

A close-up photograph of a brown praying mantis perched on a lavender plant. The mantis is positioned in the upper right quadrant, facing left. Its long, segmented body and raptorial front legs are clearly visible. The lavender plant has numerous small, purple, tubular flowers and green, needle-like leaves. The background is a dense field of similar lavender plants, creating a textured, green and purple environment. The lighting is natural, suggesting an outdoor garden setting.

*Welcome to the Garden Time Garden Program*

# Garden Time Curriculum Guide

*Garden Time's mission is to create garden programs for incarcerated men and women at the Rhode Island Adult Correctional Institution and elsewhere. Through the process of gardening, we foster education, inspiration and empowerment; teach inmates to grow their own food for economic and personal self reliance; and identify and connect with existing opportunities to allow for permanent re-entry into society.*





## What is Organic Gardening?

### *Garden Projects for the Spring Session:*

*Prune raspberries (knee-high on Valentine's Day).*

*Start seeds indoors for tomatoes, peppers & egg-plant.*

*Clean up perennial herbs & flowers.*

*Prepare beds for spring planting.*

*Amend soil according to results of soil test.*

*Plant peas (from seed) as early as St. Patrick's Day.*

*Plant spinach, arugula, lettuce, kale & other greens from seed.*

*Plant radishes, carrots, beets, turnips & other root crops from seed.*

*Clean up & mulch strawberry bed.*

*Plant onions from sets.*

*Plant potatoes from seed potatoes.*

*Harvest garlic scapes when they begin to curl.*

*Harden off seedlings started indoors.*

**Organic gardens are planted and tended without synthetic pesticides and fertilizers.** It is a rejection of modern industrial farming with its huge environmental costs: soil depletion, water pollution, climate change and tremendous health risks to humans and animals. But that is only part of the story.

**Organic gardening is an approach based on natural systems.** We see our gardens as part of an ecosystem and we work in cooperation with nature. We can't go wrong if we imitate what nature does. This approach affects how we think about the soils, plants and insects in our gardens.

**Organic gardeners start with the health of the soil.** We replenish nutrients in the soil through crop rotation, manure and compost, and planting cover crops. Our garden soil is alive with microorganisms, busy decomposing plant debris and producing organic matter. We support them by preventing soil compaction and excessive tilling. Organic gardeners keep their garden beds covered with mulch or plants. You would never see bare ground in nature—think of the forest floor, covered with layers of leaves and decomposing plants. Mulch keeps moisture in the soil and prevents erosion. It keeps the weeds down and helps prevent the spread of soil-borne diseases.

**Organic gardeners choose the right plants for their garden.** If a plant is hardy to our climate, and its sun and water requirements are well-suited to the conditions

in our garden, it will be likely to thrive. Unhealthy plants become easily stressed and more susceptible to pests.

### **Organic gardeners welcome guests.**

Since we are part of an ecosystem, we can expect to attract insects, birds and animals to our garden. Most insects are not harmful to our plants, but considered beneficial because they pollinate our plants, prey on garden pests and aerate the soil. But along with the beneficial insects come a few pests. Even butterflies we want to attract start as leaf-chomping caterpillars.

**Organic gardeners imitate the plant diversity found in nature.** Pests will not easily wipe out an entire crop if it is planted in combination with other crops. Through companion planting and other practices, we attract beneficial insects and keep the pest populations in check. A monoculture, which is a large planting of a single crop typical of industrial farming, would never occur naturally.

**Organic gardeners are tolerant of a little bit of mess and imperfection.** When did we decide that a perfect green weed-free lawn is more important than the health of our kids, pets and environment? Organic gardeners recognize their place in the natural world and the impact of their decisions. We see beauty in the rich dark soil, a diverse mix of plants and the life we attract to the garden and we strive to maintain this healthy natural balance.

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## *Start with the Soil...*

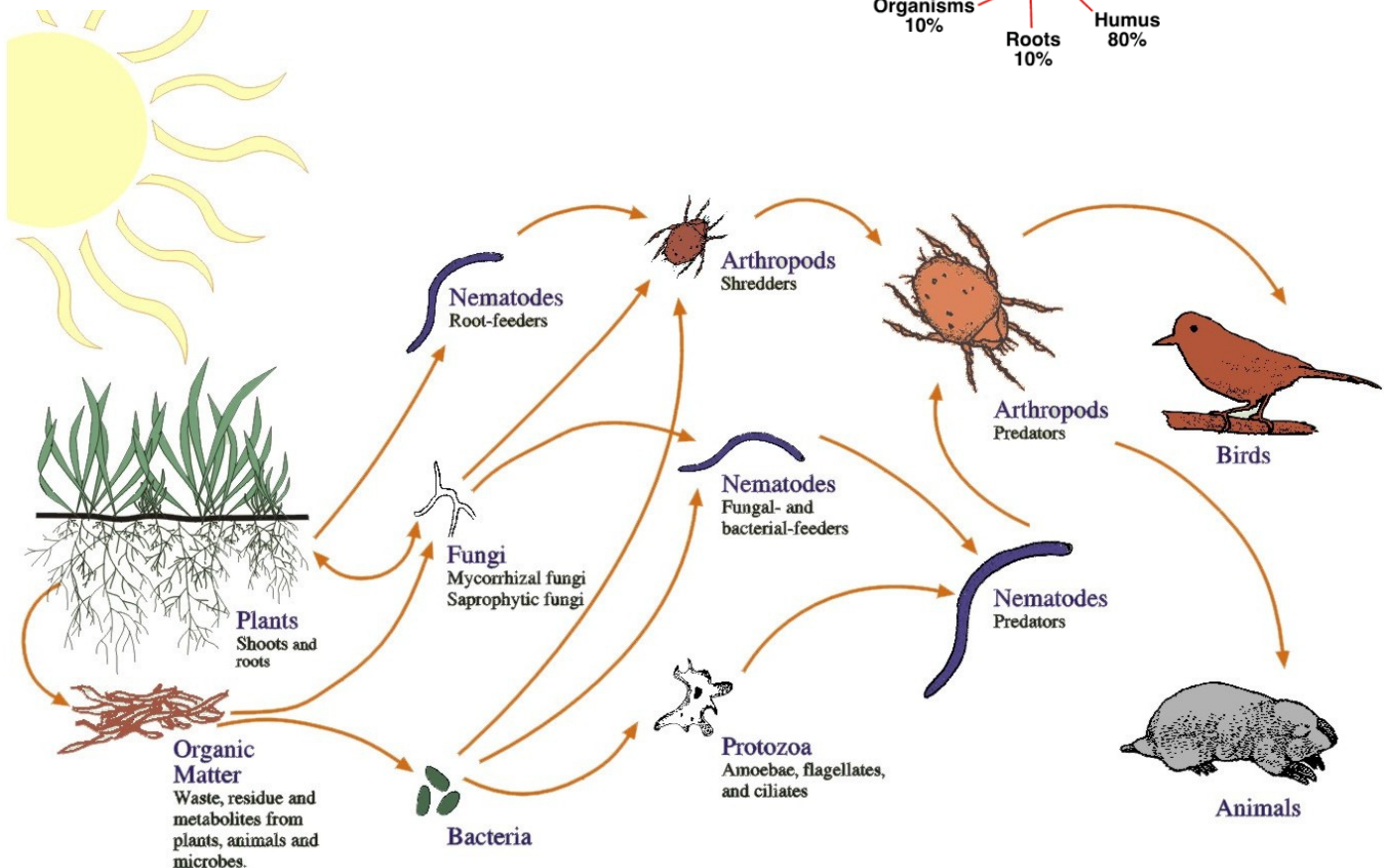
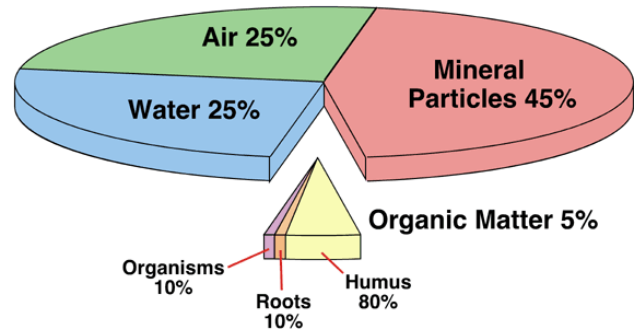
Organic gardeners spend a lot of time talking about the soil. They say “feed the soil and the soil will feed the plant” and “healthy soil=healthy plants=healthy people”. The point is that we are all connected within an ecosystem, all the way back to the tiny microorganisms in the soil. The illustration below shows the connectedness of the Soil Food Web. Organic soil is alive. We need to treat it with care.

There are a number of best practices we can follow to protect the soil. If soil becomes compacted, it can be difficult for water, air and roots to get through and a major cause of compaction is foot traffic. We should clearly define the boundaries between garden beds and paths so we don’t mistakenly walk on the beds. By making our garden beds a maximum of four feet wide, we can make sure that we can reach the middle of the bed without needing to step on the soil.

It is also possible to overwork the soil. Rototilling might be convenient the first year, especially if there is grass to remove, but after that, soil should only be loosened gently with a pitchfork or shovel. We want to cause as little disturbance as possible in the soil.



*Soil should be moist and dark brown like chocolate cake.*



## ...And the Soil Test

At least once a year we should check our soil with a soil test. A soil test will tell us the levels of nutrients in our soil. It will tell us how much organic matter is the soil and it will tell us whether there are some common contaminants in the soil. It will also give us instructions on how to improve these measures if necessary. Soil science can be complicated but just remember this:

We need to get the soil to the **pH LEVEL** that the plants prefer. Most vegetables want to be close to neutral, which is pH 7.0. Our soil in RI is acidic (lower than 7.0). In order to raise the pH, we can add limestone in the spring and fall.

We need to make sure our soil contains enough **ORGANIC MATTER**. Organic matter helps the soil to retain moisture and keeps it from becoming compacted. Adding compost to the soil increases its organic matter.

SAMPLE ID: MORAN

### RECOMMENDATIONS FOR HOME GARDENS:

#### SOIL PH ADJUSTMENT:

INCORPORATE 15 lbs of ground dolomitic (magnesium rich) limestone per 100 sq ft as early as possible prior to planting. Avoid mixing in lime when the soil is very wet.

#### FERTILIZER:

\*\* Your soil contains sufficient levels of potassium. You may apply the standard recommendations below, or you may provide sufficient nitrogen and phosphorus by using alternate sources to provide about 1/4 lb nitrogen and about 1/4 lb phosphorus per 100 sq ft.

\*\* VEGETABLES: Apply 3-4 lbs 5-10-5 per 100 sq ft in early spring.

\*\* ANNUAL FLOWERS: Apply 1.5 lbs 5-10-5 per 100 sq ft in early spring. Alternatively you may use one-half the ORGANIC recommendation given above.

\*\* ROSE BUSHES: Apply 4 tablespoons of 5-10-5 per bush in early June and early August. None after August 15.

Avoid overfertilizing which can cause plant toxicity and can contribute to insect and disease problems.

| MICRONUTRIENT  | PPM | SOIL RANGE | MICRONUTRIENT | PPM  | SOIL RANGE |
|----------------|-----|------------|---------------|------|------------|
| Boron (B)      | 0.2 | 0.1-2.0    | Copper (Cu)   | 0.2  | 0.3-8.0    |
| Manganese (Mn) | 2.0 | 3 - 20     | Iron (Fe)     | 14.0 | 1.0- 40    |
| Zinc (Zn)      | 1.7 | 0.1- 70    | Sulfur (S)    | 9.3  | 1.0- 40    |

SOIL pH 6.0  
BUFFER pH 6.5

ORGANIC MATTER: 5.0 % (Desirable range 4-10%)

| NUTRIENT LEVELS: PPM | Low                                          | Medium | High | Very High |
|----------------------|----------------------------------------------|--------|------|-----------|
| Phosphorus (P) 8     | XXXXXXXXXXXX                                 |        |      |           |
| Potassium (K) 168    | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |        |      |           |
| Calcium (Ca) 815     | XXXXXXXXXXXXXXXXXXXXXXXXXXXX                 |        |      |           |
| Magnesium (Mg) 86    | XXXXXXXXXXXXXXXXXXXX                         |        |      |           |

CATION EXCH CAP  
10.5 Meq/100g

PERCENT BASE SATURATION  
K= 4.2 Mg= 6.8 Ca=39.1

MICRONUTRIENT LEVELS  
ALL NORMAL

EXTRACTABLE ALUMINUM: 67 ppm (Soil range: 10-250 ppm)

The lead level in this soil is low.

### Study Questions:

What is the desired pH for most plants? What is the soil pH of the sample above?

Is the level of Iron in this sample sufficient? Is the level of Potassium in this sample sufficient?

What is the level of Organic Matter in this soil? Why is it important to have sufficient Organic Matter in the soil?

Why should we be careful not to walk on the garden beds?



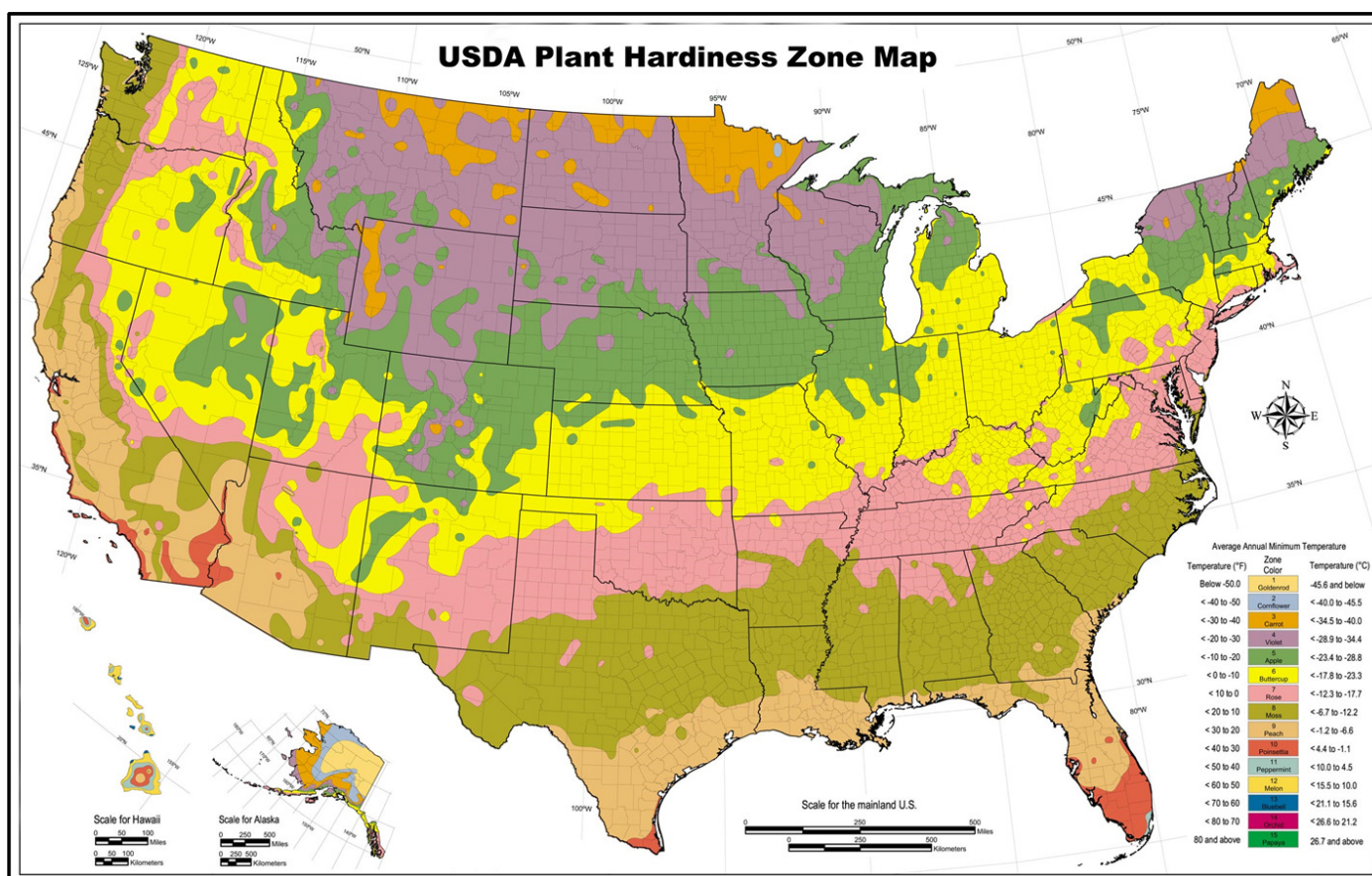
## *How do we know what to plant and when to plant it?*

Well, what do you like to eat? Maybe you want to grow the most nutritious vegetables or ones that are most expensive at the grocery store. Maybe you want to try growing something you've never heard of, or to stick to crops that are known to be relatively pest-free. It's a personal decision. We like to grow vegetables that can be eaten right from the garden or easily-prepared in the kitchen. Some fruits and vegetables, for example strawberries and tomatoes, are especially delicious when home-grown, since commercial varieties of these crops are bred for transportability not taste. Every year we learn more about what grows well in our garden and we adjust our list accordingly.

How do we know what grows in our climate? If we are planting trees, shrubs and perennials (plants that come back year after year) we look at the **USDA Plant Hardiness Zone Map**. We are primarily in zone 6!

Everyone in the horticulture industry (nurseries, seeds catalogs, etc.) uses these standards. If something is "hardy to zone 6", that usually means that it grows in the zones with higher numbers as well. We can grow plants that aren't hardy in our climate, but they probably won't survive the winter. Rosemary and Stevia are two perennial herbs that we grow as annuals, meaning that we have to replant them every year.

For annuals we use the **RI Planting Calendar for Fruits and Vegetables**. This is a valuable tool for figuring out when to plant most of the seeds and seedlings we grow. In RI we use May 15th as the average day of last frost. Warm weather vegetables (for example, tomatoes, peppers, eggplant and squash) are planted after May 15. Cold weather vegetables (for example, lettuce, peas, kale, carrots, radishes and spinach) can be planted before May 15th, even as early as March.



