



## Teacher Guide: 1<sup>st</sup> Grade

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California Education Standards: First Grade

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## **Gecko Garden: Rethinking Curriculum Integration**

Today's students are hungry for work that is real, for learning that is meaningful.<sup>1</sup> Many teachers use projects to connect learning in a variety of subject areas and most children are excited to make these leaps of understanding. This strategy allows students to take more responsibility for their learning as they make decisions and create solutions to problems that interest them. In fact, with a little imagination, all subjects can be integrated as students apply their academic, social and life skills to their work in a garden.<sup>1</sup> By adopting a project-based learning strategy, garden work will not compete with our standards; rather it will be an avenue to high standards.<sup>2</sup>

Moreover, in this age of global warming, population explosion, and declining natural resources, it is more important than ever that our children learn to be better stewards of our environment. Working in a garden helps children develop an appreciation for our environment and the precious resources it provides.

The reasons in the literature are numerous for supporting garden use and incorporating project based learning, the unique situation facing Grant with the expansion to K-8 offers several more. The joining of garden projects with a Farmers market can offer appropriate challenges to all students. It can give older students, with years of practical experience, a venue and meaningful way to foster younger students. And like no other event at Grant, it can unite all members of the school behind a showcase educational project that teachers, parents and especially students will be proud of. That said, some practical steps are required to reap the many benefits of this garden project:

1. Build upon Grant's tradition of learning in the Gecko Garden and create a school-wide garden project that could culminate in a student run Farmers Market.
2. Give students full responsibility for the garden and the market. The students should decide: what to plant and when, how to amend the soil, how to procure supplies, and how to price and market the garden produce and so on. These are all decisions we are teaching them to make with the skills they are learning in math, science, social studies and reading.
3. Utilize garden volunteers to develop and/or assist teachers in creating lesson plans to support each activity in the garden and market.
4. Foster participation from all the students and teachers at Grant through grade-appropriate activities including garden maintenance, planting and sales;

1) Rethinking Curriculum Integration, [www.ecoliteracy.org](http://www.ecoliteracy.org) (An education think-tank)

2) Childs Garden of Standards. Linking School Gardens to California Education Standards, California Department of Education, 2002. Delaine Easton, Superintendent of Public Instruction

# First Grade

## California Science Arts Content Standards-at-a-Glance

### Science

#### Physical Sciences

1. Materials come in different forms (states), including solids, liquids, and gases

*Students know:*

- a. Solids, liquids, and gases have different properties
- b. Properties of substances change when the mixed substances are cooled or heated

#### Earth Sciences

3. Weather can be observed, measured and described

*Students know:*

- a. How to use simple tools (e.g., thermometer, wind vane) to measure weather conditions and record changes from day to day and across seasons
- b. The weather changes from day to day but trends in temperature or of rain tend to be predictable during a season
- c. The sun warms the land, air, and water

#### Life Sciences

2. Plants and animals meet their needs in different ways

*Students know:*

- a. Different plants and animals inhabit different environments and have external features that help them thrive in different places
- b. Both plants and animals need water, animals need food, and plants need light
- c. Animals eat plants or other animals for food and use plants or even other animals for shelter and nesting
- d. How to infer what animals eat from the shape of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants)
- e. Roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight

#### Investigation and Experimentation

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. Students should develop their own questions and perform investigations.

*Students will:*

- a. Draw pictures that portray features of the thing being described.
- b. Record observations and data with pictures, numbers, or written statements.
- c. Record observations on a bar graph.
- d. Describe the relative position of objects by using two references (e.g., above and next to, below and left of)
- e. Make new observations when discrepancies exist between two descriptions of the same object or phenomenon

# Grade One

## Science Content Standards.

### Physical Sciences

1. Materials come in different forms (states), including solids, liquids, and gases. As a basis for understanding this concept:
  - a. *Students know* solids, liquids, and gases have different properties.
  - b. *Students know* the properties of substances can change when the substances are mixed, cooled, or heated.

### Life Sciences

2. Plants and animals meet their needs in different ways. As a basis for understanding this concept:
  - a. *Students know* different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.
  - b. *Students know* both plants and animals need water, animals need food, and plants need light.
  - c. *Students know* animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.
  - d. *Students know* how to infer what animals eat from the shapes of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants).
  - e. *Students know* roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.

### Earth Sciences

3. Weather can be observed, measured, and described. As a basis for understanding this concept:
  - a. *Students know* how to use simple tools (e.g., thermometer, wind vane) to measure weather conditions and record changes from day to day and across the seasons.
  - b. *Students know* that the weather changes from day to day but that trends in temperature or of rain (or snow) tend to be predictable during a season.
  - c. *Students know* the sun warms the land, air, and water.

### Investigation and Experimentation

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
  - a. Draw pictures that portray some features of the thing being described.
  - b. Record observations and data with pictures, numbers, or written statements.
  - c. Record observations on a bar graph.
  - d. Describe the relative position of objects by using two references (e.g., above and next to, below and left of).
  - e. Make new observations when discrepancies exist between two descriptions of the same object or phenomenon.

Questions: State Board of Education | 916-319-0693

# Grade One

## Mathematics Content Standards.

By the end of grade one, students understand and use the concept of ones and tens in the place value number system. Students add and subtract small numbers with ease. They measure with simple units and locate objects in space. They describe data and analyze and solve simple problems.

### Number Sense

#### 1.0 Students understand and use numbers up to 100:

- 1.1 Count, read, and write whole numbers to 100.
- 1.2 Compare and order whole numbers to 100 by using the symbols for less than, equal to, or greater than ( $<$ ,  $=$ ,  $>$ ).
- 1.3 Represent equivalent forms of the same number through the use of physical models, diagrams, and number expressions (to 20) (e.g., 8 may be represented as  $4 + 4$ ,  $5 + 3$ ,  $2 + 2 + 2$ ,  $10 - 2$ ,  $11 - 3$ ).
- 1.4 Count and group object in ones and tens (e.g., three groups of 10 and 4 equals 34, or  $30 + 4$ ).
- 1.5 Identify and know the value of coins and show different combinations of coins that equal the same value.

#### 2.0 Students demonstrate the meaning of addition and subtraction and use these operations to solve problems:

- 2.1 Know the addition facts (sums to 20) and the corresponding subtraction facts and commit them to memory.
- 2.2 Use the inverse relationship between addition and subtraction to solve problems.
- 2.3 Identify one more than, one less than, 10 more than, and 10 less than a given number.
- 2.4 Count by 2s, 5s, and 10s to 100.
- 2.5 Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference).
- 2.6 Solve addition and subtraction problems with one-and two-digit numbers (e.g.,  $5 + 58 = \underline{\quad}$ ).
- 2.7 Find the sum of three one-digit numbers.

#### 3.0 Students use estimation strategies in computation and problem solving that involve numbers that use the ones, tens, and hundreds places:

- 3.1 Make reasonable estimates when comparing larger or smaller numbers.

### Algebra and Functions

#### 1.0 Students use number sentences with operational symbols and expressions to solve problems:

- 1.1 Write and solve number sentences from problem situations that express relationships involving addition and subtraction.
- 1.2 Understand the meaning of the symbols  $+$ ,  $-$ ,  $=$ .

- 1.3 Create problem situations that might lead to given number sentences involving addition and subtraction.

## **Measurement and Geometry**

**1.0 Students use direct comparison and nonstandard units to describe the measurements of objects:**

- 1.1 Compare the length, weight, and volume of two or more objects by using direct comparison or a nonstandard unit.
- 1.2 Tell time to the nearest half hour and relate time to events (e.g., before/after, shorter/longer).

