water back into the soil.

Rooting and groundcover plants

Plant Type→ Groundcover. Low growing flower under 6 inches.

Soil Preference: Acid soil, Alkaline soil, Moist, well-drained soil.

Tolerances: Occasional drought, Alkaline soil.
Seasons: Survives yearound.

Flower Color & Blue,

- Purple,
- White

Growth Speed→ Moderate-Fast

How all plants co exist in final garden design

All of my layers including canopy trees, medium sized trees, shrubs, flowers, groundcover species all survive in the same soil conditions which are moist, but well drained. Anywhere evergrens, firs, and other conifer pines survive my flowers and shrubs will sruvive in that same ecosystem as well. Most of the shrubs flower species can be found in the Northern Teir of the continental US. My grapevne plants will grow on the outer edge of my garden where they'll recieve the most sunlight

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Title Image Source→ https://www.pinterest.es/pin/206602701640857962/

Ponderosa Pine Polyculture

Jared Wolf

Sage Brush

Wax Currant

About Sage Brush

The type of sage bush shown normally grows together with Ponderosa ecosystems throughout all parts of the western states. Absorbs water up to about 13 feet of depth. These shrubs let off a crisp smell on warm summer days, and lets off pungent odors after a rainstorm. Sage brushes have several roots at ground surface for absorbing monsoon rainwater. The plant produces grey, wideshaped leaves that are divided in 3 lobes near the top. This is why they grow most naturally under ponderosa ecosystems.

Wax Currant

Scientific Name is Ribes Cerum. Its a highly adaptable shrub species that grows everywhere from canyons to dry hillsides, and woodlands. These plants can differ in size and shape depending where they grow. Important food source for many birds and animals. Doesn’t need a lot of water. Requires sun, partial shade. Soil moisture is dry. Normally grows 3-5 feet tall. Gets it’s water from monsoon rainstorms. Background shows them growing in a ponderosa forestland. Wax currant is found on warm, dry soils from the sagebrush desert to the edges of arid forests, and well up to subalpine ridges

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“Sagebrush and Pine Plant Database.” Lady Bird Johnson Wildflower Center - The University of Texas at Austin, www.wildflower.org/plants/result.php?id_plant=RICE.

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https://www.flickr.com/photos/forestservicenw/36951204461→ Image Source

http://science.halleyhosting.com/nature/basin/5petal/gooseber/wax.htm

Seaberry (mare Lycium)

Also known as sea buckthorn. Deciduous shrub

Scientific Classification:
Kingdom: Plantae
Order: Rosales
Family: Elaeagnaceae
Genus: *Hippophae*
Type species: *Hippophae rhamnoides*

History:

- Wide native range in the temperate and subarctic regions of the Northern Hemisphere with the exception of North America. Naturalized in Canada in the 1930s.
- The berries produced are rich in vitamin C and have been used as a general health restorative back to the time of Alexander the Great.
- Russian has made sauce, jams, wine, tea, candy, and ice cream from the berry. Russia called the fruit “Siberian pineapple”.
- The Chinses added the leaves, bark and the berries to more than 200 food and medicinal products to treat ulcers, eye, and heart problems.

Needs:

- Hardiness zone 2 through 9
- Need at least one male and female flower for fruit
- Plant 6 to 8 feet apart in rows or 3 feet apart as a hedge
- Plant in spring in full sun
- Grow in most soils. Sand or gravel. Tolerate seashore and road salt
- Does best in well-drained soil
- Soil pH between 5.5 to 7.5
- Apply a thick organic mulch each spring for nutrition and root protection
- Need a little pruning in fall after harvesting

Characteristics:

- Fruits are bright yellow-orange to red. Tart taste
- Berries ripen in late summer
- Leaves are green-gray color
- Thorns on plant
- When mature reaches 6 to 18 feet in height
- Large, strong, and shallow root system
- Withstand drought well
- Male and female flowers grow on separate plants. Can be pollinated by wind
- Male is identified by its larger flower
- Resist most diseases and insects
- Long-term life span
- Hardy plant, able to withstand temperature as low as -45°F

Production:

- Fruit, high in vitamin C and omega fatty acid
- 30 to 50 pounds of fruit per shrub annually
- Fruit is produced 2-3 years after planting
- Make jam and juice from the fruit
- Makes excellent hedges and wildlife habitats
- Provides shelter for small animals and birds
- Nitrogen fixing
- Prevents erosion

Male flower

Female flower

Pest:

- Japanese’s beetles

Sources:

https://garden.org/learn/articles/view/697/

http://uncommonfruit.cias.wisc.edu/seaberry-sea-buckthorn/

Chantell Aubut
Steve Whitman
Introduction to Permaculture
26 March 2020

Forest Garden

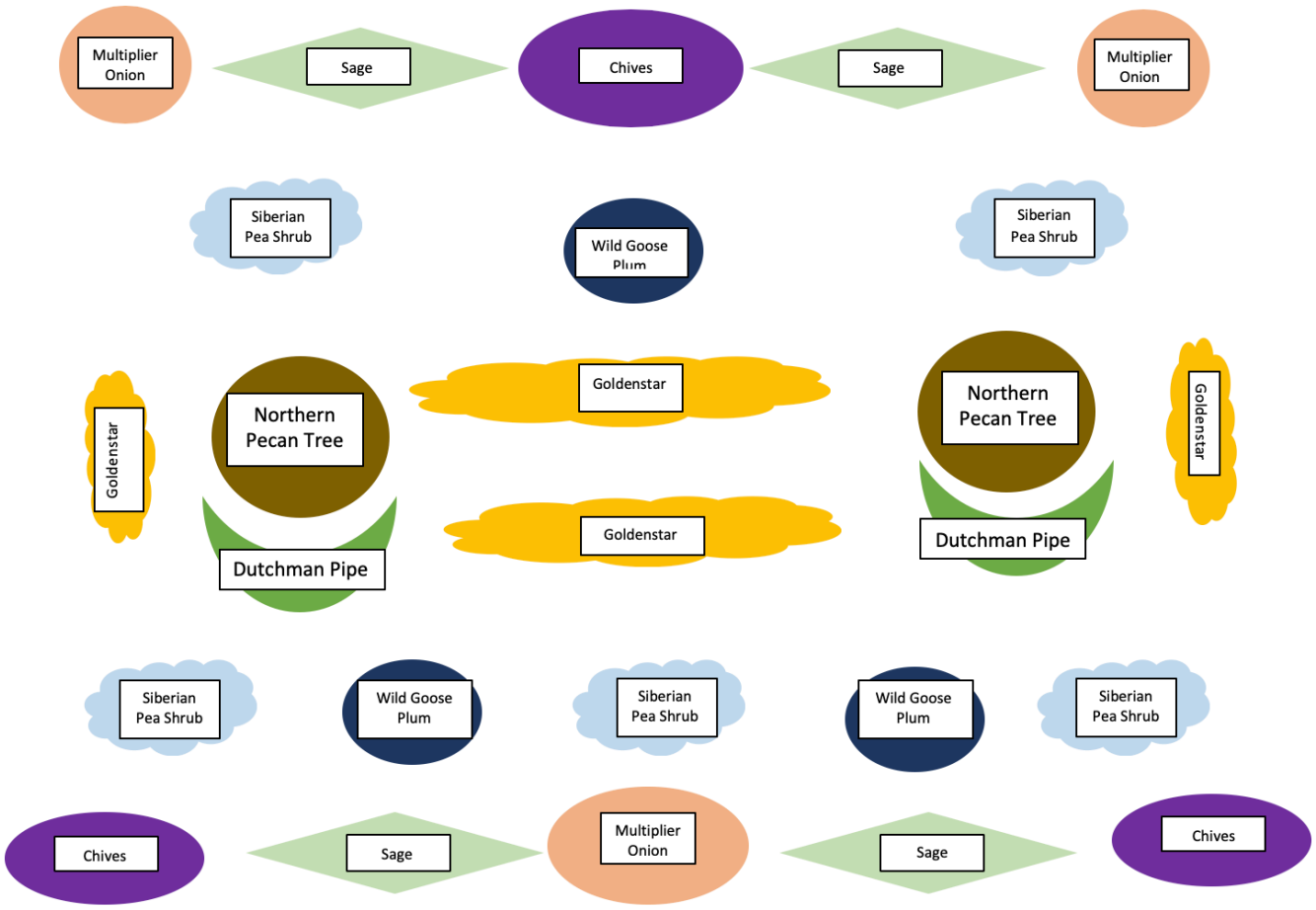
Below I have provided the lay out for my forest garden, and a niche analysis for each plant I incorporated. Many of the plants I chose to incorporate can be successfully grown in hardiness zones 5-6, in need of mostly direct sunlight, and adverse in types of soils to thrive in. For the canopy layer I used a Northern Pecan tree due to its large size, large canopy coverage and production of pecans. I used two Northern Pecan trees because in order for pollination to occur there needs to be at least two or more of the trees in a given area. I did not want to add any more than two trees due to their large canopy coverage, many of the other plants I used need to have full sun exposure.