### Study Questions:

*When is the average day of last frost in Rhode Island? What zone are we in?*

*What crops could you plant in late April? What kind of seeds could you plant in July?*



# Rhode Island Planting Calendar for Fruits & Vegetables

| Fruit or Vegetable            | Days til Harvest        | Feb |    | Mar |    | Apr  |      | May |    | Jun |    | Jul |    | Aug |    | Sep |    | Oct |    |
|-------------------------------|-------------------------|-----|----|-----|----|------|------|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|
|                               |                         | 1   | 15 | 1   | 15 | 1    | 15   | 1   | 15 | 1   | 15 | 1   | 15 | 1   | 15 | 1   | 15 | 1   | 15 |
| ASPARAGUS (purchase crowns)   | 1-2 Yrs                 |     |    |     |    |      | CR   | CR  | CR |     |    |     |    |     |    |     |    |     |    |
| BEANS, BABY LIMA              | 60-100                  |     |    |     |    |      |      | S   | S  | S   | S  | S   | S  | S   |    |     |    |     |    |
| BEANS, PINTO                  | 60-80                   |     |    |     |    |      |      | S   | S  | S   | S  | S   | S  |     |    |     |    |     |    |
| BEANS, SNAP                   | 60-80                   |     |    |     |    |      |      | S   | S  | S   | S  | S   | S  | S   |    |     |    |     |    |
| BEETS                         | 60-80                   |     |    |     |    | S    | S    | S   | S  | S   | S  | S   | S  | S   | S  |     |    |     |    |
| BLACKEYED PEAS                | 90-120                  |     |    |     |    |      |      | S   | S  | S   | S  |     |    |     |    |     |    |     |    |
| BOK CHOY                      | 45                      |     |    | S   | S  | S    | S    | S   | S  |     |    |     |    | S   | S  | S   |    |     |    |
| BROCCOLI                      | 60-90 from transplant   |     | I  |     |    | T    |      |     |    |     |    | I   |    | T   |    |     |    |     |    |
| BRUSSEL SPROUTS               | 100-120 from transplant |     |    |     |    |      |      |     |    | I   |    | T   |    |     |    |     |    |     |    |
| CABBAGE                       | 80-90 from transplant   |     |    | I   |    | T    |      |     |    | I   |    | T   |    |     |    |     |    |     |    |
| CABBAGE, CHINESE              | 45 from transplant      |     |    | I   |    | T    |      |     |    |     |    | I   |    | T   |    |     |    |     |    |
| CARROTS                       | 60-80                   |     |    |     | S  | S    | S    | S   | S  | S   | S  | S   | S  |     |    |     |    |     |    |
| CAULIFLOWER                   | 80 from transplant      |     |    |     |    | I    |      | T   | I  |     |    | T   |    |     |    |     |    |     |    |
| CELERY                        | 90 from transplant      |     |    | I   |    |      |      | T   |    |     |    |     |    |     |    |     |    |     |    |
| CHARD                         | 60                      |     |    |     |    | S    | S    | S   | S  |     |    |     |    | S   | S  |     |    |     |    |
| CORN, SWEET                   | 70-90                   |     |    |     |    |      |      | S   | S  | S   | S  |     |    |     |    |     |    |     |    |
| CUCUMBERS                     | 60-90                   |     |    |     |    |      |      | S   | S  | S   |    |     |    |     |    |     |    |     |    |
| EGGPLANT                      | 60 from transplant      |     |    |     |    | I    |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| ENDIVE/ESCAROLE               | 80-120                  |     |    |     | S  | S    |      |     |    |     |    | S   | S  |     |    |     |    |     |    |
| GARLIC                        | 5-7 Mths                |     |    |     |    |      |      |     |    |     |    |     |    |     |    |     |    | C   | C  |
| KALE                          | 60-90                   |     |    |     |    | S    | S    | S   |    |     |    | S   | S  | S   | S  |     |    |     |    |
| KOHLRABI                      | 45-60 from transplant   |     |    |     |    | I    |      | T   |    |     |    | I   |    | T   |    |     |    |     |    |
| LETTUCE, HEAD                 | 45-90                   |     |    |     |    | S    | IS   | S   | T  |     |    |     |    |     |    |     |    |     |    |
| LETTUCE, LEAF                 | 40-70                   |     |    |     |    | S    | IS   | S   | T  | S   | S  | S   | S  | S   | S  |     |    |     |    |
| LEEK                          | 160-200 from transplant |     |    |     | I  |      |      | T   |    |     |    |     |    |     |    |     |    |     |    |
| MELONS                        | 80-120 from transplant  |     |    |     |    | I    |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| ONIONS, BULB                  | SETS: 4-5 Mths          |     |    |     |    | Sets | Sets |     |    |     |    |     |    |     |    |     |    |     |    |
| ONIONS, GREEN                 | 90-100                  |     |    |     | S  | S    | S    |     |    |     |    |     |    |     |    |     |    |     |    |
| PARSNIPS                      | 100-120                 |     |    |     |    |      |      |     |    |     |    | S   | S  |     |    |     |    |     |    |
| PEAS                          | 60                      |     |    |     | S  | S    | S    | S   |    |     |    |     |    |     |    |     |    |     |    |
| PEPPERS                       | 60-100 from transplant  |     |    |     | I  |      |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| POTATO (plant seed potatoes)  | 90-120                  |     |    |     |    | S    | S    | S   |    |     |    |     |    |     |    |     |    |     |    |
| POTATOES, SWEET (order slips) | 90-120 from transplant  |     |    |     |    |      |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| PUMPKIN                       | 90-120                  |     |    |     |    |      |      | S   | S  | S   |    |     |    |     |    |     |    |     |    |
| RADISHES                      | 30-60                   |     |    | S   | S  | S    | S    | S   | S  | S   | S  | S   | S  | S   | S  |     |    |     |    |
| RUTABAGAS                     | 90-100                  |     |    |     |    | S    | S    |     |    |     |    | S   | S  |     |    |     |    |     |    |
| SPINACH                       | 40-90                   |     |    | S   | S  | S    | S    | S   |    |     |    |     |    | S   | S  | S   |    |     |    |
| SQUASH, SUMMER                | 45-90                   |     |    |     |    |      |      |     |    | S   | S  |     |    |     |    |     |    |     |    |
| SQUASH, WINTER                | 90-120                  |     |    |     |    |      |      |     |    | S   | S  |     |    |     |    |     |    |     |    |
| TOMATOES                      | 50-120 from transplant  |     |    | I   |    |      |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| TOMATILLOS                    | 65- 75 from transplant  |     |    |     |    | I    |      |     |    | T   |    |     |    |     |    |     |    |     |    |
| TURNIPS                       | 50-75                   |     |    |     |    | S    | S    |     |    | S   | S  | S   | S  | S   |    |     |    |     |    |

Legend: C: Plant Cloves; CR: Plant crowns; I: Start seeds indoors S: Direct-seed in garden; T: Transplant seedlings started indoors to garden

**NOTES:** Dates are based on final frost on May 15 and first frost on October 15.  
Be aware of local microclimates that may make your garden cooler or warmer & alter frost dates.  
Transplants should be exposed to the outdoors for increasing periods over several days before planting. ("hardened off")



## Organic Vegetable Gardening: Crop Rotation & Companions











**Companion planting** frequently includes flowers and herbs within vegetable beds.





Crop rotation and companion planting are important techniques for organic gardeners.





**Companion planting** is the planting of different crops together for their mutual benefit. It might be because one attracts the pollinators that others need or one helps repel the pests of the other. For whatever reason, they grow well together and increase crop productivity. Companion planting represents the opposite of industrial agriculture's monoculture planting. Native Americans planted corn, pole beans and squash together as companions. This is called the three sisters. See chart on next page for examples of companion planting.

**Crop Rotation** is the best practice of changing the location of a crop within a garden every year. There are different ideas about how this should be done—by plant families, by the nutritional needs of the plant or even based on which part of the vegetable is eaten. Like companion planting, crop rotation helps to confuse the pests. If you grow crops in the same place every year, the pests will know exactly where to look and where to lay their eggs in the soil. Crop rotation gives the soil a chance to be replenished when a nitrogen-fixing legume is planted in the bed and it prevents soil diseases associated with a particular crop.

|        | Area 1                                                                              | Area 2                                                                              | Area 3                                                                              | Area 4                                                                              |
|--------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Year 1 |  |  |  |  |
|        | Leaves                                                                              | Fruits                                                                              | Roots                                                                               | Legumes                                                                             |

|        | Area 1                                                                              | Area 2                                                                              | Area 3                                                                              | Area 4                                                                              |
|--------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Year 2 |  |  |  |  |
|        | Fruits                                                                              | Roots                                                                               | Legumes                                                                             | Leaves                                                                              |

|        | Area 1                                                                              | Area 2                                                                              | Area 3                                                                              | Area 4                                                                              |
|--------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Year 3 |  |  |  |  |
|        | Roots                                                                               | Legumes                                                                             | Leaves                                                                              | Fruits                                                                              |

|        | Area 1                                                                              | Area 2                                                                              | Area 3                                                                              | Area 4                                                                              |
|--------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Year 4 |  |  |  |  |
|        | Legumes                                                                             | Leaves                                                                              | Fruits                                                                              | Roots                                                                               |



**The Three Sisters** was a typical Native American companion planting of corn, pole beans and squash. The beans climb the corn and the squash shades out weeds.

### Study Questions:

List two examples of plants that are companions for each other.

List two examples of plants that are incompatible.

Why would we prefer a polyculture to a monoculture?

How do companion planting and crop rotation help us to garden organically?

Assignment: Each student will choose a vegetable to study.

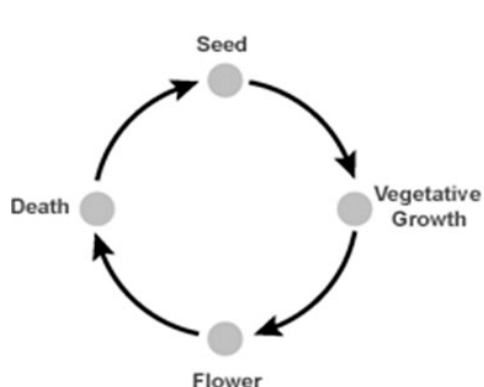


### Companion Planting Chart for Vegetables

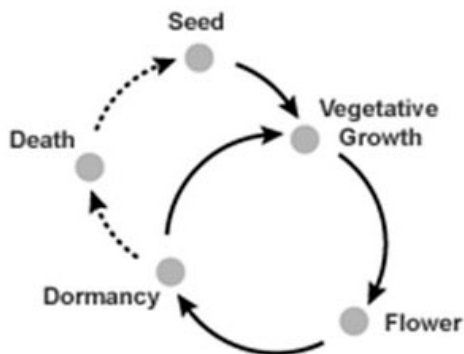
| Vegetable       | Really likes to be with...                                  | Really dislikes to be with...                |
|-----------------|-------------------------------------------------------------|----------------------------------------------|
| Asparagus       | Basil, Tomato, Nasturtium, Parsley                          | Onion, Garlic, Potato                        |
| Beans           | Carrot, Cabbage, Cauliflower, Cucumber, Marigold            | Chives, Leek, Garlic                         |
| Broad Beans     | Brassicas, Carrot, Celery, Corn, Lettuce, Potato            | Fennel                                       |
| Beets           | Brassicas, Lettuce, Onion, Sage                             | Bean (pole)                                  |
| Broccoli        | Celery, Chamomile, Dill, Rosemary                           | Oregano, Strawberry                          |
| Brussel Sprouts | Potato, Thyme                                               | Strawberry                                   |
| Cabbage         | Beetroot, Potato, Oregano, Sage                             | Strawberry, Tomato                           |
| Carrot          | Bush Beans, Pole Beans, Lettuce, Onion, Pea, Radish, Tomato | Chives, Dill, Parsnip, Radish                |
| Cauliflower     | Beans, Celery, Oregano                                      | Nasturtium, Peas, Potato, Strawberry, Tomato |
| Celery          | Cabbage, Leek, Onion, Spinach, Tomato                       | Parsnip, Potato                              |
| Corn            | Bean, Cucumber, Melon, Pea, Pumpkin, Potato, Radish         | Tomato                                       |
| Cucumber        | Bean, Celery, Lettuce, Pea, Radish                          | Cauliflower, Potato, Basil                   |
| Eggplant        | Bean, Capsicum, Potato, Spinach                             |                                              |
| Leek            | Carrot, Celery, Strawberry                                  |                                              |
| Lettuce         | Carrots, Radishes, Strawberry                               | Beans, Beetroot, Parsley                     |
| Melon           | Corn, Radish                                                | Potato                                       |
| Onion           | Bean Sprout, Broccoli, Cabbage, Lettuce, Strawberry, Tomato | Bean, Pea                                    |
| Pea             | Beans, Carrot, Corn, Cucumber, Radish                       | Onion Family                                 |
| Potato          | Bean, Corn, Cabbage, Pea, Eggplant                          | Cucumber, Pumpkin, Squash, Sunflower         |
| Pumpkin         | Corn                                                        | Potato                                       |
| Spinach         | Celery, Cauliflower, Eggplant                               |                                              |
| Tomato          | Asparagus, Celery, Carrot, Parsley, Marigold                | Corn, Fennel, Potato                         |
| Zucchini        | Nasturtium                                                  |                                              |

## The Life Cycle of a Plant

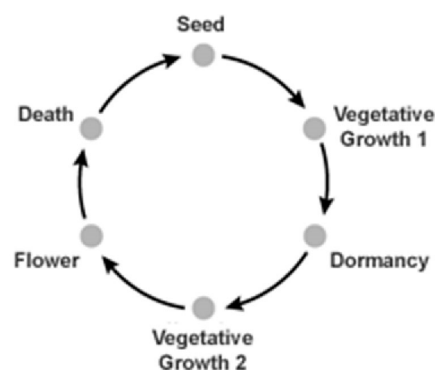
The life cycle of a plant varies depending on whether it is an **annual**, **perennial** or **biennial**. With an annual plant, a seed is planted, and the plant grows, flowers and dies in one year. It will not come back the next year, although it may self sow. Most of the vegetables we grow are annuals. Perennials don't die in the winter; they go dormant. Many of our flowers and herbs are perennial. Biennials have a two year life cycle. Parsley is a biennial in our garden, although we harvest it before it gets to its second year. The point of the second year is seed production.



The life cycle of an **annual**.



The life cycle of a **perennial**.



The life cycle of a **biennial**.

### Study Questions:

What is the difference between an annual, perennial and biennial? List some examples of each.



## Seed Structure & Germination

**What is a seed?** Each seed contains the beginning of a plant, as well as the food that the plant will need to sprout, surrounded by a protective layer, called the seed coat.

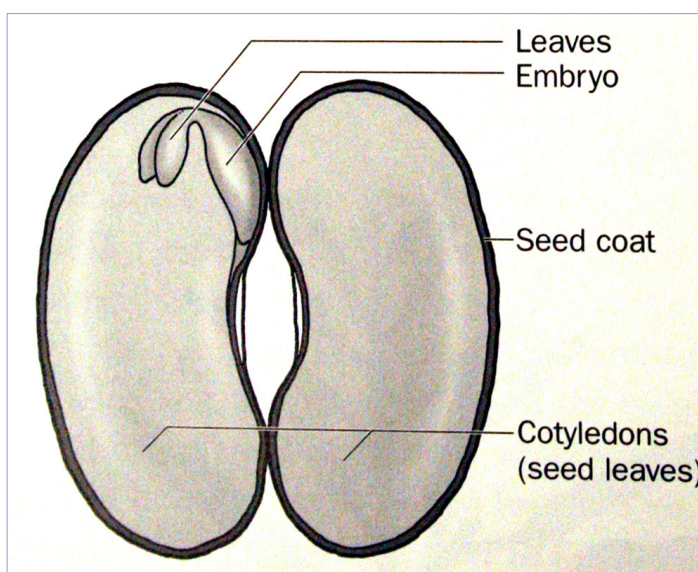
**What does a seed require to germinate?** A seed needs water, oxygen and heat, but not necessarily light, to start to grow or germinate. The seed absorbs water causing the seed coat to split. The root pushes down into the soil and the stem pushes up, dragging the cotyledons, which are the first leaves of a seedling to emerge. Seeds should not be allowed to dry out once germination has started. The soil should be kept as moist as a damp sponge. If it is too wet, the seeds will get moldy. As the root grows down into the soil, it takes in water and minerals from the soil for food. The root also anchors the plant. Remember that for germination, the seed needs the warmth from the sun or a grow light, not the light itself. Once the seedling emerges, it needs 12 or so hours of light every day. It is important to recognize seedlings in their cotyledon and mature forms so we don't mistake them for weeds. See photos on next page for cotyledon & seedling identification of common vegetables & herbs.

**Should we start seeds indoors or plant them directly in the garden?** Most crops can be planted as seeds directly in the garden, but there are some notable exceptions. Tomatoes, peppers and eggplant are tropical and do not have enough time in our RI climate to grow from seed to fruit outside. We give these plants a head start by starting them from seeds inside during the late winter or early spring. Then we transplant them to the garden at the end of May when the risk of frost has passed.

**How do we plant a seed?** Everything you need to know about planting seeds, for example depth and spacing, can be found on the back of a seed packet. Generally, seeds are planted at a depth that is twice the size of the seed. Sometimes we make a hole or a trench and plant a seed, but if they are very small we can broadcast (or scatter) the seeds and put a fine layer of soil on top. We start seeds indoors in a seed-starting mix, which is light and fluffy and allows the seedlings to emerge easily. After they get their first set of real leaves, they can be transplanted into a larger pot of planting soil which contains some nutrients. When transplanting seedlings, handle them by the root ball or leaves, not the stem.



**What is hardening off?** When it is time to plant seedlings in the garden, they need to acclimate to outdoor weather. This is called hardening off. If we plant them in the garden after they have been inside for weeks, the exposure to the sun and wind will most likely kill them. Instead, we bring them outside for an hour or so for the first few days and then take them back inside. They should not be left in direct sunlight. The time outside can be increased until after a week or so, they should be ready to plant.



### Study Questions:

*What are the first leaves of a seedling to emerge called?*

*Why is important to recognize emerging seedlings?*

*What conditions do seeds need to germinate?*

*Why do we start tomato, pepper and eggplant seeds indoors?*



## *Cotyledon & Seedling Identification*



**Cilantro Seedlings**



**Spinach Seedlings**



**Pea Seedlings**



**Arugula Seedlings**



**Dill Seedlings**



**Lettuce Seedlings**



**Carrot Seedlings**



**Radish Seedling**



**Parsley Seedling**



**Basil Seedlings**



**Cucumber Seedling**



**Sunflower Seedling**



## *Planting Strategies to Maximize Crop Yield in the Garden*



***Interplanting or Intercropping** is the practice of planting a fast-growing crop between a slower-growing one in order to make the most of your garden space.*



***Triangular plantings** squeeze more veggies into small spaces. The tight spacing, with leaves allowed to just touch each other when the plant is mature, creates a living mulch which shades the soil & saves water.*

Organic gardeners use a number of planting strategies that maximize crops by making efficient use of space and timing.

**Succession planting** is the practice of harvesting one crop and then planting another in the same space. The length of the growing season, climate, and crop selection are key factors in determining which crops to plant in which order. A cool season spring crop could be followed by a heat-loving summer crop. For example, we can broadcast lettuce seeds in an area where we later will want to plant our tomato crop. When it is time to plant tomato seedlings in mid-May, we only have to clear out a small area of lettuce to accommodate each seedling. Tomatoes are small when they are planted but end up 6' tall and 2' wide so the lettuce can continue to grow and be harvested well before the tomatoes need that much space. Peas can be planted as early as St. Patrick's Day which allows them plenty of time to mature before another crop, zucchini for example, could be planted in their place.

Sometimes gardeners want a succession planting of a single crop. We might plant a row of lettuce or green beans every two weeks so that the harvest will be staggered and we will have a continual supply of that vegetable through the growing season.

**Interplanting or Intercropping** is the planting of non-competing crops, often with different maturity dates. For example, carrots can be planted in rows 12" apart. They take 75 days to harvest. Radishes can be planted 6" apart and take only 22 days to harvest. So if we plant radishes between the rows of carrots, we harvest them after 22 days before the carrots need more room and the carrots continue to grow. Interplanting also reduces insects by increasing diversity in the garden.

**Square foot gardening** is the practice of dividing a planting bed into one square foot units which are planted intensely depending on the size of the plant. See the diagram at right for some examples of how many of each type of vegetable can be planted within one square foot.