**2.0 Students identify common geometric figures, classify them by common attributes, and describe their relative position or their location in space:**

- 2.1 Identify, describe, and compare triangles, rectangles, squares, and circles, including the faces of three-dimensional objects.
- 2.2 Classify familiar plane and solid objects by common attributes, such as color, position, shape, size, roundness, or number of corners, and explain which attributes are being used for classification.
- 2.3 Give and follow directions about location.
- 2.4 Arrange and describe objects in space by proximity, position, and direction (e.g., near, far, below, above, up, down, behind, in front of, next to, left or right of).

## **Statistics, Data Analysis, and Probability**

**1.0 Students organize, represent, and compare data by category on simple graphs and charts:**

- 1.1 Sort objects and data by common attributes and describe the categories.
- 1.2 Represent and compare data (e.g., largest, smallest, most often, least often) by using pictures, bar graphs, tally charts, and picture graphs.

**2.0 Students sort objects and create and describe patterns by numbers, shapes, sizes, rhythms, or colors:**

- 2.1 Describe, extend, and explain ways to get to a next element in simple repeating patterns (e.g., rhythmic, numeric, color, and shape).

## **Mathematical Reasoning**

**1.0 Students make decisions about how to set up a problem:**

- 1.1 Determine the approach, materials, and strategies to be used.
- 1.2 Use tools, such as manipulatives or sketches, to model problems.

**2.0 Students solve problems and justify their reasoning:**

- 2.1 Explain the reasoning used and justify the procedures selected.
- 2.2 Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students note connections between one problem and another.**

# Lesson 1: Welcome to the Garden

California Education Standards: 3b

Time: 45 minutes

**Materials:**

Teacher and student workbooks  
Pencils, regular, color

**Plan:**

Welcome Students to the garden.  
Discuss how Garden Time will work  
Student Agreement  
Black Widows  
Discuss Weather and its effect on plants.

**Explain Group Activities.**

Garden Group  
Garden Survey

**Table group:**

Visit Weather Station and fill in worksheet  
Decorate Notebook

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)



# Garden Time

**1 Sit**

**2 Listen**

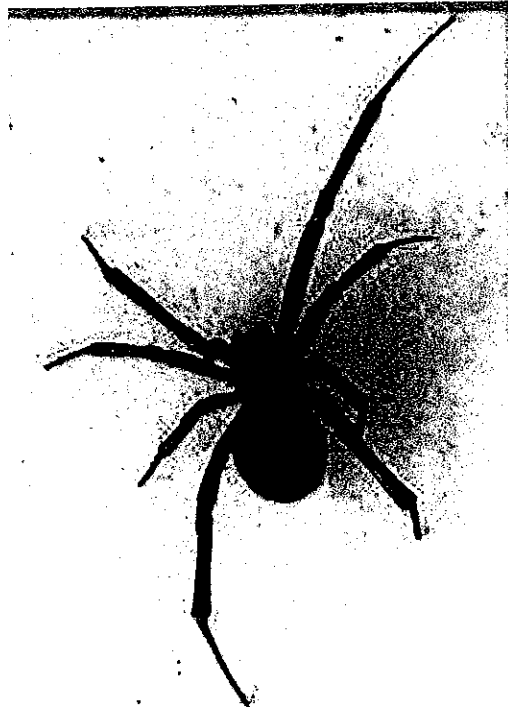
**3 Groups**

**4 Switch groups**

**5 Cleanup**

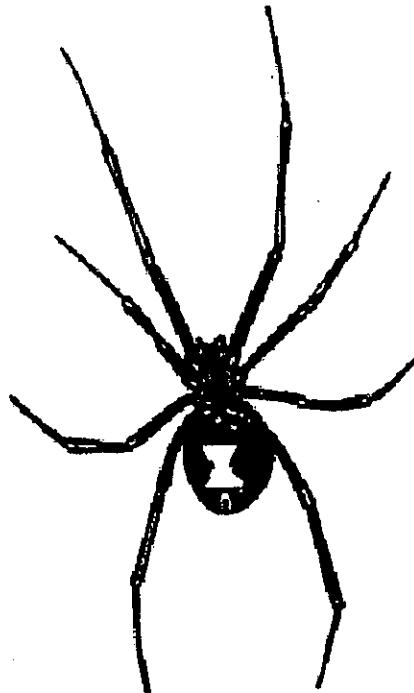
# Black Widow Spider

Back  
(dorsal)

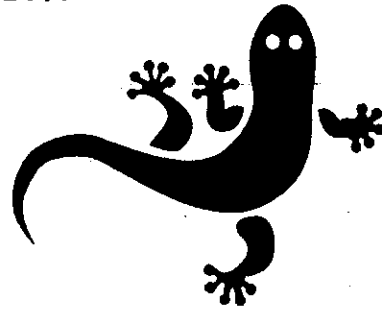


\_\_\_\_\_ legs

Front  
(ventral)





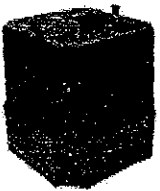

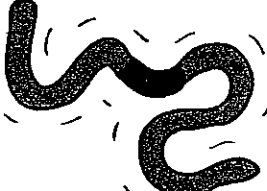

*Gecko Garden*  
**Outdoor Science Lab**  
Student Agreement


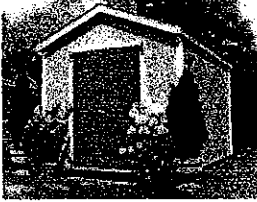
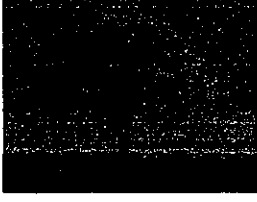
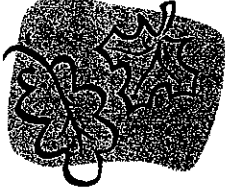




*I agree to...*

- ☐ 1) Use a quiet voice;
- ☐ 2) Not run;
- ☐ 3) Always keep the working end of tools down;
- ☐ 4) Ask before picking or eating any plants;
- ☐ 5) Keep my hands out of places I can not see;
- ☐ 6) Wash my hands when I am finished gardening;
- ☐ 7) Respect plants, animals and each other.

# Garden Survey

Picture	Word	Alive? Yes or No
	shovel	
	watering can	
	compost bin	
	trowel	
	worm	
	garbage can	

Picture	Word	Alive? Y/N
	flower	
	shed	
	tree	
	leaf	
	hose	
	insect	

# Weather Log

[illegible]

## Lesson 2: Soil Preparation

California Education Standards: 2b, 2e, 3a, 4b

Time: 45 minutes

### Materials:

Teacher and student workbooks

Pencils, regular

Tools: Shovels, hoes, hand trowels

Amendments: worm castings and compost or fertilizer

Sand to mix in soil for carrots – 1 bag/bed

### Plan:

Discuss the Farmers' Market Crop – carrots

Review plant parts and their function as a group.

Have different student read aloud the Plant Part worksheet.

Highlight root function and the plants need for water and nutrients – this is why they need to amend the soil

Show students where and how to make their Farmers' Market Crop journal entry.

