



FLAGSTAFF ECORANCH



PERMACULTURE DESIGN

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What is Permaculture?

Permaculture

Permaculture is a design system based on ethics and design principles that can be used to create healthy sustainable compositions. According to the founders of permaculture, Bill Mollison and David Holmgren, landscape permaculture is "Consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for provision of local needs."



Permaculture Landscapes Benefits

- Energy Conservation
- Recycling of Wastes
- Conservation of Water & Replenishment of Ground Waters
- Fire Protection
- Food Production
- Soil Fertility Restoration
- Integrated Pest Management
- Natural Weed Control
- Erosion Control
- Healthy Landscapes
(no harmful chemicals used)



Permaculture Flower

The permaculture journey begins with the Ethics and Design Principles and moves through the key domains required to create a sustainable culture. The spiral evolutionary path joins together these domains, initially at a personal and local level, and then proceeding to the collective and global level.

Some of the specific fields, design systems and solutions that have been associated with the wider view of permaculture are listed below.

Land and Nature Stewardship

Bio-intensive gardening | Forest gardening | Seed saving | Organic agriculture | Biodynamics | Natural Farming | Keyline water harvesting | Holistic Rangeland Management | Natural Sequence Farming | Agroforestry | Nature-based forestry | Integrated aquaculture | Wild harvesting & hunting | Gleaning

Building

Passive solar design | Natural construction materials | Water harvesting and Water Reuse | Biotechure | Earth sheltered construction | Natural disaster resistant construction | Owner building | Pattern Language

Tools and Technology

Reuse & creative recycling | Hand Tools | Bicycles and electric bikes | Efficient & low pollution wood stoves | Fuels from organic wastes | Wood Gasification | Bio-char from forest wastes | Co-generation | Micro-hydro & small scale wind | Grid-tied renewable power generation | Energy Storage | Transition engineering

Education and Culture

Home Schooling | Waldorf education | Participatory arts and music | Social ecology | Action Research | Transition culture

Health and Spiritual Well-Being

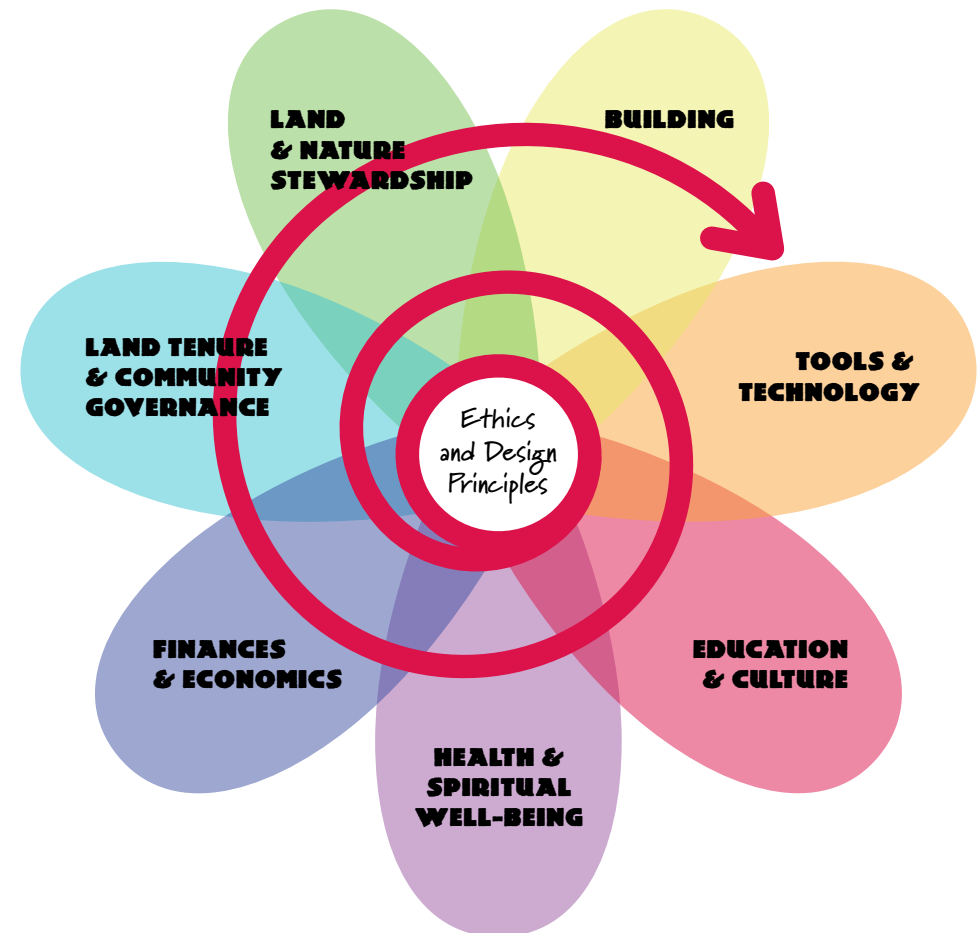
Home birth & Breast feeding | Complementary & Wholistic Medicine | Yoga, Tai Chi & other body/mind/spirit disciplines | Spirit of place, indigenous cultural revival | Dying with dignity

Finances and Economics

Local and regional currencies | Carpooling, Ride sharing & Car share | Ethical Investment & Fair Trade | Farmers markets & Community Supported Agriculture (CSA) | WWOOFing & similar networks | Tradable Energy Quotes | Life Cycle Analysis & Energy Accounting

Land Tenure and Community Governance

Cooperatives & Body Corporates | Cohousing & Ecovillages | Native Title and traditional use rights | Open Space Technology & Consensus Decision Making



Permaculture Mission Statement for Flagstaff EcoRanch

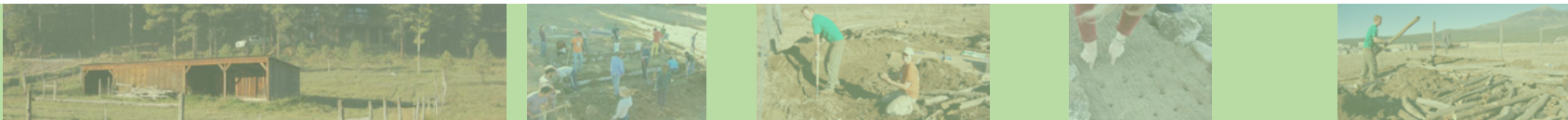
To create an outdoor classroom...

In a way that generates an engaging and memorable experience...

So that students are reconnected to their environment

Goals For The Landscape

- 1) To harvest and utilize annual precipitation to selfwater the gardens and help recharge the aquifer.
- 2) To create natural windbreaks to protect the ranch animals and gardens.
- 3) To reduce winter snow drifts on the driveway while harvesting snow in planting areas to minimize the need for irrigation.
- 4) To create a landscape that is beautiful, self sufficient, and educational planting aesthetic waterwise species and gardens that serve as productive educational opportunities.
- 5) To create a landscape that will provide products kale, honey, salad greens, eggs, etc. for EcoRanch useage and also serve as additional sources of revenue.
- 6) To create a landscape that utilizes natural methods to deter pests and vermin from damaging the landscape.



