



SCIENCE OF SOIL

Prescott Iris Society Feb 9, 2019
Stoneridge Community Center
Prescott, Arizona

STEPHANIE LAMBERT, Master Gardener
UNIVERSITY OF ARIZONA
EXTENSION OFFICE

EXTENSION PROGRAMS

About the University of Arizona College of Agriculture and Life Sciences Extension Office:

Cooperative Extension is one of the pillars of The University of Arizona's Division of Agriculture, Life & Veterinary Sciences & Cooperative Extension. We are about "Improving Lives, Communities and the Economy" by serving as a statewide network of knowledgeable faculty and staff that provides lifelong educational programs for all Arizonans. We are part of a nationwide educational network of scientists and educators who help people solve problems and put knowledge to use. Arizona Cooperative Extension provides a link between the university and the citizens of this state.

Program Mission: To engage with people through applied research and education to improve lives, families, communities, the environment and economies in Arizona and beyond.

Vision: To be a vital national leader in creating and applying knowledge to help people build thriving, sustainable lives, communities and economies.



EXTENSION PROGRAMS

HOW: We have several mechanisms in place to deliver on our mission. Those are broken into 4 pillars which include:

Agriculture and Natural Resources

- We have been assisting farmers, ranchers, agency personnel and others involved in natural resource management for over 100 years

Family, Consumer, & Health Sciences

- Strong families, strong minds, and strong bodies. That's what our FCHS personnel and programs deliver for Arizonans through several outreach programs.

4-H Youth Development

- Arizona 4-H is the "first class at the The University of Arizona." We have an established pipeline of future leaders and students, and we engage them in various programs.

Tribal Extension

- With more than 30% of land base in Arizona being Tribal, our initiatives engage Native American communities through education and outreach on development, sustainability, and resiliency.



Iris Missouriensis
Native Iris found near top
of Mingus Mountain



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4-H Youth Development

4-H Home
Arizona 4-H Youth Foundation
STEM

Animals

Animal Health
Beef Cattle
Dairy
Horse
Poultry

Community & Business

AmeriCorps
Beginning Farmer Production 
Economic Development
School Gardens
Sustainability
Tucson Village Farm

Food Nutrition & Health

Diabetes Prevention
EFNEP
Food Preservation
Garden Kitchen
Home Food Safety
AZ Health Zone
Walk Across Arizona 

Plants & Pests

Campus Arboretum 
Crops / Soils
Farm Food Safety
Fruits and Nuts
Home Gardening
Master Gardener
Pest Management
Trees, Lawns and Landscaping

Natural Resources

Climate
Forest Health
NRULPC
Rangeland Management
Water

Tribal Extension

Tribal Extension Home

Youth & Family

4-H
Agricultural Literacy 
Child Care Health
Developmental and Sensory
Screening
First Smiles
Youth Preparedness (MyPI) 

Alcazar Iris,

Purple Tall bearded iris (TB),

Hybridizer, Vilmorin

Year of registration, **1910.**

Approximate height 38".

Falls are violet, bronzed and veined,
becoming yellow.. Standards are violet.

Records show that the first Alcazar sold
commercially was sold in 1927 in New
Zealand.

One of the first tetraploids. Special to the
me as this is a 4th generation pass down
originally from my Great Grandmother's
garden in Germany.

Historic. Parentage, *L. trojana*



In Soil Prep, What Comes first?