### Explain Group Activities.

Garden Group

Turn and amend soil

Table group:

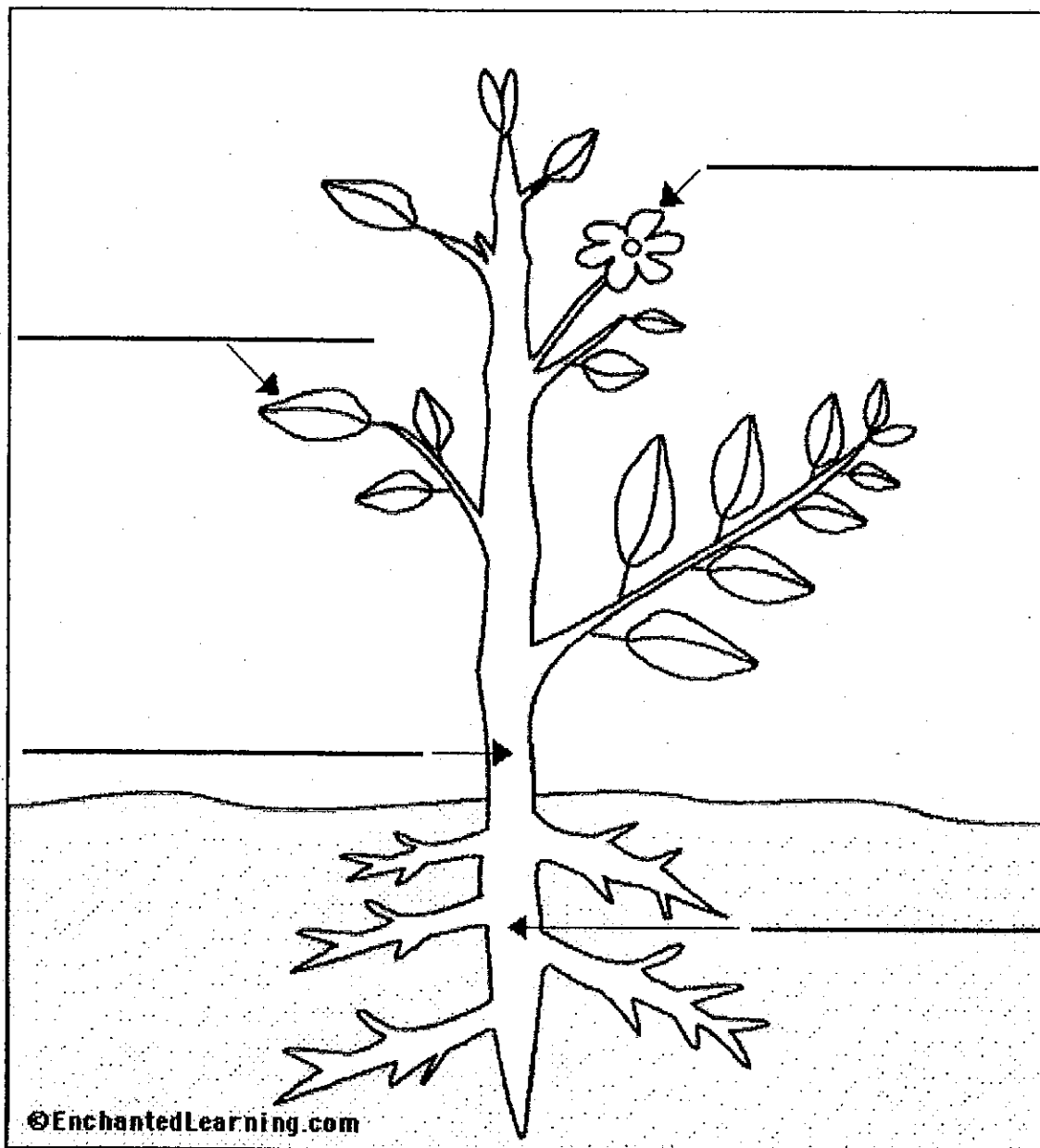
Weather Station

Plant Part worksheet

First entry in Farmers' Market Crop journal

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)



**Flowers** produce the seeds of a plant.

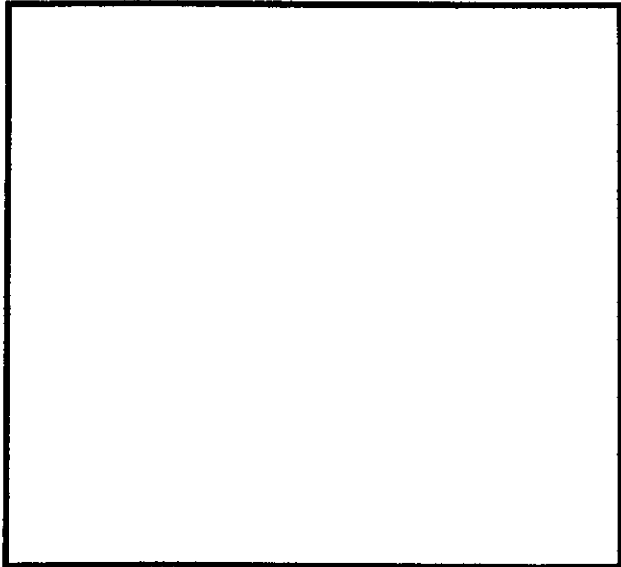
**Leaves** convert energy from sunlight into food for the plant through a chemical process called photosynthesis.

**Roots** take nutrients and water from the soil, store energy, and provide support for the plant. Most roots grow underground.

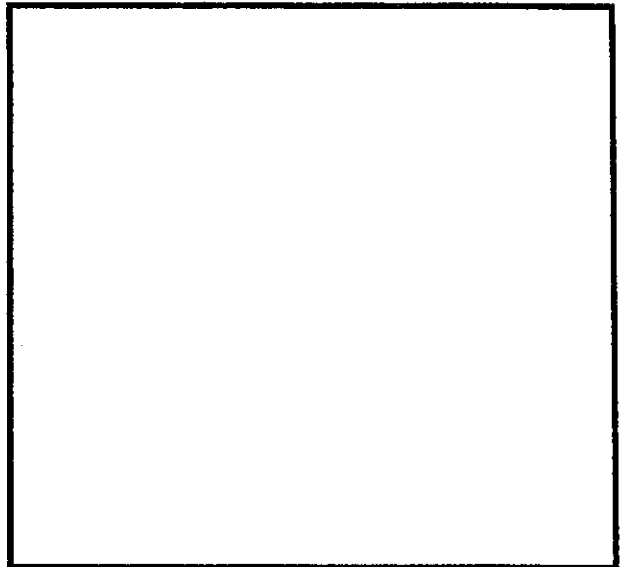
The **stem** is the main support of the plant.



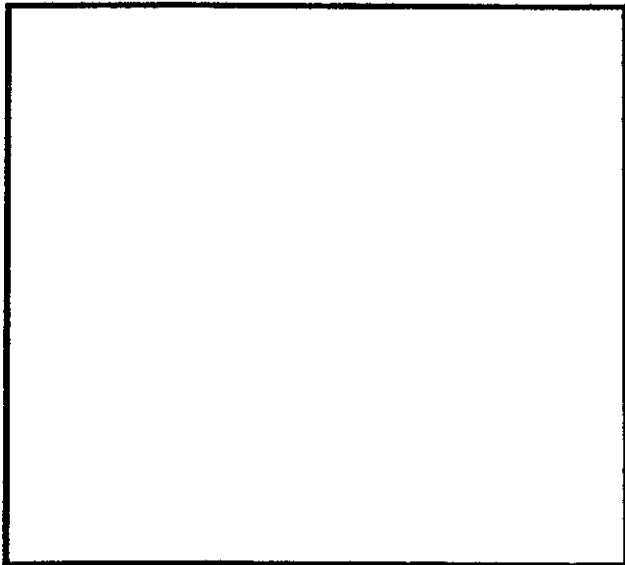
# Farmers' Market Crop



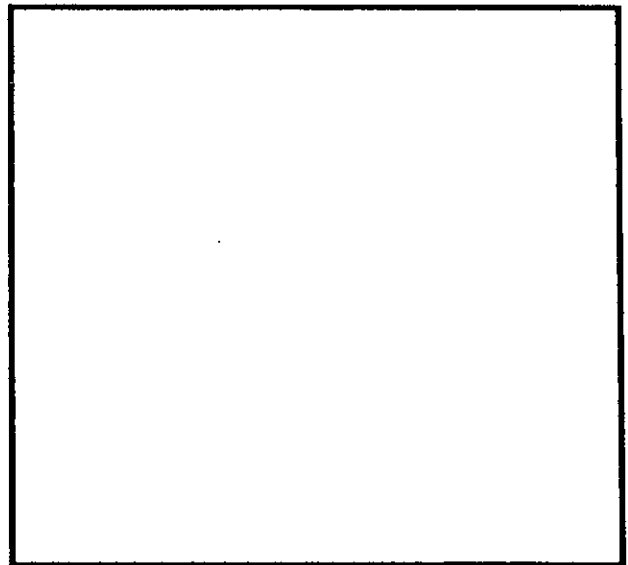
1 Amend soil  
Date



2 \_\_\_\_\_  
\_\_\_\_\_



3 \_\_\_\_\_  
\_\_\_\_\_



4 \_\_\_\_\_  
\_\_\_\_\_

## Lesson 3: Planting Carrots

California Education Standards: 2b, 4b

Time: 45 minutes

### Materials:

Teacher and student workbooks  
Pencils, regular and color  
Carrot seeds – 2 Royal Chantenay, 2 Scarlet Nantes (one type per class bed)  
Examples of different root types: Fibrous, tap and storage.