Analysis & Observation Mapping

In order to implement the most appropriate plants into the landscape, researching the area and environmental factors is key. The following maps outline the analysis and observation:

Zone Map

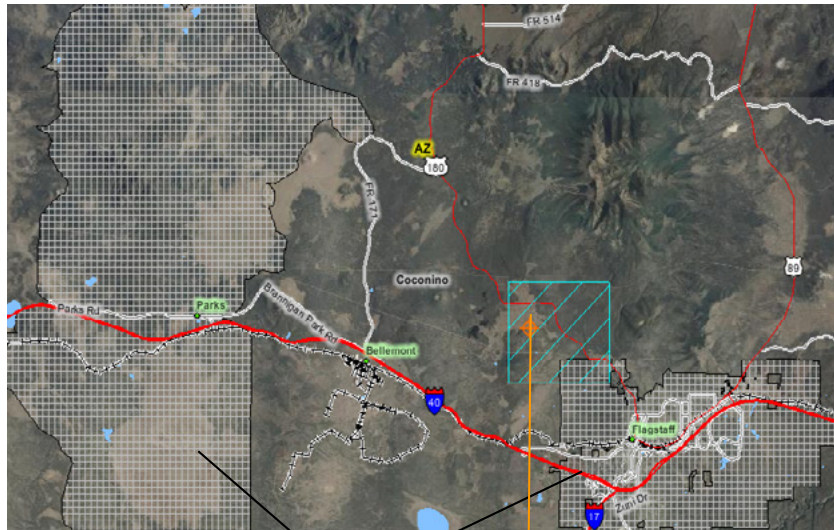
This map illustrates the different levels of usage of the property.

Zone 1 High Traffic Area	Zone 2 Visited a Few Times Per Week, Social Gathering Area, Visually Important	Zone 3 Minimal Foot Traffic	Zone 4 Rarely Visited, Visually Important	Zone 5 Never Visited, Unutilized Area, Visually Important
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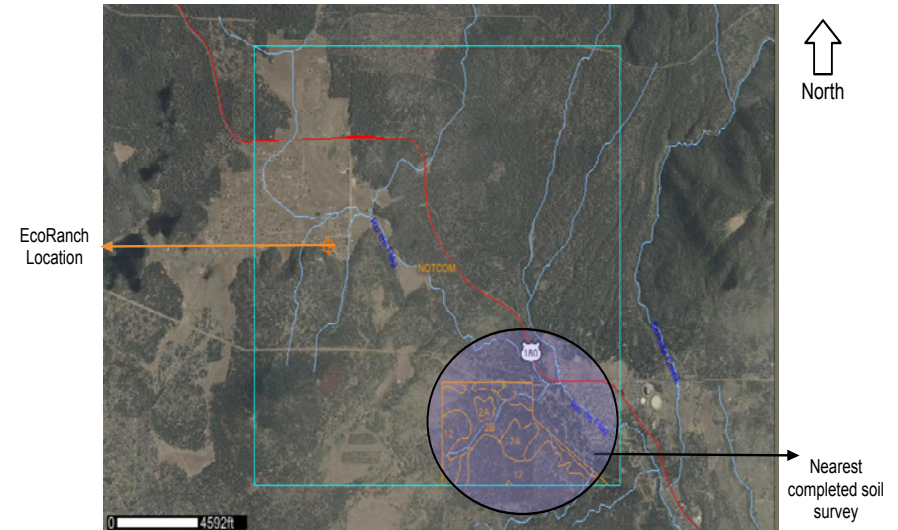
Soil Type & Properties

According to the USDA Web Soil Survey, an official soil survey has not been completed for much of Coconino County which includes the Flagstaff EcoRanch area. Extrapolating from other surveys in nearby I would classify this land to be “stoney, clay, loam” or “stoney, loam.” The Flagstaff area is known to have alkaline soils (usually ranging from 7.5-8).



Surveyed Areas

EcoRanch Location



EcoRanch Location

North

Nearest completed soil survey

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County (AZ693)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Brolliar stony clay loam, 0 to 2 percent slopes	13.5	0.2%
2A	Brolliar stony clay loam, 2 to 8 percent slopes	112.1	1.2%
2B	Brolliar stony clay loam, 8 to 30 percent slopes	218.5	2.4%
7	Tatiyee cobbly loam, 2 to 8 percent slopes	39.8	0.4%
12	Brolliar cobbly clay loam, deep variant, 0 to 5 percent slopes	283.6	3.2%
	NOTCOM Not Complete	8,308.3	92.6%
	Totals for Area of Interest	8,975.4	100.0%

Sector Maps

Sector maps illustrate the different environmental aspects of the property: Wind, Sun, Water, Pests, and Aesthetic Views



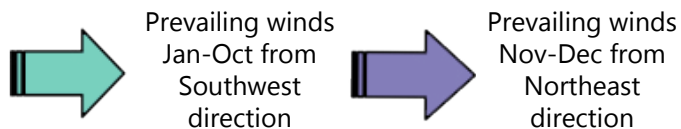
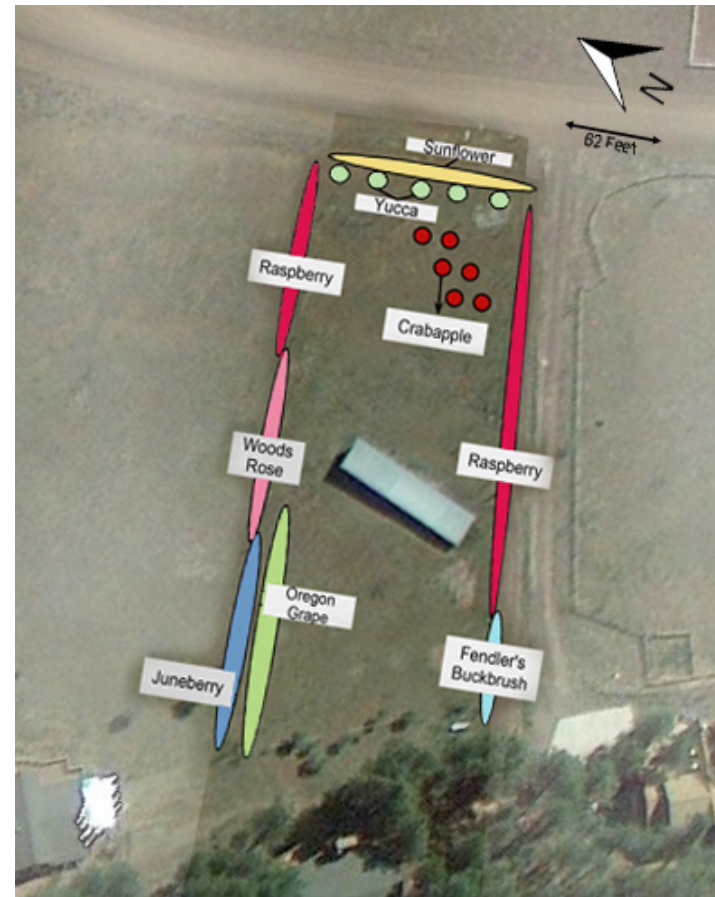
Wind Patterns

The Flagstaff EcoRanch experiences substantial wind year round. During the months of January - October, the prevailing winds come from the southwest direction. The dominant wind direction changes in November and December to blow from the northeasterly direction.

Prevailing Winds Sector Map

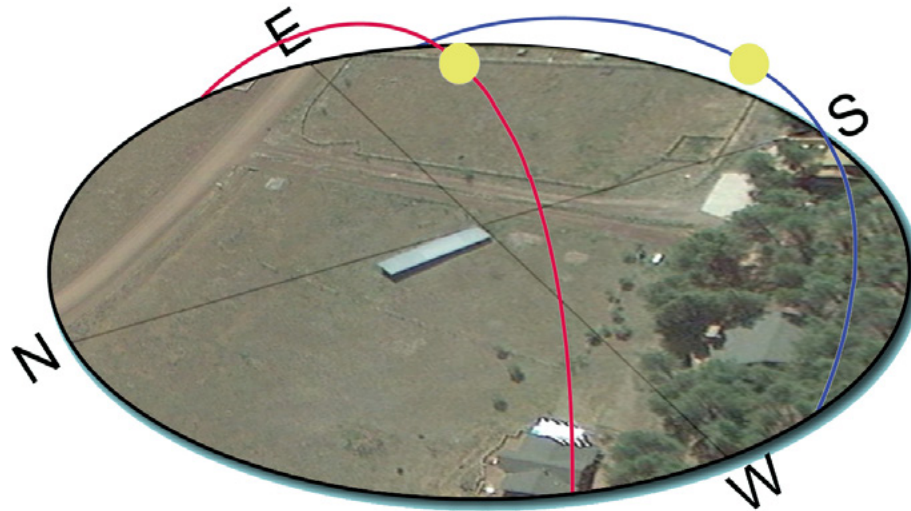


Full Property Windbreaks



Sun Sector Map

The Sun is at its highest position in the sky on the summer solstice, June 21st which provides more intense, direct rays. The Sun is at its lowest position in the sky on the winter solstice, December 21st, which provides less intense, indirect rays. From December to June, the sun moves from the lowest to the highest position in the sky increasing the amount of light every day. From June to December, the sun moves back towards its lowest position in the sky and the amount of light per day decreases.