**Biointensive gardening** uses triangular spacing and staggered rows to plant intensely. When plants are close together, there is not a lot of bare earth and therefore not as much need for mulch. Wide rows and double rows are also space efficient. For wide rows scatter seeds in a 18-24" band, then thin the crowded seedlings. For double rows, plant in sets of rows 4" apart, with traditional spacing between sets.

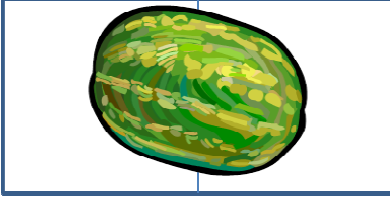
These techniques require a bit more planning but are well worth it with the space you save, enabling you to grow more food.



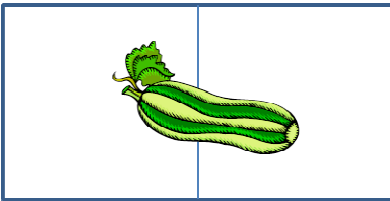
**XL**

1 plant per 2 square feet

Watermelon



Zucchini squash



Pumpkin



Melon

Winter squash

Summer squash

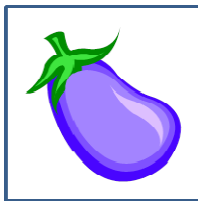
**L**

1 plant

Tomato



Eggplant



Broccoli



Cabbage

Cauliflower

Cucumber

Okra

Pepper

**M**

4 plants

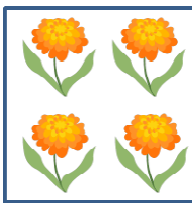
Lettuce



Basil



Marigold



Corn

Parsley

Potato

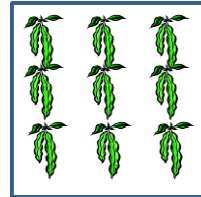
Strawberry

Turnip

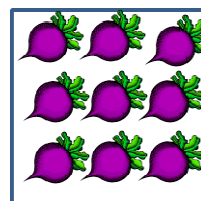
**S**

9 plants

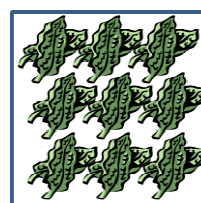
Bush bean



Beet



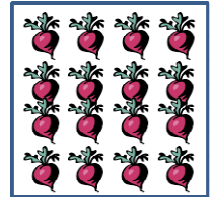
Spinach



**XS**

16 plants

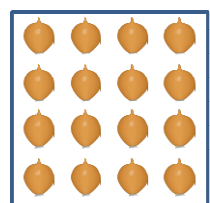
Radish



Carrot



Onions



**Square foot gardening** often uses strips of wood to mark the square foot planting areas.



**Succession planting of beans** made in two weeks intervals allows them to be harvested throughout the growing season.

Study Questions:

How many heads of lettuce could you plant in one square foot? How many radishes could you plant in one square foot?

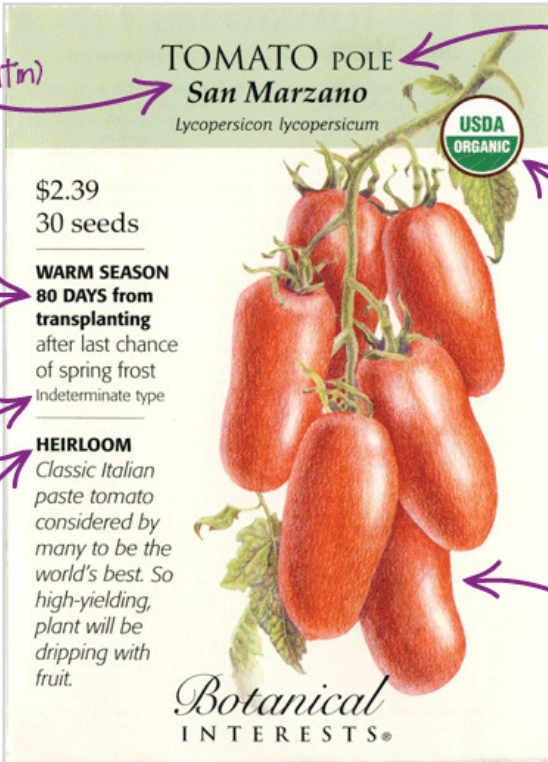
Why is succession planting an efficient planting method?

Describe some of the space-saving techniques that we might use.



## All the Info You Need is on the Seed Packet

### Front of the seed packet



**name**  
(common & Latin)

**how long**  
before you  
can eat 'em!

**indeterminate**  
produces fruit  
for a longer  
period of time

**heirloom**  
a variety at least  
50 years old,  
not genetically  
modified, and  
open-pollinated  
(good stuff!)

**TOMATO POLE**  
**San Marzano**  
*Lycopersicon lycopersicum*

\$2.39  
30 seeds

**WARM SEASON**  
**80 DAYS** from  
transplanting  
after last chance  
of spring frost  
Indeterminate type

**HEIRLOOM**  
Classic Italian  
paste tomato  
considered by  
many to be the  
world's best. So  
high-yielding,  
plant will be  
dripping with  
fruit.

**USDA**  
**ORGANIC**

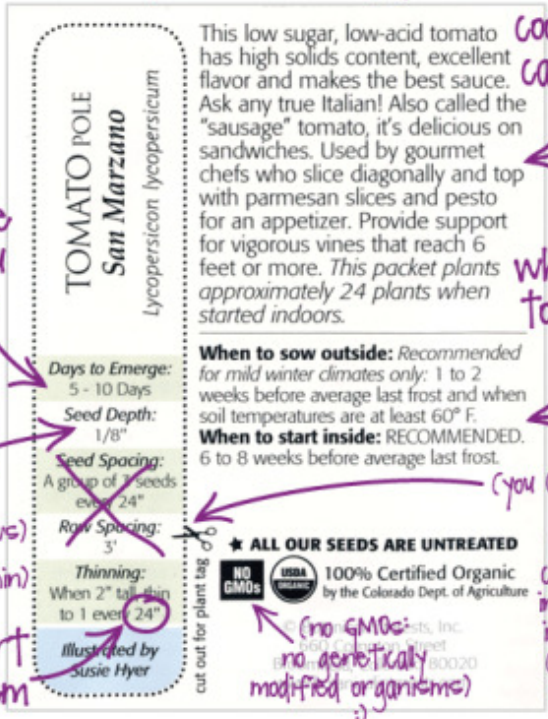
*Botanical*  
INTERESTS®

this means  
it's a vine,  
not a bush  
(you'll need poles  
to support it)

this means  
these  
are organic!  
(NO toxic pesticides  
or inorganic  
fertilizers)

(pretty illustration)

### Back of the seed packet



**TOMATO POLE**  
**San Marzano**  
*Lycopersicon lycopersicum*

This low sugar, low-acid tomato has high solids content, excellent flavor and makes the best sauce. Ask any true Italian! Also called the "sausage" tomato, it's delicious on sandwiches. Used by gourmet chefs who slice diagonally and top with parmesan slices and pesto for an appetizer. Provide support for vigorous vines that reach 6 feet or more. This packet plants approximately 24 plants when started indoors.

**When to sow outside:** Recommended for mild winter climates only: 1 to 2 weeks before average last frost and when soil temperatures are at least 60° F.

**When to start inside:** RECOMMENDED. 6 to 8 weeks before average last frost.

**Days to Emerge:**  
5 - 10 Days

**Seed Depth:**  
1/8"

**Seed Spacing:**  
A group of 3 seeds  
every 24"

**Row Spacing:**  
3'

**Thinning:**  
When 2" tall thin  
to 1 every 24"

**Illustrated by**  
Susie Hyer

**★ ALL OUR SEEDS ARE UNTREATED**

**NO GMOs** **USDA** **100% Certified Organic**  
by the Colorado Dept. of Agriculture

© (no GMOs) seeds, Inc.  
650 Colorado Street  
Boulder, CO 80502

cut out for plant tag

**cooking & plant care summary**

**when & where to plant them**  
(inside or out)

(you could cut this out and use it as a plant tag, but be careful not to cut into all of the info inside the packet.) (and it would turn soggy when wet)

how long till sprouts come up after you plant seeds

how deep to plant seeds

(we don't do rows)  
(we also don't thin)

how far apart to plant them

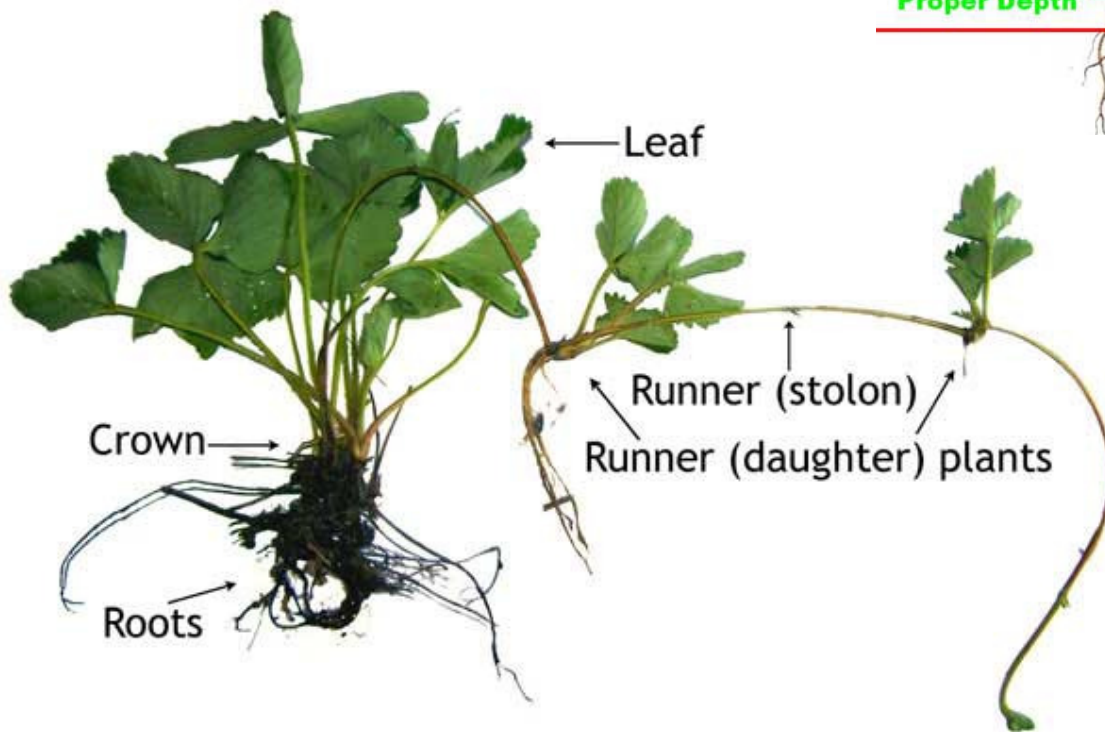
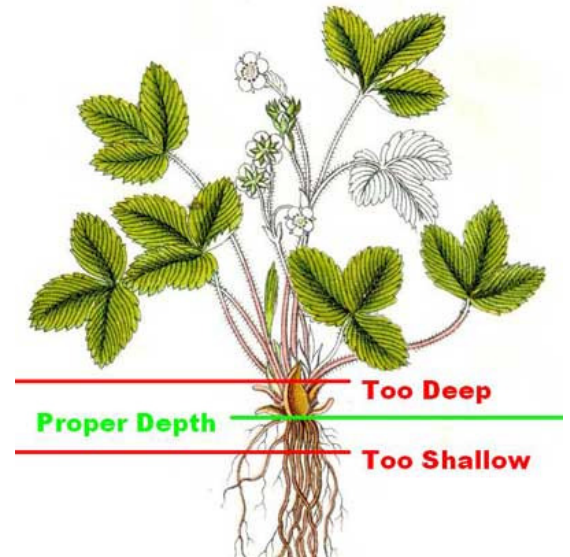


## Strawberries

Strawberries spread vigorously so be careful where you plant them. They can quickly take over a planting bed. Plant strawberries with their crowns just above the soil level. The parent plants will send out runners and the runner plants can

be transplanted or just left to grow where they root.

There's nothing like a home-grown strawberry. The ones you'll find in the grocery store likely come from California and have been bred for transportability not flavor.



## Harvesting Garlic Scapes

In the spring the garlic will start to grow a flower, called a scape. We don't want the garlic to flower. Instead, we want the plant to direct all its energy to the root, which is the developing garlic bulb. Cut the scapes off when they start to curl. You can use them as garlic or make garlic scape pesto.

### Garlic Scape Pesto

Put 1 cup chopped garlic scapes and 1/3 c. walnuts in the food processor.

Add 1/2 c. olive oil & process more.

Stir in 1/4-1/2 c. parmesan cheese

### Study Questions:

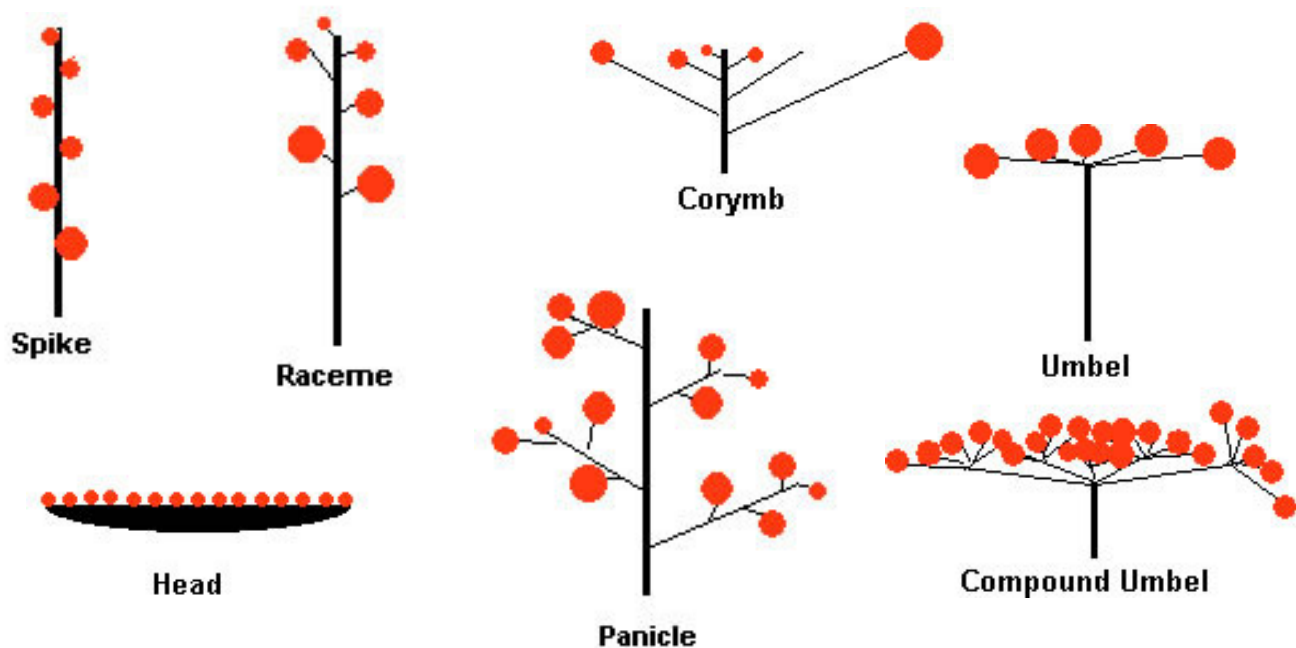
Why should we cut the scape off the garlic plant?

How do strawberries reproduce?



## *Flower Shapes & Inflorescences*

We need to know how to describe flower shapes in order to identify them. The diagrams below show some common inflorescences, which are flower clusters, or how flowers are arranged on a stem in a particular way. Where there is only one flower on a stem, it is called a solitary flower. Where there is a cluster of flowers, the entire cluster is the inflorescence and the individual flowers are called florets. The main stem of inflorescences and solitary flowers is called the peduncle. The small stems from the peduncle to the florets of an inflorescence are called pedicels. Flower shapes can attract pollinators in different ways. Butterflies will land on a head or umbel. Hummingbirds are drawn to more tubular flower shapes.



## *Botanical Names 101*

Common names are imprecise and can vary widely from region to region, so we use botanical names when specifying plants. Botanical names are Latin and typically comprised of two words. The first is the genus and the second the species. (For example, *Monarda didyma* is of the genus *Monarda* and

*didyma* identifies it as part of that species.) Frequently there will be a third designation after the genus and species and that is the variety or cultivar (or 'cultivated variety'). (For example, 'May Night' is a popular cultivar of *Salvia nemerosa*.) You'll notice that the genus is capitalized, the species is not and both are italicized.

### Study Questions:

*What is an inflorescence? What is the difference between a peduncle and a pedicel?*

*Can you see examples of the inflorescence shapes above in the labyrinth flowers?*

*What is the genus name for Lenten Rose? What is the botanical name for Lamb's Ear?*



## *Spring Flowers in the Labyrinth—Plant ID*



*Galanthus elwesii* – Snowdrops  
(bulb)



*Helleborus orientalis* - Lenten  
Rose (perennial)



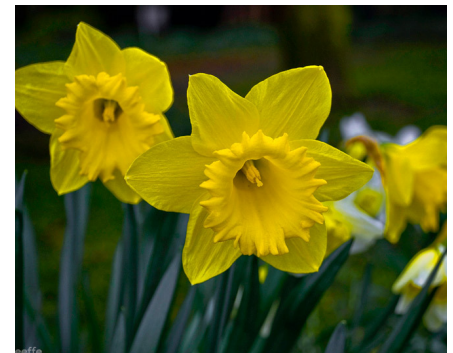
*Iris versicolor*—Northeastern  
Blue Flag (perennial)



*Monarda didyma*—Bee Balm  
(perennial)



*Muscari latifolium* - Grape Hyacinth  
(bulb)



*Narcissus pseudo-narcissus*—  
Daffodil (bulb)



*Nepeta faassenii*—Catmint  
(perennial)



*Salvia nemerosa* 'May Night' —  
Meadow Sage (perennial)



*Stachys byzantina* - Lamb's Ear  
(perennial)

### Study Questions:

What are some of the earliest flowers we might see in the labyrinth?

What is a bulb? How is it planted?



## *Culinary Herbs in the Garden*

An herb is a plant that is valued for flavor, scent, medicinal or other qualities. We distinguish between culinary and medicinal or spiritual herbs. In medicinal or spiritual use any of the parts of the plant might be considered "herbs", including leaves, roots, flowers, seeds, resin, root bark, inner bark, berries and other portions of the plant. Culinary use of the term "herb" typically distinguishes between herbs, which come from the leafy green parts of a plant (either fresh or dried), and spices, which come from other parts of the plant (usually dried), including seeds, berries, bark, root and fruit. Culinary herbs are distinguished from vegetables in that, like spices, they are used in small amounts and provide flavor rather than substance to food.

(from <http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Herb.html>, photos from <http://www.sunset.com/garden/flowers-plants/nine-indispensable-herbs-00400000011943/>)



**Thyme** (*Thymus vulgaris*) Heavily scented leaves are used to season fish, shellfish, poultry stuffing, soups, or vegetables. Perennial; to 1 foot tall.