### Plan:

Discuss different root types: Fibrous(i.e. pea, sunflower), Tap(dandelion) and Storage (carrot, radish). Have examples. Ask the students to think about why plants would have these different structures.

Explain how the carrot seeds will be planted. Sprinkle seeds on top of soil. Make sure they are spread out – not in a clump. Then sprinkle handfuls of soil on top of seeds. Each child should have a small section of the bed.

### Explain Group Activities.

#### Garden Group

- If there are weeds in the bed, have students pull weeds and observe the different root types.
- If the soil has formed a crust since last visit, have students soften the surface.
- Plant carrot seeds. Sprinkle dirt on top by hand. Sprinkle lightly with water.

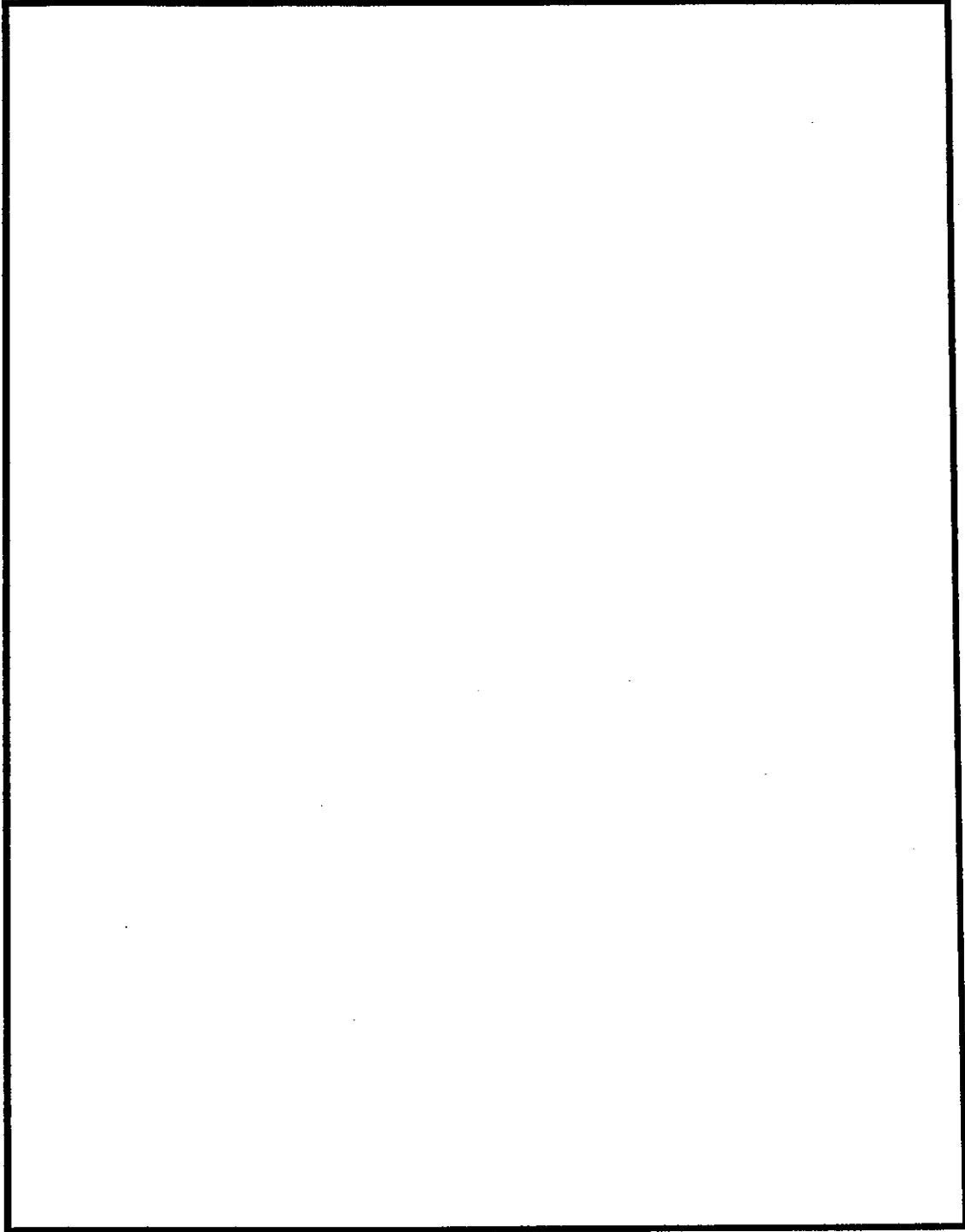
#### Table group:

- Root type pictures
- Weather Station
- 2<sup>nd</sup> entry in Farmers' Market Crop journal

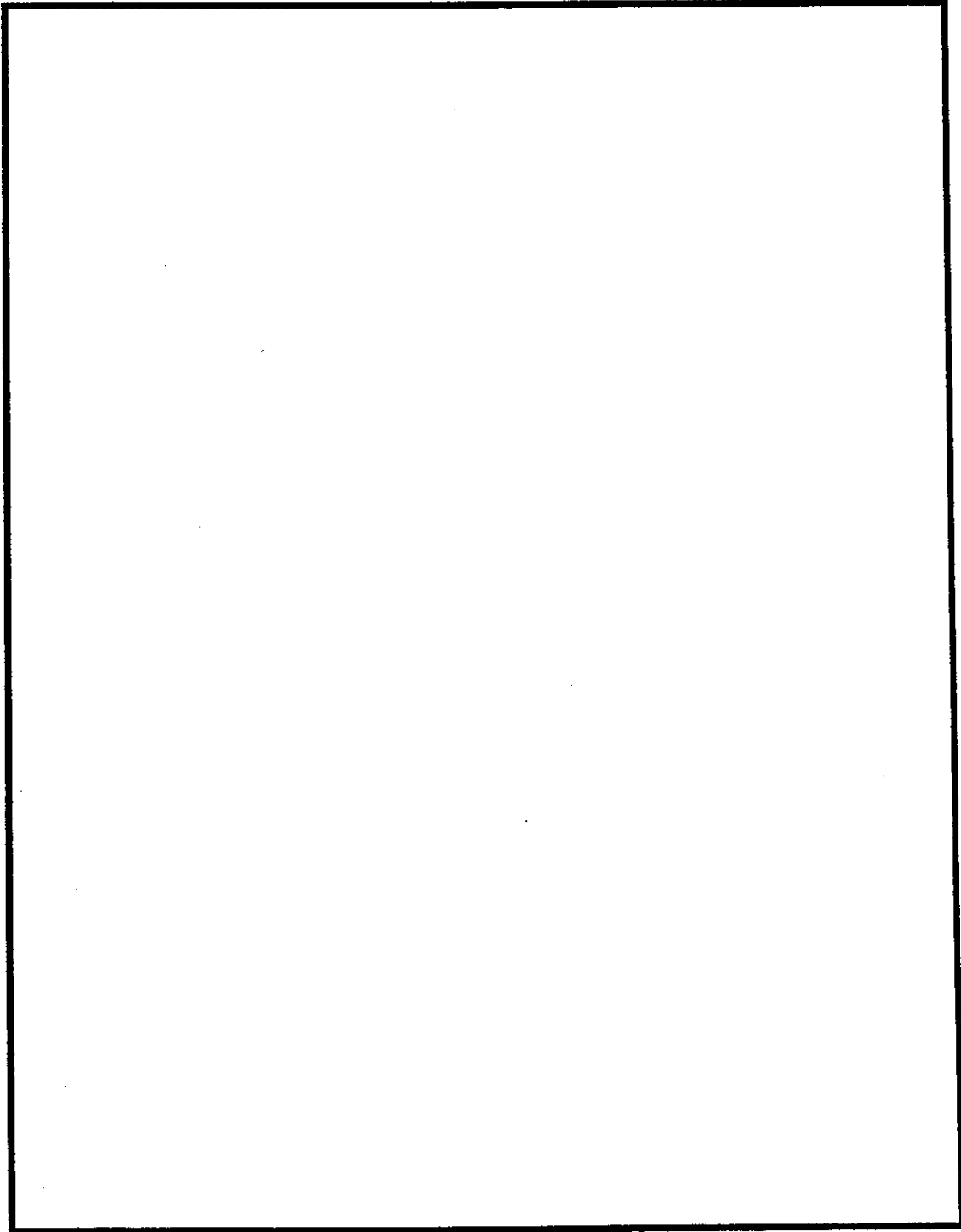
Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