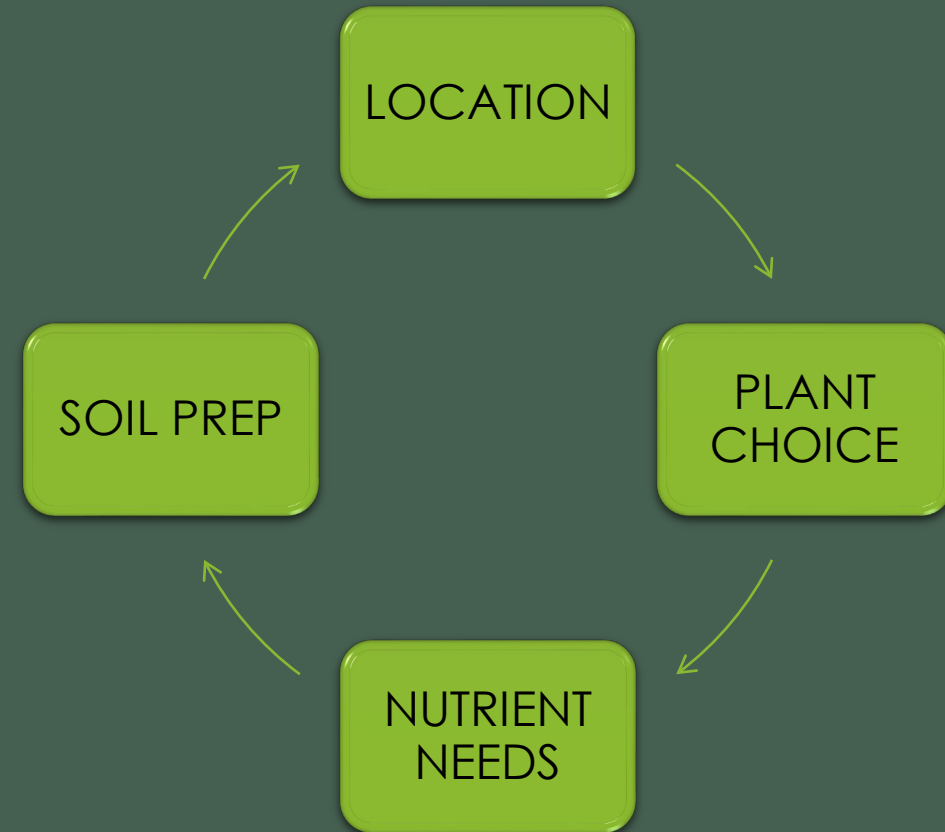
-A plan not written down is
an idea.



KNOW YOUR LOCATION



Cosmos



CONSIDERATIONS



Write it down – Sketch your plan!

Location

Where are YOU? Climate Zone? Freeze hours? Soil Type? pH? Irrigation? Have you done a map of your property? Do you have pests?

Selection

What do you want? Can it survive here? Needs? Climate, Soil Type, Location, Growing and planting Season?

Execution

Where is the best location considering ALL seasons? When & How to prep the soil Ongoing plant needs?

TIME : WHEN DO YOU WANT TO ACCOMPLISH YOUR GOAL?

WHAT IS SOIL?



What is Soil?

Mineral Portion (45%): Sand, Silt, and Clay

Organic portion (5%): organic matter and humus

Air (25%): Oxygen, carbon dioxide, other gases

Water (25%)

Living Organisms: Macro/Micro

Soil Formation Factors :

Parent Materials

Time

Topography

Climate

Organisms

Soil Texture:

Relative percentages of sand silt and clay

Texture largely determines water holding capacity
hence irrigation frequency

Clay particles have a tremendous surface area

Not easy to manipulate soil texture by adding
another soil type

Texture by feel – do this at home to determine your
soil texture

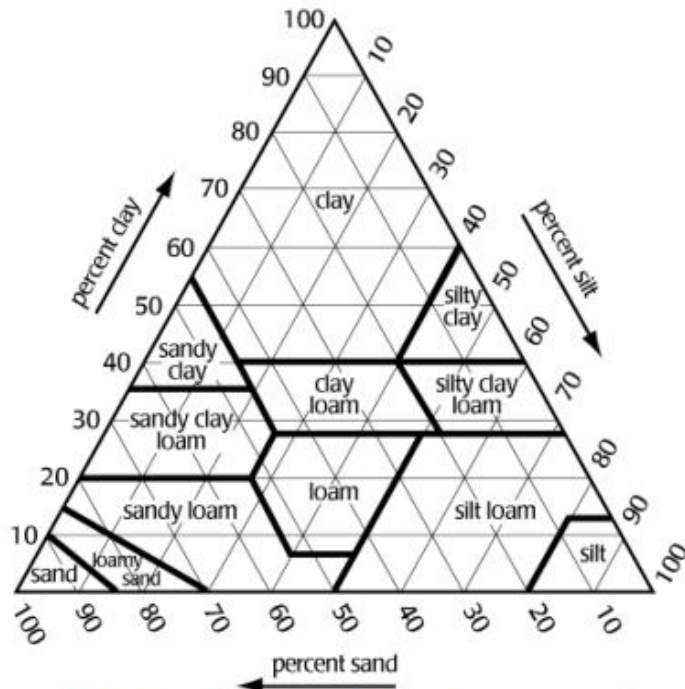


Figure 1. Soil textural triangle used to determine soil textural class.

