

Getting the Most from Your Vegetable Garden




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Why Vegetable Gardens?

- Garden to meet your needs
- Garden to help others
- Garden for fresher produce
- Garden for organic produce
- Garden for specialty crops
- Garden for the pure joy
 - It's the number #1 hobby activity





First Things First

Location

- In FULL sun (6+ mid-day hours)
- Not in a frost pocket
- With well-drained soil
- Not in a wind tunnel
- Not near a Black Walnut! (or other competitive trees)





Planning Your Garden

OTHER CONSIDERATIONS

Clearance from trees (shade, roots)

Near a water source

Convenience (weeding, watering, harvesting)

Visual considerations – screening



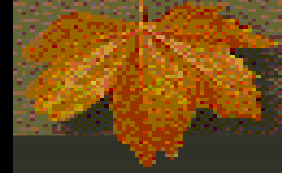


Growing Organically

Organic production means:

- * Not using synthetic chemicals
- * Building the soil
- * Working with nature as part of an ecosystem





Top Ten Ways to Get the Most from Your Garden





1. Soil

No matter what kind of soil you have, you can amend it enough to have a productive vegetable garden.

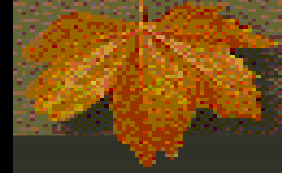


Soil

Drainage is essential

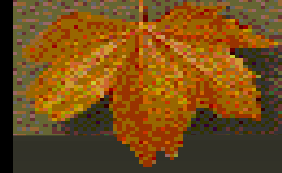
Do a soil test every 5 years.





Soil Preparation

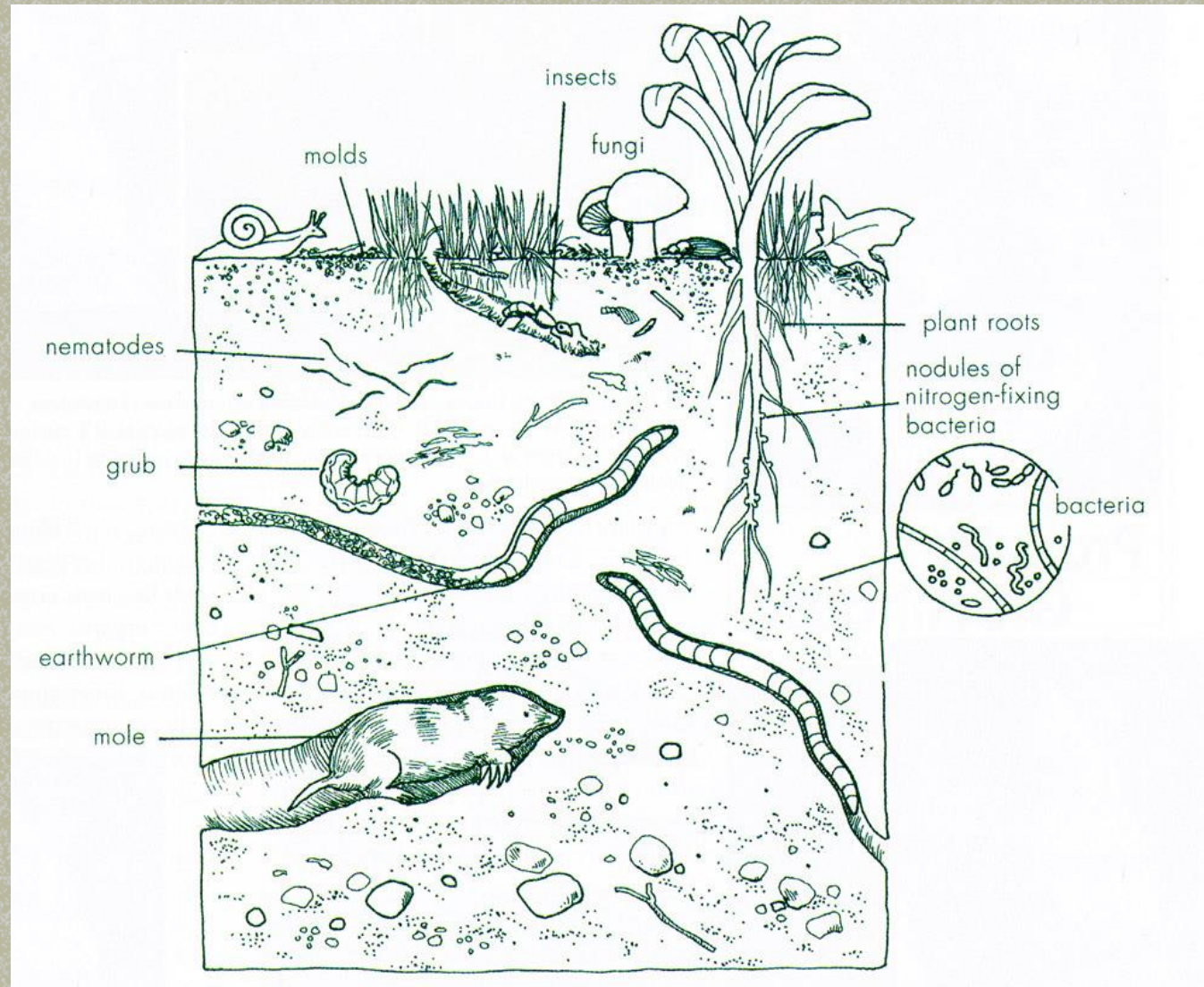
- Remove weeds, especially grasses
- Work soil to at least 8-10 inches deep
- Adjust pH if needed
 - Lime raises pH; sulfur lowers it
- Amend soil with organic matter (compost)
 - Caution: Too much wood ash raises pH and can affect nutrient balance

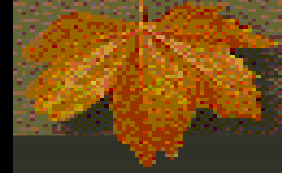


Soil Health

Soil is an ecosystem, alive with critters such as bacteria, fungi, actinomyces, and animals such as mites, worms, nematodes, insects, rodents, amphibians, millipedes and centipedes, larva and other scary looking things!

Soils are Alive!



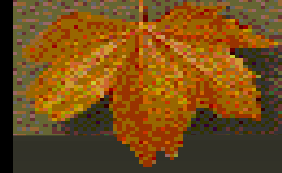


Soil Health

KEEP THE CRITTERS HAPPY!!

Organic matter (dead plant remains) provides food for microorganisms

Microorganisms release nutrients the plants need and create new surfaces to hold nutrients.