**Chives** (*Allium*) Green, grasslike, 12- to 24-inch-long spears form in clumps. Clusters of purple or white flowers in spring. Perennial.



**Oregano** (*Origanum vulgare*) Fresh or dried leaves of this perennial add spice to Spanish and Italian dishes such as pizza and ravioli. 2½ feet tall.



**Basil** (*Ocimum basilicum*) Lends a sweet-spicy flavor to sauces and pesto. Annual; grows to 2 feet tall.



**Cilantro** (*Coriandrum sativum*) Fresh leaves add flavor to salsa and guacamole. Annual; grows to 1½ feet tall. Seeds are coriander, a spice.



**Parsley** (*Petroselinum crispum neapolitanum*) Flat-leaved Italian parsley is more flavorful than the curly-leaved French variety. Grows 2-3 feet tall. Biennial.



Many herbs are perennials (plants that grow and bloom over the spring and summer, die back every autumn and winter, and then return in the spring from their root-stock) such as thyme or lavender, while others are biennials (plant which blooms in its second year and then dies) such as parsley, or annuals (a plant grown outdoors in the spring and summer and surviving just for one growing season ) like basil. Some perennial herbs are shrubs (such as rosemary, *Rosmarinus officinalis*), or trees (such as bay laurel, *Laurus nobilis*). Some plants are used as both an herb and a spice, such as dill weed and dill seed or cilantro leaves and coriander seeds. There are many herbs, such as those in the mint family, that are used for both culinary and medicinal purposes. (from <http://en.wikipedia.org/wiki/Herb>)

**Study Questions:**

*Which herbs are annuals or tender perennials and would need to be replanted each year?*

*Which herbs might be used in stuffing? Which herbs might be used for pesto? Which herbs might be used in salsa?*



**Sage** (*Salvia officinalis*)  
*Musky, earthy leaves are a staple in poultry stuffing. The plant forms a mound 1 to 3 feet tall.*



**Dill** (*Anethum graveolens*)  
*Sprinkle its feathery leaves on grilled fish and in salads and sauces. An annual, dill grows to 4 feet tall.*



**Rosemary** (*Rosmarinus officinalis*)  
*The aromatic leaves season meats, sauces, and soups. An annual (or tender perennial) in our climate.*



**Mint** (*Mentha*)  
*Peppermint & spearmint are favorites for teas. Spreads by underground stems; grow it in pots. Perennial.*



**Sweet marjoram** (*Origanum majorana*)  
*Gray green leaves on 1- to 2-foot-tall plants. Milder than oregano. Perennial in mild climates.*



**French tarragon** (*Artemisia dracunculoides*)  
*Use fresh or dried leaves in salads and cooked dishes. A sprawling perennial, it grows 2' tall.*



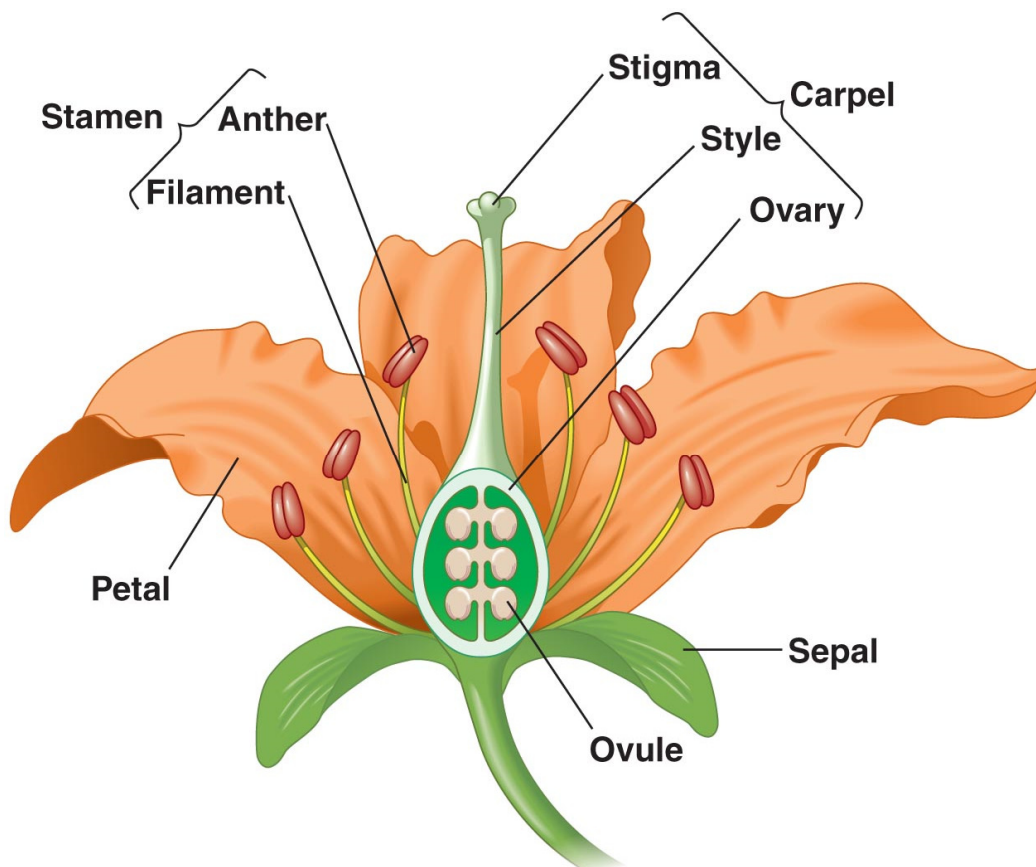
## *Flower Structure & Plant Reproduction*

Flowers have a single-minded purpose—to reproduce.

### **FLOWER PARTS (see diagram below):**

The male part of the flower is the **stamen**, made up of the **anther** and the **filament**. This is where the pollen is produced. The female part of the flower is called the **carpel** or **pistil** and includes the **stigma**, **style** and **ovary**. The stigma receives the pollen grains. The ovary contains ovules which become seeds and then fruit when pollinated. The **petals** are the most visible part of the flower. They are often brightly-colored to attract pollinators and provide a resting spot. The **sepal** protects the flower bud before blooming and looks like a leaf when the flower is open.

Flowers are divided into two types: An **imperfect flower** has either all male or all female parts. Squash blossoms are imperfect (and we can eat the male flowers since they will never produce fruit). A **perfect or complete flower** has both male and female parts in the same flower. Most flowers are complete.



### Study Questions:

*What is the purpose of a flower? What are the male parts of the flower? What are the female parts of the flower?*

*What is the difference between a perfect and imperfect flower?*

*Assignment: Each student will dissect a flower and identify its parts.*

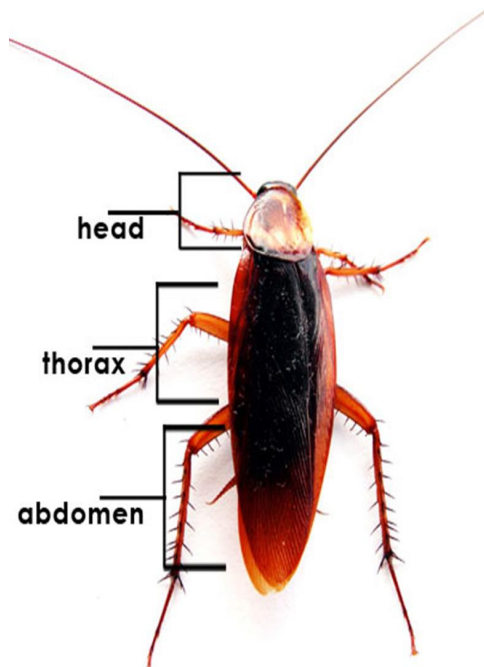


## Insects

Insects are a class of Arthropods with an exoskeleton and a three-part body, consisting of the head, thorax and abdomen. They have three pairs of jointed legs, compound eyes and two antennae. Knowing the parts of the insects body will help when we want to identify an insect using a key.

Identification can take a couple forms. We might be looking at the creature itself, or we might see evidence it was there, maybe the damage it caused.

There are more than a million species of insects. They move by walking, flying and occasionally swimming. Most are solitary but some are social.

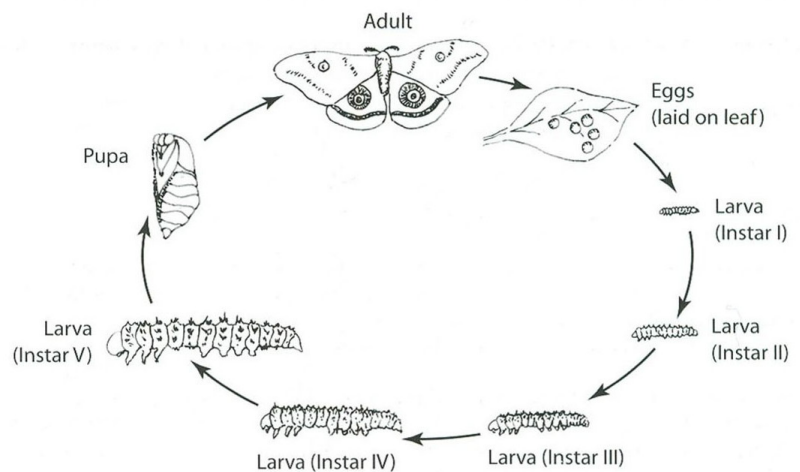


**An insect** has a head, a thorax and an abdomen.

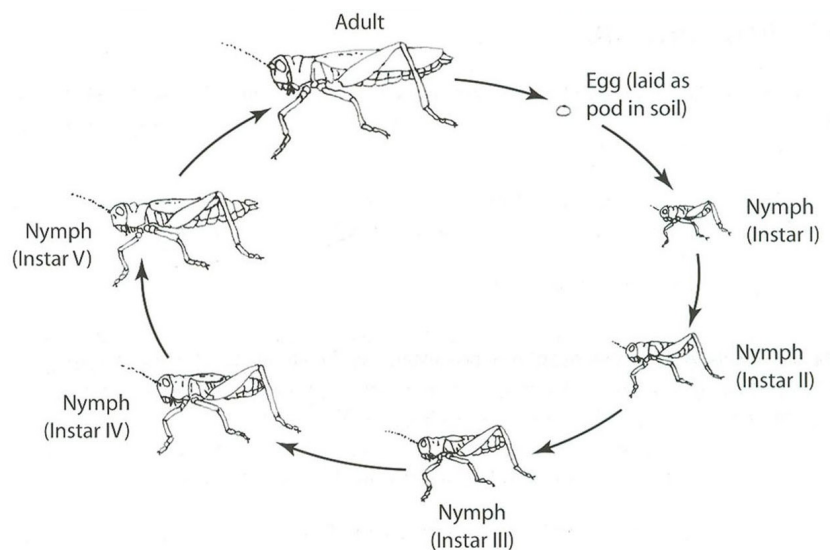
### Study Questions:

Explain the difference between simple and complete metamorphosis.

What are the three parts of an insect's body?



**Complete Metamorphosis of a Butterfly:** Most insects hatch from eggs and go through “metamorphosis”, which means a change in form. We are most familiar with complete metamorphosis—the caterpillar into a butterfly. the egg, larva, pupa and adult. Each stage is called an instar.



**Simple Metamorphosis of a Grasshopper:** Simple metamorphosis is less dramatic. The instars are egg, nymph and adult but the nymph is just a smaller version of the adult. Grasshoppers go through simple metamorphosis.

## *Beneficial Insects*

Over 97% of insects in the home garden are considered either beneficial or innocent bystanders.

Beneficial insects are classified according to how they help us in the garden into the categories **Predators, Parasitoids, Pollinators and Decomposers**. (See description of each below.)

The distinction between beneficials and pests is not always clear. For example a praying mantis is a predator that will eat pests, but it also eats other beneficial insects. Lady bugs are considered good garden visitors, but Asian ladybug has infested old houses. An insect we might not like, the fly, is a surprisingly good pollinator and its larval stage is a decomposer. Swallowtail butterfly is a pollinator but we have to tolerate its larva which eat our parsley.



**Predator:** *A praying mantis. Predators kill their prey immediately.*



**Parasitoids:** *Parasitoids are also predators but they don't kill their prey immediately. The tomato hornworm wasp lays its eggs on a tomato hornworm, the host, and when the larva hatch they start to feed on the host. The host can live for a while.*



**Pollinators:** *Honey bees, and also butterflies, bees, wasps, flies and moths are pollinators. Many vegetables (cukes, melons, squash, pumpkins, sunflowers and strawberries) can only be pollinated by insects.*



**Decomposers:** *Decomposers and recyclers are important to the nutrient cycle. Earthworms break down dead organisms and release carbon, nitrogen and other elements through their waste.*

### Study Questions:

List 5 beneficial insects and 5 pests.

How is a butterfly helpful to our garden?

Assignment: Each student will choose a beneficial insect or a pest to study.



## *Pests*

What makes an insect a garden pest? A pest harms or destroys garden plants, but it also depends on the number of insects and degree of damage and whether they contribute to garden otherwise.

The following insects are considered pests:



*The Colorado Potato Beetle lays its eggs on the underside of leaves on potatoes and eggplant among others.*



*Japanese Beetles larvae, also called grubs, are found in the soil.*



*The Striped Cucumber Beetle lays its eggs on the underside of leaves of cucumbers, squash, beans, tomatillos among others.*



*Cabbage Fly pupae can be found in the soil in the spring.*



*The Squash Vine Borer lays its eggs in the soil.*



*Flea Beetles can damage early spring crops.*

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#### SPRING SESSION

**Page 1: Cover Photo:** Christine Chitnis

**Page 2: Soil Photo:** <http://www.examiner.com/article/correction-to-backyard-recycling-seminar-schedule> **Soil Composition:** <http://www.prescriptionsoilanalysis.com/> **Soil Food Web:** <http://www.resilience.org/stories/2006-12-07/soil-food-web-opening-lid-black-box>

**Page 4: USDA Plant Hardiness Zone Map:** <http://blog.greendepot.com/green-products/options-for-winter-gardening/>

**Page 5: RI Planting Calendar for Fruits & Vegetables:** URI Master Gardener Association, August 2002

**Page 6: Companion Planting Photo:** <http://www.pushingupdandelions.co.uk/tag/companion-planting/> **Crop Rotation Diagram:** <http://growerslearning.com/blog/2014/01/16/crop-rotation-tips-what-crops-to-follow-up-with/> **Three Sisters:** <http://www.motherearthnews.com/organic-gardening/companion-planting-zm0z11zhun.aspx>

**Page 7: Companion Planting Chart for Vegetables:** <http://survivingglobalrecession.com/gardening-companion-planting-chart-for-vegetables/> **Life Cycle of a Plant:** Botany for Gardeners, URI Master Gardener Training PPT, Dave Hughes, February 7<sup>th</sup>, 2011

**Page 8: Pea Seed Germination:** <http://bishopsbackyardfarm.com/tag/peas/> **Seed Diagram:**

**Page 9: Cilantro:** <http://community.theaquaponicsource.com/group/verticalaquaponics/forum/topics/zipgrow-vertical-aquaponics>

**Spinach:** [http://www.123rf.com/photo\\_13358606\\_young-spinach-seedlings-with-water-drops.html](http://www.123rf.com/photo_13358606_young-spinach-seedlings-with-water-drops.html) **Pea:** <http://www.digginfood.com/2011/04/how-to-pre-sprout-peas/>

**Arugula:** <http://www.laughingduckgardens.com/dblog.php/2009/03/27/volunteer-seedlings/> **Dill:** <http://westsidegardener.com/guides/seedlings/dill.html> **Lettuce:** <http://chesapeakejournal.wordpress.com/2011/01/07/driftwood-deer-rockfish-cakes-cardoon-seeds-lettuce-seedlings-dogs-and-microgreens-at-pot-pie-farm/>

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**Basil:** <http://up-your-toot.blogspot.com/2011/07/oh-my-sweet-basil.html> **Cucumber:** [http://commons.wikimedia.org/wiki/File:Cucumber\\_Seedling.jpg](http://commons.wikimedia.org/wiki/File:Cucumber_Seedling.jpg) **Sunflower:** <http://blog.cameronleger.com/2009/02/18/organized/dsc06497/>

**Page 10: Interplanting:** <http://yearroundveggiegardener.blogspot.com/2012/02/interplanting-fun.html> **Triangular Planting:** <http://livinglowinthelou.blogspot.com/2012/01/sustainable-gardening-john-jeavons.html>

**Page 11: Diagram:** <http://maplegroveplace.blogspot.com/2013/03/square-foot-and-vertical-gardening.html> **Square Foot Gardening:** <http://amy-newnostalgia.blogspot.com/2010/07/square-foot-garden-progress.html> **Succession Planting:** <http://gardening.about.com/od/yourgardenphotos/ig/Your-Vegetable-Gardens/Bean-Planting.htm>

**Page 12: Seed Packet:** <http://raisingtheroot.com/2012/03/21/lesson-4-2-read-the-seeds/>

**Page 13: Strawberry Depth:** <http://strawberryplants.org/2010/05/growing-strawberries/> **Strawberry Parts:** <https://sarahssweeties.wordpress.com/category/homeschooling/preschool-corner/> **Garlic Scapes:** <http://abikeablefeast.blogspot.com/2012/05/garlic-scape-season-is-here.html>

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**Page 15: Snowdrops:** [http://www.bbc.co.uk/essex/content/image\\_galleries/snowdrops\\_easton\\_gallery.shtml](http://www.bbc.co.uk/essex/content/image_galleries/snowdrops_easton_gallery.shtml) **Lenten Rose:** <http://plantpostings.blogspot.com/2011/02/plant-of-month-hellebore.html> **Iris:** <http://www.prairiemoon.com/seeds/wildflowers-forbs/iris-versicolor-northern-blue-flag-iris.html>

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Cranshaw, Whitney. *Garden Insects of North America* Princeton: Princeton University Press, 2004

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**Pollinators:** <http://en.wikipedia.org/wiki/Pollination> **Decomposers:** <http://companionplanting.blogspot.com/2011/03/earthworms.html>

**Page 21: Colorado Potato Beetle:** [http://en.wikipedia.org/wiki/Colorado\\_potato\\_beetle](http://en.wikipedia.org/wiki/Colorado_potato_beetle) **Japanese Beetle Larvae:** <http://www.goorganicgardening.com/garden-pests-diseases/milky-spore-organic-pest-control>

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## What is Organic Gardening?

### *Garden Projects for the Summer Session :*

*Plant tomatoes, peppers, & eggplant seedlings.*

*Plant annual herbs from seed: cilantro, dill, parsley & basil.*

*Plant annual flowers from seed: zinnias, cosmos, marigolds & sunflowers.*

*Mulch garden beds with straw or shredded leaves.*

*Keep up with the weeds.*

*Water the garden regularly as days get hot & sunny.*

*Stake the tomatoes.*

*Plant beans, beets, carrots, cucumbers, corn, kale, lettuce, radishes & turnips from seed.*

*Plant zucchini late to avoid the squash vine borer.*

*Examine plants regularly for signs of pests.*

*Test soil pH of garden beds.*

*Deadhead perennials to encourage more blooms.*

**Organic gardens are planted and tended without synthetic pesticides and fertilizers.** It is a rejection of modern industrial farming with its huge environmental costs: soil depletion, water pollution, climate change and tremendous health risks to humans and animals. But that is only part of the story.

