



University of Idaho  
Extension

# **VEGETABLE GARDENING**

**FROM SOIL TO SEED TO STORAGE**

**JENNIFER JENSEN**

**UI EXTENSION, BONNER COUNTY**



MON	TUE	WED	THU	FRI
2	3	4	5	6
9	10	11	12	
16	St. Patrick's Day 17	18		
23	New Moon 24	25		
30	31			

### Spring

- Site Selection & Design
- Soil
- Seeds
- Spring Crops

### Summer

- Care for the Garden
- Succession Planting
- Summer Crops

### Fall

- Season Extension
- Cover Crops
- Seed Saving
- Fall Crops



2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27



# **SITE SELECTION AND DESIGN**

# LOCATION, LOCATION, LOCATION





Make the  
most of what  
you have!





Avoid cold pockets and windy sites if possible.

# **VEGETABLE GARDENS OF ALL SHAPES AND SIZES**

- Container Vegetable Gardens
- Intensive Gardening Methods
- Edible Garden Design
- Traditional/Row Cropping









**Grow!**

Gardeners for Regional Organic Wellbeing

**Community Garden**

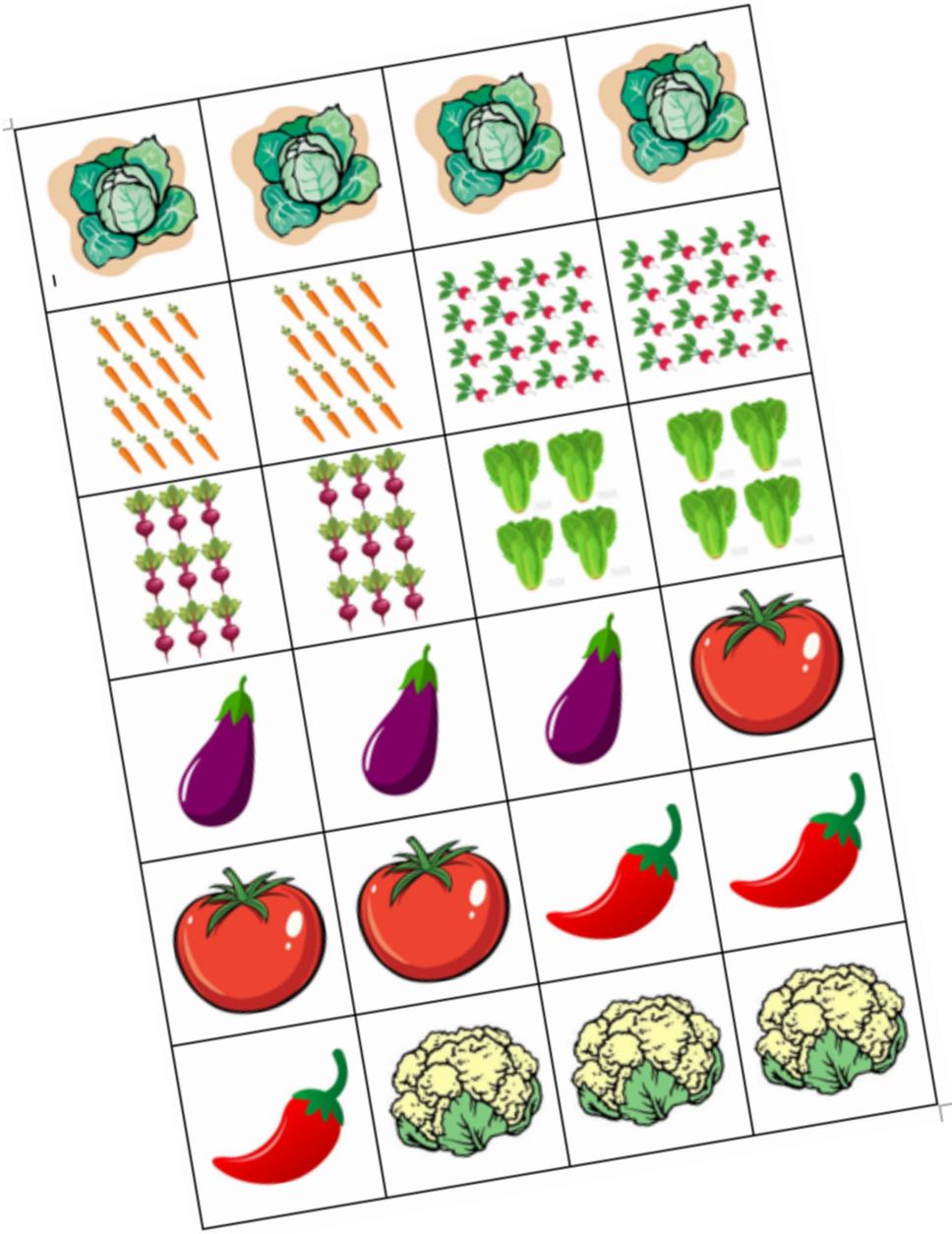




**Grow!**  
Gardens for Regional Organic Wellbeing  
**Community Garden**

























# Three Sisters Garden

## What is a Three Sisters Garden?

A traditional Native American style of gardening.

The Three Sisters system refers to corn, beans, and squash. This system creates a beneficial relationship between the three plants. It is a form of companion planting or intercropping. The corn provides a trellis for the pole bean to grow on. The beans help fix nitrogen in the air and make it available for the plants to use. The squash acts as a living mulch, shading out weeds in the garden.

The corn and beans can be harvested for fresh eating or left to dry for winter consumption. The winter squash should be harvested after the skin has hardened thoroughly.



## What is Intercropping?

Intercropping is the establishment of two or more plant species in close proximity so that some cultural benefit is derived.

Methods of companion planting that have been proven scientifically include trap cropping with radishes that attract root maggots away from carrots, rotating heavy feeder like corn with light cropping with tall, shade tolerant plants.

## How do I plant a Three Sisters Garden?

Specific planting plans vary between regions, but the main principles are the same.

Start your Three Sisters Garden by working the soil into mounds. The mounds should be about 4 inches high and 18-25 inches in diameter. The mounds should be spaced 3-4 feet apart to allow room for the plants to grow.

Plant about 4 corn plants in the center of the mound, about 6 inches apart. Once the corn is starting to grow, plant beans in a circle around the corn. The squash is then planted in separate mounds in between the corn and bean mounds.

Some three Sisters Gardens also include sunflowers which are planted at the same time as the corn. The heads are then harvested.































# Garden size – is bigger better?

- How much space is available?
- Amount of sunshine (6-12 hours needed)
- How much food do you hope to produce?
- How do you plan to use the harvest?
- Time commitment
- A small weed-free garden will produce more vegetables than a large weedy mess



# Setting Goals

Your roadmap to  
success in any garden  
enterprise

# MAKE A PLAN FOR YOUR GOALS

- Plant Selection
- Choose what your like to eat?









# SEEDS

How much?