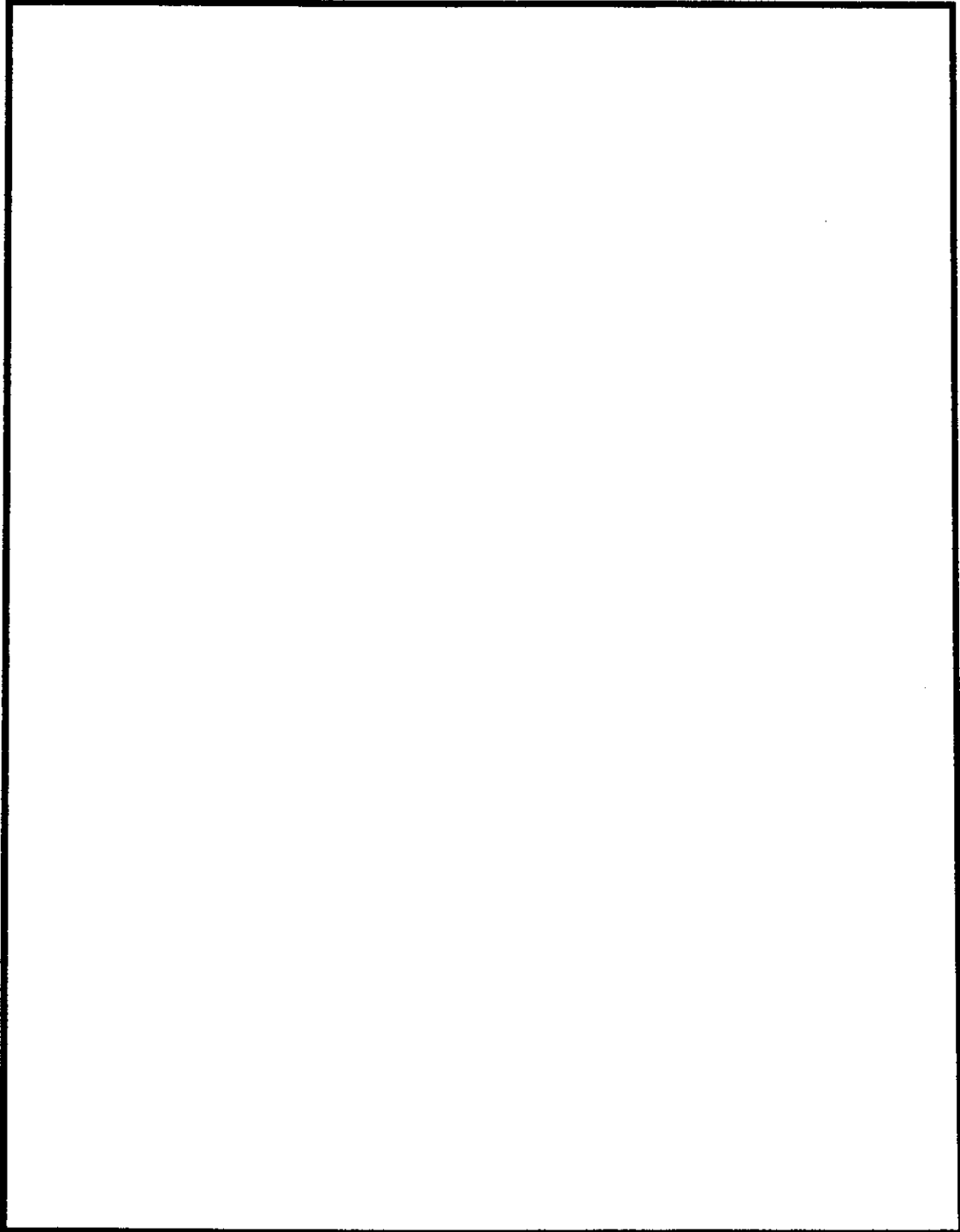
# Fibrous Root



# Tap Root



# Storage Root

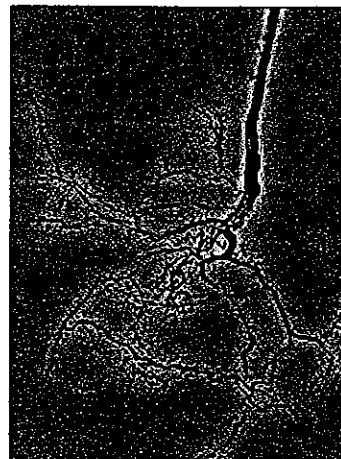


# ROOT TYPES

One way to get a handle on the topic of "root diversity" is to look at some of the root types we're likely to find around our homes:

## FIBROUS ROOTS

The roots shown in the artsy picture at the right, from a weed in my garden, the Three-seeded Mercury, *Acalypha rhomboidea*, are fibrous roots. On our [Roots Page](#) we tell of a rye grass plant which had 380 miles of branching and rebranching roots, and 14 billion root hairs. Those branching and rebranching roots were fibrous roots. Fibrous roots are probably the most common root type



## STORAGE ROOTS

The horseradish root shown below, which stores plant food in the form of starchy carbohydrate, is a storage root. When we eat storage roots such as horseradish, carrots and parsnips we're "stealing" the carbohydrate the plant had stored for its own use later on, perhaps the next year. In the case of carrots and parsnips, the storage root is also a tap root. In dahlias and sweet potatoes, storage roots develop on branch roots. Many biennials -- plants that live for two years -- spend their first year collecting carbohydrate in their storage roots, then the second year they use their stored carbohydrate to grow fast, maybe overtopping the plants around them that don't have energy stored in the form of carbohydrate.



## TAPROOTS

Taproots result when the main root growing downward, the primary root, grows much larger than the secondary roots. If you have dug up dandelions in your backyard, you've seen their taproots. In gardens, carrots are even better taproot examples. Oak, hickory, and conifer trees produce taproots,



at least when young. At the right you see the taproot of a seedling Water Oak. The yellow line denotes where the soil's surface was when I pulled the seedling from my garden soil, so you can see that, at least in the case of this seedling, the taproot can penetrate the soil far deeper than the top of the plant extends into the air.