**Organic gardening is an approach based on natural systems.** We see our gardens as part of an ecosystem and we work in cooperation with nature. We can't go wrong if we imitate what nature does. This approach affects how we think about the soils, plants and insects in our gardens.

**Organic gardeners start with the health of the soil.** We replenish nutrients in the soil through crop rotation, manure and compost, and planting cover crops. Our garden soil is alive with microorganisms, busy decomposing plant debris and producing organic matter. We support them by preventing soil compaction and excessive tilling. Organic gardeners keep their garden beds covered with mulch or plants. You would never see bare ground in nature—think of the forest floor, covered with layers of leaves and decomposing plants. Mulch keeps moisture in the soil and prevents erosion. It keeps the weeds down and helps prevent the spread of soil-borne diseases.

**Organic gardeners choose the right plants for their garden.** If a plant is hardy to our climate, and its sun and water requirements are well-suited to the conditions

in our garden, it will be likely to thrive. Unhealthy plants become easily stressed and more susceptible to pests.

**Organic gardeners welcome guests.**

Since we are part of an ecosystem, we can expect to attract insects, birds and animals to our garden. Most insects are not harmful to our plants, but considered beneficial because they pollinate our plants, prey on garden pests and aerate the soil. But along with the beneficial insects come a few pests. Even butterflies we want to attract start as leaf-chomping caterpillars.

**Organic gardeners imitate the plant diversity found in nature.** Pests will not easily wipe out an entire crop if it is planted in combination with other crops. Through companion planting and other practices, we attract beneficial insects and keep the pest populations in check. A monoculture, which is a large planting of a single crop typical of industrial farming, would never occur naturally.

**Organic gardeners are tolerant of a little bit of mess and imperfection.** When did we decide that a perfect green weed-free lawn is more important than the health of our kids, pets and environment? Organic gardeners recognize their place in the natural world and the impact of their decisions. We see beauty in the rich dark soil, a diverse mix of plants and the life we attract to the garden and we strive to maintain this healthy natural balance.

Garden Time's mission is to create garden programs for incarcerated men and women at the Rhode Island Adult Correctional Institution and elsewhere. Through the process of gardening, we foster education, inspiration and empowerment; teach inmates to grow their own food for economic and personal self reliance; and identify and connect with existing opportunities to allow for permanent re-entry into society.

## Summer Chores: Planting Tomatoes, Watering & Mulching



**Nasturtium**  
(*Tropaeolum majus*)  
*Both leaves and flowers have spicy taste.*



**Calendula**  
(*Calendula officinalis*)  
*Add petals to salads. Used medicinally as well.*



**Johnny Jump Ups**  
(*Viola tricolor*)  
*Mild tasting flowers, Use to decorate cakes, salads.*

**Why should we use mulch?** Dramatic fluctuations between wet and dry soil can slow plants' growth and harm the quantity and quality of the fruit. A layer of mulch—straw, grass clippings, shredded leaves, bark chips—helps keep the soil consistently moist. Organic matter, such as compost, mixed into the soil when you plant helps to hold moisture, too.

**When is the best time to water your garden?** In the morning, so the plants can drink up during the heat of the day. Evening is the next best time, so long as you get the water to the roots—foliage that stays wet during humid nights invites diseases and fungi to move in. Watering during midday is wasteful, because much of the moisture evaporates before the plants can take it up.

**How much water do plants need?** About 1 inch per week is a standard

### Study Questions:

*How do we plant tomatoes?*

*Why do we use mulch?*

*When is the best time to water?*

*How much water do plants generally need in the summer?*

rule of thumb. A single weekly soaking is much better than daily sprinklings, because shallow watering encourages the roots to stay in the top 4 inches of soil. Shallow roots make plants more susceptible to water stress and weed competition. Wet the soil to at least 1 foot deep.

**Where is the best spot to water plants?** Directly on the roots.

([www.organicgardening.com/learn-and-grow/watering-smart](http://www.organicgardening.com/learn-and-grow/watering-smart))



*Tomatoes will produce best if they are well-rooted, so bury them deep, right down to the topmost pair or two of leaves.*

### Home-grown Salad with Tony's Famous Dressing

Dressing:

- 1/3 cup of olive oil
- 1/3 cup of champagne vinegar
- 2 tbsp maple syrup
- 1 tbsp dijon mustard
- fresh ground pepper
- 2 cloves of minced garlic
- (optional) chopped herbs: dill/parsley/basil/chives

Mix all ingredients in a jar. Shake vigorously.

Salad: Use a mix of your favorite types of lettuce (mesclun, arugula, spinach). Sprinkle with edible flowers (for example, nasturtiums, calendula and johnny jump-ups). Toss with dressing before serving.



## *Weed Identification*



**Crabgrass**  
*Digitaria spp.*



**Yellow Wood Sorrel (Sour Grass)**  
*Oxalis spp.*



**Purslane**  
*Portulacca oleracea*



**Sheep Sorrel**  
*Rumex acetosella*



**Carpetweed**  
*Mollugo verticillata*



**Lamb's quarters**  
*Chenopodium album*



**Spotted Spurge**  
*Euphorbia maculata*



**Deadnettle (Henbit)**  
*Lamium purpureum*



**Common Pigweed**  
*Amaranthus spp.*



**Horseweed**  
*Conyza canadensis*



**Broadleaf Plantain**  
*Plantago major*



**Poison Ivy! Do not touch.**  
*Toxicodendron radicans*





*Compost is rich in Organic Matter.*



*The Compost Cycle works like nature to return plant debris to soil.*



## *The Basics of Composting*

We've learned that organic gardeners try to imitate Mother Nature, and composting is an excellent example of this. If you have ever walked in the woods and noticed the rich layer of forest soil, you have seen the work of microorganisms. They turn leaves and other raw materials into the rich decomposed soil amendment we call compost. Gardeners are not always as patient as Mother Nature, so we try to speed up this process of decomposition. We put materials in a pile or bin and provide the conditions that microorganisms prefer. Two types of materials are mixed in the compost pile: "Browns" and "Greens". Browns are carbon-rich materials such as dried leaves, small twigs, straw, and shredded newspaper. Greens are nitrogen-rich materials such as vegetable scraps, egg shells and coffee grounds. We typically put these materials into the compost in alternating 6-inch layers. We can add weeds to the compost, but it's best not to include invasive weeds or weeds that have gone to seed unless your compost is heating up enough to thoroughly decompose them. If you suspect that your plants have a disease, you should throw them in the trash, not the compost bin. The diagram on the next page shows a bottom layer of sticks that might help to aerate the pile, but generally sticks will not break down quickly enough. The microorganisms that are working so hard breaking down the soil need moisture and air, so it is necessary to keep the pile moist as well as turning it with a pitchfork regularly to allow air to get to lower depths.





## A COMPOST RECIPE TO FEED YOUR SOIL.



**KEEP MOIST:** As wet as a wrung out sponge.

**AERATE:** Air helps to speed up decomposition. Aeration should be done throughout the entire composting process.

**KEEP COVERED:** Use a compost lid, cardboard or canvas over top of your pile.



### Study Questions:

*What are some examples of nitrogen-rich "greens"?*

*What are some examples of carbon-rich "browns"?*

*Explain the compost cycle.*

## Pollination

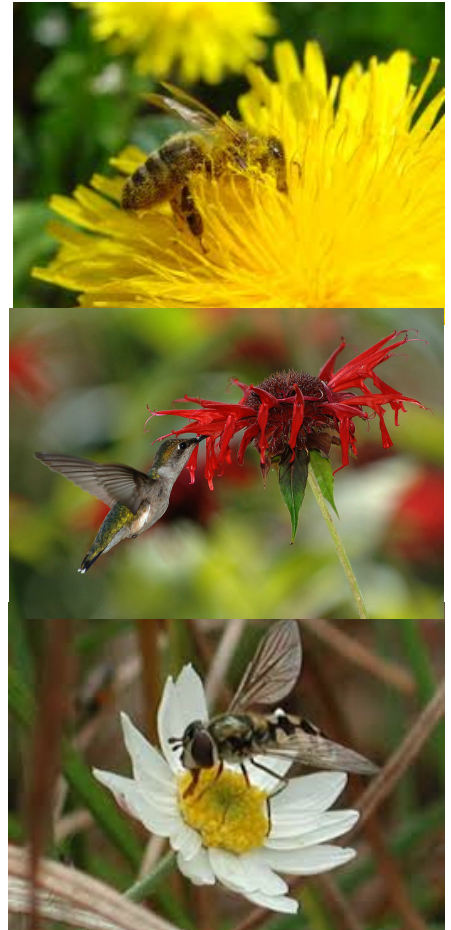
Pollination happens in different ways in different types of flowers. Some flowers don't need any help—a self-pollinating flower is fertilized by its own pollen within one flower. But other flowers do get some assistance. Wind pollinated by blowing pollen from one flower to another. Plants pollinated by the wind, which include corn, grasses and grains, often have small flowers that are not scented. These plants don't waste any of



*Wind pollinated crops, like corn, tend to have smaller unscented flowers since they don't have to attract pollinators.*

energy making showy or fragrant flowers because it is unnecessary for their survival. Wind pollinated plants produce a lot of pollen since some will be lost in the wind. Knowing how a plant is pollinated can help us know how to best plant it. For example, corn should be planted in grids rather than rows in order to maximize pollination from the wind.

Animal pollinators include butterflies, bees, moths, ants, flies, hummingbirds and bats. Flowers serve as advertising to pollinators. Bees, butterflies, moths and even flies are drawn to the showy blooms of the flower and while they are collecting nectar for their energy source and pollen for protein, pollen dust clings to their bodies and is spread to the next flowers they visit. Bats and moths pollinate some night blooming flowers.



*Plants that are pollinated by insects & animals tend to have showy flowers and scented nectar.*

## Make Your Garden a Haven for Native Pollinators

- **Use pollinator-friendly plants** in your landscape. Shrubs and trees such as dogwood, blueberry, cherry, plum, willow, and poplar provide pollen or nectar, or both, early in spring when food is scarce.
- **Choose a mixture of plants** for spring, summer, and fall. Different flower colors, shapes, and scents will attract a wide variety of pollinators. If you have limited space, you can plant flowers in containers on a patio, balcony, and even window boxes.
- **Reduce or eliminate pesticide use** in your landscape, or incorporate plants that attract beneficial insects for pest control. If you use pesticides, use them sparingly and responsibly.
- **Accept some plant damage** on plants meant to provide habitat for butterfly and moth larvae.
- **Provide clean water** for pollinators with a shallow dish, bowl, or birdbath with half-submerged stones for perches.
- **Leave dead tree trunks**, also called “snags,” in your landscape for wood-nesting bees and beetles.
- **Support land conservation** in your community by helping to create and maintain community gardens and green spaces to ensure that pollinators have appropriate habitat.

(from: <http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/plantsanimals/pollinate/gardeners/>)

### Study Questions:

*What are some ways that plants are pollinated?*

*Why would wind pollinated plants generally have smaller unscented flowers?*

*What are some ways we can attract pollinators to our garden?*



## *Summer Flowers in the Labyrinth—Plant ID*



*Asclepias tuberosa*—Butterfly Weed (perennial)



*Centaura Montana* - Perennial Bachelor Button (perennial)



*Coreopsis verticillata* 'Moonbeam' - Threadleaf Coreopsis (perennial)



*Echinacea purpurea*—Purple Coneflower (perennial)



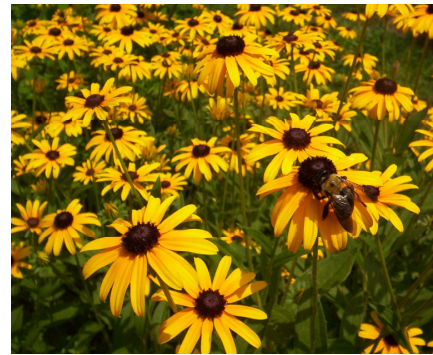
*Helenium autumnale* – Sneezeweed (perennial)



*Hemerocallis sp.*—Daylily (perennial)



*Oenothera sp.* - Evening Primrose (perennial)



*Rudbeckia hirta*—Black Eyed Susan (perennial)



*Tagetes sp.* – Marigolds (annual)

### Study Questions:

*Can you identify the plants shown above?*

*What is the difference between a perennial and an annual?*



## Medicinal Tea Herbs

The idea behind using herbs medicinally is not necessarily to cure a problem, but to support the body to help itself heal. Certain herbs support our body's particular systems. For example, oregano, thyme and lavender have antibiotic properties and are good for sore throats. Many herbs including mint, anise hyssop and feverfew aid with digestion. A medicinal herb tea regime goes along with a healthy lifestyle. Be sure to eat a well-balanced diet and avoid white sugar and processed foods. To make an herbal tea, put fresh or dried herbs into a glass mason jar with almost boiling water. Cover the jar, give it a shake and let it steep for 20-30 minutes. Drink it hot or cold. Try experimenting with combinations of herbs. Mint and anise hyssop add flavor and stevia leaf adds a natural sweetener (and is safe for diabetics). Drink four cups of tea a day for maximal health benefits.



**Thyme** (*Thymus vulgaris*)

**Heals:** Coughs, congestion, sore throats, indigestion, gas. The active principle in thyme, thymol, is a strong antiseptic.



**Anise Hyssop** (*Agastache foeniculum*)

**Heals:** Indigestion, respiratory problems, coughs, gas.



**Sage** (*Salvia officinalis*)

**Heals:** Mouth and throat inflammations. Sage's genus name, *Salvia*, means "to heal," reflecting its early use as a medicinal, not culinary, herb.



**Feverfew** (*Tanacetum parthenium*)

**Heals:** Headaches (including migraines), arthritis, skin conditions. Use leaves and flowers for teas; chew leaves to ease headache pain.



**Peppermint** (*Mentha Piperita*)

**Heals:** Indigestion, respiratory problems, coughs, gas.



**Chamomile** (*Thymus vulgaris*)

**Heals:** Indigestion, nausea, abdominal pain, anxiety.

**Study Questions:** What could you take if you had a headache? Indigestion? A sore throat?  
How many cups of herbal tea should you drink per day for the most health benefits?



## *Organic Pest Control—Keep an eye out for these summer pests!*



*Cutworms are often found in the soil.*



*Japanese Beetles defoliate many plants.*



*Aphids on the underside of a leaf.*



*Scale sucks sap from the plant and leaves a sticky residue.*



*The Squash Vine Borer larva tunnel through the stems of squash plants.*



*Look for orange eggs of Cucumber & Potato Beetles on the underside of leaves.*

Organic gardening offers best practices that help to keep pests away. We practice **crop rotation** and **companion planting** and choose pest-resistant varieties of vegetables. We keep plants healthy with good air circulation and not too many weeds to compete for nutrients in the soil. In the spring, we can use **floating row covers**, white semi-transparent fabric that allows light to reach the plant, but protects it from pests. Row covers need to be removed when the plant has flowers in order for them to be pollinated. Sometimes we delay planting of a crop until after the adult has laid its eggs, for example, we can plant zucchini in July to avoid the squash vine borer. But if preventative measures aren't sufficient and you find evidence of pest damage, there are options for the organic gardener. Some pests, such as the tomato hornworm, are large and few enough that

they can be **removed by hand**. If you find the small orange eggs of the Cucumber beetle on the underside of plant leaves, you can rub them off. **Insecticidal soap** works against aphids and other soft bodied insects and needs to be sprayed directly on them. **Horticultural oils** are sprayed directly on pests to suffocate them. There are a few different types of oil to use depending on time of year and type of insect. Remember that organic gardeners need to tolerate a bit of pest damage in order to ensure they are providing a healthy ecosystem for beneficial insects, birds and themselves. Also remember that the monarch and swallowtail butterflies that we want to attract to our garden starts as a caterpillar. Don't harm any caterpillars until you have positively identified it as an unwanted guest.

*Study Questions: What are some of the preventative measures that organic gardeners take to avoid pests? Why might we tolerate a bit of pest damage in the garden? What are some of the organic pest control options?*

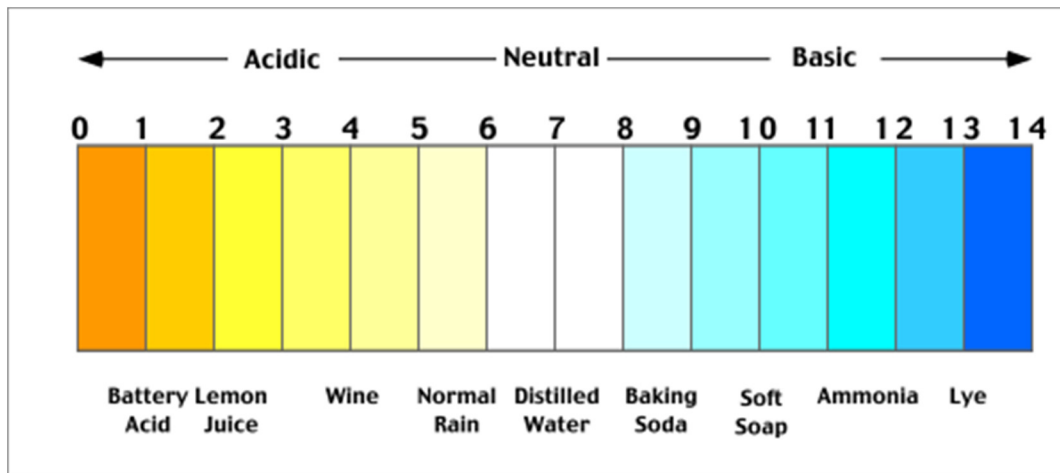
## *The Basics of Soil pH*

**Soil pH** tells us if our soil is acidic, neutral or alkaline. Most plants prefer a soil that is neutral and we try to adjust the soil pH to make it so. Soil pH is measured on a scale of 0-14, with 7 being neutral, below 7 acidic (or sour) and above 7 alkaline (also called sweet or basic). See the chart below for the pH scale. In Rhode Island our soils tend to be acidic. Some plants, such as blueberries, thrive in acidic soils, however most food crops prefer a soil close to neutral (6.0-7.0 is okay).

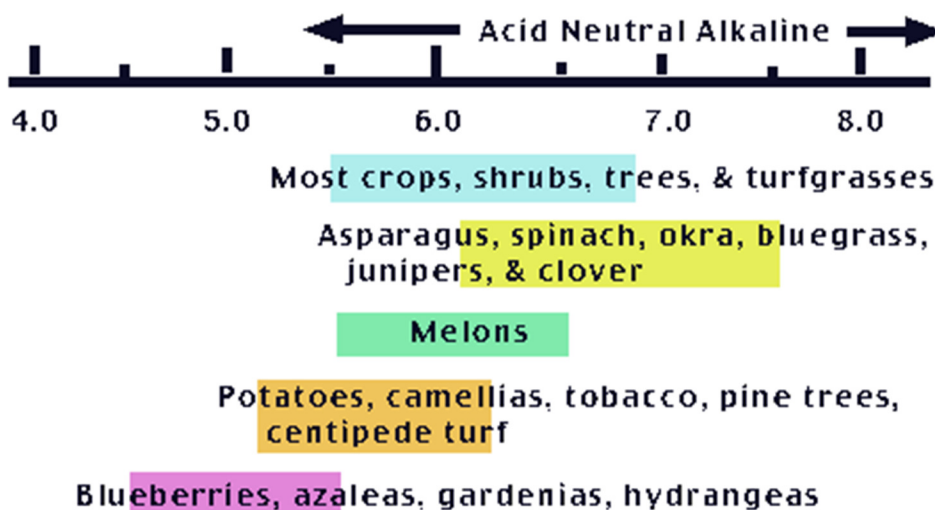
Soil pH is important to us because if the soil is too acidic or alkaline, the nutrients in the soil are not readily available to the plants. When the soil is close to neutral, plants are able to get the nutrients they

need through their roots from the soil.

