FIELD BINDWEED Science Page

DID YOU KNOW?

Field bindweed is used as a medicine. It is also a weed that can be very difficult to destroy. Its vines can wrap around and choke many crop plants and flowers.

A piece of its root only 5 cm (2 in) long can grow into a new plant.

Its seeds can still sprout and grow after being buried in the soil for 50 years!

ORIGINS

Field bindweed is native to Europe and Asia. People accidentally brought it to other parts of the world. Its seeds were mixed in with grains that were being shipped.

THE FIELD BINDWEED PLANT

Field bindweed is a perennial. Its long, slender stems trail on the ground or wrap around other plants.

The vines grow 0.3 to 1.8 meters (about 1-8 ft) long.

The funnel-shaped flowers are white to pink in color.

The leaves are shaped like arrowheads.

The seeds grow in pods about 5 mm (0.2 in) long. On average, one plant produces about 550 seeds.

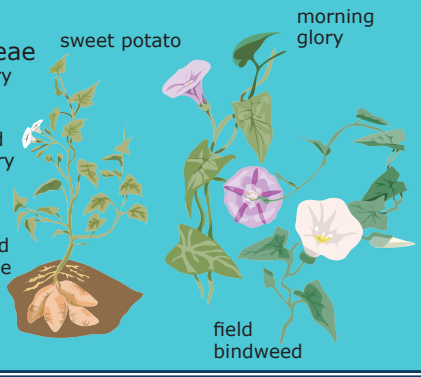
The plant has a thick taproot, which can grow to a depth of 7 meters (about 25 feet). Many side roots grow out from the taproot.

CLASSIFYING FIELD BINDWEED

FAMILY

Convolvulaceae
(morning glory family)

The family is commonly called the morning glory family because most of the flowers open in the morning, and close again in the afternoon.



GENUS

Convolvulus

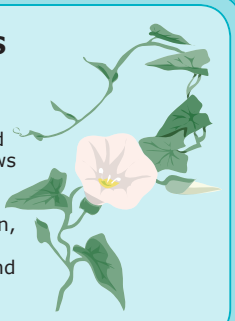
In Latin, this means "to wrap around."

The stems of this family run along the ground and wrap around plants and other objects.

SPECIES

arvensis

"Arvensis" is Latin for "of the field." Field bindweed grows as a weed in orchards, and in fields of corn, small grains, sugarbeets, and grapes.



FRIEND . . .

For many years, people have used field bindweed as a medicine. Native Americans have used it to treat spider bites, fevers, and wounds. Europeans have used it as a laxative.

. . .OR FOE?

Field bindweed can quickly choke out other plants. The roots take up a lot of water from the soil, so crops and flowers growing near field bindweed cannot get enough water.

Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.

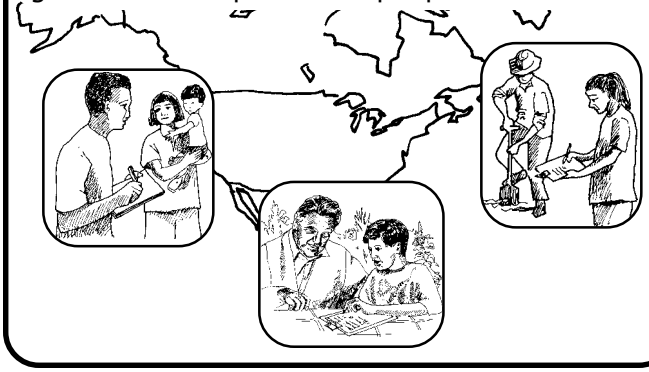
GARDEN HIKE

WHAT IS THE GARDEN HIKE?

The Garden Hike is a "mobile interview." You will interview gardeners as you walk through the garden.

WHY THE GARDEN HIKE?

You will join people all over North America gathering information for the online Community Garden Inventory. Together you can help us understand why community gardens are important to people.



WHAT WILL YOU NEED?

- ✔ copy of Community Garden Inventory Form
- ✔ 3x5 inch cards or paper to write your questions on
- ✔ pencils
- ✔ clipboards
- ✔ cameras (optional)