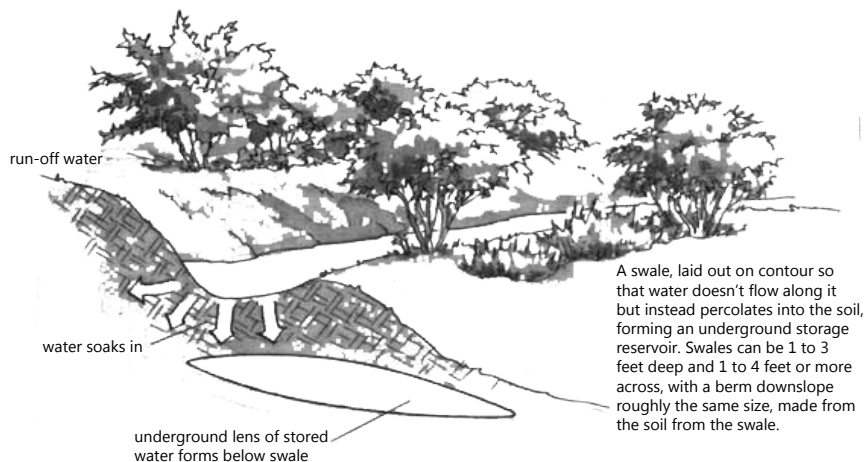


Water Flow

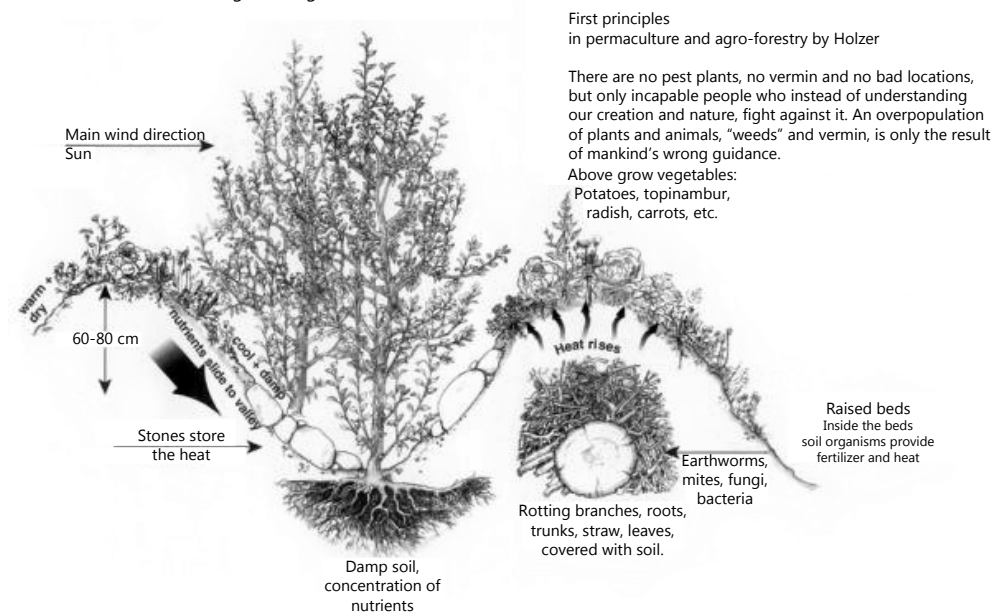
Here in the Southwest, water is a precious and limited resource. It is all of our responsibilities to be conscientious of our water usage and what we can do to utilize it. **Rainwater harvesting** is an excellent way to capture precipitation year round instead of draining from our wells or aquifers. Based on square footage and an average annual rainfall of 20"/yr, the house roof = 2057 ft² and the barn roof = 868 ft², approximately 36,780 gallons of precipitation could be harvested per year.

Swales have been incorporated in the landscape design to slow the movement of water running downhill. Swales trap overland water flow to allow for more precipitation to infiltrate the soil and reduce soil erosion. The swales are built on contour and spaced so the grade over which water is traveling is 1%. A 1% or less slope allows for the best percolation.

The installation of **hugelkulturs** were designed to absorb the water that will be traveling down the property from snowmelt and rain storms. The hugelkulturs are composed of old woody material covered with fall leaves, manure, and soil. They act as a natural sponge, resulting in a raised garden bed that will soak up and retain annual precipitation.



Holzer's methods of gardening and cultivation



Water Sector Map



Fire Sector Map

The fire potential for Flagstaff EcoRanch is very low. To the north of the property, the area consists of open grassland, and the frontage road and driveway act as a barrier if there was a fire event. The main risk for fire comes from the southwest where the property is on the edge of a large section of Ponderosa pine forest owned by the Forest Service. However, it is beneficial that the EcoRanch home is downslope of where a fire event would occur and has a road behind the house which acts as another fire barrier.



Kale Production

The Flagstaff EcoRanch has been given the opportunity by a local business owner, Jonathan Netzky of Local Alternatives, to produce kale for his locally made veggie burger sold in various establishments in the area. The EcoRanch has been asked to grow a minimum of 240 lbs in a season for the veggie burger recipe. Jonathan has currently been growing the kale himself, and was able to grow approximately 650 lbs of kale with a 18'x35' plot. This could be an excellent source of income, publicity, and food for the ranch. The EcoRanch will be able to incorporate this experience into workshops and school programs to discuss the importance of local food networks, collaboration, reducing impacts, maintaining sustainable markets within a community, and the science, history, and culture of agriculture.



Pests & Predators

Pocket Gophers

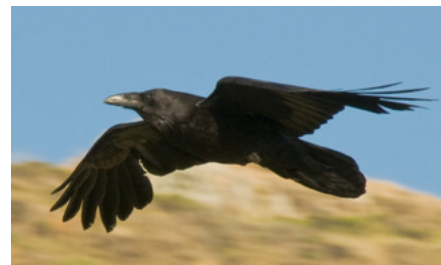
The main foreseen pest problem on the EcoRanch is pocket gophers. There is evidence of them burrowing throughout the property, but concentrated on the lower part of the property. Gophers form mounds as they dig tunnels and push the loose dirt to the surface. One gopher can create several mounds in a day. Pocket gophers live in a burrow system that can cover an area that is 200 to 2,000 square feet. The burrows are about 2.5" to 3.5" in diameter. Feeding burrows usually are 6" to 12" below ground, and the nest and food storage chamber can be as deep as 6ft. Pocket gophers often invade yards and gardens, feeding on many garden crops, ornamental plants, vines, shrubs, and trees. A single gopher moving down a garden row can inflict considerable damage in a very short time. Gophers also gnaw and damage plastic water lines and lawn sprinkler systems. Their tunnels can divert and carry off irrigation water, which leads to soil erosion. For more information on how to combat gophers, please see appendix A.