So how do we find out the pH of our soil? We can take a soil test and send it to a lab (see <http://soiltest.umass.edu/> for more information) which will tell us soil pH as well as levels of nutrients, organic matter, lead contamination and other measures, or we can use a hand-held device that simply measures pH. If we find that the pH is below 7 (acidic soil) we can add limestone to the soil in the spring and fall. The chart on the next page tells us how much to add per 100 sf of garden space. We have to measure the area of each garden bed to determine how much we need. We want to raise the soil pH gradually so it does not become too alkaline.



### Soil Acidity and Desirable Ranges for Garden Crops, Ornamentals and Turfgrasses

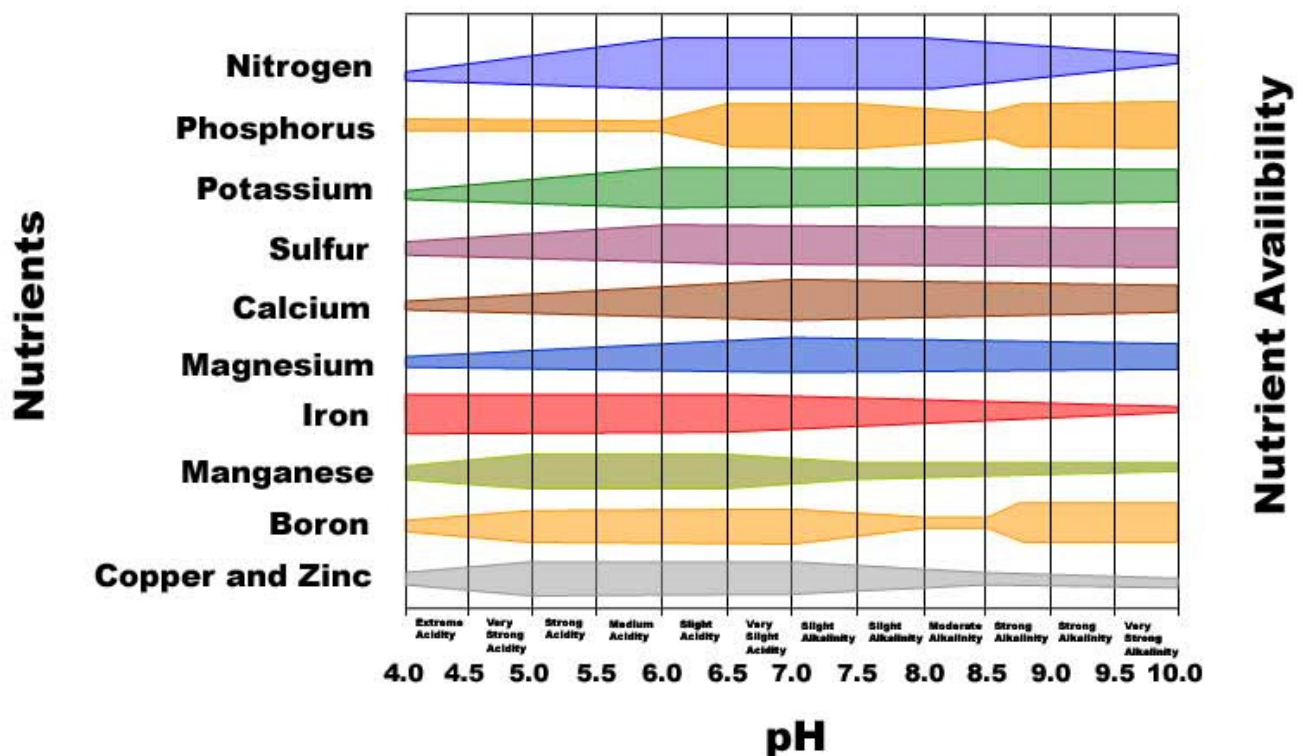




**pH Adjustments for Trees, Shrubs, Flower And Vegetable Gardens**

|               |                                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.9 or below: | add 20 pounds of lime per 100 square feet. Incorporate well into new garden bed <b>or</b> make four applications of 5 pounds each to established gardens                                |
| 5.0-5.5:      | add 10 pounds of lime per 100 square feet. Mix half in and rake the other half into the surface of a new garden bed <b>or</b> apply half in spring, half in fall to established gardens |
| 5.6-6.4:      | add 5 pounds of lime per 100 square feet                                                                                                                                                |
| 6.5-7.4:      | no lime is needed                                                                                                                                                                       |
| 7.5-7.9:      | add 1 pound of sulfur <b>or</b> 5 pounds of iron sulfate <b>or</b> 5 pounds of aluminum sulfate per 100 square feet                                                                     |
| 8.0-8.9:      | add 2 pounds of sulfur <b>or</b> 10 pounds of iron sulfate per 100 square feet                                                                                                          |

**Influence of pH on Availability of Plant Nutrients**



Study Questions:

What is more acidic: lemon juice or ammonia? What is more alkaline or basic: wine or baking soda?

What is the pH level that most plants prefer? What is this called?

What happens if the soil is too acidic for a plant?

## *The Earth's climate is changing*

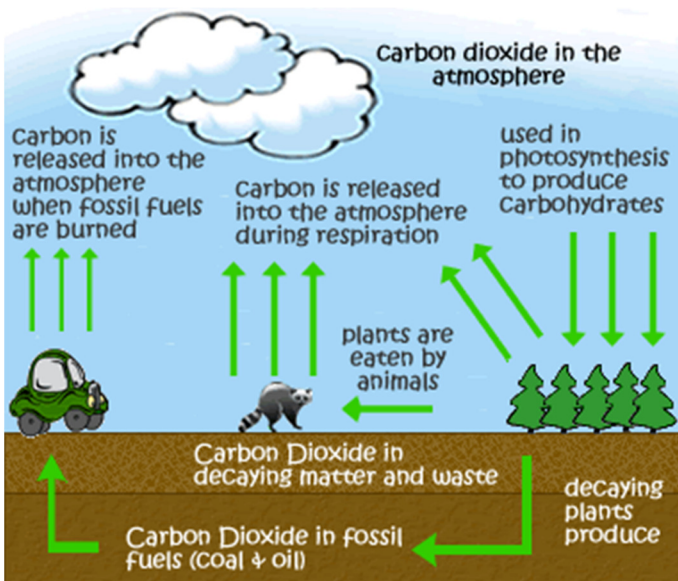
More than 100 years ago, people around the world started burning large amounts of coal, oil, and natural gas to power their homes, factories, and vehicles. Today, most of the world relies on these fossil fuels for their energy needs. Burning fossil fuels releases carbon dioxide, a heat-trapping gas, into the atmosphere, which is the main reason why the climate is changing. The Earth's climate has changed before, but this time is different. People are causing these changes, which are bigger and happening faster than any climate changes that modern society has ever seen before.

Heat-trapping gases are also called **greenhouse gases**. They exist naturally in the atmosphere, where they help keep the Earth warm enough for plants and animals to live. But people are adding extra greenhouse gases to the atmosphere. These extra gases are causing the Earth to get warmer, setting off all sorts of other changes around the world—on land, in the oceans, and in the atmosphere. Rain patterns are changing, sea level is rising, and snow and ice are melting sooner in the spring. As global temperatures continue to rise, we'll see more changes in our climate and our environment. These changes will affect people, animals, and ecosystems in many ways. Less rain can mean less water for some places, while too much rain can cause terrible flooding. More hot days can dry up crops and make people and animals sick. In some places, peo-

ple will struggle to cope with a changing environment. In other places, people may be able to successfully prepare for these changes. The negative impacts of global climate change will be less severe overall if we reduce the amount of greenhouse gases we're putting into the atmosphere and worse if we continue producing these gases at current or faster rates.

**Here's an easy way to remember the difference between weather and climate: Climate helps you decide what clothes to buy, and weather helps you decide what clothes to wear each day.**

The atmosphere isn't the only part of the Earth that has carbon. The oceans store large amounts of carbon, and so do plants, soil, and deposits of coal, oil, and natural gas deep underground. Carbon naturally moves from one part of the Earth to another through the carbon cycle (see chart on this page). But right now, by burning fossil fuels, people are adding carbon to the atmosphere (in the form of carbon dioxide) faster than natural processes can remove it. That's why the amount of carbon dioxide in the atmosphere is increasing, which is causing global climate change. (from <http://epa.gov/climatechange/>)





## *What Can We Do about it?*

Can one person help stop global climate change? Yes! Especially when the simple steps you, your friends, and your family take are multiplied by millions of people all over the world.

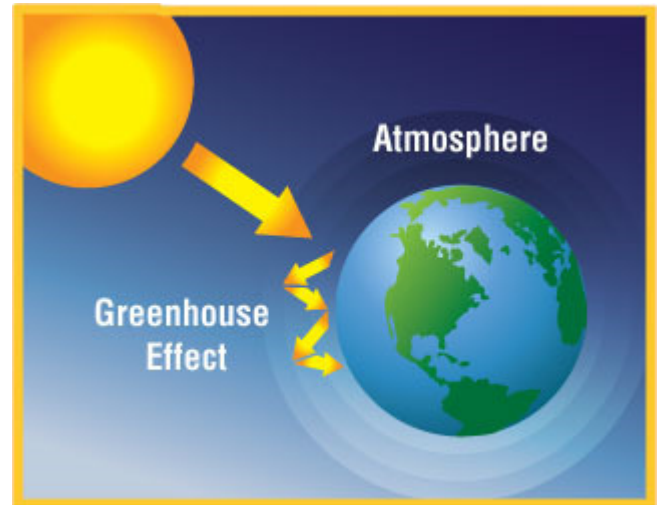
**Use Less Energy** Most of the energy you use comes from burning fossil fuels. Using less energy means burning fewer fossil fuels and putting less carbon dioxide into the atmosphere. Switch to clean energy that comes from renewable energy sources, like wind, solar and water.

**Climate change is causing droughts and hotter temperatures, but also increased winter events, which causes some people to doubt that the planet is heating up. Claiming that global warming doesn't exist when it is unseasonably cold is like claiming the sun doesn't exist during a rainstorm.**

**Travel Green** Cars, trucks, airplanes, and other kinds of vehicles are responsible for about one-third of the greenhouse gas emissions in the United States. Smart transportation choices can make a big impact on reducing emissions. Encourage your family to make one big trip to run all their errands at once, instead of making lots of small trips. Consider sharing rides with others, and use public transportation like buses or trains whenever you can. Don't idle—running the engine burns fuel, which not only wastes gasoline, but also produces greenhouse gases and other kinds of air pollution.

**Watch Your Water Use** Saving water saves energy, which in turn reduces greenhouse gas emissions. It takes a lot of energy to treat the water you use every day to make it safe to drink and to deliver it to your house. It takes even more energy to turn it into hot water. Turn the water off while brushing your teeth, and try taking shorter showers. Wash only full loads of laundry, and use cold water instead of hot. About 90 percent of the energy used for washing clothes is for heating the water.

**Reduce Waste** Most people don't realize that reducing, reusing, and recycling can help slow climate change. How? To begin with, every product has a life cycle, and every step—from manufacturing to disposal—leads to greenhouse gas emissions. Reducing,

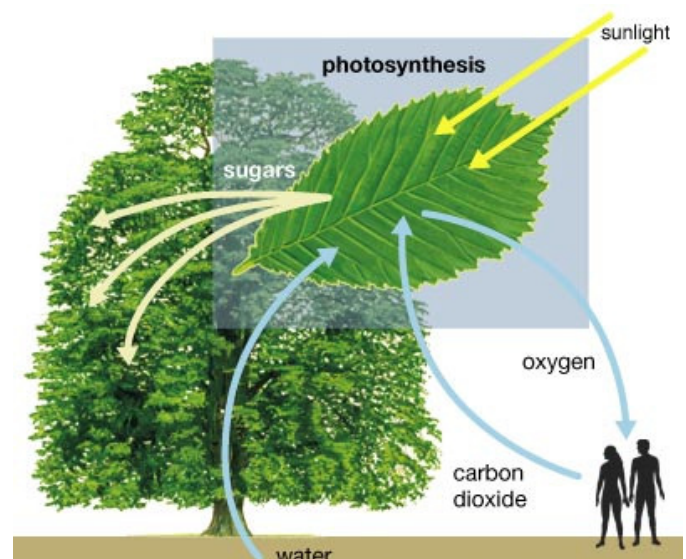


reusing, and recycling means you buy and throw away less stuff, and that helps reduce the amount of greenhouse gases we're adding to the atmosphere.

**What else? Plant a tree.** Trees help to slow climate change because they absorb carbon dioxide during photosynthesis. Trees also provide shade, which helps keep streets and houses cooler in the summer-time and reduces the need for air conditioning.

**Consider buying locally grown food.** The further your food travels, the more greenhouse gas emissions are produced in transporting the food from the farm to your plate. You can find locally grown food at a farmers market and even at some grocery stores. **Spread the word.** Explain to your family and friends how their actions can cause or reduce climate change.

(from <http://epa.gov/climatechange/>)



***Study Questions:** What is a "carbon footprint"? What are some easy steps we can take to reduce our carbon footprint? How are humans contributing to climate change? What are some examples of renewable resources? What is photosynthesis?*

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Page 3: Crabgrass: <http://sajunk.wordpress.com/2010/03/18/learning-to-lovehate-crab-grass/big-crab-grass/> **Yellow wood sorrel:** <http://manyhandshouse.blogspot.com/2011/05/herb-walk-yellow-wood-sorrell.html> **Purslane:** <http://www.ppd1.purdue.edu/ppdl/weeklypics/3-17-08.html> **Sheep sorrel:** <http://www.suburbanforagers.com/2012/12/17/twelve-wild-greens-winter-solstice/sheep-sorrel/> **Carpetweed:** <http://www.backyardnature.net/n/h/mollugo.htm> **Lamb's quarter's:** <http://www.veggiegardeningtips.com/surprising-lambs-quarters/> **Spotted Spurge:** <http://laudatortemporisacti.blogspot.com/2008/08/spotted-spurge.html> **Deadnettle:** <https://www.no-tillfarmer.com/pages/News---Dealing-With-Henbit,-Purple-Deadnettle-In-No-Till-Fields.php> **Common Pigweed:** <http://extension.umass.edu/vegetable/weeds/pigweed-redroot> **Horseweed:** <http://healthyhomegardening.com/Plant.php?pid=663> **Broad-leaf Plantain:** <http://tccpermaculture.blogspot.com/2012/10/permaculture-plants-plantain.html> **Poison Ivy:** <http://justacloud.wordpress.com/2009/12/14/poison-ivy-serious-allergic-reactions/>

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Page 10: pH Scale: <http://onpasture.com/2013/07/15/whats-soil-ph-and-why-do-i-care/> **Soil Acidity & Desirable Ranges for Garden Crops, Ornamentals & Turfgrasses:** [http://hubcap.clemson.edu/~blprrt/acidty2\\_review.html](http://hubcap.clemson.edu/~blprrt/acidty2_review.html)

Page 11: pH Adjustments for Trees, Shrubs, Flower and Vegetable Gardens: [www.rocklandcce.org/PDFs/Horticulture\\_Fact\\_Sheet\\_009.pdf](http://www.rocklandcce.org/PDFs/Horticulture_Fact_Sheet_009.pdf) **Influence of pH on Availability of Plant Nutrients:** <http://onpasture.com/2013/07/15/whats-soil-ph-and-why-do-i-care/>

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Fall Session  
September, October  
& November

## Welcome to the Garden Time Garden Program



# Garden Time

## What is Organic Gardening?

**Organic gardens are planted and tended without synthetic pesticides and fertilizers.** It is a rejection of modern industrial farming with its huge environmental costs: soil depletion, water pollution, climate change and tremendous health risks to humans and animals. But that is only part of the story.

**Organic gardening is an approach based on natural systems.** We see our gardens as part of an ecosystem and we work in cooperation with nature. We can't go wrong if we imitate what nature does. This approach affects how we think about the soils, plants and insects in our gardens.

**Organic gardeners start with the health of the soil.** We replenish nutrients in the soil through crop rotation, manure and compost, and planting cover crops. Our garden soil is alive with microorganisms, busy decomposing plant debris and producing organic matter. We support them by preventing soil compaction and excessive tilling. Organic gardeners keep their garden beds covered with mulch or plants. You would never see bare ground in nature—think of the forest floor, covered with layers of leaves and decomposing plants. Mulch keeps moisture in the soil and prevents erosion. It keeps the weeds down and helps prevent the spread of soil-borne diseases.

**Organic gardeners choose the right plants for their garden.** If a plant is hardy to our climate, and its sun and water requirements are well-suited to the conditions

in our garden, it will be likely to thrive. Unhealthy plants become easily stressed and more susceptible to pests.

**Organic gardeners welcome guests.** Since we are part of an ecosystem, we can expect to attract insects, birds and animals to our garden. Most insects are not harmful to our plants, but considered beneficial because they pollinate our plants, prey on garden pests and aerate the soil. But along with the beneficial insects come a few pests. Even butterflies we want to attract start as leaf-chomping caterpillars.

**Organic gardeners imitate the plant diversity found in nature.** Pests will not easily wipe out an entire crop if it is planted in combination with other crops. Through companion planting and other practices, we attract beneficial insects and keep the pest populations in check. A monoculture, which is a large planting of a single crop typical of industrial farming, would never occur naturally.

**Organic gardeners are tolerant of a little bit of mess and imperfection.** When did we decide that a perfect green weed-free lawn is more important than the health of our kids, pets and environment? Organic gardeners recognize their place in the natural world and the impact of their decisions. We see beauty in the rich dark soil, a diverse mix of plants and the life we attract to the garden and we strive to maintain this healthy natural balance.