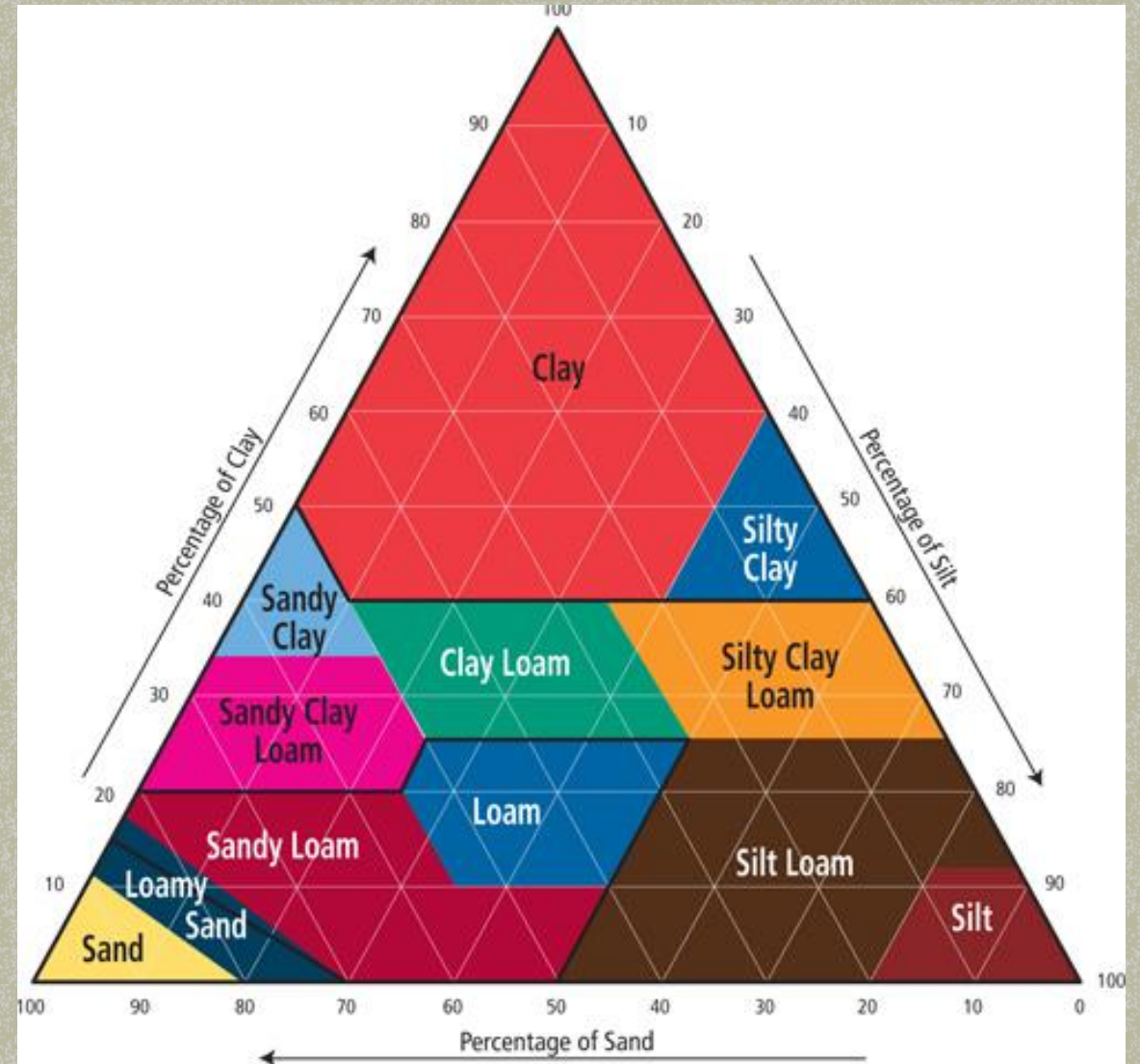


Soil Health

- Healthy soil has:
 - Physical fertility (texture, structure, tilth, drainage)
 - Chemical fertility (nutrient supply)
 - Biological fertility (microorganisms, organic materials, soil environment/habitat)

Soil Health

Soil **TEXTURE** refers to the amount of sand, silt, or clay in the soil, and is very difficult to change.





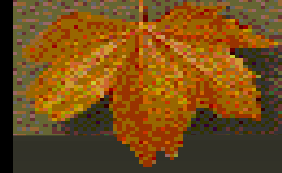
Soil Health

Soil **STRUCTURE** refers to how those particles are glued together into different sizes and shapes of “aggregates”.

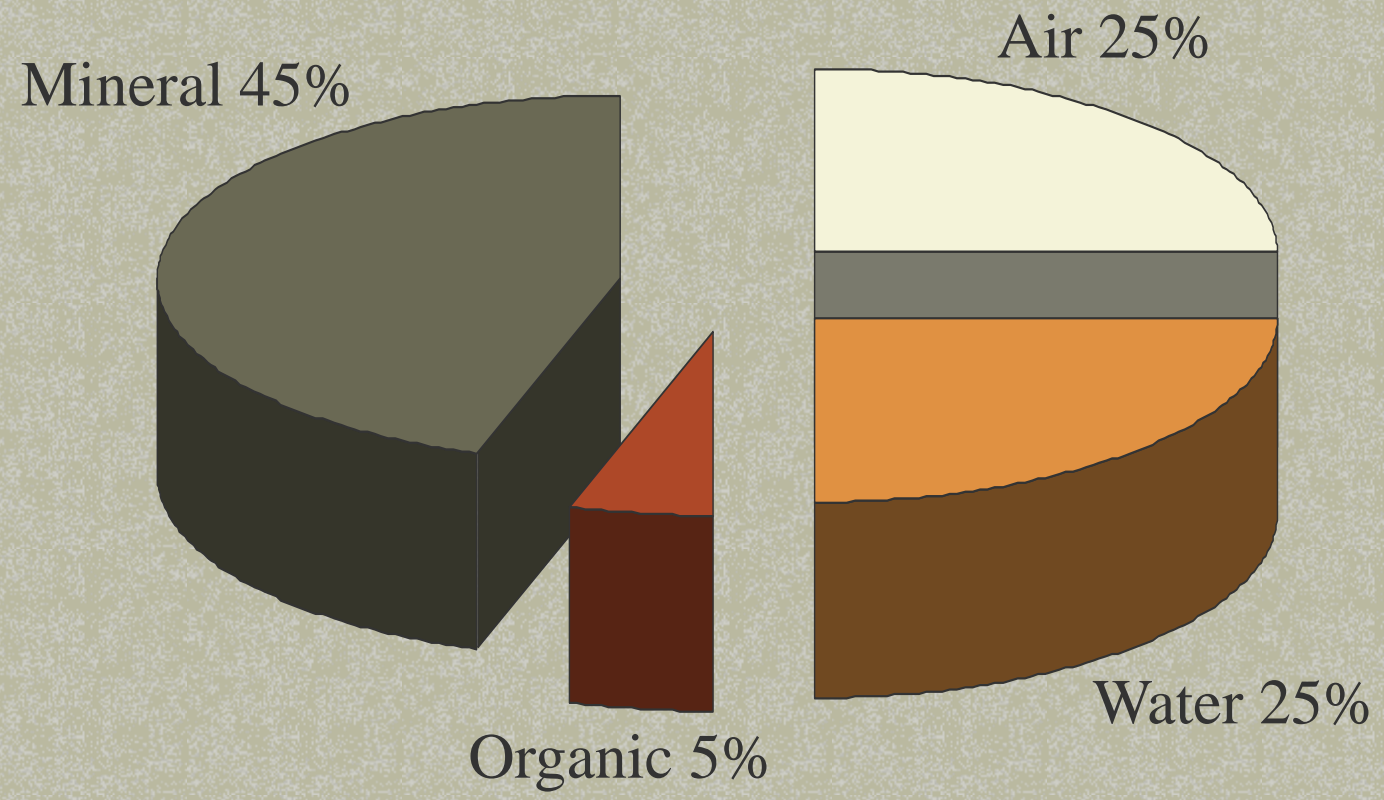
Good soil structure looks like cookie crumbs!