Raptors and Ravens

There are various raptors and ravens that hunt in the surrounding open fields. There have been no problems thus far with them preying on the chickens, but there could be a potential issue of that occurring. If either of these birds do pose a threat, it is recommended to put netting above the chicken run area with metallic streamers hanging from it. One could make their own net-system by putting stakes around the chicken pen and tying old fishing line or rope around the tops of the posts, and crossing it back and forth to create lines over the entire area about one foot apart.

Elk and Deer

There has been no evidence of deer or elk exploring the property. Neighbors have suggested that it could be a likely problem when gardens are established. Issues arise with elk or deer damage, using row covers or mesh netting over gardens can help protect it from being foraged. Installing a 7-foot fence to keep elk out is also recommended. No plant is completely deer/elk resistant, but there are many plants that deer typically avoid because of the scent or bad taste. Some of these unappetizing perennials include lavender, astilbe, asters, bee balm, coneflowers, yarrow, peonies, catmint, russian sage, lupine, and thyme. Deer/Elk resistant bulbs include Daffodils, iris, hyacinth, and ornamental onions.



Pest Sector Maps



-  Gophers
-  Elk and deer

APPENDIX - Flagstaff EcoRanch Plants



	According to Western Gardening Book: We are Zone 1A	Mild days and chilly night = good bloom for summer perennials: columbine & Shasta Daisies	If snow comes late or melts early, cover plants w/ 5-6" of organic mulch	Can plant warm-season veggies, but need to be SHORT-season varieties	Growing season = Late May - Mid Sept				
	Zone 1A= coldest mountain and intermountain areas	Reliable snow cover for insulation = could grow perennials	Good for Hardy evergreen conifers, tough deciduous trees and shrubs	Better to start from SEEDS					
Seed/Plant Ordered	Plant	Scientific name	Sun Requirement	Water	Flowering	Fruiting	Dimensions	Uses	Other
	Wind Break								
	Rocky mountain maple	<i>Acer glabrum Torr.</i>	Partial Shade and Shade tolerant	Moderate - Regular	Greenish/yellow April-June(-July)	winged nutlets (samaras) August (-September and October)	1.5-2 m Shrub or	wildlife habitat, stabilize slopes, windbreak	best established by transplanting 2-year-old or older stock
	Aspen Sunflower	<i>Helianthella quinque nervis</i>	Full sun	Average	July-Oct		to 4'	Wildlife food, pollinator, windbreak	symbiotic relationship with ants
	Juneberry	<i>Amelanchier utahensis</i>	full sun to partial shade	deep watering 1/month	April-May	ripen in mid summer	can grow to 15'	Wildlife food, pollinator, windbreak, edible, bio accumulator	hardy
	Shrub live Oak	<i>Quercus turbinella</i>	full sun	drought tolerant	Spring		can grow 13'	wildlife habitat, stabilize slopes, windbreak	
	Red Raspberry	<i>Rubus strigosus</i>	Full Sun light shade	moderate - Regular	June July			Wildlife food, pollinator, windbreak, food	
	Flowering Crabapple	<i>Malus sp.</i>	Full Sun, can tolerate light shade	Moderate drought tolerant	April-May		15'-20'		
	Fendler's Buckbrush	<i>Ceanothus fendleri</i>	Full Sun - Partial Shade	Moderate	Early Summer		up to 6' usually less	wildlife food, pollinator, windbreak, can eat red berries	Deer love
	Wood's Rose	<i>Rosa Woodsii</i>	Full Sun - Partial Shade	Moderate	Mid Summer		1.5 6' tall	insectory, wildlife food, windbreak	Wood's rose is fast growing, often forming nearly dense thickets with a rhizomatous, shallow, and fibrous root system.
	Banana Yucca	<i>Yucca baccata</i>	Full Sun	Drought-tolerant	April-July		24 36" H space 4-6'	insectory, hedge	
	Oregon Grape http://www.nativeplantlandseed.com	<i>Mahonia aquifolium</i>	Full Sun	Average	mid spring		36-48"	insectory, deer resistant, medicinal	

Medicinal Plants									
	Pol Marigold	<i>calendula</i>	Full Sun - Partial Shade	Average	Late Spring		18-24" H and spacing	Good companion plant	medicinal purposes such as headaches, toothache, swelling, and strengthening the heart
x	Chamomile, German	<i>Chamomilla recutita</i>	Full Sun - Partial Shade	Average	All Season		6"-12" H, space 6"	Potassium and Calcium Accumulator	white fragrant flowers
x	Echinacea	<i>Echinacea</i>	Full Sun - Partial Shade	Average	Mid Summer - Mid Fall		18-24" H, space 18-24"		
	Common Sage	<i>Salvia officinalis</i>	Full Sun - Light Shade		Late Spring - Mid Summer		12-18" H, space 18"		insectory, aromatic
	Munstead Lavender	<i>Lavandula angustifolia 'Munstead'</i>	Full Sun	Low Water after established	June-Sept		12-18" H 18" Space	insectory, hedge, drought tolerant	hardest of lavenders
	Comfrey	<i>Symphytum officinale</i>	Full Sun - Partial Shade	Low Water after established	Late Spring - Summer		24"-36" H, space 12"	bio accumulator, insectory, drought tolerant,	needs contained area
	Red Clover	<i>Trifolium pratense</i>	Full Sun - Partial Shade	average, drought tolerant	Late Spring - Summer		18" 24" H	insectory, living mulch, N fixer	one of the richest sources of isoflavon
	Arizona Rose, Fendler Rose	<i>Rosa arizonica, Rosa fendleri</i>	Full Sun - Partial Shade	Infrequent Watering When Needed, Water below leaves to reduce fungus	May-July	ripe when hips turn red	4-6" H, space 36"	insectory, hedge, wildlife food, fragrant	http://www.helpmefind.com/rose/pl.php?n=54844
	Banana Yucca	<i>Yucca baccata</i>	Full Sun	Drought-tolerant	April-July		24-36" H space 4-6"	insectory, hedge	
	Lemon Balm	<i>Melissa officinalis</i>	Full Sun	Average, drought tolerant	Mid summer - Early Fall		12"-18" H, space 12"	insectory,	
	Garlic	<i>Allium sativum</i>	Full Sun - Partial Shade	average			12-18" H		
	Witch Hazel	<i>Hamamelis virginiana</i>	Full Sun - Partial Shade	Moderate, don't over water	Mid Fall-Early Winter		8'-10'	Insectory, mulch, The leaf, bark, and twigs are used to make medicine	
	New Mexican Vervain	<i>Verbena macdougalii</i>	Full Sun - Partial Shade	moderate, don't over water	mid summer		2'-3'	insectory, drought tolerant, medicinal	
	Mintleaf Beebalm	<i>Monarda menthaefolia</i>	Sun to Partial Shade	Average	Late Spring-Early Fall		24-36" Space 24-36"	Insectory, attracts butterflies, drought tolerant, fragrant	
	Dianthus	<i>Dianthus barbatus</i>	Full Sun	Average	Early Summer		6-12" H	insectory, tastes like cloves, use for nerve tonics	
x	Borage	<i>Borago officinalis</i>	Full Sun	Average	Early Summer - Early Fall Repeat blooming		12-24"	insectory, fragrant flowers,	Borage is used in companion planting. It is said to protect or nurse legumes, spinach, brassicas, and even strawberries