SOIL PREPARATION

- LOOSEN AND SIFT
 - Double dig, remove grass and weeds,
 - Sift out rock, loosen compacted soil
 - You may need to add more soil if there are a lot of rocks filtered out
- TEST (IRISES PREFER NEUTRAL TO SLIGHTLY ACIDIC SOIL)
 - Do not amend soil until you understand its natural composition
 - Consideration: Is your water hard water? Water Softener? What trace minerals have been taken away or added by using your water.
 - What type of soil do you have? What is it missing?
- BUILD (IRISES NEED HIGHER LEVELS OF PHOSPHORUS AND POTASSIUM)
 - Build your soil with organic matter and trace minerals needed for your chosen plants to survive
 - Nitrogen
 - Phosphorus
 - Potassium
 - Trace Minerals – MAY WANT TO LOOK INTO SULPHUR



Iris Specifics



LADY
FRIEND

Key: Keep Rhizomes are firm and fleshy by not over or under watering. Good drainage – **moist not wet soil**

Full sun 6-8 hours a day. (Some of the delicate Pinks and Blues do better with afternoon shade for a part of the day to protect faded blooms)

Warning: Excessive shade will prevent or reduce flowering

Will live in many **Soil Types** but loves a light loamy soil that has organic amendments added. Prefers **pH between 6.0-7.5**

New Plantings benefit from bone meal or triple super phosphate at the root zone (3-4 inches below the roots).

Fertilize once or twice a year with a 5-10-10 or similar and cut dead blooms off unless you want the seed.

Warning: DO NOT FERTILIZE AFTER MID-AUGUST.

Irrigation needs are the same – Water regularly at first planting not allowing the rhizomes to dry out, deep watering every 2-3 days during the summer. Test soil moisture especially after monsoon. DO NOT FORGET ABOUT WINTER WATER NEEDS

Harden off. After first Hard frost, cut back tops of Irises to about 6" and clean up debris.

Divide in late summer after flowers die back about every 3-4 years, when they get thick, or after noticed bloom declination

SOIL PREPARATION CONT.

PREPARING THE SEEDBED

- Do not work the soil when too wet. Let it dry out until crumbling in your hands
- Soils must be well-drained and preferably dry and friable at planting time. Spade the soil 10 to 12 inches deep adding compost liberally as you work. Dried leaves, grass clippings, manure or other organic matter could be substituted as these materials will break down further over time and feed the plant through the bloom period. Be careful not to add those pesky weed seeds.
- Level area by raking, prepare planting space with proper depth per planting instructions
- Use rows for an attractive, easier managed bed for cultivation, insect control and harvesting. Use markers with string to identify rows. Use 1 layer of toilet paper if working with seeds so you can easily see the spacing
- Cover with soil, gently tamping soil by hand
- Irrigate lightly by sprinkling water on surface. Seeds need moisture and heat to germinate.
- Top dressed planting area with 3" layer of organic mulch after seedlings emerge –or- after transplanting. Continue to water, but less often and deeper.
- Remove weaker plants. You can use scissors to cut out weak or damaged plants. Thin out if overcrowding, but do not wait too long

Organic mulch will cool the soil which can retard growth at higher elevations

Close Quarters / Poor Soil

- Artificial Soil (like Peat), can be used
- If soil doesn't drain well, **consider using raised garden beds filled with ½ garden soil, ½ artificial soil** and sand, perlite, or vermiculite amendments

Taking Bulbs out of Storage

- If you buy bulbs early, store them in a cool (below 70 degrees F), dry place and preferably in peat moss or vermiculite.

Transplanting

- Harden plants first. Take outside for exposure
- Transplant in evening or cloudy day
- Hour before plant, water thoroughly
- Take out carefully and put in hole deeper than existing pot. Be sure to break off or completely cover peat pots
- Firm soil around plant, protect from excessive sun and wind.