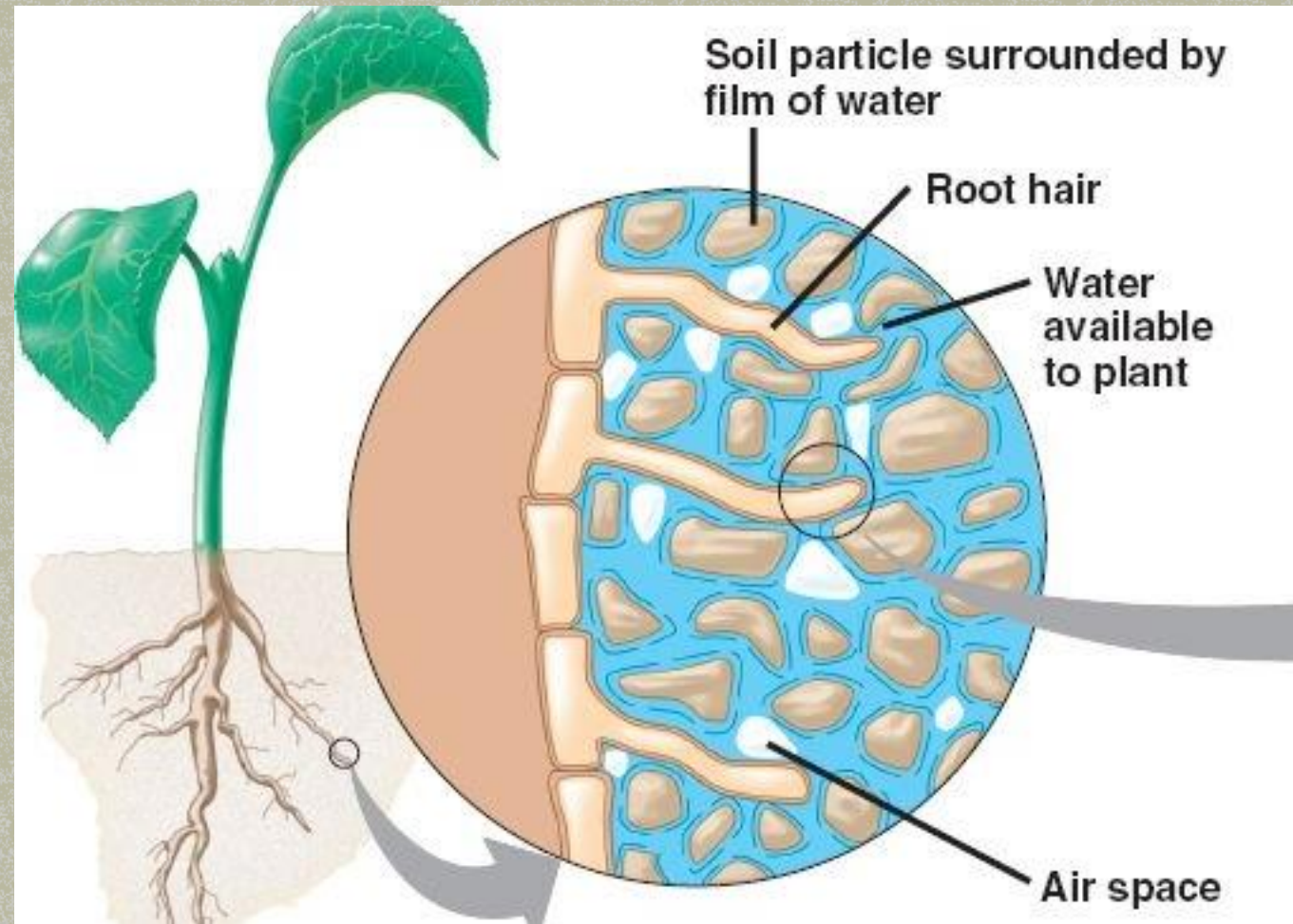
Protect structure! Avoid excessive rototilling, compaction, working wet soil.



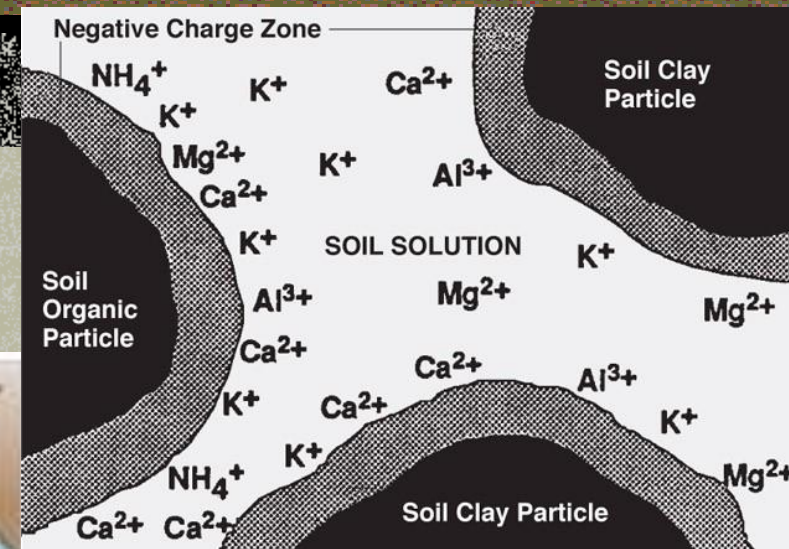
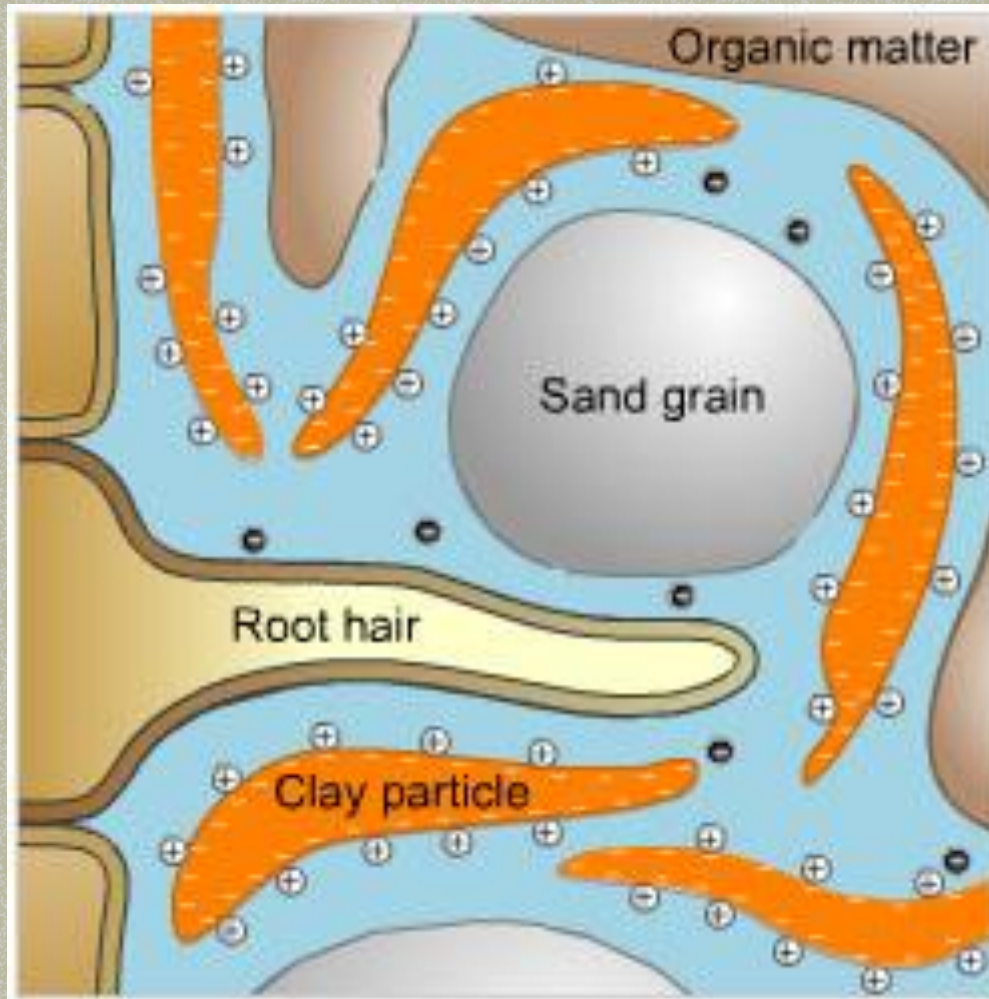
Composition of a good silt loam garden soil



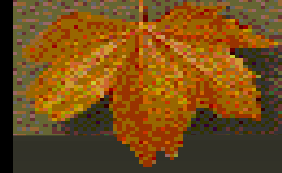
Roots in the Soil Solution



Soil Health



Nutrient exchange between a clay particle and the soil solution



Soil Health

Cation Exchange Capacity indicates how readily cations can be released into the soil solution and therefore be available to be taken up by plants.

CEC is affected by soil composition (e.g., organic matter, pH, parent material, etc.)