	Amount for one adult (fresh)		People in my family consuming this	Amount to plant feet of row	Final Plant Spacing Inches	Number of plants
	avg. lbs. eaten	Feet of Row				
Broccoli	5	7	4	28	20	17
Carrots	10	10	4	40	2	240
Cucumber	4	5	4	20	18	13
Lettuce, leaf	5	10	2	20	6	40
Peas	4	13	4	52	3	208
Sweet Corn	5	17	4	68	10	82
Tomatoes	24	15	2	30	24	15

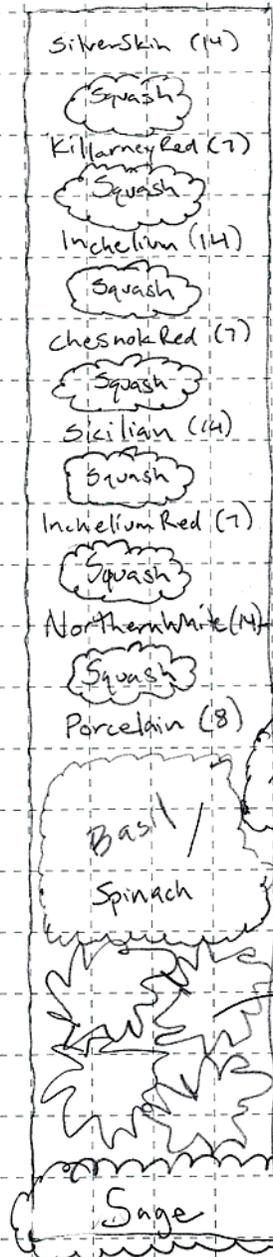
# Community Garden 2012

2011

Planted garlic 10/30/2011

2012

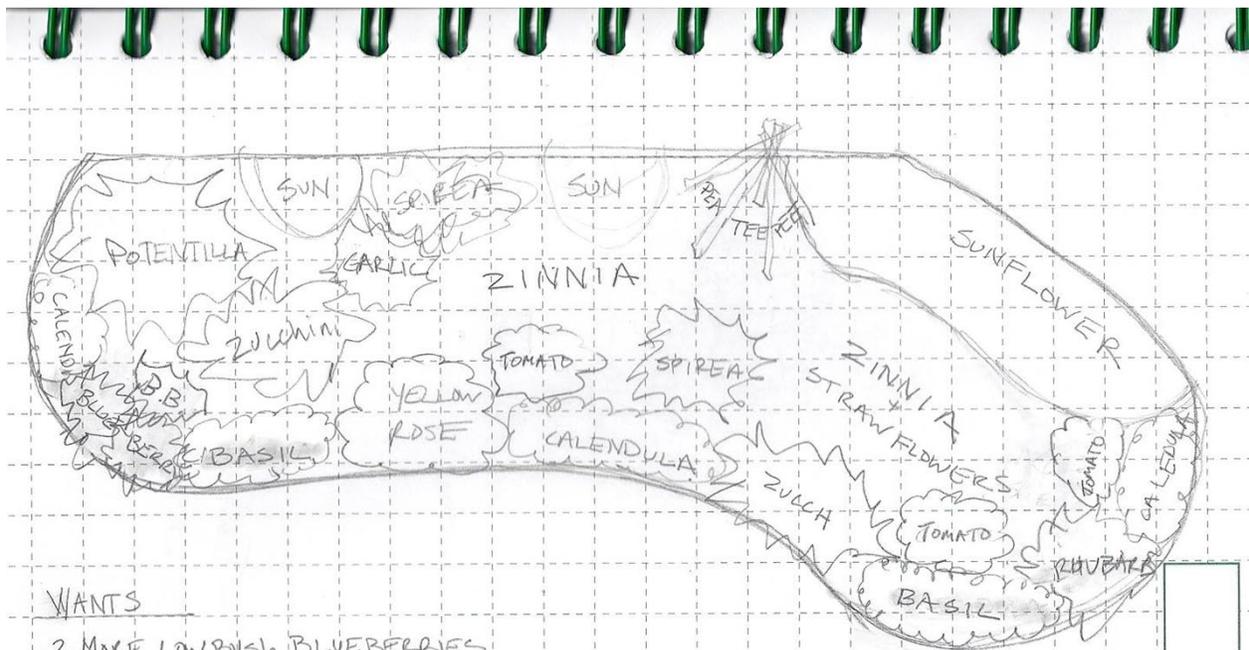
- April plant Spinach (cover w/ row cover)
- Mid-April start Basil transplants
- May Plant out Basil
- June start harvesting Basil (start freezing Pesto)



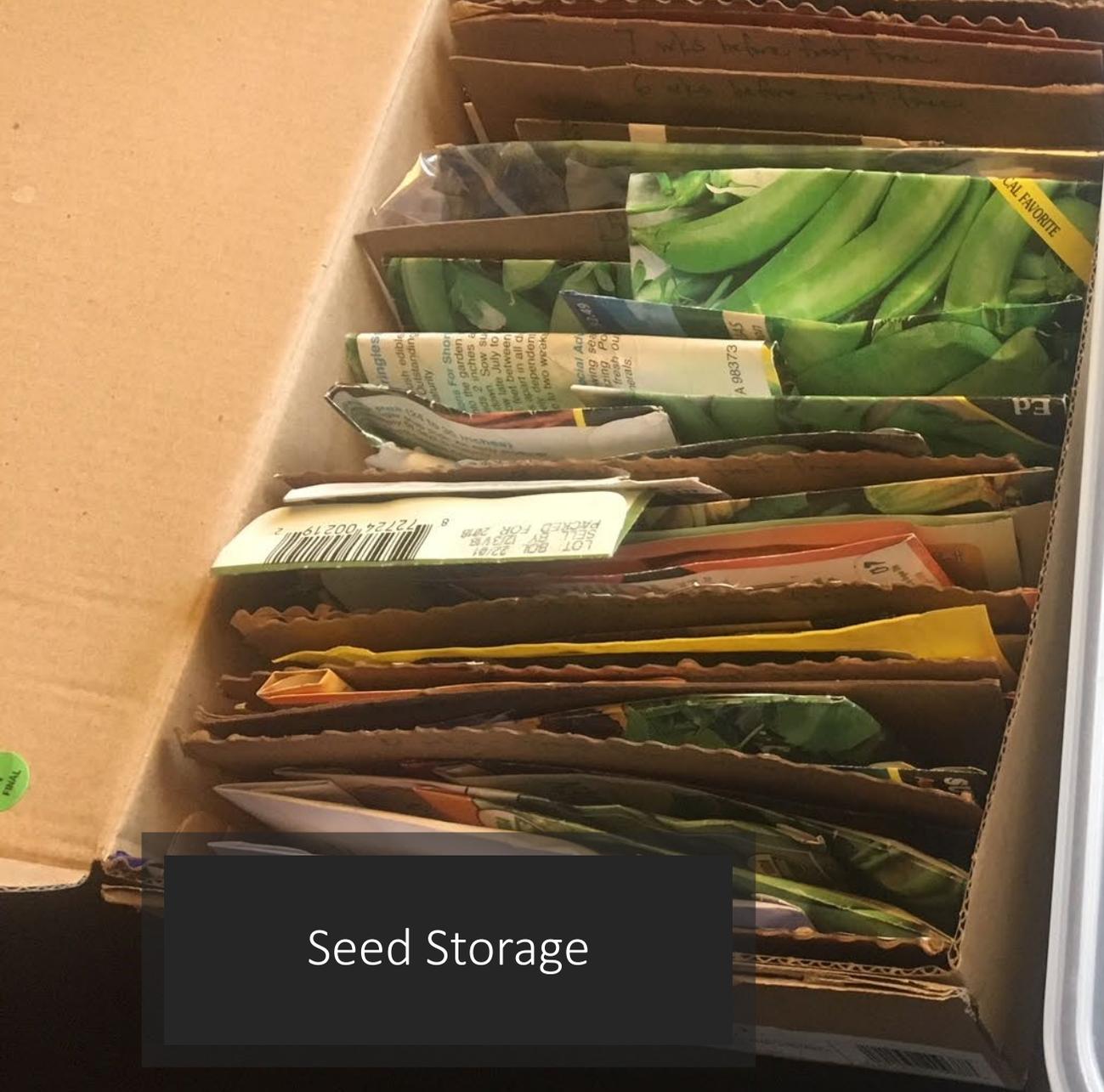
Thyme

Roma Tomatoes/  
Spinach

- Squash Cultivars
- Sweet Dumpling
  - Delicata
  - Butternut



- WANTS
- 2 MORE LOWBUSH BLUEBERRIES
  - ZINNIA SEEDS (RED, ORANGE, GREEN)