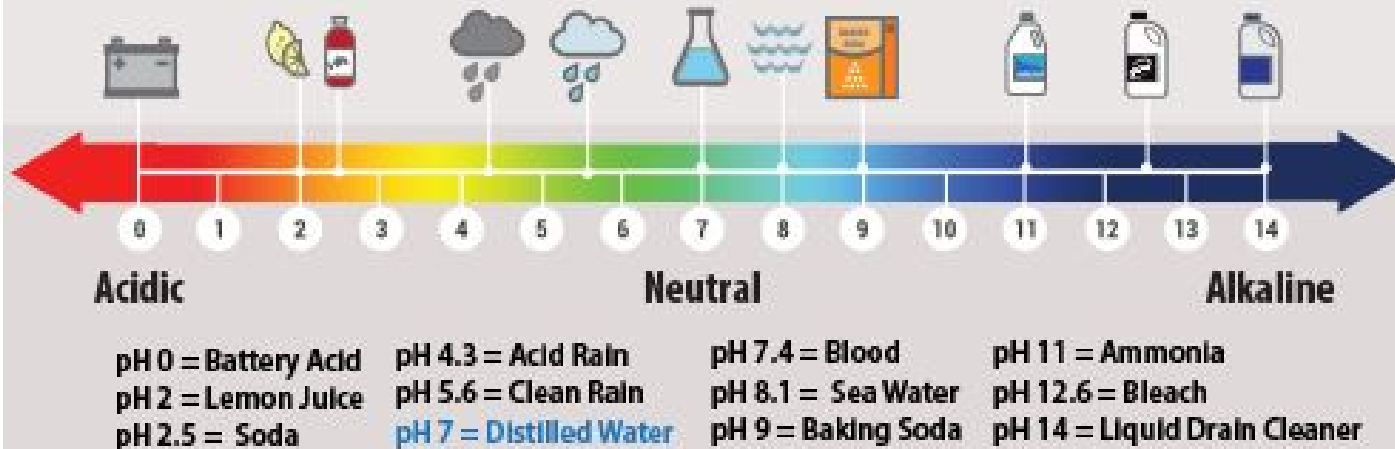
TRANSPLANTING



DEVIL MAY CARE

TESTING

The pH Scale



BACKDRAFT



Estimated pH range of

“greatest” availability of elements:

6.0 – 8.0: Nitrogen (leaf growth, fruit setting)

6.5 – 8.0: Phosphorous (root system, bright flowers, fruit development and yield)

6.0 – 10.0: Potassium, Sulfur (essential for cell division and strong stems)

6.5 – 9.0: Calcium, Magnesium

6.5 -10.0: Molybdenum

5.0 –7.0: Manganese, Boron, Copper, Zinc

Below 6.5: Iron

Irises:

fertilize in mid to late April with bone meal, superphosphate, or a fertilizer low in nitrogen such as 6-10-10, again if needed a month after bloom. Fertilizers high in nitrogen tend to cause bacterial rot and lush, but weak, foliage growth.

SOIL BUILDING:

ORGANIC AMENDMENTS

- Alfalfa meal
- Blood meal
- Bone meal
- Compost
- Cottonseed meal
- Cover Crops
- Feather meal
- Greensand (Contains Iron & Magnesium)
- Leaf mold
- Manures: poultry, sheep, goat, cow, rabbit (High in ammonia, age at least 6 months. Fresh manure/ possibility of pathogens, high in salts, burn roots)
- Rock phosphate
- Sulfur
- Sphangnum Peat (excellent for sandy soil, acidic, water retention)
- Vermiculture (Worms)

Composting



Photogenic

Touching On The Basics:

Compost is full of nutrients that we want to get down in the soil to feed the plants through their roots. It's all about the Carbon and Nitrogen. The lower the Carbon to Nitrogen (C:N) ratio is, the faster composting happens.

Micro and Macro Organisms EAT Carbon and Nitrogen in Decaying Materials

Manure by itself is too strong to be used on plants. It can damage roots and may even kill some plants. **Compost manure** for at least two heating cycles at 130 to 140 degrees F to kill any pathogens before applying the manure to vegetable gardens. Most home composting systems do not sustain temperatures at this level.

Compost has many benefits. Manure is just one ingredient in compost. For example, composting chicken manure adds organic matter to the soil and increases its ability to hold water.

Mulch

is the layer of organic materials placed on the top of the soil as a protective cover. It helps to keep much needed moisture from evaporating.