### *Garden Projects for the Fall Session:*

*Harvest fall-bearing raspberries.*

*Harvest tomatoes, basil, zucchini, beans, cucumbers & other summer vegetables.*

*Deadhead flowers to encourage continued bloom but leave some dried flowers on the plant for seed saving.*

*Plant cool-weather crops: spinach, arugula, lettuce, kale, peas & radishes from seed.*

*Amend soil according to results of soil test. Add limestone to raise the pH level of the soil to neutral.*

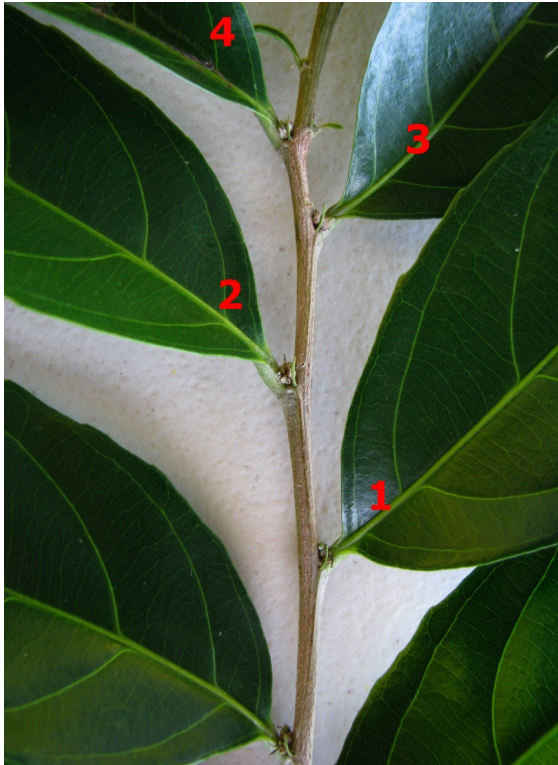
*Plant garlic around Halloween.*

*Clean up the garden for the winter.*

*Dispose of annual plants. Leave perennials to clean up until the spring.*

**Garden Time's** mission is to create garden programs for incarcerated men and women at the Rhode Island Adult Correctional Institution and elsewhere. Through the process of gardening, we foster education, inspiration and empowerment; teach inmates to grow their own food for economic and personal self reliance; and identify and connect with existing opportunities to allow for permanent re-entry into society.

## *Leaf Characteristics & Vocabulary for Tree Identification*



*Alternate Arrangement of leaves on a stem*



*Opposite Arrangement of leaves on a stem*

A botanical “key” is a series of questions to answer in order to narrow the choices and identify a particular species. In order to use a key to identify trees, we need to be able to answer questions about leaf characteristics.

### **Opposite or Alternate?**

Leaves are arranged on a stem in either an alternate or opposite pattern. Maples and Dogwoods are easily identified by their opposite arrangement.

### **Simple or Compound?**

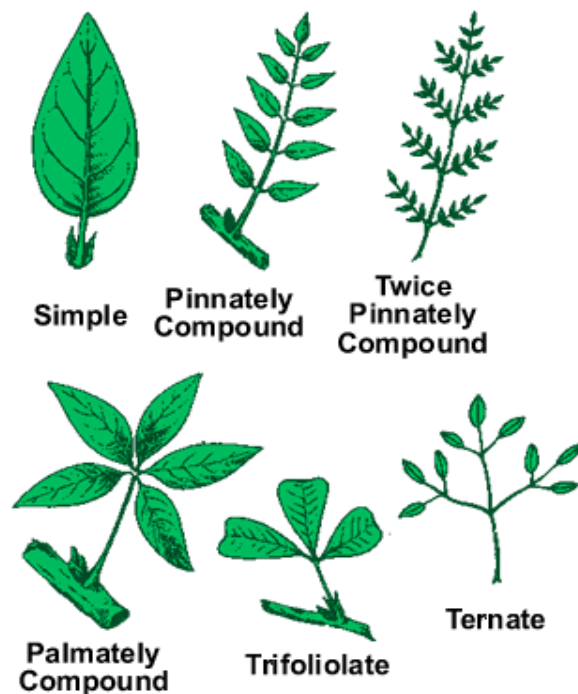
A leaf is considered simple if it is attached directly to the stem with a bud at the base. A leaf is compound if it is composed of a number of leaflets together with a bud at the base of the grouping. The arrangement of the leaflets determines whether it is pinnately, palmately or otherwise compound.

### **Parts of the Leaf**

A leaf is connected to the stem by a petiole. At the base of the petiole is the axillary bud. The leaf itself is called the blade and can be described by its shape, for example, linear, oval or cordate (heart-shaped). The edge of the leaf is called the margin.

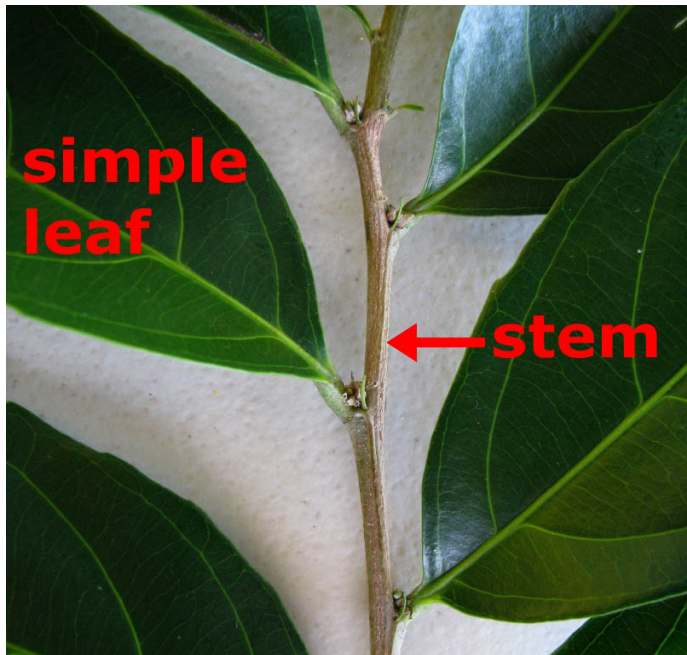
**Margins** may be toothed, lobed or entire (with no edge pattern). Leaves can be palmately lobed like a Maple leaf or pinnately lobed like an Oak leaf.

**Venation** is another identifying characteristic. A leaf can be palmately veined with veins radiating from the base. A leaf can be pinnately veined with secondary veins branching off a central primary vein, or it can have parallel venation.

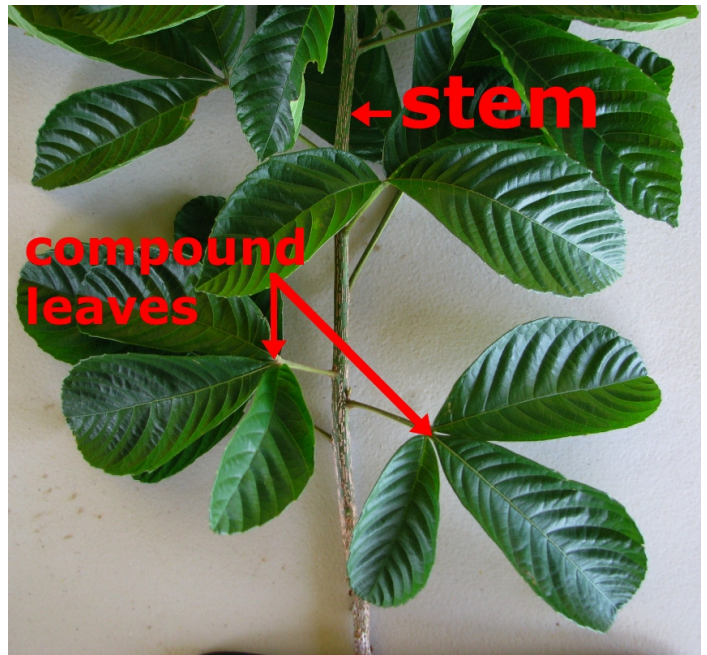


*Simple and Compound Leaves*

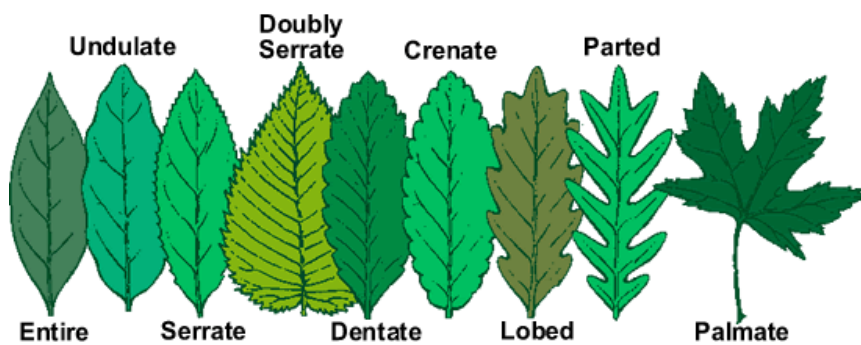




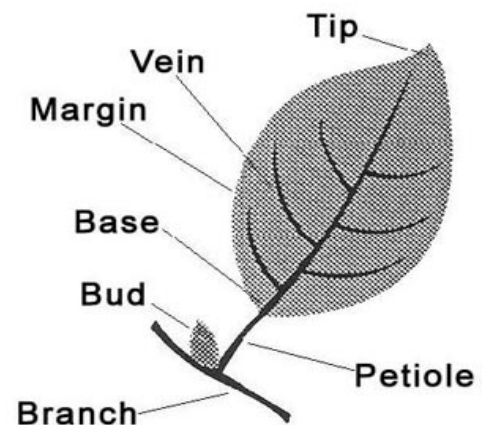
*Simple Leaf*



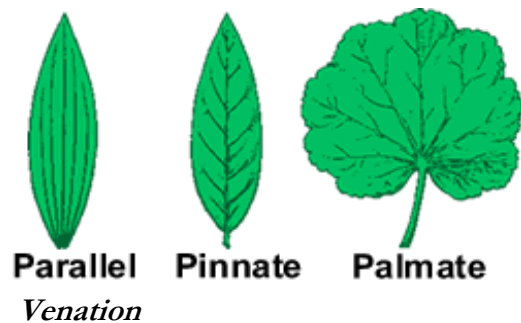
*Compound Leaf—The three leaflets make up the leaf.*



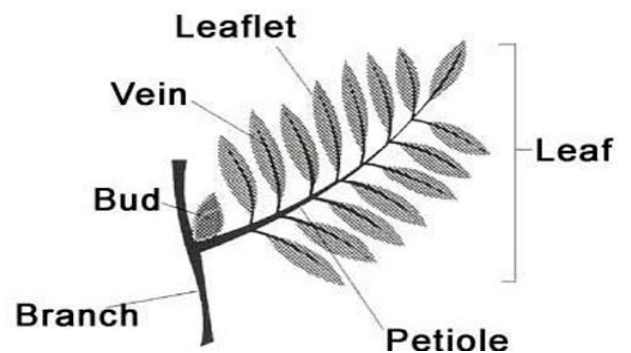
*Leaf Margins*



*Parts of a Simple Leaf*



*Venation*



*Parts of a Compound Leaf*

*Study Questions:*

*What is the difference between alternate and opposite arrangement?*

*What is the difference between simple and compound leaves.*

*Describe the parts of a leaf.*



## *Common Deciduous Trees of Rhode Island*



*Acer rubrum*—Red Maple



*Acer saccharum*—Sugar Maple



*Acer platanoides*—Norway Maple



*Acer rubrum*—Red Maple



*Acer saccharum*—Sugar Maple



*Acer platanoides*—Norway Maple



*Quercus alba*—White Oak



*Cornus florida*—Flowering Dogwood



*Ginkgo biloba*—Maidenhair Tree



*Quercus alba*—White Oak



*Cornus florida*—Flowering Dogwood



*Ginkgo biloba*—Maidenhair Tree



The trees shown on these pages are deciduous trees found in Rhode Island. Deciduous trees lose their leaves every fall, often after a period of bright coloration. We use tree form, bark, leaves, flowers and fruit to identify trees. Even within a genus there are differences that help us to identify different species. For example, *Acer* is the genus for Maples. The Red Maple (species: *Acer rubrum*) is the RI State Tree. It has a three lobed leaf and red petioles. The Sugar Maple (species: *Acer saccharum*) is another RI native, but this leaf is more palmate. The Norway Maple (species: *Acer platanoides*) is a non-native, even invasive, tree and its leaves are broader across and when pulled off emit a milky sap from the petiole. Its samaras—the helicopter-like seed pods—are more open than the samaras on the Sugar Maple.



***Fagus grandifolia*—American Beech**



***Liriodendron tulipifera*—Tulip Poplar**



***Fagus grandifolia*—American Beech**



***Liriodendron tulipifera*—Tulip Poplar**



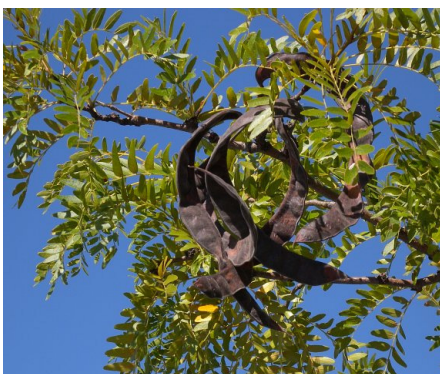
***Gleditsia triacanthos*—Honey Locust**



***Liquidambar styraciflua*—Sweetgum**



***Betula papyrifera*—Paper Birch**



***Gleditsia triacanthos*—Honey Locust**



***Liquidambar styraciflua*—Sweetgum**



***Betula papyrifera*—Paper Birch**



## *Seed Formation & Dispersal*

After fertilization a plant transfers its energy from flower production to seed formation. The ovary swells and ripens into the fruit which holds the seed while it matures. In the botanical language, the word “fruit” means everything that holds a seed or seeds. Seeds can be tiny and barely visible, or huge, like a coconut. A fruit can hold hundreds of seeds, like a poppy, or just one, like an avocado.

So how are seeds spread? Some just fall to the ground and start to grow at the base of the plant. An example of this would be an apple tree. Birds spread seeds. They drop seeds as they fly, or more typically, the seeds fall after going through the bird's

digestive system. This can be a big problem with invasive plants! With sunflowers, birds eat the dried seeds and drop a few in the process. So even though they are annuals, once you plant sunflowers, you continue to have a new crop every year without planting them again. Animals help scatter seeds. An example of this would be a squirrel burying acorns. Wind scatters seeds. Some seeds have little fluff that helps them float, like dandelions. Others like Maple seeds have wings that help them spin as they fall. Some seeds have hooks that stick to fur or clothes and later they drop off. At least one seed—the coconut—travels by water.



Top row from left: the seeds of Butterfly weed, *Asclepias tuberosa*, are wind spread. A bird eating sunflower seeds drops some that will grow next year. Bottom row from left: The strawberry flower develops into fruit. A tomato flower's ovary ripens into fruit. Maple samaras help the seeds fall.

### Study Questions:

What are some of the ways seeds are spread?



## *Fall Flowers in the Labyrinth—Plant ID*



*Ageratum houstonianum*, Blue Horizon Ageratum (perennial)



*Ceratostigma plumbaginoides* - Dwarf Plumbago (perennial)



*Chrysanthemum* 'Hillside Pink Sheffield' - Chrysanthemum (perennial)



*Cleome hassleriana* - Spider Flower (annual)



*Cosmos* spp.—Cosmos (annual)



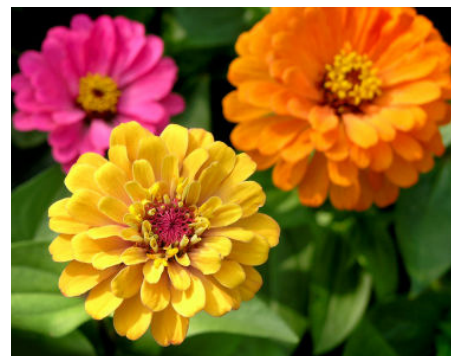
*Helianthus annuus*—Sunflower (annual)



*Sedum rupestre* 'Angelina' – Angelina Stonecrop (perennial)



*Sedum spectabile* 'Autumn Joy' Stonecrop (perennial)



*Zinnia elegans*—Zinnia (annual)

### Study Questions:

*What is the difference between a perennial and an annual?*



## Beginner's Guide to Seed Saving

We know that a plant's number one priority is reproducing, or making seeds. The flower gives way to the fruit which is where the seeds are formed. If we know where to look, we can collect seeds from the crops we grow to plant next year. Some seeds are easier to collect than others so we will focus on some of plants with easy-to-save dry seeds.



**Cilantro/Coriander**—The cilantro plant flowers and then makes seeds. After the seeds dry on the plant, they can be easily collected and saved for next year. Cilantro readily **self-sows**, which means that it drops seeds and grows new plants at the base of the old plants.



**Basil**—Basil is easy as well, but

there is one more step to the seed saving process. When the flowers are dry, strip them off the stem and rub them gently between your hands. This will separate the seed from the chaff (the dried covering of the seed). This process is called winnowing. Basil seeds are tiny and black.



**Peppers**—Pepper seeds are easy. When a pepper is ripe, cut it open and take out the seeds (and eat the rest). Let them dry on a plate. Don't use a paper towel or they will stick. You can tell when a seed is dry enough to be saved for the winter. When you push into it with your fingernail, it should break, not dent. Store seeds in envelopes or glass jars for the winter.



**Annual Flower Seeds**—Zinnias, marigolds and sunflowers are easy seeds to save. Simply wait until the flower has dried on the plant and pull the petals off. The seeds are at the base of the petals. If birds are eating the sunflower seeds before they can dry and be saved, you can put a paper bag over one or

two of the flowers, tie it in place and leave it on until the seeds are dry.



**Tomatoes**—Tomatoes are more complicated to save because they have wet seeds. Tomato seeds are protected by a gel that serves as a germination inhibitor so the seed does not sprout inside the tomato. We need to get rid of the gel before we can save the seed. Take your best tomato and squeeze the seeds into a jar or a plastic ziplock bag. Let it sit for at least four days (up to a week and a half) so the mixture begins to ferment. Open the bag and fill it with clean water. The good seeds will sink to the bottom. Remove anything that floats and let the good seeds dry on a plate until they are hard enough to store. Remember to label the seeds with as much information as you know—crop, variety and date.



### Study Questions:

*What is winnowing? Where are seeds formed? What does it mean for a plant to self-sow? How do you know if a seed is dry enough to be stored? How do you save basil seeds? How do you save tomato seeds?*



## *Plant Garlic in Fall (Halloween) & Harvest it in Summer (July)*



Use “seed garlic” or organic garlic from the supermarket. Non-organic garlic may be treated to keep it from sprouting. Separate the garlic bulb into individual cloves. Leave the skins on.



Plant the garlic a couple inches deep in a row or a diagonal pattern, 4 to 6 inches apart, with the flat end of the clove pointing down and the pointed end pointing up.



Gently cover the cloves with soil and then cover the bed with 6 inches of straw mulch. This will protect the garlic and prevent erosion during the winter.



Harvest the garlic when several of the lower leaves go brown, but five or six up top are still green. Depending on the weather, this typically happens in RI in July.

## *Plant a Cover Crop for Erosion Control & Soil Fertility*

A cover crop, sometimes referred to as “green manure”, helps replenish nutrients that have been depleted from the soil after a long growing season. We plant a cover crop in late summer or early fall in beds that have already been cleaned up for the winter. The cover crop begins to grow in the fall and holds the soil in place over the winter. It also prevents weeds from growing in empty beds. In the spring, we turn the cover crop into the soil before it has grown too high, and leave it for a week or two before we plant. This replenishes nitrogen in the soil. If the cover crop has already grown tall, we can cut it and then turn the cut pieces and the roots into the soil. We use a mix of seeds in our cover crop that includes winter rye, field peas, hairy vetch and red clover. We prepare the beds by raking them to loosen the soil, then scatter the cover crop seeds evenly around the beds, then rake once more to give the seeds a bit of soil covering.

### Study Questions:

What time of year should you plant garlic? When do you harvest garlic? How do you plant garlic?  
What is the purpose of a cover crop?