## AERIAL ROOTS

You can see aerial roots on English Ivy, Poison Ivy, Trumpet Creeper, the Virginia Creeper (shown below), and lots of other vines and creepers. Aerial roots anchor climbing stems to vertical surfaces. In the Virginia Creeper



picture at the left the vine's aerial roots stick to one of the slats of a yellow-painted window shutter. The diagonal item is the vine's stem, which in real life is about the size of a small lollipop's rolled-paper handle (2 mm diameter), and you can plainly see how each tendril of the aerial root ends in a flat appendage that sticks to the slat's old paint. These things stick so well that when later I pulled the stem away, the roots broke but the stickers stayed stuck! Remember that here we are seeing roots arising from along the plant's stem, not at it's base. You could follow this stem

to the ground and then below the ground you'd find regular fibrous roots. The main job of these aerial roots is to support the vine as it climbs up the window shutters, not to absorb water and nutrients. Organs arising where they are not typically found, such as these roots arising from along a stem, are said to be adventitious.

## PROP ROOTS

You can see another kind of adventitious root if you grow corn (maize) in your garden. On mature corn stalks you can often see prop roots arising from the lower parts of corn stalks. Prop roots prop up stems that might otherwise fall over during a stiff breeze or when the ground becomes soft. They are much more common in tropical and subtropical areas than in our Temperate Zone. I'm trying to get a picture of some good prop roots, so hold on...

## ROOTS WITH NODULES

"Roots with nodules" isn't usually thought of as a root type, but nodule-bearing roots are so important to ecology and they are so easy to find in typical backyards that we're mentioning them here. Some roots, particularly those on plants in the Bean



Family, are equipped with tiny, white, bag-like things, sometimes as large as BBs, called *nodules*. Inside these nodules reside special fungi that help the plant acquire usable nitrogen, which the plant must have in order to live and grow. The nodules at the right were found on a White Clover growing not a yard from my door!

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# Carrots

If you are just now making the transition to deeply worked, raised garden beds, use the first of your beds for carrots. The differences in size, shape, flavor, and yield per square foot between row-crop and wide, raised, deep bed-crop carrots are — putting it mildly — dramatic. Like the carrot on the stick that keeps the horse walking forward, the beautiful carrots you pull from your first raised bed will encourage you to grow all your vegetables this way.

## THE SITE

Prepare and enrich the bed in fall by forking in a layer of fallen leaves. If you're preparing the bed in spring, mix in a generous amount of compost a few weeks before seeding. Rake and smooth the bed carefully.



Sow & Grow

### CARROTS

(*Daucus carota* var. *sativus*)

Carrot family (*Umbelliferae*)

### SOWING

Seed depth: 1/4–1/2" (6–13 mm)

Germination soil temperature: 75°F (24°C)

Days to germination: 6

Sow indoors: Not recommended

Sow outdoors: Early spring to midsummer

### GROWING

pH range: 5.5–6.5, but best above 6.0

Growing soil temperature: 60–70°F (16–21°C)



▲ **A 24-karat vegetable.** When carrots are stored, they often lose their moisture and sweetness. What better reason to grow your own? Once you've experienced the pleasure of pulling those slender beauties from the earth, you're sure to be hooked on homegrown carrots.

**Spacing in beds:** 2" (5 cm) apart in rows 6–8" (15–20 cm) apart, 3 rows to a 30" (0.75 m) bed, 4 rows to a 36" (0.9 m) bed

**Watering:** Moderate

**Light:** Full sun for best yield; tolerates light shade

**Nutrient requirements:** N=high; P=low; K=low

**Rotation considerations:** Avoid rotating with celery, dill, fennel, parsley, parsnip.

**Good companions:** Bean, Brussels sprout, cabbage, chive, leaf lettuce, leek, onion, pea, pepper, red radish, rosemary, sage, tomato

**Bad companions:** Celery, dill, parsnip

**Seed longevity:** 3 years

**Seeds per ounce:** 22,000 (733 seeds per g)

Carrots can germinate in a week with a soil temperature at about 75°F (24°C). The colder the soil temperature, the longer the germination period. If it gets much below 45°F (7°C), germination may not happen at all. Plan to sow carrots about the time you sow pole beans or tomatoes.

One for Now. One for Ever.

Plant a quick-maturing variety for summer eating as soon as you like, but postpone the winter-storage crop until the soil warms up, about the time you plant tomatoes.

No matter how carefully I space the seeds, carrots always seem to need some thinning. Carrots can grow very close together and still produce excellent crops, but if they grow too close together they'll be stunted, excessively slender, or deformed.

202 V E G E T A B L E S &amp; H E R B S , A - Z

## HARVESTING AND STORING

In loose soil, carrots can be gathered by pulling them from the ground by their tops. If the tops break off when you pull the plants, preloosen the soil carefully with a garden fork or broadfork. Clip the foliage about an inch (2.5 cm) from the root. Cull any damaged or misshapen roots; they won't store well and should be refrigerated for immediate use. Layer storage carrots in damp sand or sawdust in a bin, box, or plastic pail in the root cellar.

## BEST VARIETIES

**Nantes.** A longtime favorite of home gardeners, these sweet, crisp, full-flavored carrots are easily recognized by their cylindrical, sausage shape and blunt tip. Some excellent Nantes varieties include Bolero, Napoli, Sweetness II, Nelson, Mokum, and Scarlet Nantes.

**Imperator.** This is the long, tapering supermarket carrot. Easy to harvest and ship (which means little to gardeners), Imperators have less overall flavor and crispness than many other types. Some of the best varieties in this group, including Nevis and Artist, are actually hybrids with Nantes types.

**Baby or Mini.** These tasty, small carrots with a range of shapes are best used fresh. This type is a bit of a catch-all category, since, if it's little, it can go here. Some popular varieties include Thumbelina, Minicore, Amsdor, and Parmex.

**Chantenay.** All-purpose carrots with a broad shoulder, stocky build, and blunt tip, Chantenays keep their shape better in stony or heavy soils than other carrots. Some varieties include Chantenay Red-Cored, Chantenay Royal, and Chantenay Imperial.

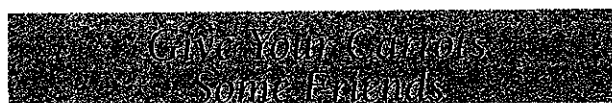
**Danvers.** These good all-around carrots are similar in shape to Chantenay, but longer. Their flavor is good, but lacks the sweetness of Nantes. Some good varieties include Danvers Red-Cored and Danvers Half-Long.



▲ **Long life.** Carrots store best if you cut off the greens, leaving about 1 inch (2.5 cm) of stem.



▲ **Hidden treasure.** Carrots grown in deeply dug beds will be larger, more shapely, and more flavorful than you can imagine.



Because of their small size, carrot seeds produce tiny seedlings that do not have the strength to push through crusted soil. Help them out by:

- **Interplanting them with radishes.** The radishes will emerge first and break up crusted surface soil.
- **Keeping the soil moist throughout the germination period.** This keeps the soil from crusting.

# Growing Carrots in the Garden

Because they are easy to grow and a wonderful source of Vitamin A, carrots are an excellent crop in the garden. The new varieties are easy to grow and make a great addition to children's gardens.

## Climatic Requirements

The carrot is a hardy, cool season crop that can be planted in the garden as soon as the soil can be prepared in the spring. Carrots require relatively large amounts of moisture and are not tolerant of drought. Prolonged hot weather in the later stages of development may not only retard growth but result in an undesirable strong flavor and coarseness in the roots. At the other extreme, prolonged temperatures below 55 degrees F tend to make the roots longer, more slender and paler in color than expected. The best temperature for highest quality roots is between 60 and 70 degrees F.

## Soils

Carrot plants thrive in deep, loose, well-drained soil. Avoid stony, cloddy or trash-laden soils as they increase the incidence of root defects. Because raised-beds usually have loose soil and receive little compaction from foot traffic, they are an ideal location to grow carrots. Carrots grown on heavy soils may produce considerable leaf growth and forked roots. Carrot plants do not grow well in strongly acid soils; therefore, a pH range of 6.0 to 6.8 should be maintained for best results.