Soil Test

Tells you the pH of your soil

Important for nutrient uptake

Important for some diseases

Tells you Phosphorus and Potassium Levels

Tells you organic matter content

Department of Soil Science
College of Agricultural and Life Sciences
University of Wisconsin - Madison/Extension
Lawn and Garden Soil Road
Vernon, WI 53595
(608) 262-4354
http://wvetab.soils.wisc.edu

Lab No.: _____
Date: _____

Lawn and Garden Submission Form

Customer Information		Payment Information	
Name: _____	Account ID: _____	Amount Paid (if not being billed): \$ _____	Payment Type: _____
Company Name: _____	City: _____ State: _____ Zip: _____	Credit Card check card: <input type="checkbox"/> Master Card <input type="checkbox"/> Visa	Payment Number: _____
<input type="checkbox"/> Address*	Phone: _____	Expression Date: _____	Check - Number: _____
<input type="checkbox"/> Fax Results To*	<input type="checkbox"/> Email Results To*	<input type="checkbox"/> Check - Number: _____	<input type="checkbox"/> Cash

Sample No.	Description	Sample Name (if Area Description)	Landscaping Category
		(Example: Front Yard Grass)	(see codes below)

Which Landscaping Category describes what you are planning to grow?

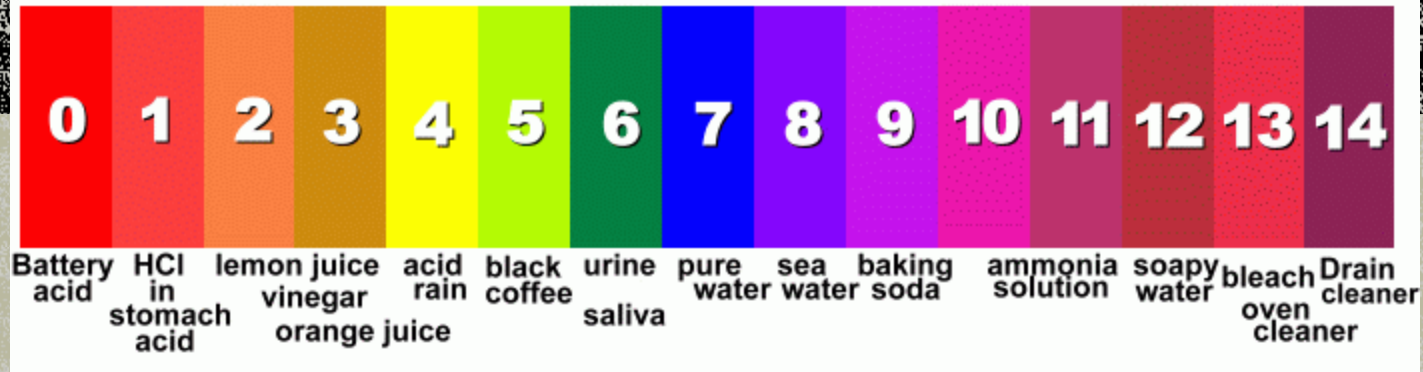
Landscaping Category	Private Landscaping Category	Public Landscaping Category	Business Landscaping Category
Lawn	L1 - Turfgrass	L2 - Turfgrass	L3 - Turfgrass
Flower Gardens	F1 - Annual flowers & perennials	F2 - Annual flowers & perennials	F3 - Annual flowers & perennials
Vegetable Gardens	V1 - Annual vegetables	V2 - Annual vegetables	V3 - Annual vegetables
Permanent Cover Crops	PC1 - Sod grasses	PC2 - Sod grasses	PC3 - Sod grasses

Additional Tests

Test	Sample Number(s):
<input type="checkbox"/> Lead (ppm)	
<input type="checkbox"/> Cadmium (ppm)	
<input type="checkbox"/> Phosphate (ppm)	
<input type="checkbox"/> Nitrate (ppm)	
<input type="checkbox"/> Sulfur (ppm)	
<input type="checkbox"/> Manganese (ppm)	
<input type="checkbox"/> Zinc (ppm)	
<input type="checkbox"/> Other	

Tests include: pH, lime requirement, organic matter, available phosphorus (P), and available potassium (K).
Additional Tests (available for an additional fee) include: lead, cadmium, nitrate, physical analysis, boron, sulfur, manganese, zinc, or others.
Sample size required for analysis: 2 cups. 04/05

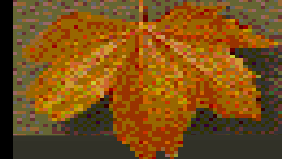




How does pH affect soils?

pH measures the amount of hydrogen ions in the soil.

Hydrogen ions can affect the availability of other plant nutrients—they can be “in the way” of other ions.



Why is pH important?

pH measures hydrogen ions in the soil.

It affects the availability of nutrients.

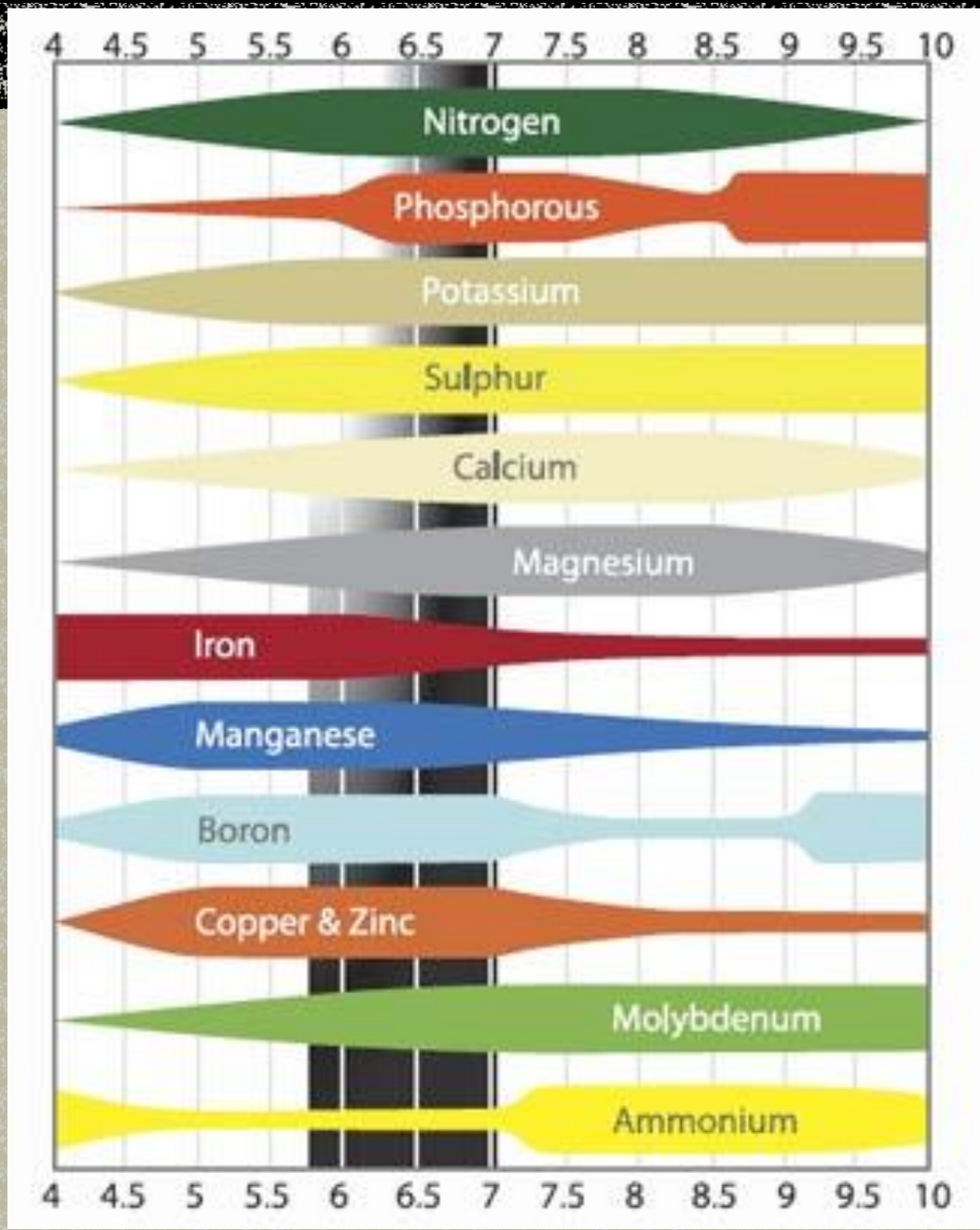
It can affect some diseases, such as potato scab and club root.



For vegetable gardens, somewhere between 6.4 and 7.2 is ideal.