COMPOST NEEDS



LOCATION &
CONTAINMENT



RAW
MATERIALS



AERATION



MOISTURE



TEMPERATURE



CURE TIME

FERTILIZING

- Apply a layer of organic matter 2-3" thick on the garden area 1-2 months BEFORE planting
- Work it into the top 10-12 inches of soil and irrigate thoroughly to leach the salts from the root zone area. If composted poultry Manures are used – use at half the rate above.
- Fertilizers used should contain Nitrogen and Phosphorus. *Remember for Irises, too much nitrogen is an issue. Irises need larger amounts of Phosphorus and Potassium. It is recommended by the National Iris society to use 6-10-10 fertilizer.
- During growing season, if more fertilizer is needed, consider a side-dressing. No closer than 4" from the plants, apply appropriate fertilizer on soil surface and water in. Be careful to not be too close to plant as this process incorrectly done could burn the roots.

FERTILIZING

CONTINUED

- Many bulbs require little attention and come back year after year.
- Supplemental irrigation will improve the quality and quantity of flowers and increase the longevity of the bulbs. The real trick for successful flowering year after year is to promote sufficient foliage growth to store enough energy in the bulb for successive years. After flowering, remove flowers before they produce seeds. Seed production takes energy away from the plant. This energy is much better used to produce the following year's flowers. A light application of 5-10-10 fertilizer after blooming will improve the following year's blooms. Fertilizer should be kept off the leaves to prevent foliar damage.
- Spring flowering bulbs can usually be left to themselves for many years. However, they may become too crowded. Digging and dividing should only be done after flowering and growth have ceased and the foliage has died to the ground. If the bulbs appear puny or unhealthy, you may consider replacing them with new ones. Finally, remember that javelina love tulips and are curious about many other bulbs. Narcissus, daffodils, and bearded iris are not palatable to wildlife.



FASHION QUEEN



IRRIGATION



IRRIGATION
PLAN



SOIL
MOISTURE



WEATHER
MONITORING

IRRIGATION SCHEDULE

WATERING SCHEDULE FOR NEWLY PLANTED DESERT ADAPTED PLANTS*

Weeks 1 & 2	Water every 1-2 days in summer, every 3-4 days fall through spring
Weeks 3 & 4	Water every 3-4 days in summer, every 6-7 days fall through spring
Weeks 5 & 6	Water every 4-6 days in summer, every 7-10 days fall through spring
Weeks 7 & 8	Water every 7 days in summer, every 10-14 days fall through spring
After week 8	Gradually extend the time between irrigations until plants are established.

Note: After the eighth week, move the drip emitters to the outer edge of the root ball.

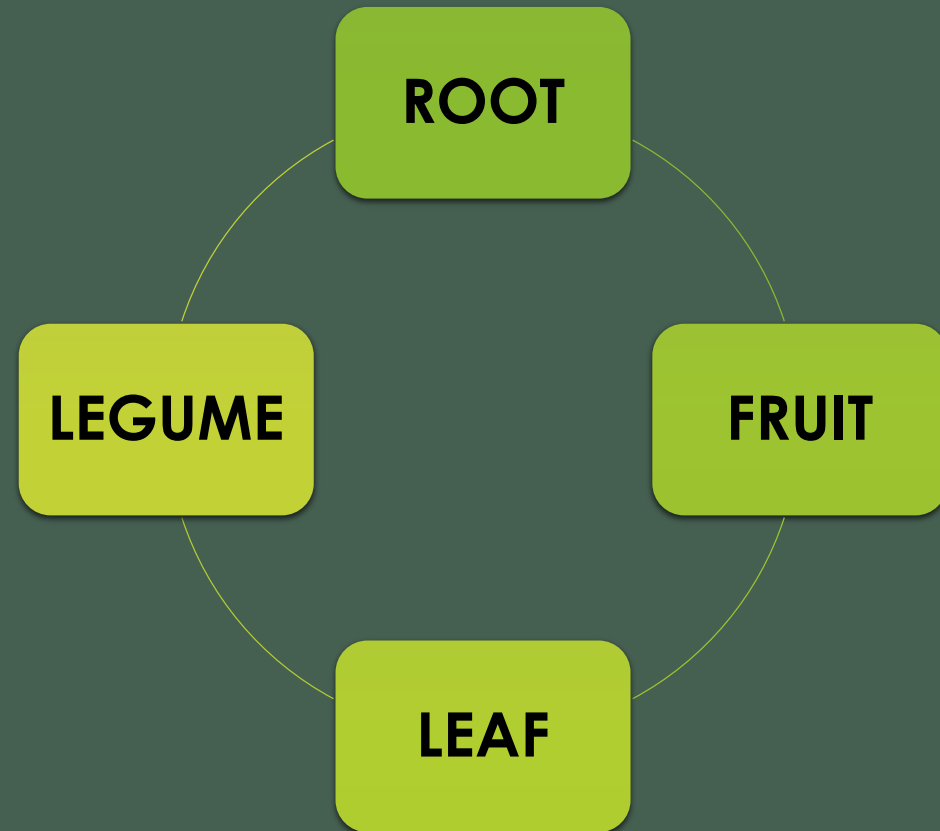
* High water use plants will require more frequent irrigations.