For the small tree and shrub layer I chose to use a Wild Goose Plum and a Siberian Pea Shrub. I used the Wild Goose Plum plant for the production of plums, this can be a food source for birds and other wild life, and this plant also attracts and provides nectar for nectar loving insects and pollinators. The Siberian Pea Shrub is an important piece to my forest garden since it is a nitrogen fixing plant, as well as attracts pollinators. I chose to place them in five separate locations in my forest garden, mainly near plants (Multiplier Onion) that especially need the nitrogen rich soil.

The plants I chose to use in the herbs and low ground cover layer consist of Sage, Chives, and Goldenstar. Sage was used for its medicinal properties, attraction to pollinators, and the fact that it is not susceptible to many pests. Chives were used because it confuses pests, attraction of butterflies and pollinators, and it can be used as a food source. Lastly Golden star was used as the ground cover in my forest garden because it provides nitrogen in the soil, attracts pollinators, and can be edible. I placed the Goldenstar near the Northern Pecan tree because this plant is tolerant to shaded areas.

For the root layer I used the Multiplier Onion. This plant can be used as an insect repellant and a food source. The food source is abundant due to the multiple bulbs grown at a given time. This plant is tolerant to some frost, which can be helpful in a climate where frost is more likely to happen later in the year, such as NH. As I mentioned earlier I placed this plant next to the Siberian Pea Shrub due to its need of nitrogen rich soil that the Siberian Pea Shrub will provide.

The final layer is vining, and for this layer I chose to use the Dutchman’s Pipe. This plant can handle both full sunlight exposure and shaded areas. Due to its tolerance to shaded areas I placed it next to the Northern Pecan tree. Due to its close proximity to the Northern Pecan tree the Dutchman’s Pipe will have a perfect structure to climb and vine around. This Dutchman’s Pipe is also a host to Pipevine Swallowtail. Lastly the Dutchman’s Pipe is also known for working compost into the ground to give the soil more fertility.


Multiplier Onion
Sage
Chives
Sage
Multiplier Onion
Siberian Pea Shrub
Wild Goose Plum
Siberian Pea Shrub
Goldenstar
Northern Pecan Tree
Goldenstar
Goldenstar
Northern Pecan Tree
Goldenstar
Dutchman Pipe
Dutchman Pipe
Siberian Pea Shrub
Wild Goose Plum
Siberian Pea Shrub
Wild Goose Plum
Siberian Pea Shrub
Chives
Sage
Multiplier Onion
Sage
Chives

I. Canopy

Northern Pecan (Carya illinoinensis)

Needs:

- Full sunlight, at least 6 hours of direct, unfiltered sunlight each day
- Can grow in soils that are acidic, alkaline, loamy, moist, rich, sandy, silty loam, well-drained, wet and clay soils
- Hardiness zone: 6

Provides:

- Nuts provide a food source for humans, squirrels, deer, raccoons, foxes, wild turkeys, wood ducks, crows, blue jays and several bird species
- Good source of protein and unsaturated fats

Intrinsic Values:

- Compound leaves that are up to 20” in length and consist of 9-17 spearhead-shaped leaflets that are 4-8” long. Leaflets are slightly toothed.
- Should be planted in multiples to ensure pollination
- Lifespan is 300 years
- Oval or rounded wide spreading crowns of branches that extend far down the trunk
- Pyramidal crowns
- Deep taproot, difficult to transplant
- Grows at a medium rate, height increases 13-24” per year
- Can grow to a height of 7-100’ and spread of 40-75’ at maturity
- Bears nuts within 6-10 years after planting
- Single, straight trunk

Sources:

“PecanCarya Illinoinensis.” *Pecan Tree on the Tree Guide at Arborday.org*, www.arborday.org/trees/treeguide/treedetail.cfm?itemID=897.

II. Small Tree & Shrub

Wild Goose Plum (Prunus munsoniana)

Needs:

- Full sunlight
- Medium water use
- Dry soil
- Soil can be limestone-based, sandy, sandy loam, medium loam, clay loam, clay

Provides:

- Nectar for bees, butterflies and other nectar-insects
- Food source for some mammals
- Food source for birds
- Leaves can be used to produce dyes ranging from green to dark grey

Intrinsic Values:

- Seeds found inside the fruit contain a poisonous substance and should never be eaten
- Perennial
- Red fruit
- Can grow up to 12-36’
- Thicket forming shrub
- Leaves alternately arranged along stems
- Leaf shape is elliptic and ovate, 5-6 centimeters
- Flowers usually blossom around March to April

Sources:

“Plant Database.” *Lady Bird Johnson Wildflower Center - The University of Texas at Austin*, www.wildflower.org/plants/result.php?id_plant=PRMU.