Soil Health





Soil Health

Plants need good soil structure so that:

- the roots can physically push between the soil particles
- Oxygen can permeate to the root zone
- Water can infiltrate through the soil
- Microbes have a happy home and can break down organic matter and release nutrients





Soil Health



The problem with heavy clay soil is lack of pore space between the tiny particles.

Clay soils compact easily, have poor drainage so that roots suffocate, and can be “cloddy”

Solution? Add organic matter



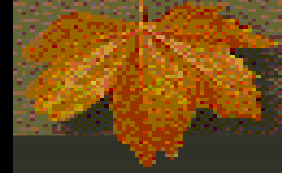
Soil Health

The problem with light sandy soil is the pore spaces between the soil particles are too big.

This results in lack of moisture and nutrient retention

Solution? Add organic matter!





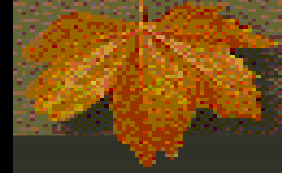
Compost – aka “Gardener’s Gold”



Organic Matter in the Soil

- Cultivation increases loss of organic matter
- Higher temperatures and moisture increase organic matter loss





Organic Matter

Add organic matter regularly

*After 1 year, only 5-10% of organic matter addition remains stable

*After 2 years, only 1-2% remains

GENERAL RULE: Add 1-2" of composted organic matter to your garden each year.



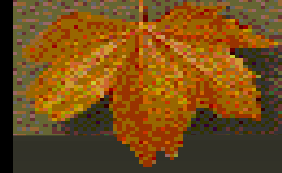
Adding Organic Matter

Cover Crops




Mulch Incorporation





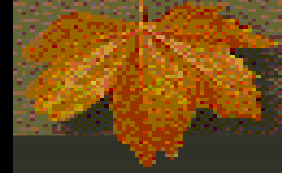
What to Plant?



2. Choosing Plants

Plant what you'll eat!!!





Choosing Plants



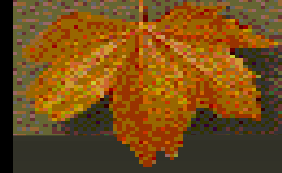
New Gardener?

Start small and with easy crops

Lettuce
Beans
Potatoes
Tomatoes

Pumpkins
Squash
Cucumbers
Radishes





Choosing Plants

More experienced?

Carrots

Sweet corn

Peas

Peppers

Broccoli

Cauliflower





Planning Your Garden

GARDEN SIZE

How much produce
do you want?

(fresh, freezing, canning, donating)

How much time do you have for
maintenance?





Garden Size

How much produce do you get from each crop based on how much space it takes

Heavy yielders:



cabbage

carrots

cauliflower

cucumbers

tomatoes



Crop Production (by space)

Medium Yielders

- Beets
- Onions
- Beans
- Radishes
- Sweet potato
- Broccoli

Light Yielders

- * squash
- * peas
- * potatoes
- * corn





Vegetable Crop Selection

Know your growing season

Are you In town or out?


Last frost:

May 24thish

First frost:

September 21stish





Planting Vegetable Gardens

- Cool Season Crops – plant as soon as soil can be worked
 - Spinach, broccoli, cauliflower, peas
- Warm Season Crops – plant after danger of frost and when soil is warm
 - Tomatoes, beans, peppers, squash





Choosing Plants

Read labels! Some produce more pounds per plant than others

Try to plant two different varieties each year—a tried and true and a new one.



3. Planting and Spacing

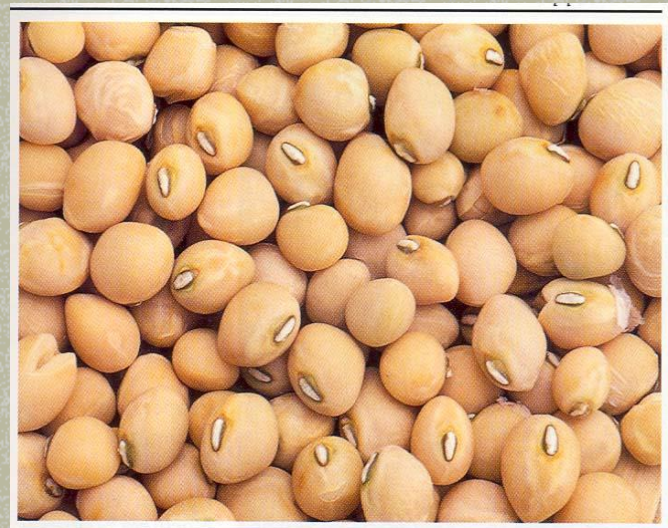


Overcrowding reduces production per plant
Consider pollination needs
Closing canopy reduces weeds



Planting Seeds vs. Plants

- Less expensive
- More cultivars available
- Some plants don't transplant well
- Fast growing crops





Using Transplants

- More expensive
- Get harvest sooner
- Some plants won't mature in our growing season without the head start



Tomatoes

Melons

Peppers

Lettuce

Broccoli

Onions

Cauliflower

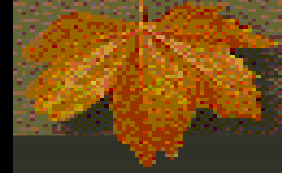
Eggplant



Transplants

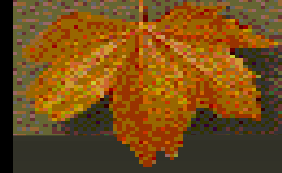
- Purchase stocky, healthy transplants
- Inspect for leaf spots, insects, eggs, etc.
- Harden off adequately
- Plant on cloudy day or in the evening
- Handle with care but break apart roots
- Water and firm soil well
- Protect from wind, critters





Seeding Outdoors

- Prepare soil as for transplants
- Wait until danger of frost is past and soil is warm for warm season crops
- Smooth surface and plant seed at a depth of 1-3 times their diameter
- Cover with thin layer of organic matter or vermiculite to prevent crusting
- Mist and keep seedbed moist until germinated



Cool Gardening Idea

Seed Tape – for straight rows and evenly spaced plants from small seeds



Note all packet information to help you with growing success.

- Variety
- Maturity
- Seed depth
- Germination
- Indoor/out
- Fertilization
- Growing tips

READ YOUR
PACKETS

Olds Seed Solutions
PO Box 7790, Madison, WI 53707-7790

Radish, French Breakfast


Contains about 300 seeds.

Whether *anybody* in France actually eats these for breakfast remains a mystery. Fact is, this oblong variety produces a lot of radish in a short time in the same space as a round radish.

Planting Depth	Seed Spacing	Spacing Between Rows	Days to Germination	Spacing After Thinning	Days to Maturity
1/2"	1"	6"	3-10	2"	25
1 cm.	2.5 cm.	15 cm.		5 cm.	

Sow seed in spring as soon as soil can be worked. Plant successively until hot weather comes. Plant again in late summer and well into autumn. Radish thrives in cool, moist soil. Firm soil over seed. Harvest when young.

Stock #0373
Copyright © 1999



7 18964 97139 6

You can count on Olds. If you are not 100% satisfied with this product, mail the empty packet with an explanation to Olds (address on top flap). Your satisfaction is our goal.

SOLD BY 12/05

Certified Organic by Oregon Tilth

7/4317

Thin Plants to	8-12"
Light Requirements	partial shade
Days To Germination	up to 21
Soil Temp. For Germ.	55-65°
Seed Depth	1/8"

LETTUCE *Lactuca sativa*
ORGANIC
LT435 Sucrine
ROMAINE LETTUCE
 60 days. Light green leaves with a sweet crisp texture.
 Sampler 1 1/2 gram
 \$2.55 - Packed for 2005

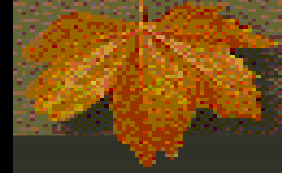
PLEASE READ OUR SEED WARRANTY BEFORE OPENING THIS ENVELOPE

Sowing Indoors-Sow 3-4 seeds per inch in sterile seedling mix 3 weeks prior to planting outside. Two weeks after seeding, lettuce can be transplanted into individual pots. Remember to harden off for 2-3 days before planting out. To harden off, set transplants outside in a sheltered area and reduce the amount of water.
 Sowing Outdoors-Direct sow as soon as the soil can be worked. Cover seeds lightly and gently press down. Thin as soon as 2-3 true leaves have formed.
 Growing Tips-Most lettuce can germinate when the soil temperature is as low as 40°F and performs best when the air temperature is between 60-70°F. With a bit of planning, you can plant every 3 weeks all season, for a continual harvest.
 Fertilization Tips-Apply 1 cup of our blended organic fertilizer per 10 row feet to provide the nutrition necessary for optimum production.
 Seeds Specs-Min. germ. standard: 80%.
 Usual seed life: 3 years.
 Some varieties are suitable for winter gardening. See winter catalog.