1, 2, 3 RULE

Depth	Size of Plants	Examples
1 Foot	Small	Ground covers, cacti and bedding plants
2 Feet	Medium	Shrubs
3 Feet	Large	Trees



CROP ROTATION IMPORTANCE



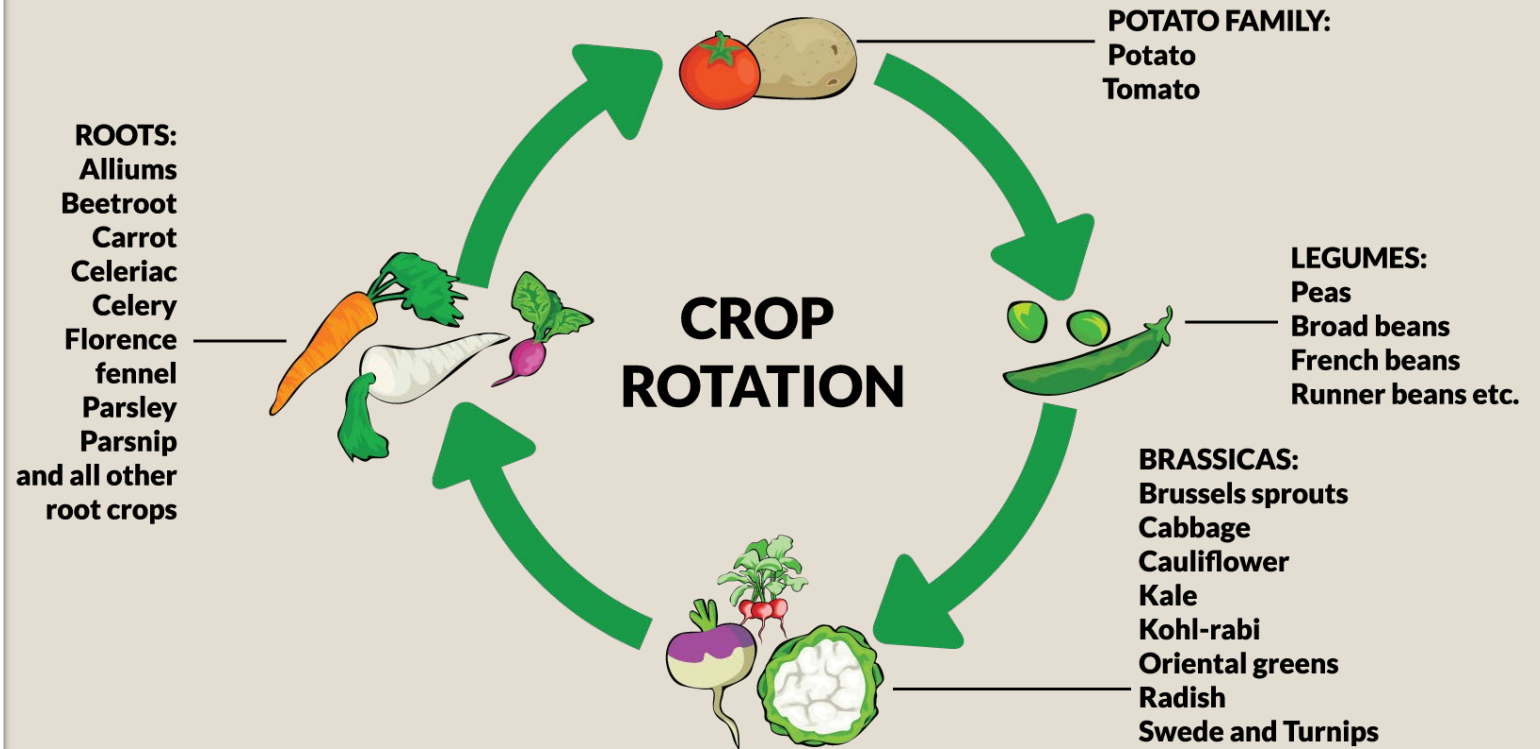
BASICS:

Keeps soil healthy and fertile

Using the same soil drains nutrients

Plants don't just take – they also add – Legumes are nitrogen fixers
Rotating helps manage soil-borne diseases like verticillium wilt, and soil-dwelling insects like corn rootworms. These types of diseases and pests prefer certain kinds of plants, and the longer the plants stay in the same soil, the better the chance that these enemies will show up and cause trouble.

Fallow beds (empty for a season) gives soil time to rest – plant a cover crop to help prepare soil for next planting. Bonus: Planting cover crops to choke out weeds.





**Shakers Prayer
Siberian**

Soil Myths

TURNING SOIL:

The guidance from the extension office is that soil should NOT be turned under. Although it is natural to think that the plant should be turned under to naturally compost into the ground, doing so can cause disease. It is better to use fertilization and composting techniques. Also, if the plant are woody, they will take Nitrogen out of the soil.

TURN OF SOIL VERSUS CLEARING TOPSOIL AND ADDING AMENDMENTS:

Do not clear your topsoil. The recommendation is to add amendments or cover crops in the off season and irrigate to leach through the soil to boost its profile.

SUPER THRIVE:

There is no scientific evidence to support the claims. Research done shows no advantage for the product claims

COFFEE GROUNDS:

Good to mix SOME in with compost. Many gardeners assume that coffee grounds are acidic, but this does not hold true experimentally. The pH of decomposing coffee grounds in these experiments ranged from 4.6 (mildly acidic) to 8.4 (somewhat alkaline). The pH also changes over time and you should not assume that it will always be acidic. As for soil-borne diseases, coffee grounds do appear to suppress some common fungal rots and wilts (*Fusarium*, *Pythium*, and *Sclerotinia*) as well as some bacterial pathogens (*E. coli* and *Staphylococcus*). Coffee ground composts and mulches enhanced germination of some seeds while inhibiting germination of others.




Iris sibirica
Plant Specs
Zone:3-9
Height:28-34"
Exposure: Full Sun
Width:18-24"
Flower color: Purple-blue



MASTER GARDENER
Prescott Office

fb:
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SOIL TIPS FOR RAISED BEDS - APRIL 25, 2018

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/soilforraisedbeds.html>

SPRING FLOWERING BULBS - OCTOBER 26, 2016

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/springfloweringbulbs2016.html>

GARDEN SOIL PREPARATION - APRIL 5, 2006

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/gardensoilprep.html>

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/gardensoilprep.pdf>

SOWING AND PLANTING SEEDS PRESENTATION

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/sowingandplantingseeds.pdf>

SOIL AMENDMENTS FOR THE GARDEN - MARCH 13, 2002

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/soilamendments.html>

SOILS AND SOIL PREPARATION

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/soilsandsoilpreparation.pdf>

GARDEN WATERING AND IRRIGATION PRESENTATION

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/gardenwateringandirrigation.pdf>

IRRIGATION PRESENTATION

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/irrigation.pdf>

USING COFFEE GROUNDS IN THE GARDEN - OCTOBER 31, 2018

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/coffeegrounds2018.html>

CONTAINER GARDENING PRESENTATION

<https://extension.arizona.edu/sites/extension.arizona.edu/files/attachment/containergardens.pdf>

TEN STEPS TO A SUCCESSFUL VEGETABLE GARDEN

<https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/AZ1435-2015.pdf>

BACKYARD COMPOSTING - ARTICLE

JEFF SCHALAU, AGENT, AGRICULTURE & NATURAL RESOURCES

UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION, YAVAPAI COUNTY

YAVAPAI COUNTY DEMOGRAPHICS

<http://www.yavapai.us/about-us>

REFERENCES