Seed Storage

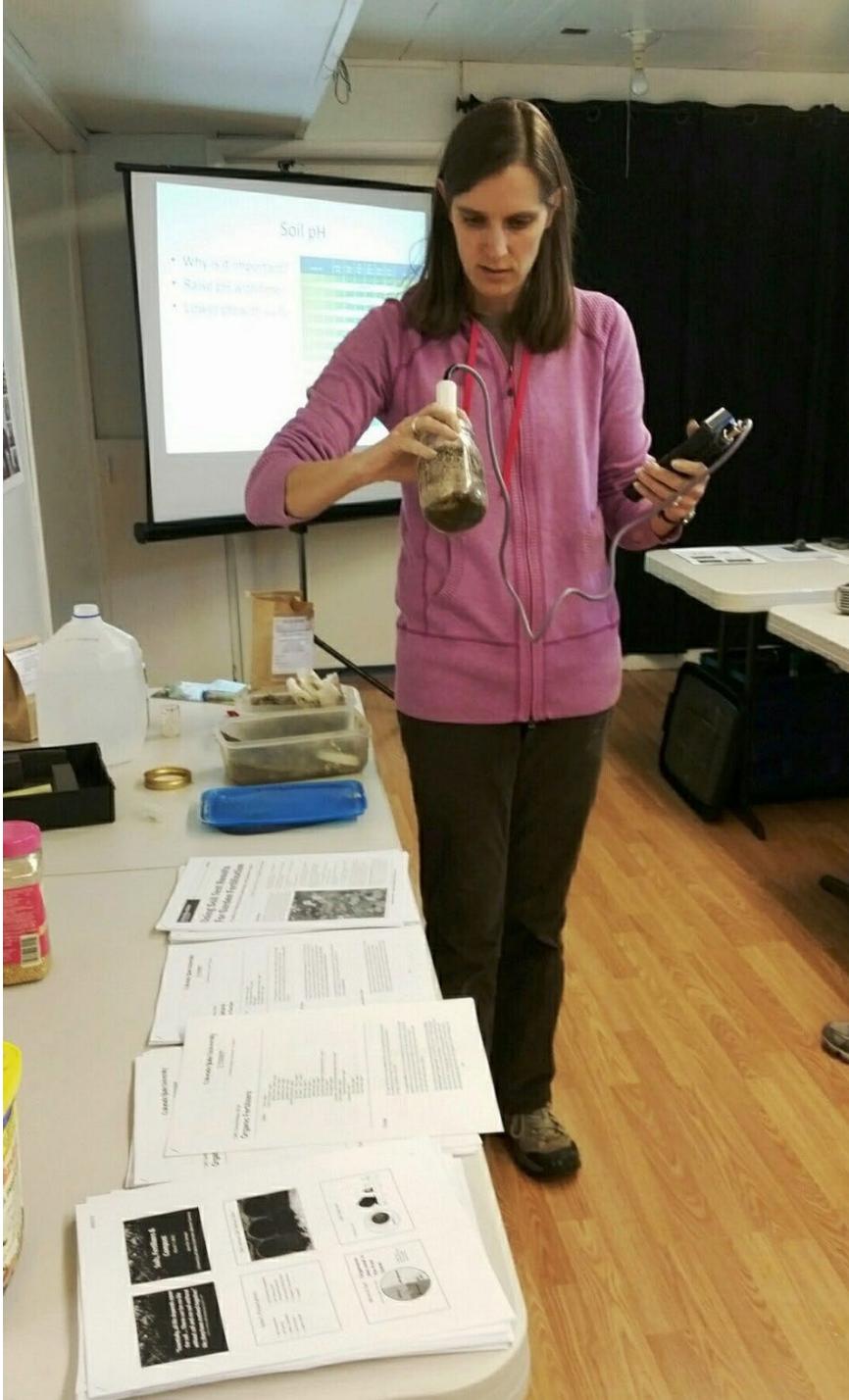


# Sowing seeds

- Start with quality seeds
  - Fresh
  - Viable



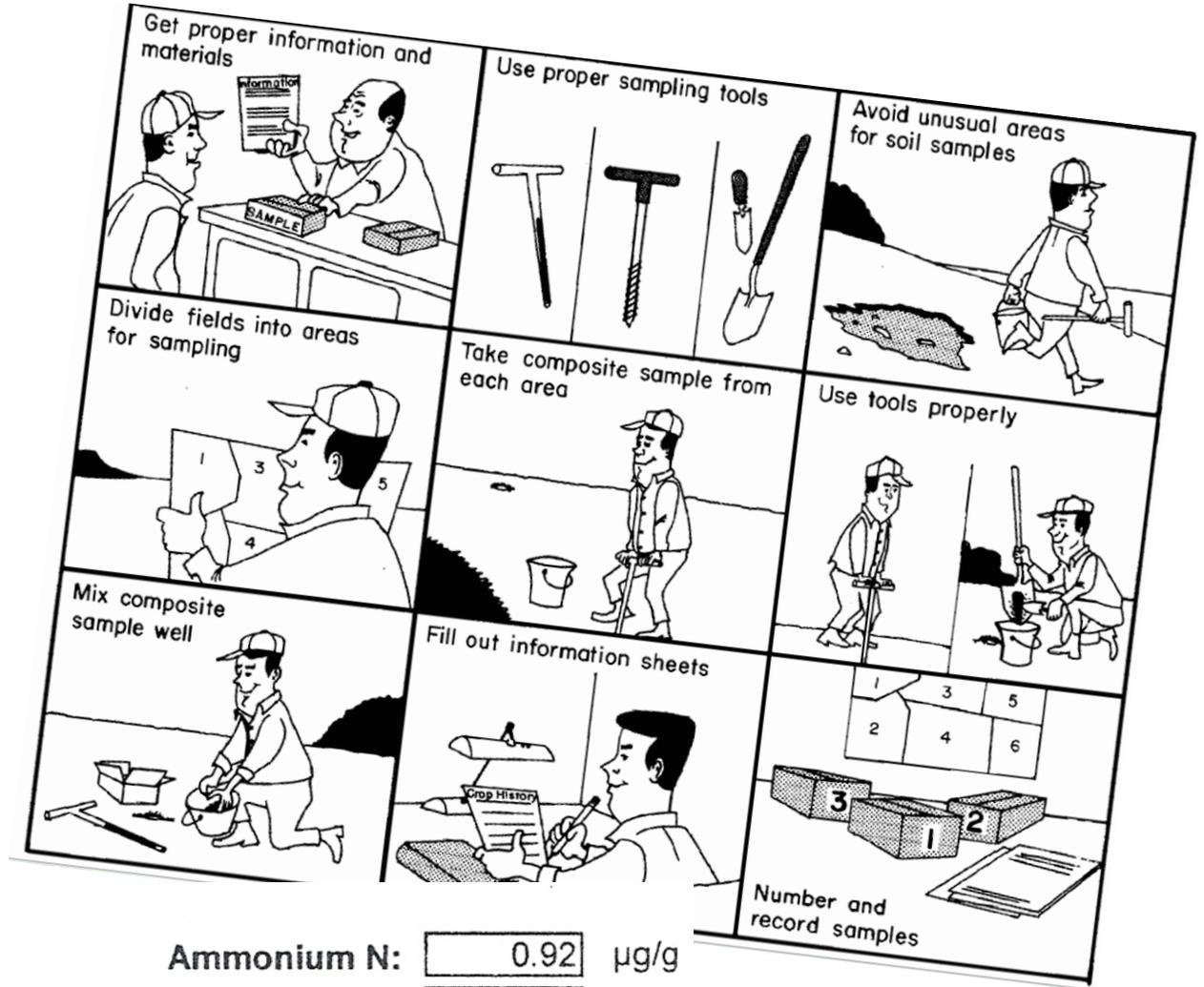
**SOIL**



# Get to know your Soil

- Get to Know Your Soil
  - Soil Testing
  - Soil Surveys

# Soil Testing



pH:  Saturated Paste

Ammonium N:  µg/g

Nitrate N:  µg/g

Bicarbonate P + K     Acetate P + K

Available P:  µg/g

Organic Matter:  %

Available K:  µg/g

Sulfate-S:  µg/g

Boron:  µg/g

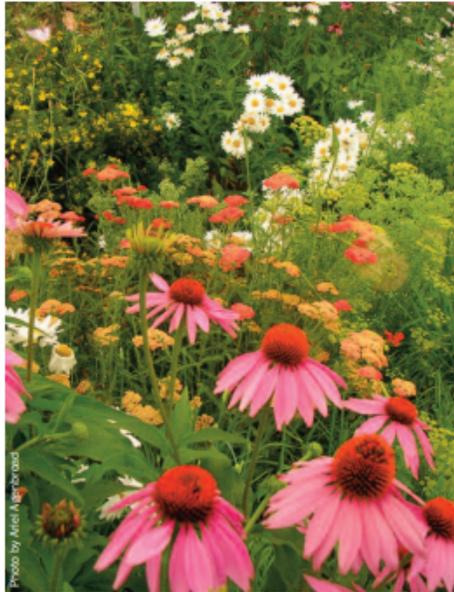
# Using Soil Test Results For Garden Fertilization

*A Guide for Fertilizing Home Landscapes and Gardens in Idaho*

*by Amber Moore, Mike Bauer, Ariel Agenbroad, and Susan Bell*

## Introduction

Homeowners are often encouraged to have their soil tested in order to learn more about their particular piece of ground and to prevent under- and over-fertilization of their plants. Soil tests are particularly important for homeowners who suspect nutrient deficiencies in their plants, have



over-applied nutrients, or do not know how much fertilizer to apply.

Nutrient deficiencies can occur under a variety of situations, including:

- New gardens that have received no previous fertilizer; or
- Manure applications; or