Phone orders and catalog requests: 541-942-9547
 Fax orders: 888-657-3131
 Web site: <http://www.territorial-seed.com>

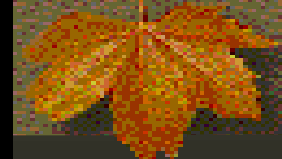
Territorial Seed Company
 P.O. Box 158, Cottage Grove, Oregon 97424





A general rule is that seeds should be covered to a depth three times their size.





Garden Layout

- Row gardening
- Bed gardening
- Raised bed gardening
- Square foot gardening
- Squeeze-it-in gardening





To Raise or Not to Raise

Raised beds offer:

- * better water drainage
- * earlier warming of soil
- * less compaction
- * opportunity for better soil



But consider:

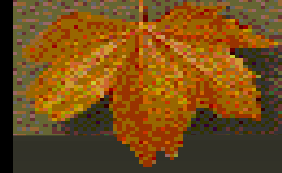
- * initial investment
- * different tillage methods
- * faster drying



Raised Beds

- Mounded raised beds
- Sided raised beds
 - Wood (not treated)
 - Rocks
 - Recycled plastics
 - Concrete blocks

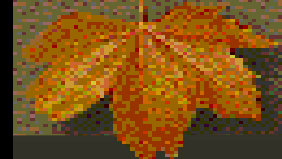




Watering Raised Bed Gardens

Water the soil, not the foliage
or surrounding space



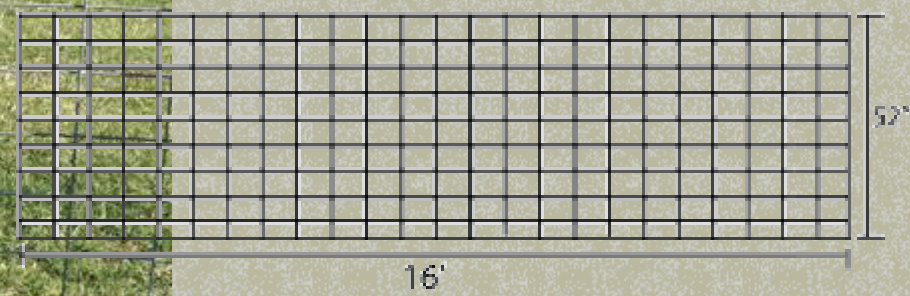
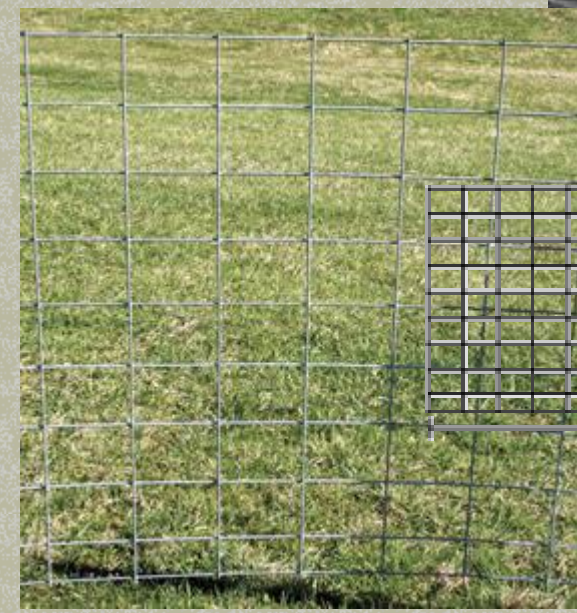


Go Vertical

Get things off the ground!

Trellises

Cattle Panels

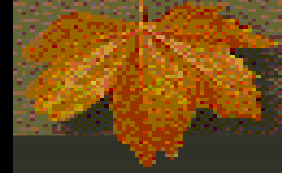




4. Intercropping, Succession Planting, Companion Planting

- Plant short, quick-growing crops along with longer-maturing crops
- Plant cool season crops in early spring and again in mid-summer for fall crop
- Plant tall, narrow plants among vines
- Do tomatoes love marigolds?





Encourage Pollination





Planting is the Fun Part!

**Now comes the
maintenance**

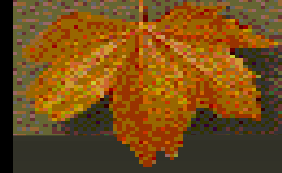


5. Fertilizing

Plant Nutrients



There are **17** essential plant nutrients, necessary for plants to complete their life cycle.



Plant Nutrients

Carbon, Hydrogen and Oxygen come from the air.

There are 14 essential **soil** elements

N, P, K – **Primary (macro)**

Ca, Mg, S – **Secondary (macro)**

B, Cl, Ni, Cu, Fe, Mn, Mo, Zn – **Trace**

FERTILIZERS

What do the numbers mean?

10 – 18 – 20

10 – 10 – 10

24 – 3 – 3



Percentages of Nitrogen, Phosphorus,
and Potassium

Soil Nutrients

All of the micro or trace nutrients, and most of the rest, can be supplied by dead plants – i.e., organic matter.



Soil Health

COMPOST!



In nature, plants are recycled as they fall to the ground and are decomposed by microbes.

Composting is a controlled form of this.

Fertilizer

Vegetables are heavy nutrient users. For maximum production:



Follow soil test result recommendations, or:

Balanced (10-10-10) starter fertilizer at 3 lbs/100 sq. feet

Side-dress at 6-8 weeks with granular about 6-12 inches from row for some crops or on sand

Liquid fertilizers bi-weekly follow math and label

You may only need Nitrogen!!!!

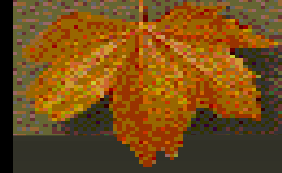


Fertilizing

Over fertilizing can cause problems
(excess foliage, salt buildup).

Crop rotation needed because different
crops use different nutrients.





Soil Health

Chemical vs. organic fertilizers?

- Organics help protect the microbes, and are slower release, but the nutrients (ions) are the same.
- Organic fertilizers often add organic matter to improve soil

What about other additives?

Egg Shells

Epsom Salts

Whole Eggs

Aspirin

Tums

Cider Vinegar



6. Watering the Garden

- Provide 1" of water each week, by rain or irrigation
- Water only soil, not leaves
- Overwatering or uneven watering can cause splitting of fruits and other structures
- Moisture extremes can cause fruit deformities such as blossom end rot



Watering

Irrigation

T-tape

Soaker hoses

Time how long it takes to get wet
4" deep.



Watering

Water deeply

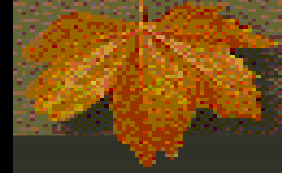


Let top inch of soil become dry before watering

- *Overwatering causes disease
- *Poor nutrient uptake because of lack of oxygen to roots

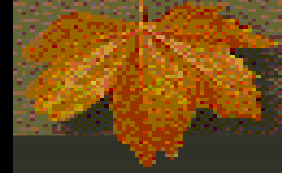
Be efficient with water!

i.e., Rain Barrels



7. Weed Control

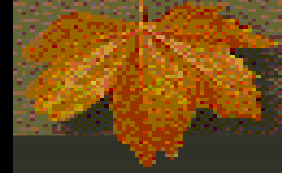




What Is a Weed?