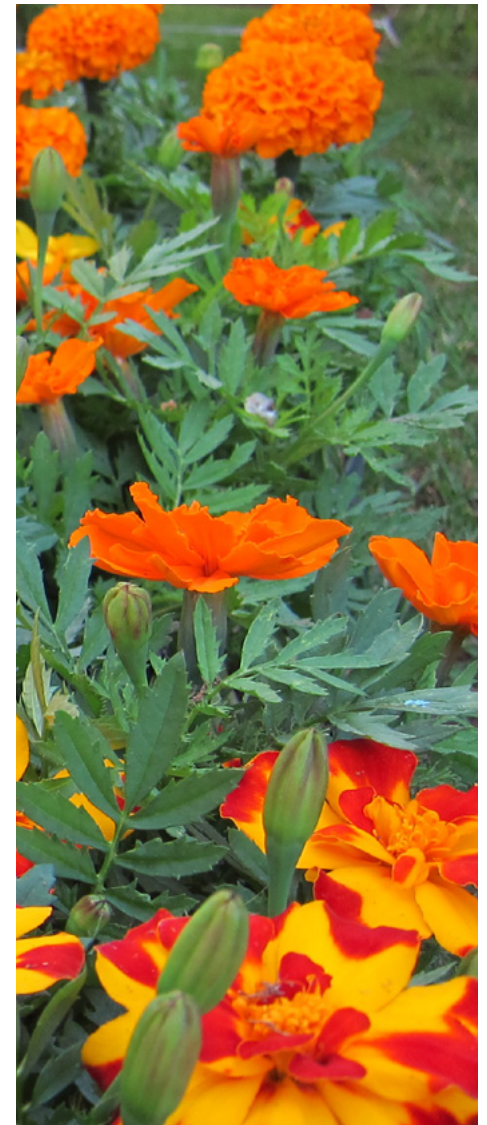


Flagstaff EcoRanch Plants Continued



	Shade Tolerant									
	Dwarf Hemlock 'Lewis'	<i>Tsuga canadensis</i> 'Lewis'	Partial - Full Shade					3-6'	upright form	
	Dwarf Hemlock 'Jeddeloh'	<i>Tsuga canadensis</i> 'Jeddeloh'	Partial - Full Shade	Moderate				3-6'	A widely cultivated lowmounding or nest-like plant. Very striking. Make Jam, jelly, taste like blueberries, can dry like raisins, birds love them, insectory	native american's used for dye
	Utah Serviceberry	<i>Amelanchier utahensis</i>	partial Shade	moderate	April-May			small tree to 15'	good ground cover, insectory, attracts hummingbirds	
	Coral Bells	<i>Huchera sanguinea</i>	Partial - Full Shade	moderate	March-Oct			to 2'	insectory, drought tolerant,	
	Rocky Mountain Columbine	<i>Aquilegia caerulea</i>	Partial - Full Shade	moderate	June July Blue			30"	insectory, drought tolerant,	
	Red Columbine	<i>Aquilegia tritermata</i>	Partial - Full Shade	Moderate	May-Oct			to 1'	insectory, drought tolerant,	
	Yellow Columbine	<i>Aquilegia chrysantha</i>	Partial - Full Shade	moderate	april sept			to 4'	insectory, drought tolerant,	
	Rocky Mountain Clematis	<i>Clematis pseudoalpina</i>	Partial - Full Shade	moderate	Jun- July			Climbing woody vine to 5'		
	Rocky mountain maple	<i>Acer glabrum Torr.</i>	Partial Shade and Shade tolerant	Moderate - Regular	Greenish/yellow April-June(-July)	winged nullets (samaras) August (-September and October)		1.5-2 m Shrub or	wildlife habitat, stabilize slopes, windbreak	best established by transplanting 2-year-old or older stock
Wetland Plants										
	"Wetland should be 12-24" deep w/ pea gravel covered w/mulch or soil	"Cover inlet and outlet pipes w/ 1-3" round gravel"								
	Rocky Mountain Iris	<i>Iris missouriensis</i>	Partial Shade - Full Sun	moist	Late summer			to 3' 18" 24" spacing		Parts of plant are poisonous if ingested. Perennial herb, leaves are used to weave mats, edible rootstocks
	Common Cattail	<i>Typha latifolia</i>	Partial Shade - Full Sun	Very moist	Late summer			Height To 9' 12" -15" spacing to 3' 18" 24" spacing	Elevation to 7,500' so questionable	
	New Mexican Checkermallow	<i>Sidalcea neomexicana</i>	Light shade	moist	Mid Summer				Birds and small mammals eat this plants berries. Deer browse leaves.	A good shade plant with late spring blossoms
	False Solomon's Seal	<i>Smilacina racemosa</i>	Part Shade - Shade	Med. Moist	May July			to 3'		
	Mountain Lobelia	<i>Lobelia anatina</i>	Part Shade - Shade	moist soil but low water useage	July-Oct	deep lavender flower		to 18" 6"-9" spacing		
	Ligularia	<i>Ligularia</i>	Part Shade - Shade	Very high moisture needs; suitable for bogs and water gardens	Mid Summer	orange daisy-like flowers		3-5' high 2-3' wide		can divide rootball to keep planting
	Columbine Meadow Rue	<i>Thalictrum aquilegifolium</i>	Part Shade - Shade	moderate moist	Early - Mid summer	Pink, White, Lavender		2-3' high 12-18" wide	deer and rabbit resistant	

Other Flowers									
	Alpine Poppy	<i>Papaver alpinum</i>	Part Shade- Full Sun	Average	Late Spring-Mid Summer		6-12" Space 6-9"	Insectory, attracts butterflies, drought tolerant	Plant after May 15
	Silverstemp Lupine	<i>Lupinus argenteus</i>	Full Sun	Average	Mid Spring Early Summer		12-36" Space 24-36"	Insectory, attracts butterflies and/or birds. Drought-tolerant	Plant after May 15
	Mintleaf Beebalm	<i>Monarda menthaefolia</i>	Sun to Partial Shade	Average	Late Spring Early Fall		24-36" Space 24-36"	Insectory, attracts butterflies, drought tolerant, fragrant	plant after May 15
	Cosmos	<i>Cosmos parviflorus</i>	Full Sun	Average	Late Spring-Early Fall		to 2.5'	Insectory, attracts butterflies	
Culinary Herbs									
	Common Sage	<i>Salvia officinalis</i>	Full Sun - Light Shade		Late Spring - Mid Summer		12-18" H, space 18"		insectory, aromatic
x	Tarragon	<i>Artemisia dracunculus</i>	Full Sun - Partial Shade	Average, drought tolerant	Mid Fall - Early Winter		18-24" H, Space 18-24"		
	Curly Parsley	<i>Petroselinum crispum</i>	Full Sun - Partial Shade	Average	Blooms repeatedly Late Spring/Early Summer		12-18"H Space 12-15"	insectory, fragrant flowers	Self-sows freely, deadhead if you do not want volunteer seedlings next season
x	Italian Parsley	<i>Petroselinum crispum var. neapolitanum</i>	Full Sun - Partial Shade	Average	Blooms repeatedly Late Winter/Early Spring		18-24"H Space 12-15"	insectory, fragrant flowers	
	Greek Oregano	<i>Origanum vulgare subsp. hirtum</i>	Full Sun	Average	mid summer		18-24" H		
x	Dill	<i>Anethum graveolens</i>	Full Sun	Average	mid summer		24-36" H	insectory	
x	Sweet Italian Basil	<i>Ocimum basilicum</i>	Full Sun	Average	Mid Summer - Late Fall		18-24"		
x	German Thyme	<i>Thymus vulgaris</i>	Full Sun	Average			8-12"		