- New construction where native topsoil may have been removed or disturbed.

Adversely, extremely high concentrations of nutrients in the soil can result from all-too-common practices such as:

- Frequent applications of lawn fertilizers; or
- Annual loads of manure; or
- Compost piled several inches high on a small garden; or
- Not following fertilizer application instructions on a fertilizer container.

Along with plant toxicity concerns, excessive applications of seemingly harmless plant nutrients can quickly move through the soil or accumulate in runoff, leading to unintended pollution of ground and surface water.

**The goal of this publication** is to introduce University of Idaho Extension county educators, Master Gardeners, landscape professionals, and homeowners to the most common nutrients required for plant growth, and to provide easy-

# Using the information from your soil test for fertilization

# Living Soil Components





Soil preparation





# **GROWING SPRING CROPS**

# PLANNING FOR SEED SOWING

- Frost Free Date
- Soil Temperature
- Indoors vs. Outdoors



# Propagating Plants from Seed

A PACIFIC NORTHWEST EXTENSION PUBLICATION • PNW0170



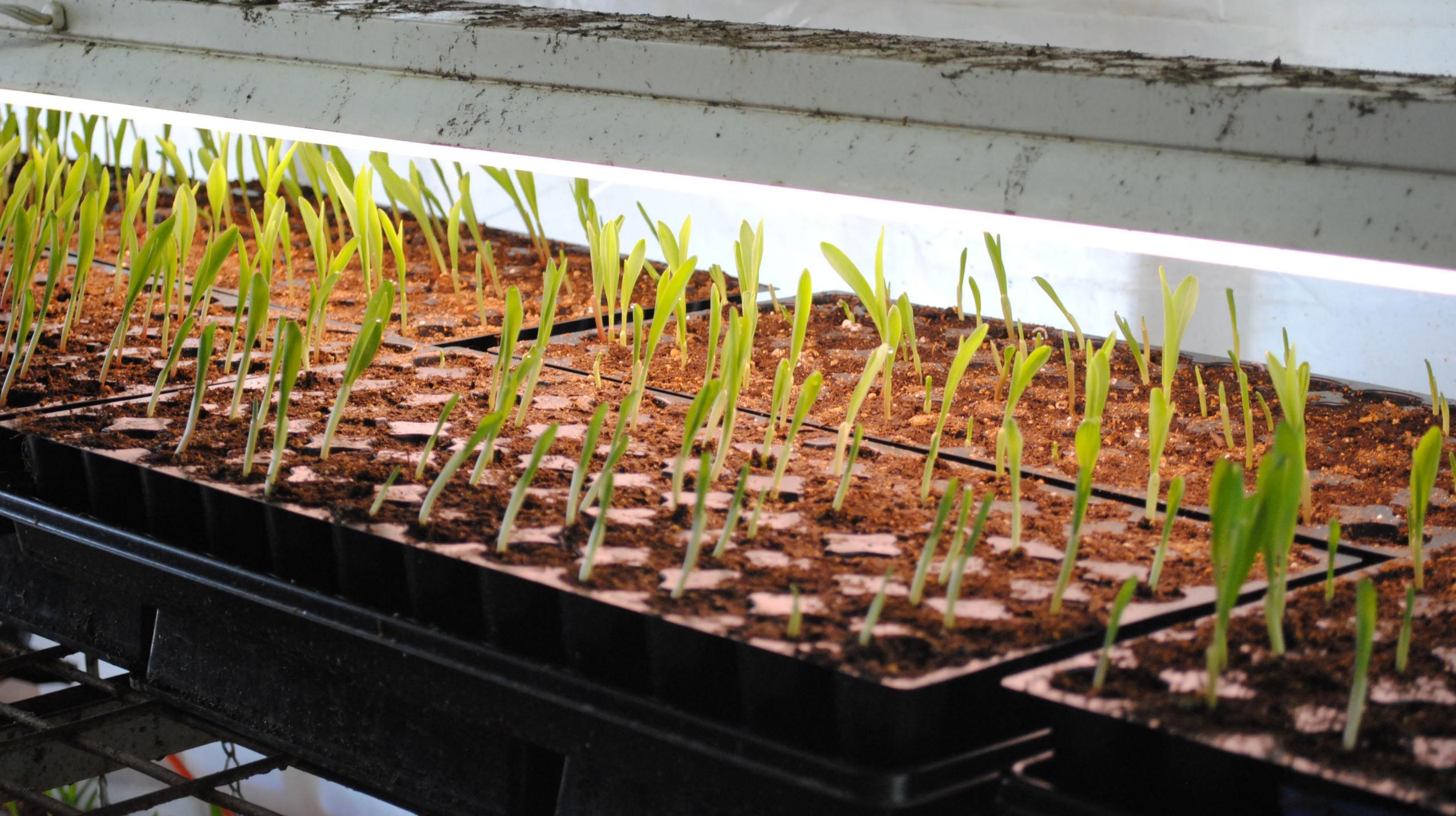
Washington State University • Oregon State University • University of Idaho