Any plant that is a hazard, nuisance, or causes injury to man, his animals, or his desired crops.





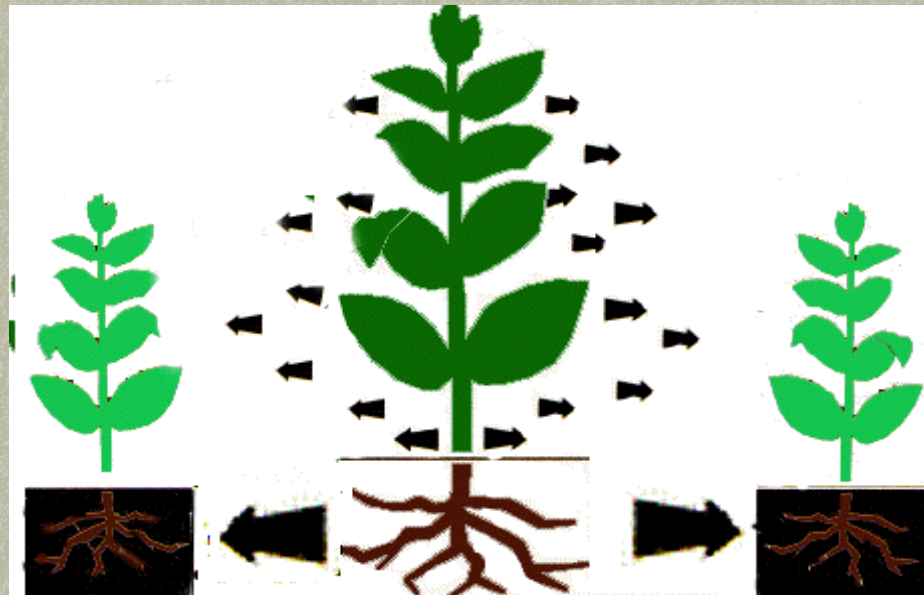
Why Control Weeds?

- Competition – light, water, nutrients, space
- Aesthetics



Why Control Weeds?

Allelopathy – Release of compounds from one plant that are phytotoxic to other plants



Why Control Weeds?

Allelopathy

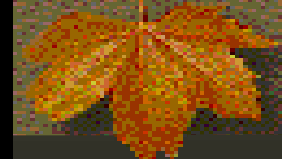


Common Ragweed

Common Purslane



Black Walnut



Why Control Weeds?

Alternative Hosts –
Insects
& diseases

Example: fungal disease
Early Blight on tomato



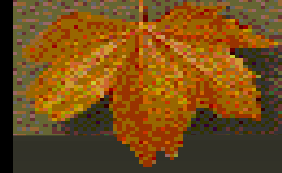


Why Control Weeds?

Weed Seed Production Potential / Plant

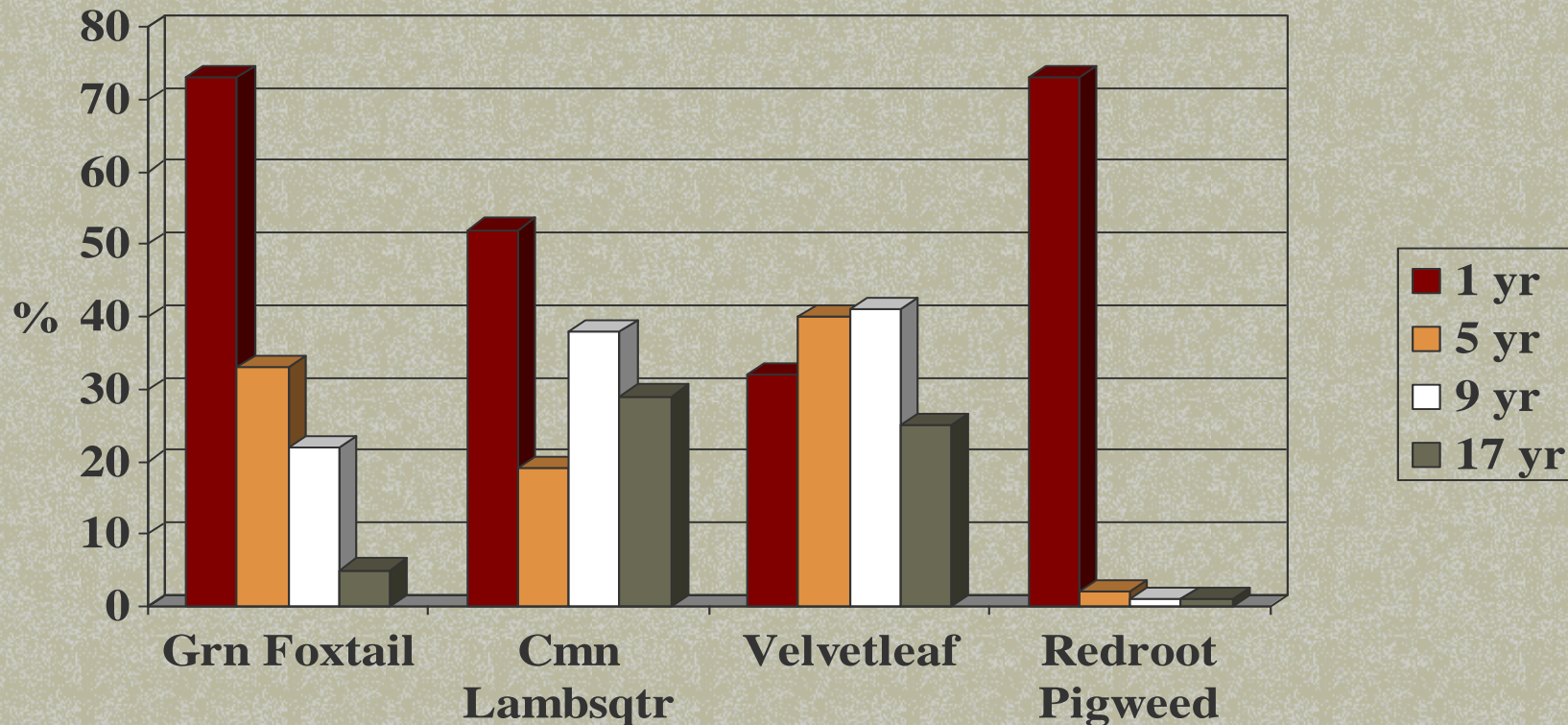
- | | |
|----------------------------|---------|
| ➤ Redroot Pigweed | 230,000 |
| ➤ Common Lambsquarter | 38,000 |
| ➤ PA Smartweed | 6,500 |
| ➤ Eastern Black Nightshade | 40,000 |
| ➤ Green Foxtail | 4,000 |
| ➤ Woolly Cupgrass | 40,000 |





Seed Longevity

Many weed seeds have the potential to survive long periods in soil ---- dormancy





Integrated Weed Management

Using all the available tools to manage weeds in an economical and environmentally safe manner



Weed Management Strategies

- Avoidance
- Tillage (Aerate/Till)
- Hand pulling
- Hoeing
- Mulch (Soil temp.)
 - Inorganic, plastics, etc.
 - Organic
- Corn gluten
- Mowing/weed wacker
- Digging
- Hot water
- Burning
- Green mulch
 - Rye, clover, Brassica's



Vinegar??????

Mulches in the Garden

- Mulches help:
 - Retain moisture
 - Prevent soil splashing
 - Add organic matter to soil
 - Protect existing organic matter
 - Reduce weeds
 - Reduce compaction
 - Provide mud-free footing





Mulches in the Garden



- However, mulches can also:
 - Harbor pests such as slugs
 - Allow for overwintering of pests
 - Deplete nitrogen during decomposition in rare circumstances



Corn Gluten

Corn gluten is a byproduct of the corn milling process.



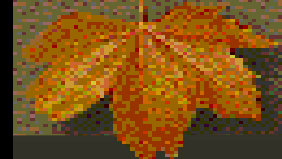
It keeps roots from forming on newly germinated seeds.

All organic, and adds some nitrogen

It can't tell a weed from a carrot!