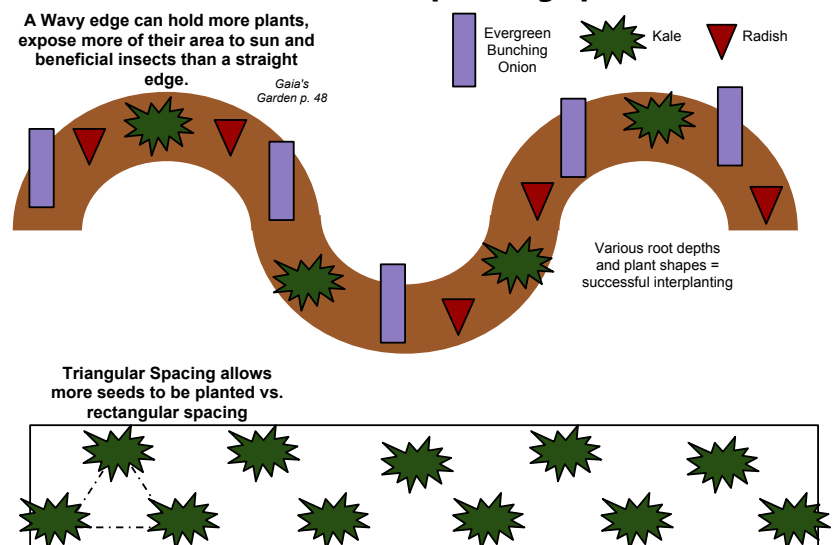


Kale Growing Tips

Kale is a nutrient rich, ultracoldhardy, leafy green that works very well in cool weather gardens. It can tolerate temperatures as low as 20F degrees, but will start to turn bitter and tough in temperatures over 80F degrees. Kale becomes even sweeter and more flavorful if it has been touched by frost. There are various types of kale, such as Scotch Curly kale which is sweet and mild, Dinosaur kale that has tall narrow leaves, Premier kale a fast grower, dark red Redbor kale a magenta-colored, mild flavored variety, and Siberian kale one of the most cold and pest hardy varieties. Jonathan Netzky requested the EcoRanch grow 'Vates,' which is a variety of the Scotch Curled type, and possibly Red Russian, which is a variety of Siberian kale. The Vates variety is a low compact plant with finely curled, bluishgreen leaves. It requires full sun, grows 12-16" high, can spread 12" and takes approximately 55 days to mature. Red Russian kale is much larger than other varieties. The purplish leaves can grow 23" tall, spreads 12," requires full sun, and takes about 60 days to mature. If starting seedlings inside, sow seeds 57 weeks before the last frost day. If directly sowing seeds outside, plant 24 weeks before the last frost or a minimum of 10 weeks prior to the first frost of the season. The soil temperature needs to be at least 40F degrees and kept moist for good germination. Good companion plants for kale are beets, celery, herbs, onions and potatoes. It is not recommended to plant kale near beans, strawberries, or tomatoes. Kale prefers soil that is moist, slightly acidic, but not too rich in nitrogen. Leaves are ready to be picked when they are large enough for raw salad use or when outer leaves are 6-14 inches long for cooking greens. Avoid picking the smallest inner leaves so as not to damage the growth end. Pick early in the day and cool quickly by dunking in cold water.



How to maximize planting space



Lentil Growing Tips

Lentils are a cool season nutrient rich cousin of the bean. They are known to have the highest level of protein of any vegetable next to soybeans. Four to eight plants per person are required to provide enough seed for consumption. There are many varieties of lentils, but the ranch will focus on growing the Black Beluga lentil. If there has not been any legumes or peas previously cultivated in garden bed, then it is important to inoculate seeds with *Rhizobium leguminosarum* just prior to planting to increase growing success. Lentils require full sun, loose, well drained soil, and grow best in a soil pH of 6.0 to 8.0. Seedlings are able to tolerate light frost and are more drought tolerant than other beans. Keep lentils evenly moist, but stop watering when pods have begun to dry. Dried lentils are ready for harvest around 110 days after sowing, but can also be harvested like snap beans while they are still green, which is about 70-80 days after planting. For dried pods leave them unshelled until they are ready to be eaten. Good companion plants are potatoes, summer savory, and cucumbers. Avoid planting with onions or garlic. Lentils need a low trellis or cage to help support tendrils.

Lentil, Potato, and Summer Savory Hugelkultur



Medicinal Plant Catalog



Red Clover



Lemon Balm



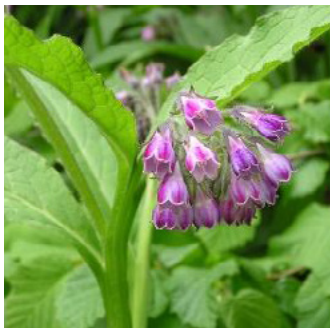
New Mexican Vervain



Chamomile



Mintleaf Beebalm



Comfrey



Munstead Lavender



Rosa fendleri



Pot Marigold



Dianthus



Banana yucca



Echinacea



Arizona Rose



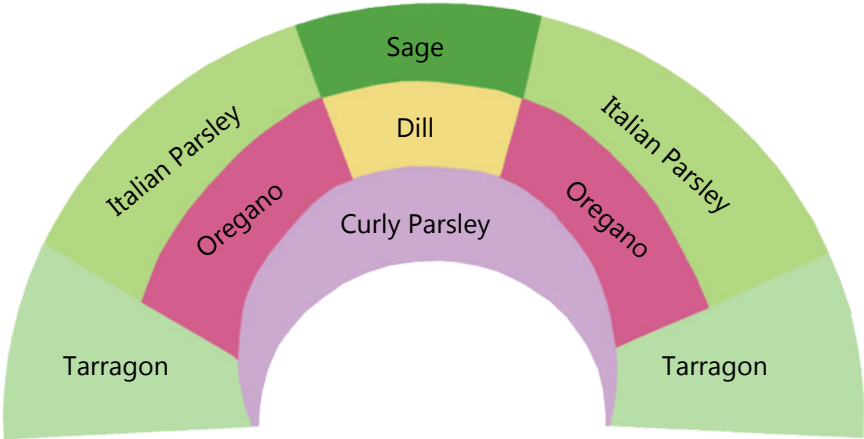
Borage



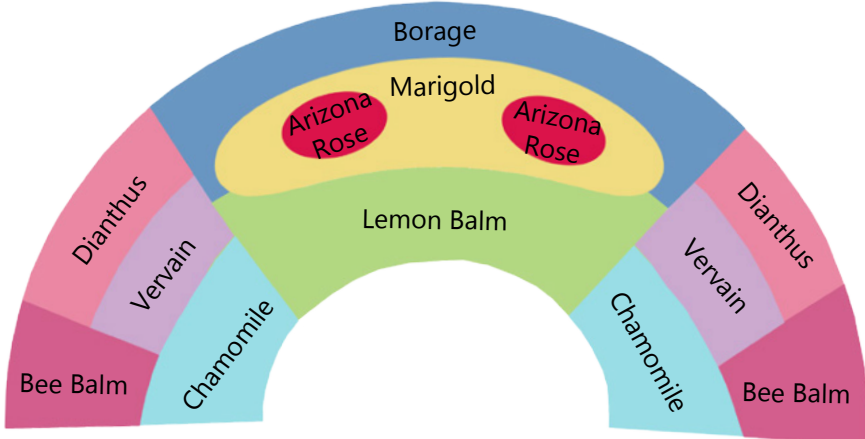
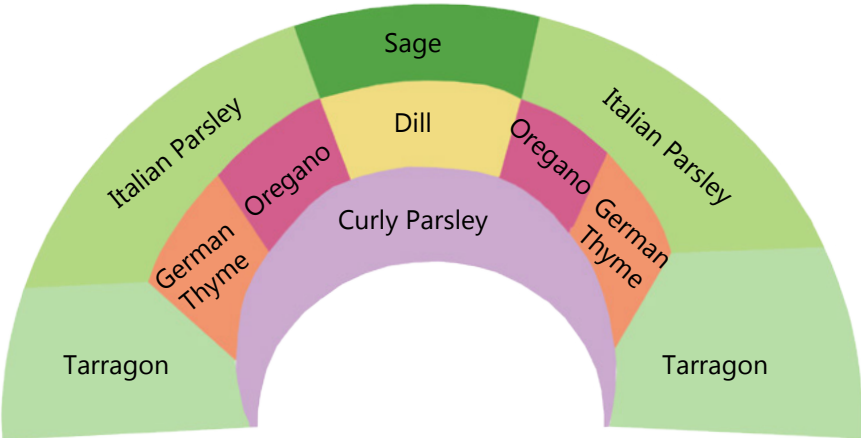
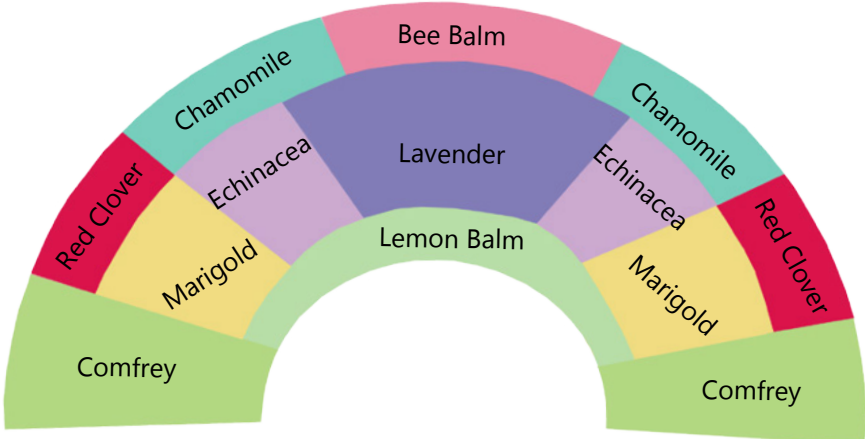
Common Sage