“Wild Goose Plum) (Prunus Munsoniana).” *INaturalist*, www.inaturalist.org/taxa/167467-Prunus-munsoniana.

Siberian Pea Shrub (Caragana arborescens)

Needs:

- Well drained soils
- Prefers full sunlight, but can tolerate some shade
- Pollination by bees
- Continental climate
- Hardiness zone 2-7

Provides:

- Nitrogen in the soil, soil improving plant
- Food source for humans and animals
- Medicinal properties for breast cancer, orifice of the womb, and other gynecological problems
- Soil stabilization
- Can be used to create a blue dye obtained from the leaves
- Can be used for erosion control

Intrinsic Values:

- Can grow 10-15’ tall
- Leaves are alternate
- Leaves are 3-5” long, each leaf is composed of 8-12 ova leaflets
- Yellow flowers bloom in early spring with fruit pods containing many seeds
- Both seeds and seed pods are edible
- Very tolerant of infertile soils, cold temperatures and drought conditions
- Tolerant of alkaline soils and deicing salt
- Can adapt to poor sites
- Requires little maintenance
- Medium to fast growing perennial shrub
- Not frost tender
- Noted for attracting wildlife
- Has an extensive root system

Sources:

“Plant Guide.” *USDA Natural Resources Conservation Service*, plants.usda.gov/plantguide/pdf/pg_caar18.pdf.

Lam. “Caragana Arborescent-Lam.” *Pfaf Plant Search*, pfaf.org/user/plant.aspx?LatinName=Caragana%2Barborescens.

III. Herbs & Low Ground Cover

Sage (Salvia officinalis)

Needs:

- Full sunlight exposure
- Well-draining soil, either sandy or loamy
- Soil that is between 60 and 70 degrees Fahrenheit for best growth results
- pH between 6 and 7 for best results
- Plants should be at least 2’ apart

Provides:

- Culinary purposes
- Medicinal properties include improvement of memory and stomach ailments
- Attracts pollinators

Intrinsic Values:

- Can grow to be between 12 and 30 inches in height
- Velvet-soft greyish green leaves
- Easy to grow
- Does not tolerate summer humidity and heat well
- Drought tolerant
- Not susceptible to many pests
- When planted in hardiness zones 5-8 it is a perennial plant

Sources:

Old Farmer's Almanac. “Sage.” *Old Farmer's Almanac*, www.almanac.com/plant/sage.

“Growing Sage: Your Guide to Planting & Growing a Sage Plant.” *Gilmour*, 18 July 2019, gilmour.com/growing-sage.

Chives (Allium schoenoprasum)

Needs:

- Hardiness zone 5
- Full sunlight
- Fertile, well-drained soils
- Average water needs

Provides:

- Pest confuser
- Attraction to butterflies
- Attraction to pollinators
- Food source for humans and other animals

Intrinsic Values:

- Drought tolerant
- Easily grown
- They will self-seed
- Grows 1-2’ in height
- 1-2’ in spread
- Blooms in late spring to early summer
- Grows in dense clumps of slender bulbs
- Each bulb producing hollow tubular leaves
- Leaves are 8-20 inches long
- Has globe-shaped inflorescences, these are composed of many individual florets (10-30 individual flowers in one globe)
- Each flower has six petals

Sources:

“Allium Schoenoprasum (Chives).” *Gardenia.net*, www.gardenia.net/plant/allium-schoenoprasum-chives.

Susan.mahr. “Chives, Allium Schoenoprasum.” *Master Gardener Program*, 22 Dec. 2015, wimastergardener.org/article/chives-allium-schoenoprasum/.

Goldenstar (Chrysogonum virginianum)

Needs:

- At least half a day of sunlight
- Can tolerate most types of soil
- Regular watering
- Well-draining soil
- Hardiness zone 5

Provides:

- Excellent ground cover
- Nectar for pollinators

Intrinsic Values:

- 1” star shaped flowers
- Blooms are done it great numbers during the early spring
- Leaves are oblong or ovate and 1-3” long
- Grows about 5” tall with a 12” spread
- Can tolerate drought
- Resistant to pests

Sources:

“Goldenstar.” *Shop Monrovia*, www.monrovia.com/plant-catalog/plants/139/goldenstar/.

(www.clarity-connect.com), Clarity Connect. “New Moon Nurseries.” *Chrysogonum Virginianum Golden Star from New Moon Nurseries*, www.newmoonnursery.com/plant/Chrysogonum-virginianum-Superstar.