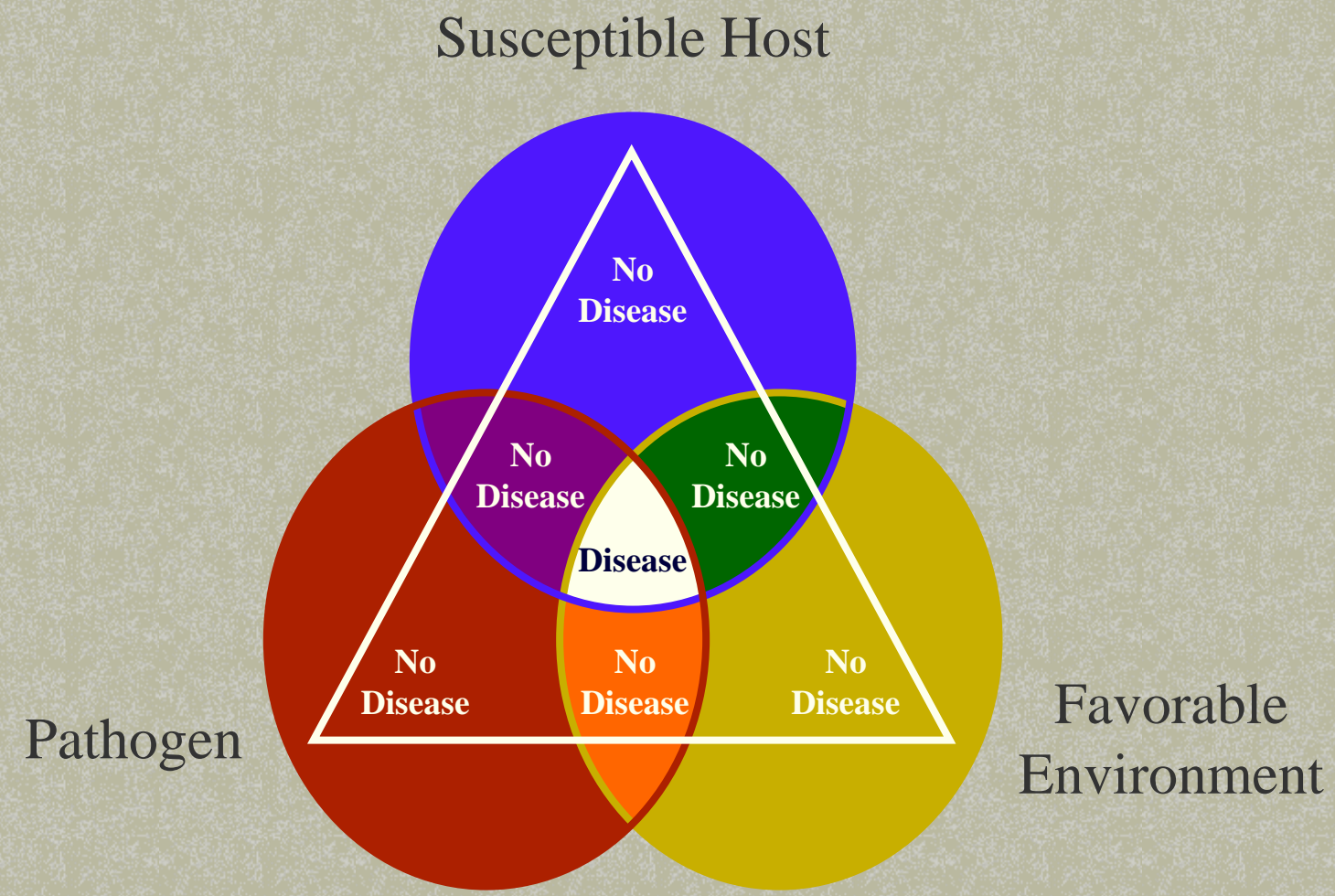
8. Pest Control





Plant Diseases

The Disease Triangle





Conditions Leading to Disease



Moisture – most diseases are caused by a fungus, which needs moisture.

Most pathogens (spores, etc.) overwinter in soil or plant debris.


Some diseases are spread by insects.



Disease Management Strategies



- Crop Rotation
- Select Disease Resistant Plants
- Space/Trellis Plants
- Water Correctly
- Control insect vectors
- Avoid Shade
- Weed Control
- Manage Borders
- End of Season Clean-up
- TOLERANCE



Diseases reduced by staking,
mulches, crop rotation



Septoria Leaf Spot



Early Blight

Insect mouthparts

- Chewing mouthparts



damage

- Sucking mouthparts



damage



Insect Management Strategies



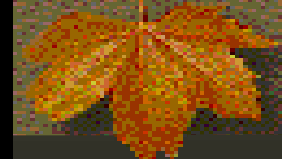
- Scouting
- Row covers
- Paper Bags
- Hand Picking
- Vacuuming
- Shaking
- Sticky Traps
- Light Traps
(beneficial insects)
- Sanitation



Know Your Adversary!!!

- Is that insect really a pest? Or is it eating your pest?
- Positively identify your pest.
- Know your pest's lifecycle.





Row Covers

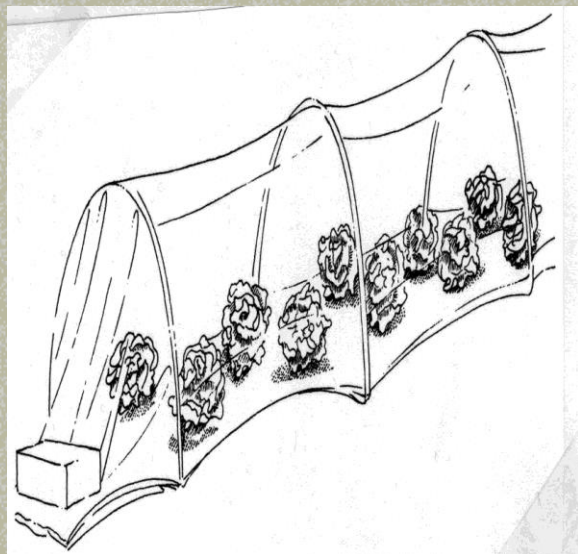


Photo by M.C. Themes





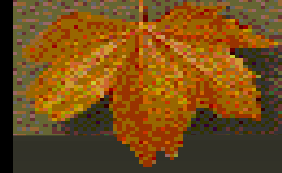
Pesticides in the Garden

Always follow label instructions, especially time between application and harvest.

Organic does not always mean non-toxic.

IPM – Integrated Pest Management – uses a combination of methods to control pests.





Wildlife



9. Harvesting



Timing – When it's ready.

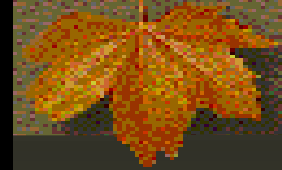
Stems and leaves – slightly immature

Fruits – when just ripe

Harvest in morning when cool

Post-Harvest Handling

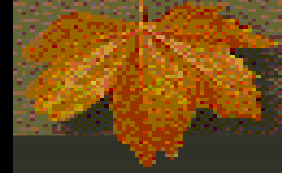
Cool out “field heat” then store at proper temp
and humidity



10. Season Extension and other Tidbits

Timing – Planting too early, when soil is cool, wet, and sun is not strong yet, will slow development

Planting potatoes later reduces or eliminates Colorado Potato Beetle problems.



Plant Lifecycles

Some vegetables are biennials

Onions

Some will flower due to day length

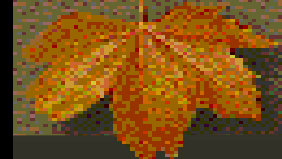
Radishes

Lettuce/spinach

Season Extending Methods

- Cold frames
- Hot beds
- Cloches
- Hotcaps
- Plastic soil mulches
- Covering
- Tunnels
- Row covers
- Greenhouses





Sometimes, it's Out of Your Control!

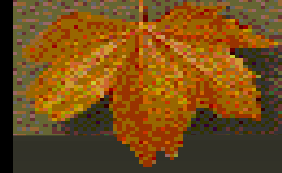
High or Low temperatures during blossom will cause flower abortion or drop of fruit.

Poor pollination will result in poor fruit set.

Hail and winds

Too much rain





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