Medicinal Herb Garden

Two Herb Garden Designs



Two Medicinal Herb Garden Designs



Wetland Plant Catalog



Rocky Mountain Iris



Common Cattail



New Mexican Checkermallow



False Solomon's Seal



Mountain Lobelia



Ligularia

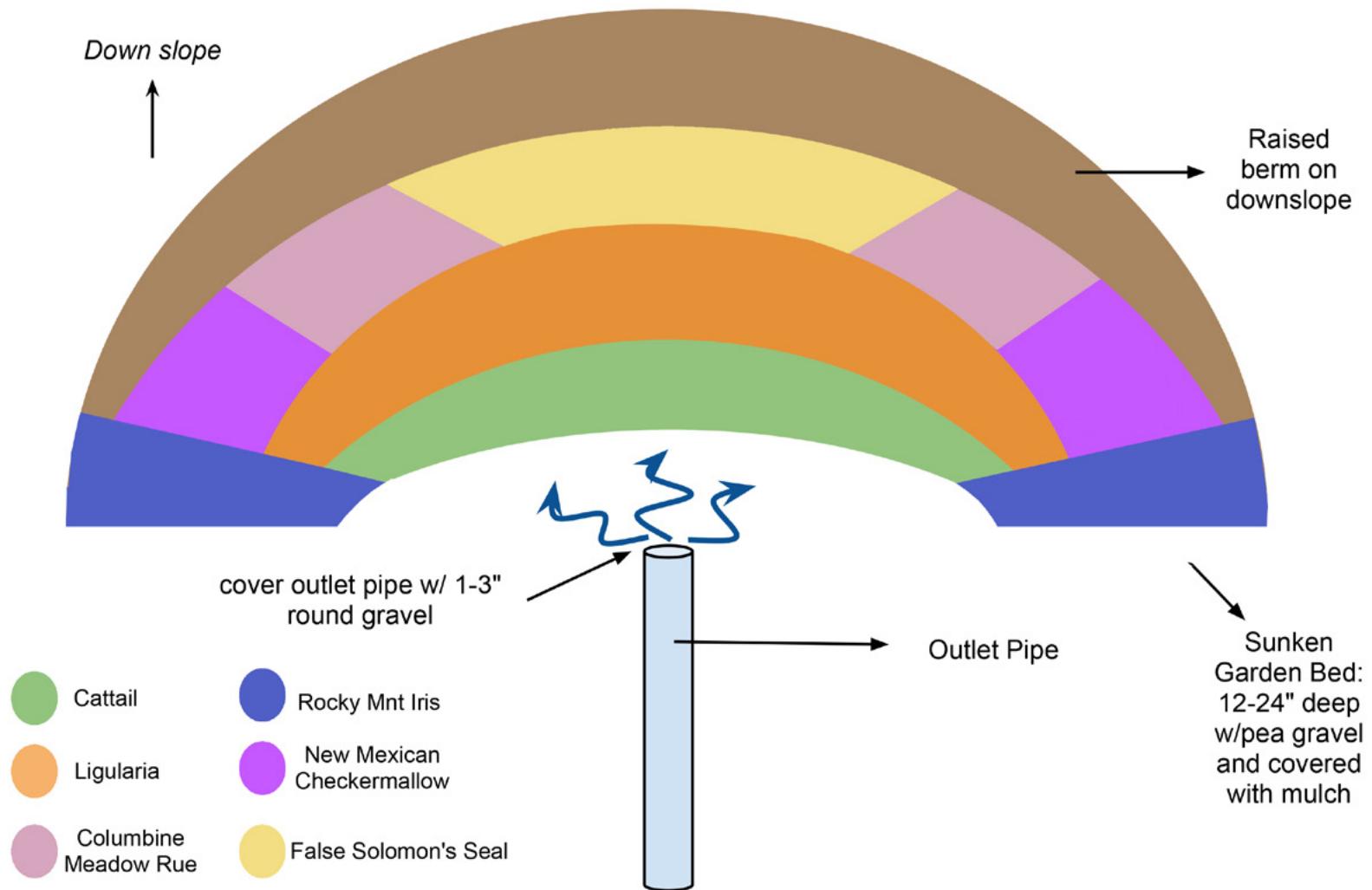


Columbine Meadow Rue

Greywater Garden Design

Greywater Garden

The vegetation is arranged according to moisture needs and height. Near the pipe outlet are moisture loving and tallest species.



Shade Plant Catalog



Dwarf Hemlock 'Lewis'



Dwarf Hemlock 'Jeddeloh'



Utah Serviceberry



Coral Bells



Rocky Mountain Columbine



Red Columbine



Yellow Columbine



Rocky Mountain Clematis



Rocky Mountain Maple

Windbreak Plant Catalog



Rocky Mountain Maple



Aspen Sunflower



Juneberry



Shrub Live Oak



Red Raspberry



Flowering Crabapple



Fendler's Buckbrush



Oregon Grape

Attracting Fauna



Owls

Why?

These nocturnal creatures are great predators to combat the various pests on the EcoRanch such as gophers, voles, mice, and other rodents, as well as large insects that can wreak havoc on the gardens. They are also beautiful birds to watch and listen to.

Pest control is one positive benefit to having owls around the property. However, the most important reason to providing nesting boxes is for conservation. Owl populations like the barn owl have plummeted over the last 40 years, partially due to development and habitat loss, along with their low-flying hunting tactics that cause many to be struck by cars.

How?

Learning to vocally call owls can draw them in. People have also been known to use recordings of owl songs to attract them. They may answer the call or fly in to investigate due to their territorial nature.

Build a Nesting Box: Providing them a space for nesting in the spring can help attract them to the area. Install a nest box about 15 feet in a tree where they won't be disturbed and where you won't mind "whitewash," or owl pellets falling.

Prevent Smaller Birds From Invading the Nest: Other birds such as European starlings are known to take over owl nest boxes. The number one way to avoid this invasion is to place your box in a wooded area, not in an open area.