## Nutrition 101

Do you feel like you can't keep up with the latest nutrition news because it's always changing? While it's true that what is known about nutrition and diet is evolving, there are some nutrition basics you can keep in mind. By knowing these nutrition basics, you'll be better equipped to sort through the latest research and advice. Mastering the nutrition basics comes down to understanding the food groups and becoming more aware of calories and the roles that specific nutrients play in a healthy diet. The Healthy Eating Plate below illustrates the five food groups that are the building blocks for a healthy diet using a familiar image—a place setting for a meal. Before you eat, think about what goes on your plate or in your cup or bowl.

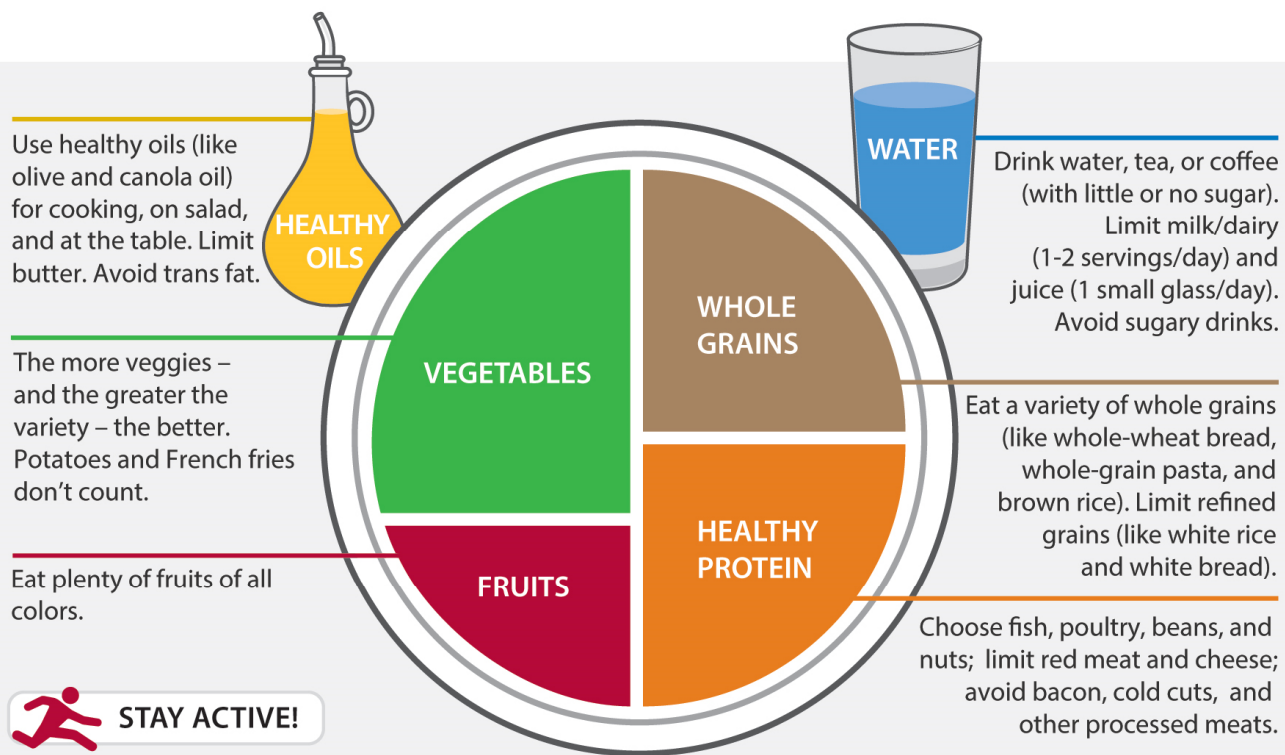
### Do you want to adopt a healthy diet but aren't sure where to start?

Look for a diet that includes a variety of foods from the major food groups: fruits, vegetables, whole grains, low-fat dairy products, lean protein, nuts and seeds, and healthy fats; that provides guidelines for how much food to choose from each group includes foods you can find in your local grocery store and fits your tastes, lifestyle and budget. Also consider your health risks. Do you have high cholesterol or high blood pressure? If so, be sure to follow a diet that's low in salt, saturated fat and cholesterol, and high in fruits, vegetables, whole grains and healthy fats. For personalized advice, talk with your doctor or a dietitian.

### Would you like to make satisfying and healthy meals that help protect your family from heart disease and other health problems?

Then move away from calorie-laden, fatty and salty convenience items. Experiment with quick and healthy cooking techniques, such as baking, grilling and sautéing. Learn important food safety tips, recipe makeovers and more. And then enjoy knowing that your new healthy cooking skills are helping to reduce your family's risk of health problems.

## HEALTHY EATING PLATE



**STAY ACTIVE!**

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The Nutrition Source  
[www.hsph.harvard.edu/nutritionsource](http://www.hsph.harvard.edu/nutritionsource)

Harvard Medical School  
Harvard Health Publications  
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## What are Carbohydrates?

Your body uses carbohydrates (carbs) to make glucose which is the fuel that gives you energy and helps keep everything going. Your body can use glucose immediately or store it in your liver and muscles for when it is needed.

You can find carbohydrates in the following:

● Fruits ● Vegetables ● Breads, cereals, and other grains ● Milk and milk products ● Foods containing added sugars (e.g., cakes, cookies, and beverages).

Healthier foods higher in carbohydrates include ones that provide dietary fiber and whole grains as well as those without added sugars. Complex carbohydrates are carbohydrates that take longer to break down into glucose; such as vegetables, fruits, whole grains and beans.

What about foods higher in carbohydrates such as sodas and candies that also contain added sugars? Those are the ones that add extra calories but not many nutrients to your diet.

## What is Protein?

Proteins are part of every cell, tissue, and organ in our bodies. These body proteins are constantly being broken down and replaced. The protein in the foods we eat is digested into amino acids that are later used to replace these proteins in our bodies.

Protein is found in the following foods:

● meats, poultry, and fish ● legumes (dry beans and peas) ● tofu ● eggs ● nuts and seeds ● milk and milk products ● grains, some vegetables, and some fruits (provide only small amounts of protein relative to other sources)

Most adults in the United States get more than enough protein to meet their needs. It's rare for someone who is healthy and eating a varied diet to not get enough protein.

### Study Questions:

*What are some sources of protein? What are some sources of carbohydrates?*

*How much fat should an adult consume?*

*What portion of your meal should be fruits and vegetables together?*

## How much *total* dietary fat do I need?

The *Dietary Guidelines for Americans 2010* recommend that Americans:

- Consume less than 10% of calories from saturated fats.
- Replace solid fats with oils when possible.
- Limit foods that contain synthetic sources of *trans* fatty acids (such as hydrogenated oils), and keep total *trans* fatty acid consumption as low as possible.
- Eat fewer than 300 mg of dietary cholesterol per day.
- Reduce intake of calories from solid fats.
- Fat should be between 20% to 35% of total calories consumed by adults.

(from [www.cdc.gov/nutrition/everyone/basics/](http://www.cdc.gov/nutrition/everyone/basics/))



**Protein** is found in a variety of meat and vegetarian sources. Women need approx. 46 grams of protein per day.

## *Resources for Gardening around the State of Rhode Island*

**Southside Community Land Trust, <http://www.southsideclt.org/>**



Southside Community Land Trust provides access to land, resources, and education to help people grow food. They also host an annual plant sale at City Farm—not to be missed! One weekend in May, hundreds of varieties of annuals, perennials, and fruit and vegetable plant starts are available for purchase.

**Farm Fresh RI, <http://www.farmfreshri.org/>**



Farm Fresh Rhode Island is growing a local food system that values the environment, health and quality of life of RI farmers and eaters. See the website for a list of RI Farmer's Markets. Not only do they accept SNAP/EBT, but they give you \$2 extra for fruit and vegetables for each \$5 you spend.

The Healthy Foods, Healthy Families program empowers low-income Rhode Island families with the tools to shop for and cook affordable fresh foods through a series of hands-on activities, offered in English and Spanish, at the farmers market. Parents come with their children to the market where the Healthy Foods, Healthy Families staff offers free samples, games, recipes, financial incentives, and giveaways.

**Farmacy Herbs, <http://farmacyherbs.com/index.html>**



Farmacy Herbs runs an herb shop in Providence and offers consultations on a sliding-scale. They offer an Herbal Education and Training Program twice a year for a "Certificate of Herbal Education" and includes Everyday uses of over 30 plants, Nutritional Healing/Detoxification Methods, Dental Health, Immune Health, Endocrine Health, Digestive Health, Repro-

ductive Health, Regulatory Breakdown, Local Plant Id, Wildcrafting Techniques, Harvesting and Drying Techniques, Herbal First Aid, and how to make Decoctions, Infusions, Tincturing, Syrups, Salves, Linaments, Creams, Poultices, Infused Oils, and Cordials.

**Groundwork Providence, [www.groundworkprovidence.org](http://www.groundworkprovidence.org)**

Groundwork Providence's Adult Job Training engages local residents in projects that improve the places where they live, work, and play. GroundCorp, the social venture of Groundwork Providence, is a landscape design-build and maintenance service. It provides valuable, paid, hands-on experience to graduates of the job training program as they search for permanent environmental work.

**URI Master Gardeners, <http://www.urimastergardeners.org/home>**

Through community service and educational outreach, Master gardeners provide home gardeners and community organizations the knowledge and skills to create healthy, sustainable gardening environments. URI offers a 16-week course to become a Master Gardener.

**Garden Time, [www.gardentime.us](http://www.gardentime.us)**



## Evergreens & Conifers

In botany, an **evergreen** is a plant that has leaves in all four seasons, always green. This contrasts with deciduous plants, which completely lose their foliage during the winter or dry season. There are many different kinds of evergreen plants, both trees and shrubs. Evergreens include most species of conifers (e.g., hemlock, blue spruce, red cedar, and pines); live oak, holly, and "ancient" gymnosperms such as cycads; and most angiosperms from frost-free climates, such as eucalypts and rainforest trees.

The Latin binomial term *sempervirens* (literally, "always green") refers to the evergreen nature of the plant, for instance:

*Acer sempervirens* (a maple)

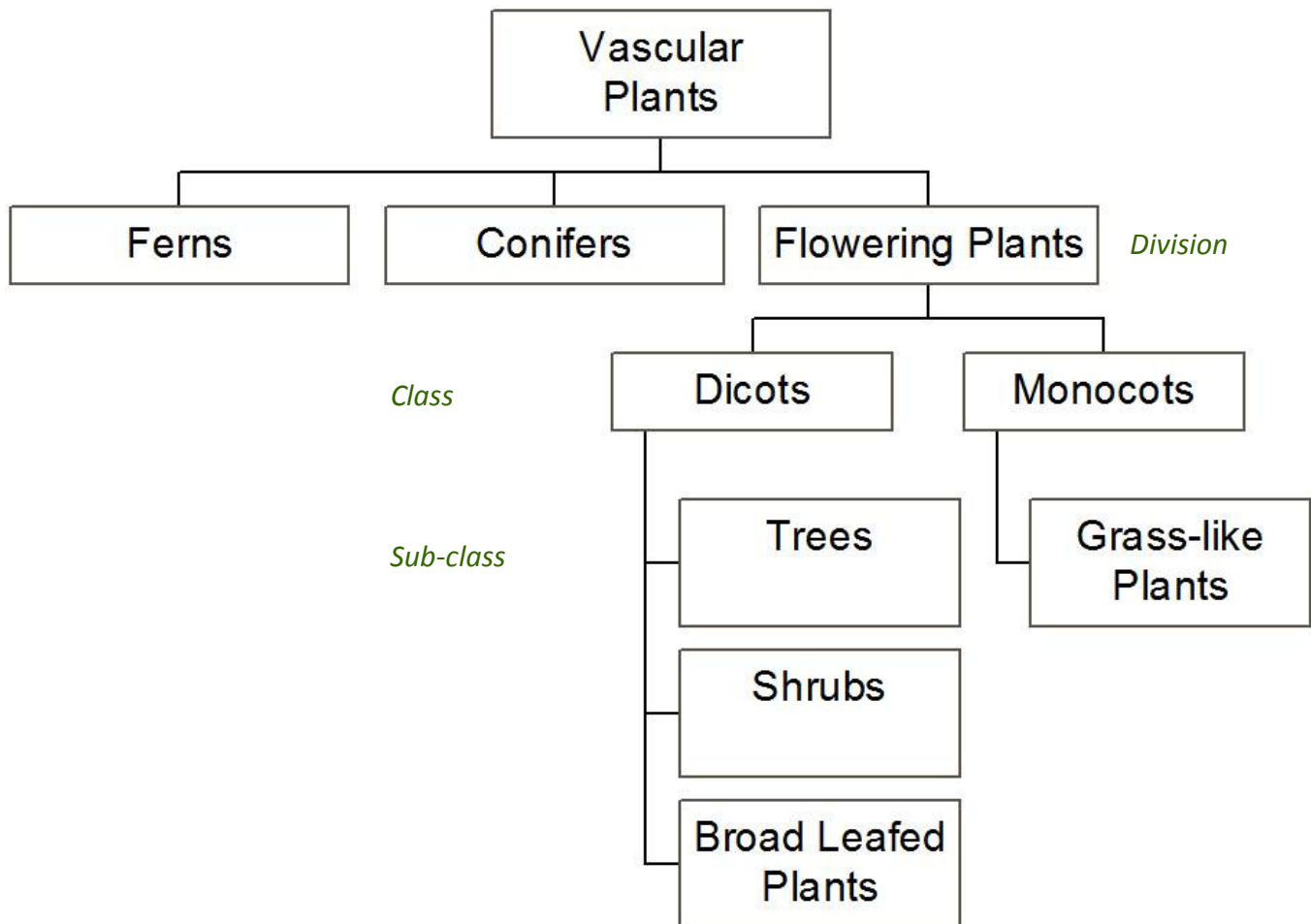
*Cupressus sempervirens* (a cypress)

*Lonicera sempervirens* (a honeysuckle)

*Sequoia sempervirens* (a sequoia)

All living **conifers** are woody plants, and most are trees, the majority having a single, straight trunk with side branches. Many conifers have distinctly scented resin, secreted to protect the tree against insect infestation and fungal infection of wounds. The world's tallest, thickest, and oldest living trees are all conifers.

(from <http://en.wikipedia.org/wiki/Evergreen>)



### Study Questions:

What are the three divisions of vascular plants?

What class do trees and shrubs belong to?

## *Evergreens & Conifers—Plant Identification*

Most conifers (cone bearing plants) are easy to identify to genus, based on leaf type.

- *Pinaceae* family (pine, spruce, fir and Douglas fir) – needle-like leaves
- *Cupressaceae* family (juniper and arborvitae) – scale-like or awl-like leaves
- *Taxaceae* family (yew) – leaves flat and feather-like in arrangement



**scale-like**  
*Junipers and Arborvitae*



**awl-shaped**  
*Junipers*



**linear, feather-like**  
*Yews*



**single needles**  
*Fir, Douglas Fir & Spruce*



**bundled needles**  
*Pine*



**clustered needles**  
*Larch*



***Pinus strobus*—White Pine**  
*Blue-green needles arranged in bundles of 5, on a raised woody peg with long slender cones.*



***Thuja occidentalis* —Arborvitae**  
*scale-like leaves; cones are small & brown.*



***Pseudotsuga menziesii* —Douglas Fir** (not a fir) *unique cone with forked bracts extending from each scale.*



## Evergreens & Conifers—Plant Identification

### Key to Conifers

- A. Leaves scale-like or awl-like.** Fruit berry-like cone with scales fused together. – *Cupressaceae* family (junipers and arborvitae)
1. Leaves scale-like or awl-shaped, often closely pressed to the branches. Foliage arranged around the branch, rather than flattened. Cones berry-like with scales pressed together. – ***Juniperus* (Junipers)**
  2. Leaves small, scale-like hugging the stem. Foliage in flattened plate-like display. Cones berry like with thick scales – ***Thuja* (Arborvitae)**
- B. Leaves needle-like** – *Pinaceae* family (pine, spruce, fir, and Douglas fir)
1. Needles single
    - a) Needles flat in cross-section and flexible
      - 1) Leaf scar oval, bud tips pointed. Cones have three-pronged lobed tongue-like “bract” that extend out beyond the scales. – ***Pseudotsuga menziesii* (Douglas Fir)**
      - 2) Leaf scar round, bud tips roundish. Cones grow upright on the branch, usually disintegrating before falling to the ground. – ***Abies* (Fir)**
    - b) Needles square in cross-section and stiff. Older twigs studded with the persistent stumps of fallen needles. – ***Picea* (Spruce)**
  2. Needles sheathed at the base in bundles of two to five. Cone scales thick and woody with swollen tips – ***Pinus* (Pine)**
  3. Short needles in tufts of ten or more. May be deciduous. – ***Larix* (Larch)**
- C. Leaves flat, linear-shaped in a feather-like display.** Shrubs with dark green leathery leaves. Red, berry-like fruit. – ***Taxus*, (Yew)**

(from <http://www.ext.colostate.edu/mg/gardennotes/152.html>)

Assignment: Use the key above to identify various types of conifers.



***Picea abies*—Norway Spruce**  
Needles, stiff, 1/2-1 inch long, with sharp pointed tip, shiny deep green.



***Tsuga Canadensis*— Eastern Hemlock** Flattened branches, short needles and tiny cones.



***Juniperus virginiana*—Eastern Red Cedar** Two types of leaves: sharp & scaly, blue berry-like seed cones.

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Page 4: **Red Maple:** <http://www.publicdomainpictures.net/view-image.php?image=12819&picture=red-maple-tree> **Red Maple dtl:** [http://www.meridian.k12.il.us/middle%20school/student\\_work/whitley/Red%20Maple.html](http://www.meridian.k12.il.us/middle%20school/student_work/whitley/Red%20Maple.html) **White Oak:** [http://en.wikipedia.org/wiki/Quercus\\_alba](http://en.wikipedia.org/wiki/Quercus_alba) **White Oak dtl:** [http://www.netstate.com/states/symb/trees/ct\\_white\\_oak.htm](http://www.netstate.com/states/symb/trees/ct_white_oak.htm) **Sugar Maple Tree:** [http://www.meridian.k12.il.us/Middle%20School/student\\_work/kendra\\_trees/Sugar%20Maple.html](http://www.meridian.k12.il.us/Middle%20School/student_work/kendra_trees/Sugar%20Maple.html) **Sugar Maple dtl:** <http://www.waterfordvillage.org/nature-garden/trees-maples.htm> **Flowering Dogwood:** <http://bernheim.org/explore/arboretum/bernheim-select/flowering-dogwood/> **Flowering Dogwood dtl:** [http://floridanature.org/species.asp?species=Cornus\\_florida](http://floridanature.org/species.asp?species=Cornus_florida) **Norway Maple:** <http://www.itrees.com/royal-red-norway-maple.html> **Norway Maple dtl:** <http://www.waterfordvillage.org/nature-garden/trees-maples.htm> **Maidenhair Tree:** [http://www.plantsystematics.org/imgs/dws/r/Ginkgoaceae\\_Ginkgo\\_biloba\\_38836.html](http://www.plantsystematics.org/imgs/dws/r/Ginkgoaceae_Ginkgo_biloba_38836.html) **Maidenhair Tree dtl:** [http://blog.pennlive.com/thrive/2007/12/med\\_watch\\_ginkgo\\_biloba.html](http://blog.pennlive.com/thrive/2007/12/med_watch_ginkgo_biloba.html)

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Page 12: **Logos** from each organization's website

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