# PROPAGATING PLANTS FROM SEED PNW 0170

Table 2. Suggestions for successful propagation of common vegetables from seed and vegetative propagules.

Vegetable	Seeds		Distance				Soil temperature for seed*			Weeks to grow to transplant size†	Days to maturity‡
	Depth to plant (inch)	No. to sow per foot of row	Between plants (inch)	Between rows (inch)			No. days to germinate	Needs light to germinate	Needs cool soil		
Asparagus	1½		18	36	7-21	—	•			1 year	3 years
Asparagus Lettuce	½	8-10	12	18	4-10	—	•			4-6	80
Beans: Snap Bush	1½-2	6-8	2-3	18-30	6-14	—			•		45-65
Snap Pole	1½-2	4-6	4-6	36-48	6-14	—			•		60-70
Lima Bush	1½-2	5-8	3-6	24-30	7-12	—			•		60-80
Lima Pole	1½-2	4-5	6-10	30-36	7-12	—			•		85-90
Garbanzo											
Chick Pea	1½-2	5-8	3-4	24-30	6-12	—			•		105
Scarlet Runner	1½-2	4-6	4-6	36-48	6-14	—			•		60-70
Soybean	1½-2	6-8	2-3	24-30	6-14	—			•		95-100
Beets	½-1	10-15	2	12-18	7-10	—		•			55-65
Buck-eye Cowpea	½-1	5-8	3-4	24-30	7-10	—			•		65-80
Southern Peas											
Yardlong Bean	½-1	2-4	12-24	24-36	6-13	—			•		65-80
Broccoli, sprouting	½	10-15	14-18	24-30	3-10	—		•		5-7**	60-80T‡‡
Brussels Sprouts	½	10-15	12-18	24-30	3-10	—		•		4-6**	80-90T‡‡
Cabbage	½	8-10	12-20	24-30	4-10	—		•		5-7**	65-95T‡‡







Transplanting









Tools



# Hardening Off Plants







# **SUMMER CARE FOR THE GARDEN**

# IRRIGATION SYSTEMS

- Surface Irrigation
  - Furrow/Flood Irrigation
- Aerial Irrigation
  - Sprinkler Systems
- Drip Irrigation
  - Drip Hoses



# IRRIGATION FACTORS

- Rooting Depth
  - Shallow rooting plants (lettuce)
  - Deep rooting plants (tomatoes, trees)
- Soil Type and Depth
  - Sandy soil = little water holding capacity
  - Clay soil = much greater water holding capacity
- Stage of Growth
  - Young plants generally need less water than mature plants
  - Moisture stress can be more severe during certain stages than others.

# MULCHING

- Retains moisture in the soil
- Helps limit weeds



# MULCH

- Leaves
- Straw
- Wood chips
- Bark mulch
- Plastic mulch
- Cardboard
- Newspaper



# INTEGRATED PEST MANAGEMENT



Common-sense approach to pest control that combines alternatives to pesticides with wise use of pesticides.

Pest Identification & Monitoring

Least-Toxic  
Pesticides

Conventional  
Pesticides

Horticultural  
Controls

Bio-Control

# PESTICIDES

- Conventional
- Biorational/Least Toxic
  - Physiologically Selective
  - Ecologically Selective

Pest Identification & Monitoring

Least-Toxic  
Pesticides

Conventional  
Pesticides

Horticultural  
Controls

Bio-Control

# ALTERNATIVES TO PESTICIDES

- Horticultural Controls
- Physical Controls
- Mechanical Controls
- Biological Controls