## Fertilizers

Fertilizers and lime are best applied to soils for carrot production using soil test results as a guide. Arrangements for soil testing can be made through your local Extension office. Carrots require large amounts of plant nutrient elements, particularly potassium, for good production. A fertilizer with the ratio of 1-2-2 such as a 5-10-10 analysis would be appropriate at the time of seeding and again when tops are three to four inches tall and six to eight inches tall. Too much manure and fertilizer applied just before seeding can result in forked roots.

## Establishing the Planting

Direct seed carrots into a well-prepared soil early in the spring. Suggested planting depth is 1/4 inch deep in rows spaced 12 to 18 inches or more apart depending on the method of cultivation used. It is important to avoid crusting of the soil around the seed-bed. Covering the seed with vermiculite or fine compost and keeping the soil evenly moist until the seedlings have emerged will help prevent this problem.

After the seedlings have emerged, thin them to one inch apart. When the tops of the carrots grow thicker, thin them to about two to three inches apart. Some seed companies are now offering pelletized seed, making the seeds easier to plant and thin.

## **Cultural Practices**

After plants are established, applied mulches will help conserve moisture and suppress weed growth. Cultivation, if necessary, should be shallow in order to avoid root injury. Carrots require an evenly-distributed and plentiful soil moisture supply throughout the growing season. However, avoid too much moisture towards the end of the season as this will cause roots to crack.

Watch for the appearance of orange crowns at the soil level as the plants mature. If this occurs, mulch with soil or compost as the sunlight will turn them green. Potential pest problems include leafhoppers, wireworms, carrot rust worm larvae, aster yellow, leaf spot and soft rot. Contact your local Extension office for current control recommendations.

## **Harvesting and Storage**

Harvest can begin when carrots are finger size. In general, the smaller carrots are juicier and more tender. You do not have to harvest the entire crop at once. They can remain in the soil until you are ready to use them. Carrots will last until winter in the soil if mulched well. Carrots are best stored at temperatures near freezing in a moist environment.

## **Varieties**

Choosing a variety depends upon your preference and your soil type. Shorter types such as Red-Cored Chantenay and Short and Sweet are better suited for heavy soils. Other varieties include Nantes Half-long, Danvers Half-long, Pioneer and Spartan Bonus. Gourmet varieties such as Little Finger are also excellent in container gardens. Below are some varieties and their characteristics.

- Red-Cored Chantenay - 6 inch roots, grow well in heavy clay soils, crisp and tender, red-orange color to the core.
- Danvers Half Long - Tapered roots average 6-1/2 to 7-inches long, heavy yields and good storage capabilities.
- Little Finger - 3 to 5 inches long and 1/2 inch across, exceptionally high sugar content, performs well in heavy soils.
- Thumbelina - 2-inch golf ball sized round carrot, excellent for heavy clay soils.

# History of Carrots

The wild ancestors of the carrot are likely to have come from Afghanistan, which remains the center of diversity of *D. carota*. The familiar wild plant wild carrot, sometimes called Queen Anne's lace, is the same species as the garden carrot (which was bred from it); garden carrots that run to seed soon revert to their wild prototype, with a forking carrot-smelling, edible root that quickly becomes too woody and bitter to eat. The parsnip is a close relative of the carrot.

The Western carrot emerged in the Netherlands in the 15th or 16th century, its orange color making it popular in those countries as an emblem of the House of Orange and the struggle for Dutch independence. The orange color results from abundant carotenes in these cultivars. While orange carrots are nearly ubiquitous in the West, other colors do exist, including white, yellow, red, and purple. These other colors of carrot are raised primarily as novelty crops.

## Interesting Facts:

In 2005, a poll of 2,000 people revealed that the carrot was Britain's third favourite culinary vegetable.

Carrots are noted in popular culture for being the favorite food of rabbits, and are also associated with fictional rabbits such as Bugs Bunny. However, rabbits finding carrots in a garden are more likely to eat the exposed greens than to dig up the root.

The world's largest carrot was grown in Palmer, Alaska, by John Evans in 1998, weighing 18.99 pounds.

The world's largest carrot statue is located in Ohakune, New Zealand.

Carrots are traditionally used as noses when building snowmen.

## Lesson 4: Caring for Carrots

California Education Standards: 2a, 2c, 2e,

Time: 45 minutes

### Materials:

- Teacher and student workbooks
- Pencils, regular and color
- 1" strips of paper

### Plan:

Discuss how and why we thin carrots (plants in general). Show them on a ruler how big one inch is. Have one inch strips of paper to use at the bed for them to measure the distance between carrot seedlings. Challenge the students to see if they can pull just one at a time – this is difficult for them. Probably best to have them show you which one they intend to pull otherwise they tend to pull too many at once.

Discuss Pill bugs and how they can be both friend and foe in the garden. Talk about different ways to control pest and how we do not use chemical pesticides in the Gecko Garden. Have students remove any pill bugs and put them into a cup. Send the pillbugs on “vacation” in the canyon. (Pill bugs will eat the carrot seedlings if there is a large population.)

\*Optional Activity: If you see a lot of Pill Bugs -build a pill bug trap. This consists of a submerged cup filled half way with water. Place a piece of plastic or wood over top with just enough room for pill bugs to climb under.

OptionalActivity: If carrots have germinated, cover a few with a container that will block the sun and possibly water - such as a dark cup. This should allow the students to compare the effect of decreased sun light and water on plant growth.

### Explain Group Activities.

#### Garden Group

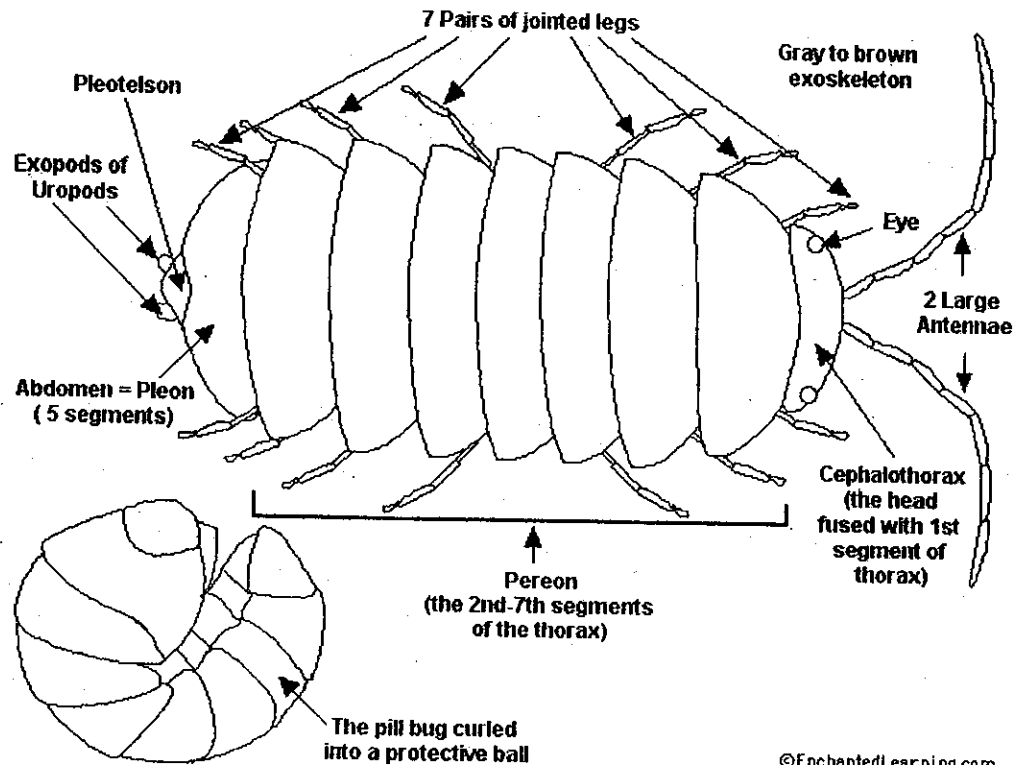
- Thin carrots to about 1" apart
- Remove any Pill Bugs

#### Table group:

- Weather Station
- Pill bug worksheet
- Finnish root type pictures

Divide into groups and switch after approximately 10 minutes.  
Save the last 5 minutes to clean up.