IV. Root Layer

Multiplier Onion (Allium cepa aggregatum)

Needs:

- Hardiness zone 5
- Full sunlight exposure
- Regular watering
- Loose, fertile and high in nitrogen soil

Provides:

- Food source
- Insect repellent

Intrinsic Values:

- Each plant produces 7-9 bulbs that will be about 2” across
- Takes around 2-3 months to produce a decent sized bulb
- Can tolerate some frost
- Top growth happens in the fall, will be winter-killed but will resume in the spring
- Ready to harvest by late June or early July

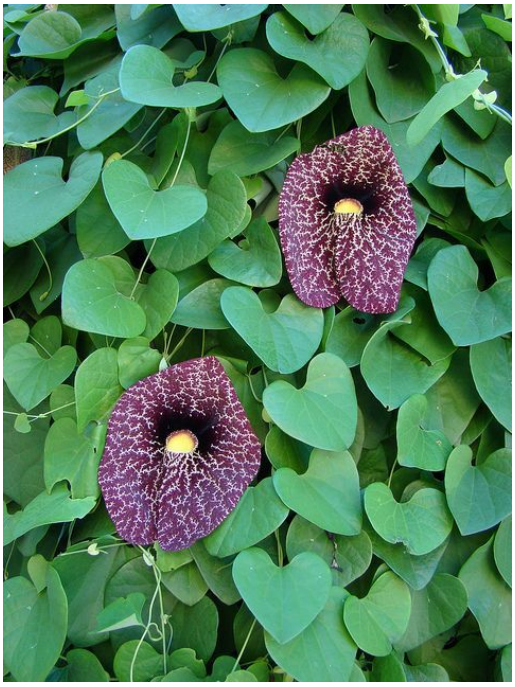
Sources:

“How to Grow Multiplier Onions.” *How to Grow Multiplier Onions | Backyard Gardening Blog*, www.gardeningblog.net/how-to-grow/multiplier-onions/.

Klein, Susan, et al. “Potato Onion - A Multiplier Onion.” *Tending My Garden*, 20 Aug. 2019, tendingmygarden.com/potato-onion-a-multiplier-onion/.

V. Vining

Dutchman's Pipe (Aristolochia macrophylla)



Needs:

- Hardiness zone 5
- Can handle full sun to partial shade
- Well-draining soil
- Medium water usage

Provides:

- Shade
- Attractions for butterflies
- Works compost into the soil to promote fertility
- Larval host to Pipevine Swallowtail

Intrinsic Values:

- Climbing vine
- Vigorous grower
- Grows to a height of 20-30' tall
- Large heart-shaped leaves
- Flowers occur singly or in 2-3 per cluster
- Tap root type
- Blooms May-June
- Bloom color is green, purple and brown

Sources:

Beaulieu, David. "Put This in Your Pipe and Smoke It!" *The Spruce*, The Spruce, 18 Oct. 2019, www.thespruce.com/why-you-should-grow-dutchmans-pipe-vines-2132889.

"Plant Database." *Lady Bird Johnson Wildflower Center - The University of Texas at Austin*, www.wildflower.org/plants/result.php?id_plant=arma7.

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Niche Analysis #3

Image Source→

https://www.gardeningknowhow.com/ornamental/flowers/salvia/purple-sage-planting.htm

Purple Sage Bush
Latin Name: Salvia Dorrii
Needs→ Requires sandy Soil, requires full sun. It only needs less than 10" of rain. Needs 1"-2 layer of mulch required for this plant to be successful. Needs trimming occasionally. Doesn't need fertilizer. Plant it where the soil is fast draining and rocky, sandy or loamy in texture.
Provides→ Habitat for butterflies, attracts hummingbirds, the bloom type is late spring to late summer. It's a fast growing, heavy bloomer that's best suited to the hottest, most challenging planting sites. This small growing shrub has leaves that are both beautiful and resistant to browsing mammals. This is an excellent companion plant for late spring blooming.
Intrinsic Values→ Grows in states such as Utah and Nevada. The flower colors are generally blue and purple. The bloom time is late spring to late summer. It can be shipped as a potted plant, and its growth height in a pot is 2.5". It grows with multiple stems. Purple sages have tolerances for droughts, dry conditions, and they're fire resistant.

Works Cited

"Desert Purple Salvia." *High Country Gardens*, www.highcountrygardens.com/perennial-plants/salvia/salvia-dorrii-desert-purple-sage.

"Conservation Plant Characteristics for ScientificName (CommonName): USDA PLANTS." *Conservation Plant Characteristics for ScientificName (CommonName) | USDA PLANTS*, https://plants.usda.gov/java/charProfile?symbol=SADO4