Pest Identification & Monitoring

Least-Toxic Pesticides

Conventional Pesticides

Horticultural Controls

Bio-Control

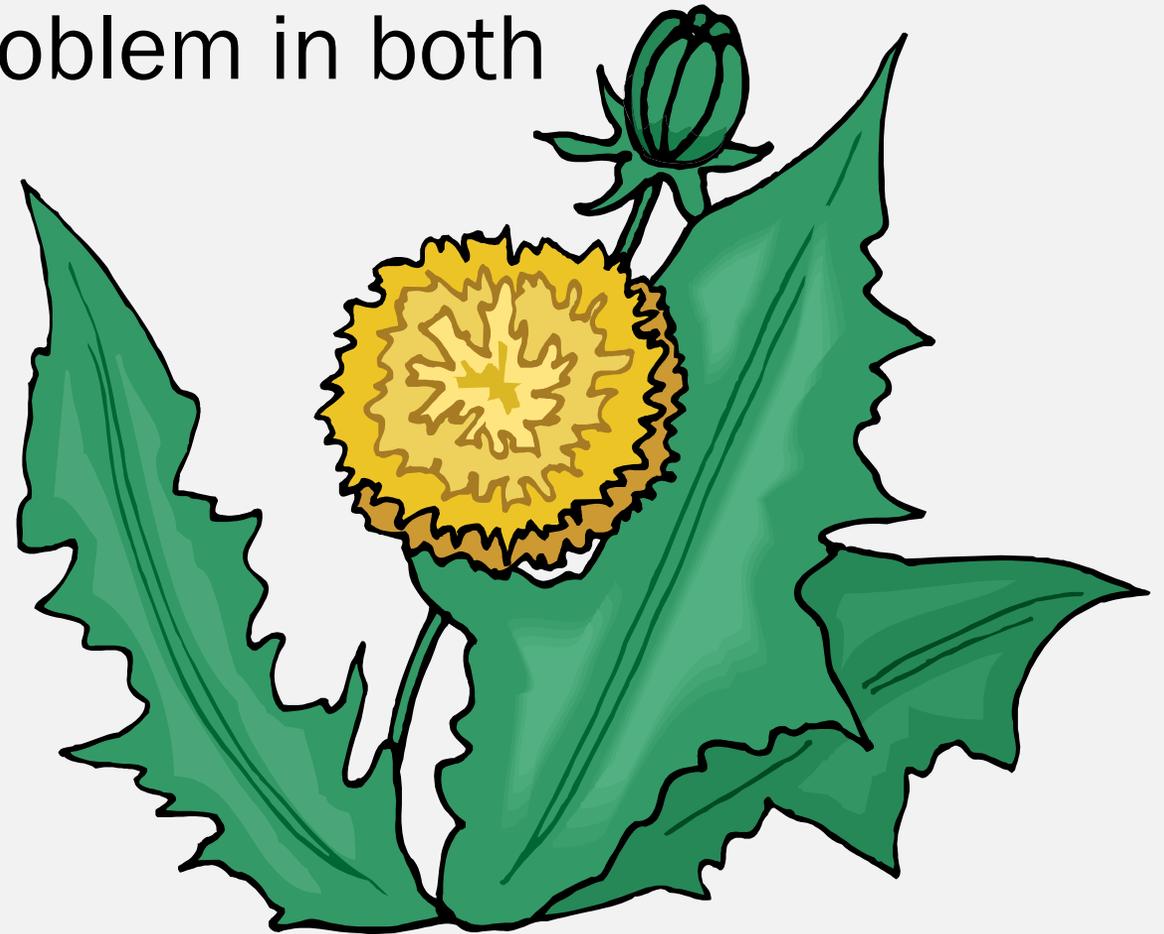


**WEEDS,  
INSECTS,  
DISEASES  
AND MORE**

**OH MY!**

# WEEDS, WEEDS, WEEDS

- Weeds are frequently cited as the most challenging pest problem in both organic and non organic gardens.



# WHAT WEEDS ARE IN YOUR GARDEN?



# CRITICAL WEED-FREE PERIOD

- Minimum length of time a crop must remain nearly weed-free to prevent reduction in yield or quality
- For most vegetables it's the first  $1/4$  to  $1/3$  of their growing season (4-6 weeks after seedlings emerge or less for transplants)
- Weeds after this period have less impact on vegetable yields

# APHIDS & ADELGIDS

- Many species, many hosts
- Overwinter as eggs
- Cause wilting, twisted, malformed leaves and buds



# CATERPILLARS ON COLE CROPS

- Three species, Brassica plants
- Overwinter pupae in the soil
- Defoliation, holes in leaves



# WIREWORMS

- Several species affect almost all vegetable crops
- Overwinter as larvae or beetles in soil
- Holes in root crops, gouges in newly planted seed



Art Cushman, USDA Systematics  
Entomology Laboratory,  
Bugwood.org

Eric LaGasa, Washington State Department of Agriculture, Bugwood.org



# FLEA BEETLES

- Several species, affecting brassica crops and Solanaceae crops
- Overwinter in soil and plant debris
- Cause defoliation and crop loss



# COMMON SCAB

- Bacterium on potato and other crops
- Corky lesions on the tuber's surface

Clemson University - USDA Cooperative  
Extension Slide Series, Bugwood.org



UGA1436170

Gerald Holmes, California Polytechnic  
State University at San Luis Obispo,  
Bugwood.org



1578010

Gerald Holmes, California Polytechnic  
State University at San Luis Obispo,  
Bugwood.org



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# ROOT KNOT NEMATODES

- Attack a number of vegetable crops
- Stunted plants, malformed roots



Photo from OSU Extension Plant Pathology Slide Collection

Photo by Kathy Merrifield, 1991.



Jonathan D. Eisenback, Virginia Polytechnic Institute and State University, Bugwood.org



5440574

# POWDERY MILDEW

- Many species affect many plants
- Infection can occur between 50°F and 90°F with 68°F to 81°F being optimum
- Severely infected leaves may turn brown, exposing the fruit to sunscald and possibly affecting rind color or storability of winter squash

Howard F. Schwartz, Colorado  
State University, Bugwood.org



5358902



1577243

Gerald Holmes, California Polytechnic  
State University at San Luis Obispo,  
Bugwood.org

# HERBICIDE RESIDUE DAMAGE



# PHYSIOLOGICAL LEAF CURL

- On tomato
- Dry soil conditions, high nitrogen fertility programs, phosphate deficiency,
- Severity of leaf roll appears to be cultivar dependent



University of Illinois Extension

# CAT FACE TOMATO

- Growth disturbance during blossoming, prolonged unseasonable cool weather, excess nitrogen, 2,4-D exposure
- Occurs in some cultivars more than others.

Iowa State University Extension



Umass  
Extension

# BLOSSOM END ROT

Gerald Holmes,  
California  
Polytechnic State  
University at San  
Luis Obispo,  
Bugwood.org



- Soil moisture fluctuations, lack of calcium especially during drought stress, excess nitrogen applications which increase the demand for calcium.
- Occurs in some cultivars more than others.

Photo by Jay W. Pscheidt, 1994.



Paul Bachi,  
University of  
Kentucky  
Research and  
Education  
Center,  
Bugwood.org





# SUMMER CROPS





# SEASON EXTENSION

# GROWING SEASON

- The period between the beginning of growth in the spring and the cessation of growth in the fall.

# WHY MODIFY YOUR GROWING SEASON?

- Too Cold
- Too Hot
- Too Short of a “Growing Season”
- Too Wet
- MORE FOOD!!

# STRUCTURES

- Greenhouse
- High Tunnel
- Low Tunnel
- Cold Frame
- Row Cover
- Shade



# WINTER IN THE GARDEN



It could look like this



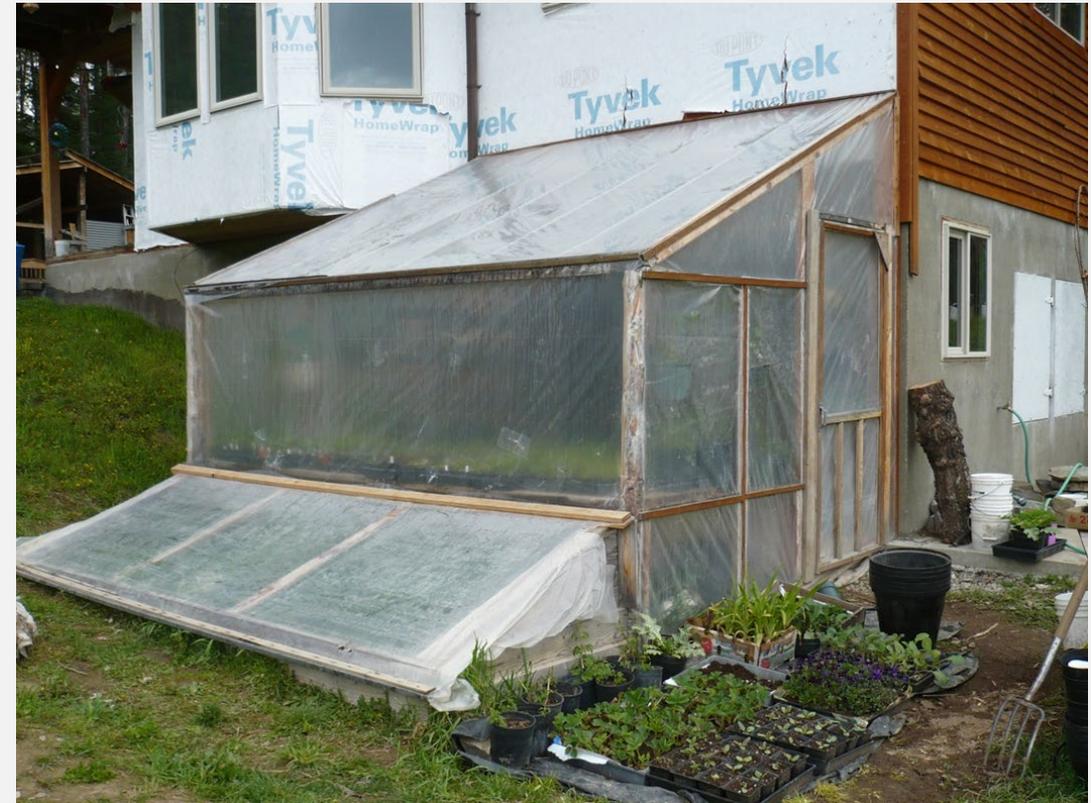
Or it could look like this.