# Pill Bugs: Friend and Foe



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The pill bug is not an insect, but a crustacean like a crab. Insects have 6 legs and pill bugs have 14. Pill bugs have gills and like to live where it is damp. They eat both live and dead plants.

- |  |        |
|--|--------|
| 1) The pill bug is an insect.                | T or F |
| 2) The pill bug is a crustacean like a crab. | T or F |
| 3) The pill bug has gills.                   | T or F |
| 4) Pill bugs eat dead and live plants.       | T or F |
| 5) Pill bugs have _____ legs.                |        |



## Lesson 5: What Plants Need to Grow

California Education Standards: 2b, 2e, 4b

Time: 45 minutes

### Materials:

- Teacher and student workbooks
- Pencils, regular and color
- 2" strips of paper

### Plan:

- Discuss what plants need to grow: air, water and sun.
- Discuss photosynthesis

As a group observe the carrot plants that were covered. Also look for carrots that may be in drier parts of the bed. Discuss what you see.

If the carrots need more thinning, thin to 2" apart

Optional Activity: Read *The Magic School Bus Gets Planted*. This can be done in class or the garden.

### Explain Group Activities.

#### Garden Group

- Thin carrots to 2" apart
- Remove pill bugs (from other beds too), check traps – if made.
- Observe covered carrots

#### Table group:

- Photosynthesis worksheet
- Weather Station
- Farmers' Market Crop entry

Divide into groups and switch after approximately 10 minutes.

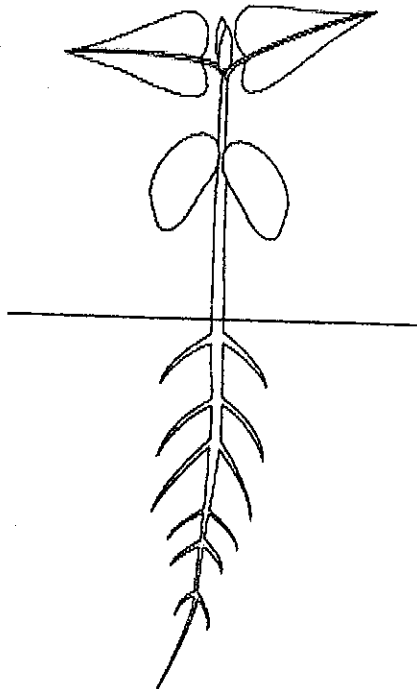
Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

Name \_\_\_\_\_

## Photosynthesis

1. The \_\_\_\_\_ shines on the leaves.
2. \_\_\_\_\_ goes in the stomata.
3. Roots take up \_\_\_\_\_.
4. Chloroplasts make \_\_\_\_\_.

Vocabulary: sugar sun air water



## **Lesson 6: Observation and Data**

Time: 45 minutes

### **Materials:**

- Teacher and student workbooks
- Pencils, regular
- 2" paper strips.
- Poster board

### **Plan:**

Observe carrots. Look for evidence of pest – pill bugs, squirrels or gophers?  
Thin to 2-3" if necessary.

Do the Find that Veggie worksheet.

Have the students analyze their Weather Log. Plot the temperature on their Bar Graph. Do this together as a group – in the garden or classroom.

Optional Activity: Have students participate in making a class poster (one per class) that represents their work in the Gecko Garden. These can be displayed at their Farmers' Market along with their carrots. Some examples might be: 'Weather in the Gecko Garden' or 'Root Type and Function', 'Carrot Pest and Control'. These can be done in the classroom or garden.

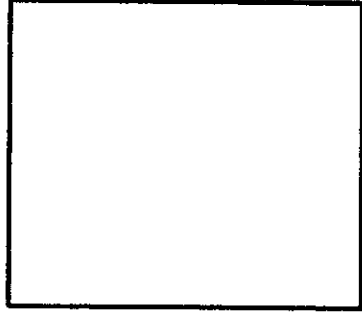
Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

# Roots

## Purpose

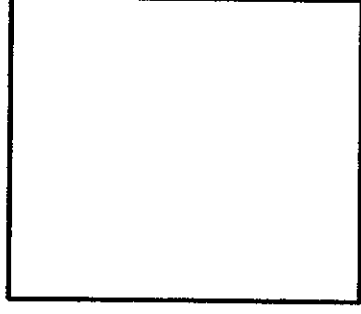
- 1) Absorb water and nutrients
- 2) Provide stability
- 3) Store sugar

## Root Types



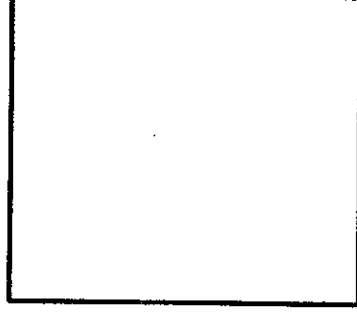
Fibrous Root

Pea



Storage Root

Carrot  
Radish

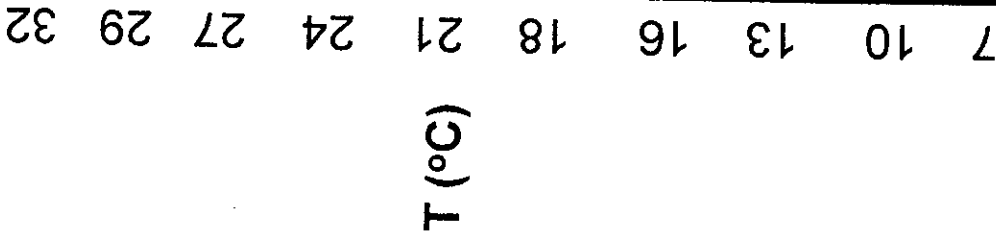


Tap Root

Dandelion

Year:

## Bar Graph



	Oct.	Nov.	Dec.	Jan.	Feb.	Mar	Apr.	May	Jun.
--	------	------	------	------	------	-----	------	-----	------

Month

Name \_\_\_\_\_

## Find That Veggie!

Vegetable	Bed Number	Part We Eat (circle one)
carrots		root, tuber, bulb, stem, leaf, flower, seeds
peas		root, tuber, bulb, stem, leaf, flower, seeds
potato		root, tuber, bulb, stem, leaf, flower, seeds
lettuce		root, tuber, bulb, stem, leaf, flower, seeds
onions		root, tuber, bulb, stem, leaf, flower, seeds
radish		root, tuber, bulb, stem, leaf, flower, seeds
		root, tuber, bulb, stem, leaf, flower, seeds

## Lesson 7: Harvest

Time: 45 minutes

### Materials:

- Teacher and student workbooks
- Pencils, regular
- 3 Large buckets of water
- Plastic grocery bags to store carrots

### Plan:

Discuss how carrots will be harvested. It may be easiest to harvest as a group. Have students pull only 1 carrot at a time, then wash, starting with bucket 1. Refresh water if it gets too dirty. If the market is within 1-2 days leave the greens on the carrots. If the carrots need to be stored longer than 2 days you should remove the greens and put them in compost.

Allow students to sample some of the smaller carrots or take a few to the classroom and cut into smaller pieces for them to sample. Discuss the nutritional benefits of carrots.

If there is extra time they can do the Find that Veggie worksheet if they did not do it last visit.

### Explain Group Activities.

#### Garden Group

##### Harvest Carrots

- Pull one

- Wash: Bucket 1-Bucket 2-Bucket 3

- Remove greens if necessary – save for compost

- Put carrots in plastic bags. Label bags with carrot type and class.

- Store in refrigerator

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