Northern Arizona Owls



Barn Owl



Western Screech Owl



Great Horned Owl



Mexican Spotted Owl



Northern Pygmy Owl



Northern Saw-whet Owl

Crop Rotation

Production Category	Common Pests	Vegetable	Most Nutrient Used
Legume	Bacterial Blights, Stink Bugs, Cowpea	Beans	FIXES - N
Green crop Green crop	Aphids, Leaf Miners, Cabbage Worms	Leafy Greens Spinach	N N
Root Crop	Root Maggots, Wire Worms	Radish Carrot Onion Parsnip Potatoes	P, K P, K P, K P, K P, K
Vine	Cucumber Beetle, Squash Big, many	Summer Squash Winter Squash Cucumber	P, N P, N P, N
Fruit/Flower Crop	Flea Beetles, Cut Worms, Hornworms	Broccoli Peppers Tomatoes	P, K P, K P, K

Suggested 3-Yr crop rotation plan

Year 1	Year 2	Year 3
Legume Legume	Greens Vine	Fruit/Flower Root
Green Green	Fruit/Flower Root	Root Fruit/Flower
Root Root	Fruit/Flower Fruit/Flower	Vine Green
Vine	Legume	Root
Fruit/Flower	Vine	Legume

Growing Dates Varieties

		2013 Almanac	
		Recommended Flagstaff	
Vegetable	Varieties	OUTDOOR Sowing Dates	Production Category
Spinach	Savoyed and semi-savoyed types	Apr 28-May 12	Green crop - uses a lot of N
Radish	Cherry Belle	Apr 28-May 12	Root Crop- need P for roots, K to increase hardiness
Carrot	Nantes, Nelson, Mokum, Little Finger	May 5-19	Root Crop- need P for roots, K to increase hardiness
Onion	Chives, Green Onion, Green Garlic	May 12-19	Root Crop- need P for roots, K to increase hardiness
Broccoli	Broccoli Raab	May 19-26	Fruit/Flower Crop- Use a lot of P and K
* Parsnip	All American, The Student	May 19-Jun 9	Root Crop- need P for roots, K to increase hardiness
Leafy Greens	Chard, Kale, Arugula, Bok Choy, Lettuce	Jun 2-23	Green crop - uses a lot of N
Potatoes	Red Norland, Yukon Gold, Viking Purple	Jun 9-23	Root Crop- need P for roots, K to increase hardiness
Beans	Bush or Dwarf varieties	Jun 9-23	Legume - Fix-N
Summer Squash	Zucchini-Condor Variety	Jun 16-23	Vine- Uses a lot of P and N
Winter Squash	Small Varieties w/Bush habits: Table Queen Acorn, Sweet Dumpling	Jun 16-23	Vine- Uses a lot of P and N
Cucumber	English, European, or Middle East Varieties: Socrates, Picolino, Rocky (thin skinned & seedless)	Jun 16-23	Vine- Uses a lot of P and N
Veggies NEED to Start INDOOR			
Peppers	Gypsy, Cajun Belle Sweet Pepper		Fruit/Flower Crop- Use a lot of P and K
Tomatoes	Cherry or Grape tomatoes		Fruit/Flower Crop- Use a lot of P and K
Other plants		Based on Viola's Garden	
** Herbs	Basil, Dill, Oregano, Thyme	6/15/2013	
Sunflowers	Aspen Sunflower	5/10/2013	
** Corn		5/10/2013	Fruit/Flower Crop- Use a lot of P and K

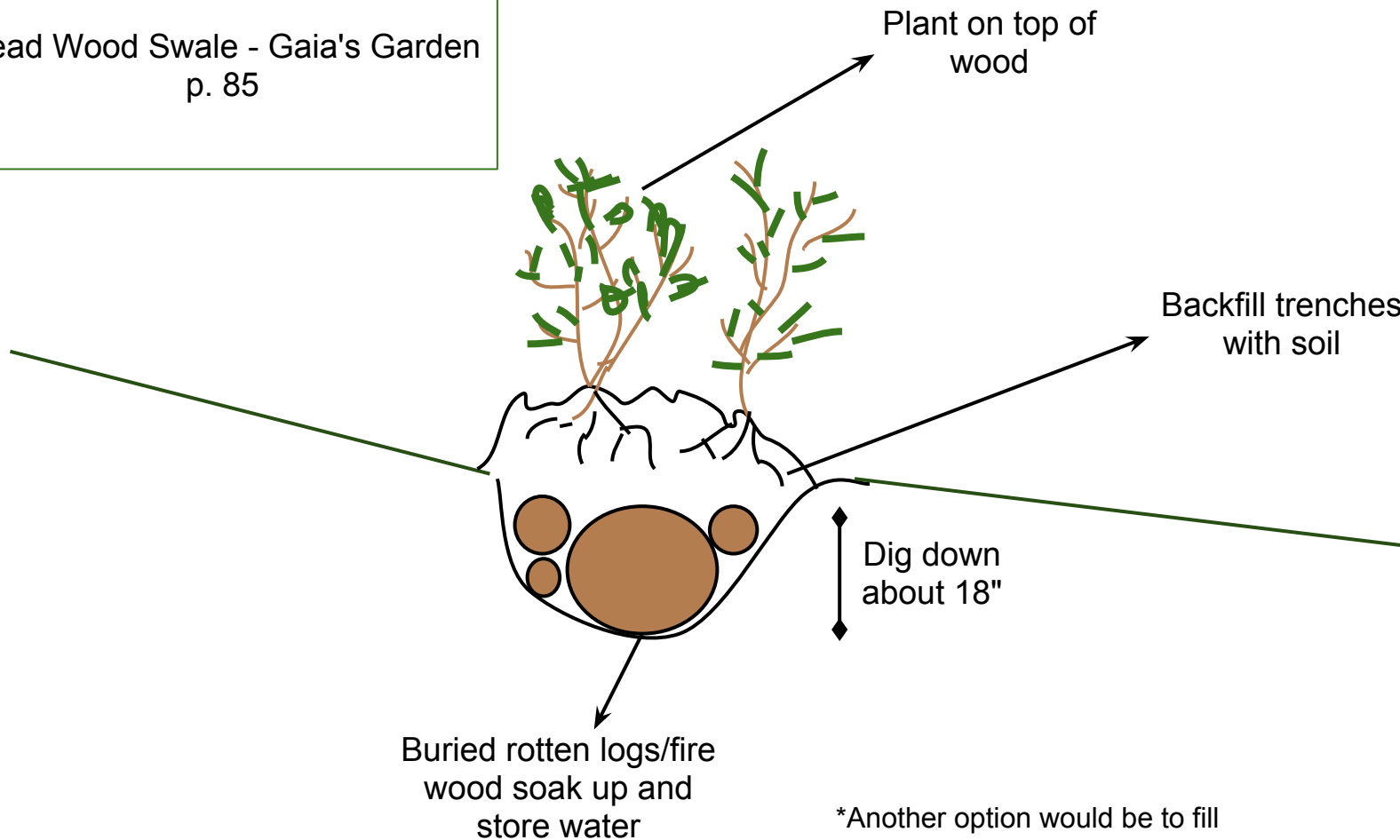
*Use protective gloves and clothing

** Best if seeding

Note: This list includes fast-growing varieties

Dead Wood Swales

Dead Wood Swale - Gaia's Garden
p. 85



*Another option would be to fill swale with straw and top with thin layer of sandy topsoil. Most of excess soil is removed, leaving a slight berm downslope.
Gaia's Garden p. 100

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7433.html>

<http://www.motherearthnews.com/sustainable-farming/chicken-hawks-zmaz80mjzraw.aspx?page=2#ixzz2KRSZmI00>

http://www.everscapes.com/plantings_elk_altitude.htm

<http://www.bhg.com/gardening/gardening-by-region/mountain-west-and-high-plains/the-top-deer-resistant-plants-for-the-mountain-west--high-plains/#page=p>

http://www.dfw.state.or.us/wildlife/living_with/docs/Elk_Damage_Flyer.pdf

<http://www.rodale.com/attracting-owls>

<http://cals.arizona.edu/yavapai/anr/hort/byg/archive/northernazowls2010.html>

<http://www.almanac.com/gardening/planting-dates/AZ/Flagstaff>