# TYPES OF GREENHOUSES/HIGH TUNNELS



- Attached or free standing











# TYPES OF GREENHOUSES/HIGH TUNNELS



- Attached or free standing





















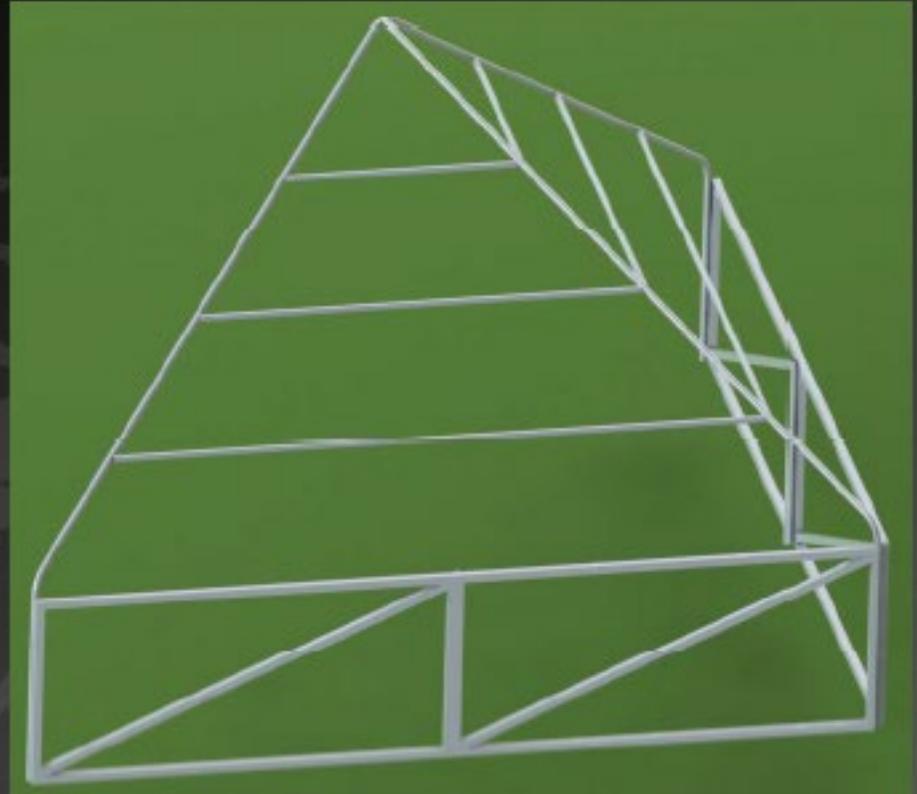


Photo Credit: Stephen Love



# Windbreak Details

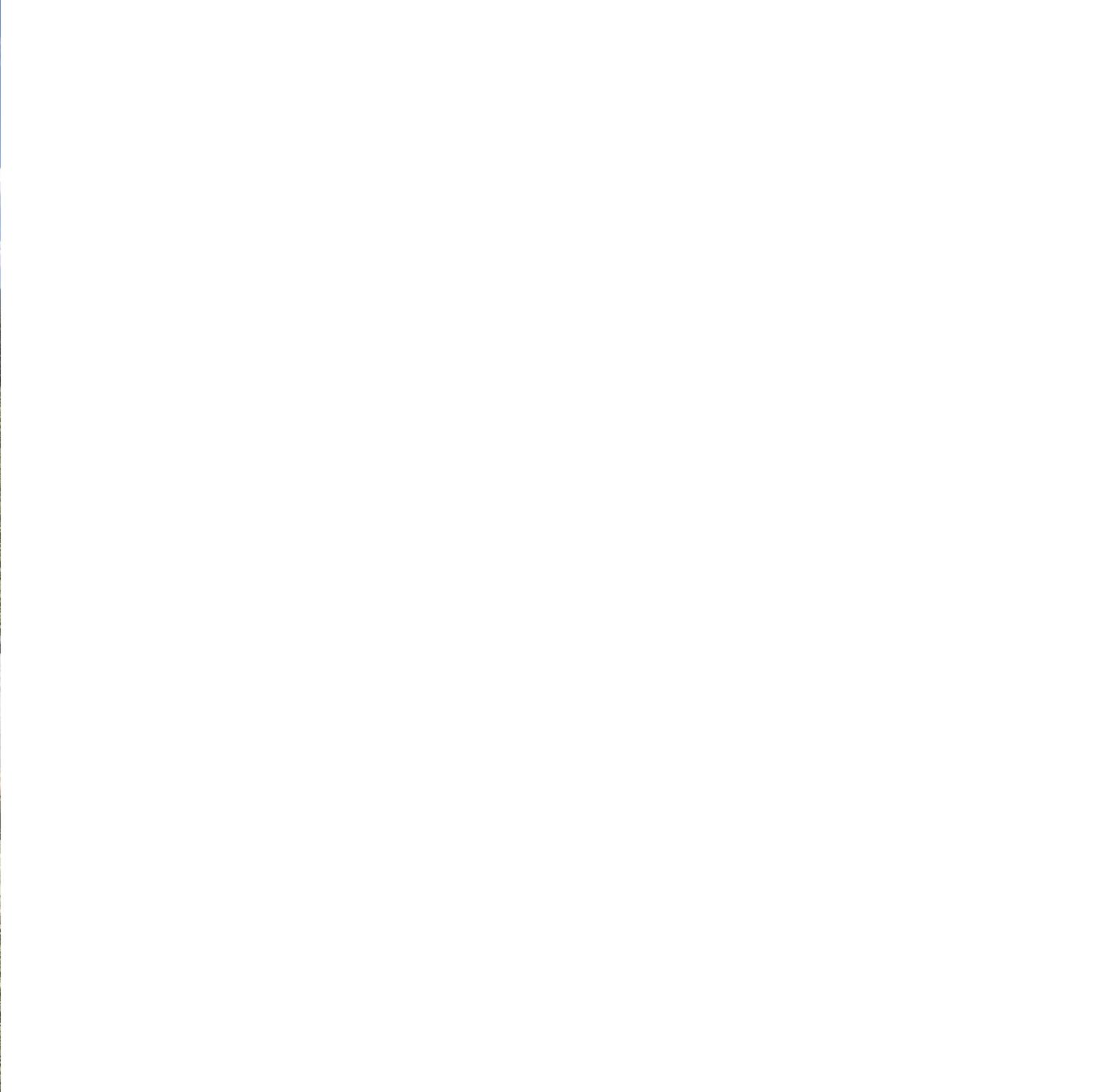
- 12' long to the point
  - Use half of a kit frame
- 3 extra anchor points
  - Point and each side
- 4' high sidewalls
  - 2 welded panels on each side
  - Secured to anchor points
- Purlins
  - Secured by welding or pipe fittings

















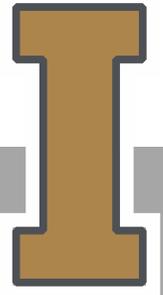


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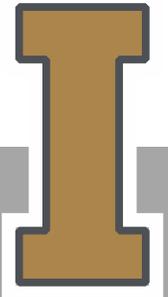
Extension of  
Local Food  
Production

# GREENTREE NATURALS

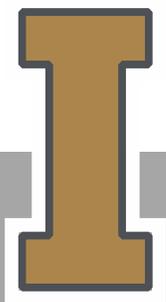
Certified Organic Farm



Extension of  
Local Food  
Production



# Extension of Local Food Production



# Extension of Local Food Production



# Extension of Local Food Production





# FALL COVER CROPS

...are an inexpensive way to build better soil structure.

...are a safe way to incorporate organic matter.

...build nutrients in the soil.

...help reduce soil compactions and prevent erosion.

...help loosen heavy-textured soils, better air and water penetration.

...help suppress weeds.

## Cover Crops for Home Gardens...

## Cover Crop Periodic Table

Cool Season Plants						Warm Season Plants			
Grass		Broadleaf Plants						Grass	
Barley									Pearl Millet (wk)
Oat (wk)	Arugula							Safflower (wk)	Foxtail Millet (wk)
Ryegrass	Flax (wk)							Buckwheat (wk)	Proso Millet (wk)
		Legumes							
Wheat	Rape	Turnip (wk)	Winter Field Pea	Chickling vetch (wk)	Medic	Chickpea (wk)	Sunflower (wk)	Sudan grass (wk)	
Cereal rye	Phacelia	Radish (wk)	Lentil	Red clover	Ladino clover	Cowpea (wk)	Amaranth (wk)	Teff (wk)	
Triticale	Canola / Mustards	Beet	Spring Pea (wk)	Crimson clover	Bean (wk)	Soybean (wk)	Chicory	Grain Sorghum (wk)	
Forage Oat	Ethiopian Cabbage	Tyfon (wk)	Vetch	Sweet clover	Alfalfa	Sun Hemp (wk)	Flower mix	Corn (wk)	

(wk) = winter killed











# Managing Cover Crops Profitably

THIRD EDITION



## Resources

- Managing Cover Crops Profitably
  - <http://www.sare.org/publications/covercrops/covercrops.pdf>
- Cover Crops for Home Gardens
  - <http://extension.oregonstate.edu/catalog/html/fs/fs304-e/>
- Choosing the best cover crops for your organic no-till vegetable system
  - <http://newfarm.rodaleinstitute.org/features/0104/no-till/chart.shtml#>



# **PRODUCE HARVEST & STORAGE**

# HARVESTING

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- Harvest at the appropriate maturity stage.
- Light frost (28-32°F)
  - Hard shell squashes and pumpkins should be cured in the field then protected from a heavy frost.

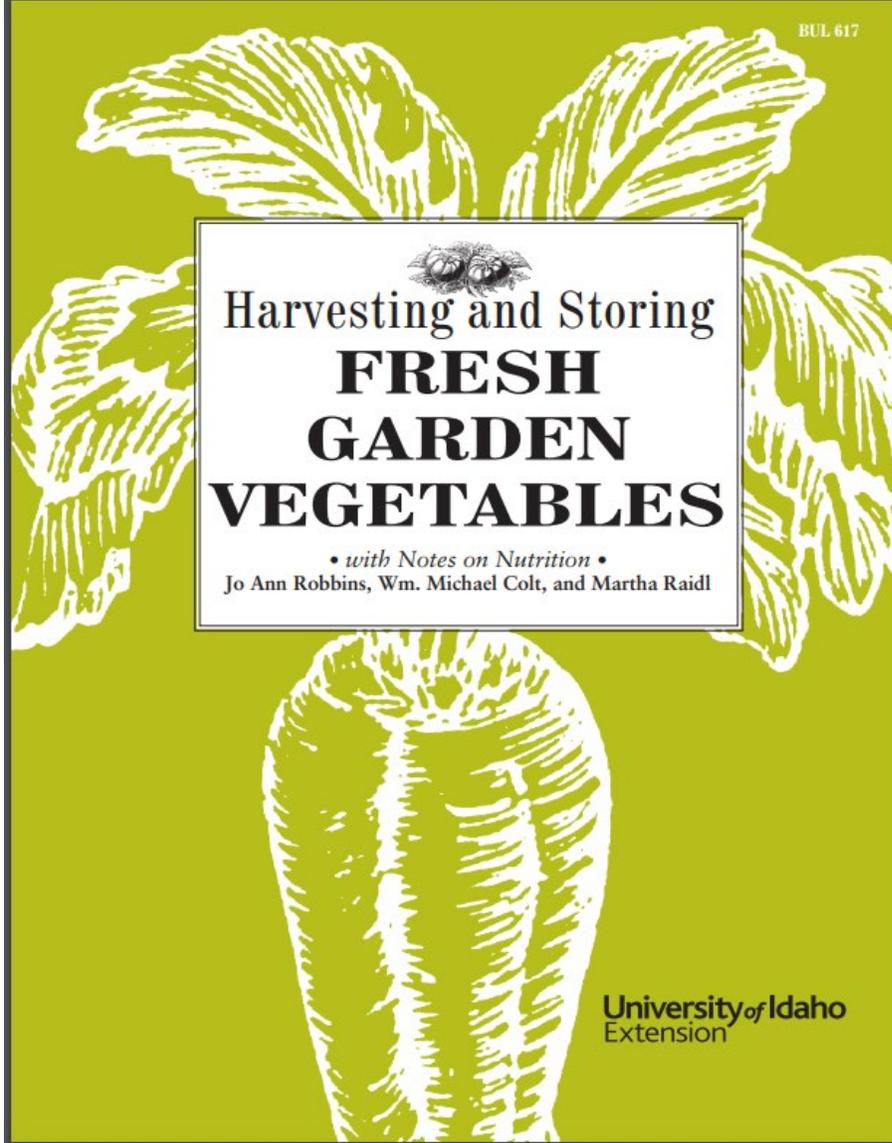




# HANDLING/ VEGETABLE PREPARATION

- Be gentle, bruising leads to rot
- Select only your best produce for storage
- Curing
  - onions, garlic, squash, pumpkins and sweet potatoes need curing

BUL 617



# Harvesting and Storing **FRESH GARDEN VEGETABLES**

• *with Notes on Nutrition* •  
Jo Ann Robbins, Wm. Michael Colt, and Martha Raidl

University of Idaho  
Extension

WASHINGTON STATE  
UNIVERSITY  
EXTENSION



**STORING VEGETABLES AND FRUITS AT HOME**

By  
Virginia "Val" Hillers, Extension Food Specialist, Department of Food  
Science and Human Nutrition, Washington State University

WSU PEER  
REVIEWED  
EB1326E



# SEED SAVING

# Seed Saving

- Random pollination results in plants different than the parents
- Self Pollinated or open pollinated varieties are best for seed saving



# Cleaning Seeds





















# FALL CROPS







**Thanks!**

**Questions?**