WHAT TO DO...BEFORE GOING TO THE GARDEN

Background Research

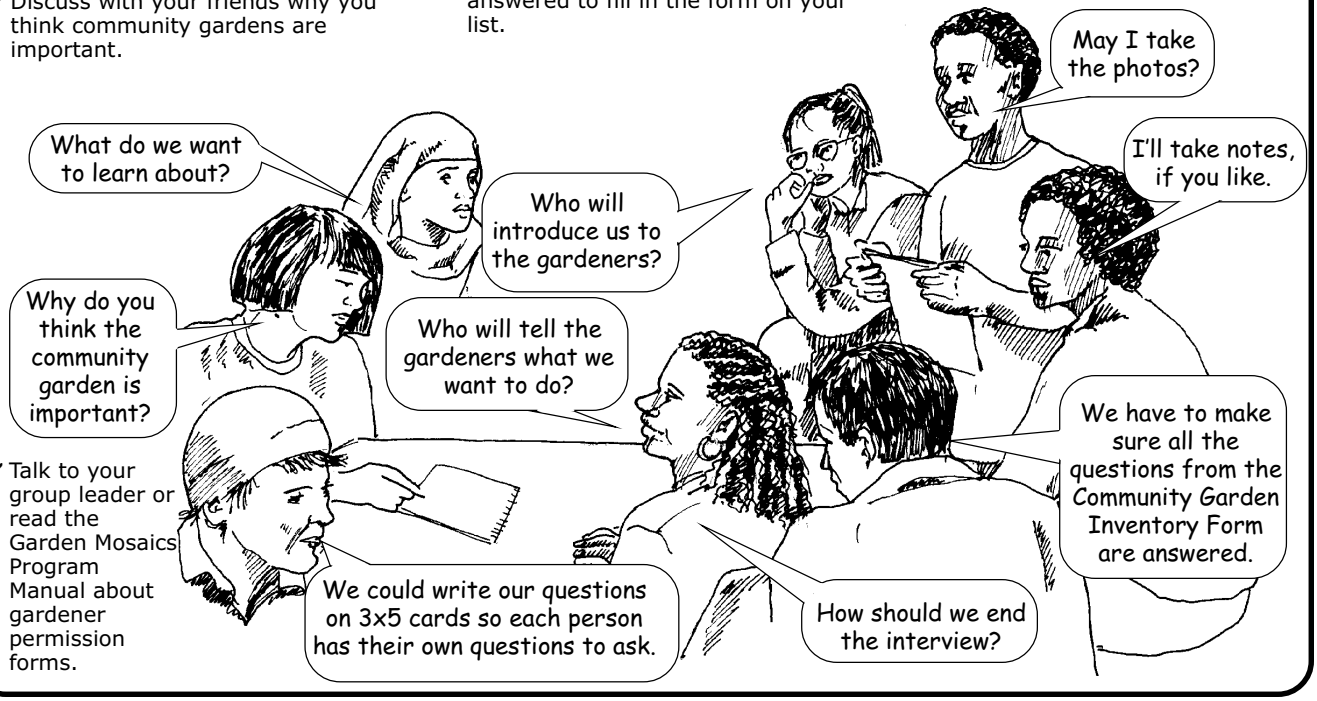
- ✔ Read about community gardens on the Garden Mosaics website. Also go to the Community Garden Inventory Database on the Garden Mosaics website and read about some other gardens.
- ✔ Discuss with your friends why you think community gardens are important.

Generate Questions

- ✔ Brainstorm a list of questions that you think are important to ask gardeners.
- ✔ Look at the online Community Garden Inventory Form. Make sure to include the questions you need answered to fill in the form on your list.

Practice Interviewing

- ✔ Review interviewing skills on the website and practice interviewing with your friends.
- ✔ Decide what everyone is going to do during the interview in the garden.



- ✔ Talk to your group leader or read the Garden Mosaics Program Manual about gardener permission forms.

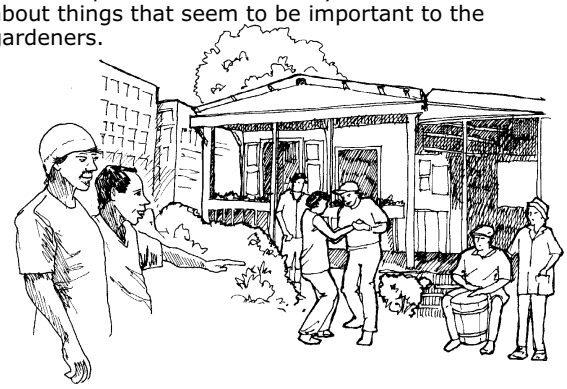
Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.

WHAT TO DO...AT THE GARDEN

✔ Introduce yourselves and the activity to the gardeners.
✔ Tell them about the Garden Hike.

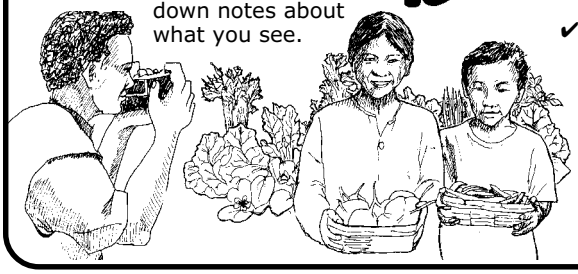
✔ Begin at one end of the garden and walk through the garden with the gardeners. As you walk, ask questions from your checklist.

✔ Also ask questions about what you see and about things that seem to be important to the gardeners.



✔ Don't be afraid to ask questions about things you don't understand or want to learn more about. The gardeners will be excited to know that you are interested in what they do!

✔ Observe things, take photos, and jot down notes about what you see.



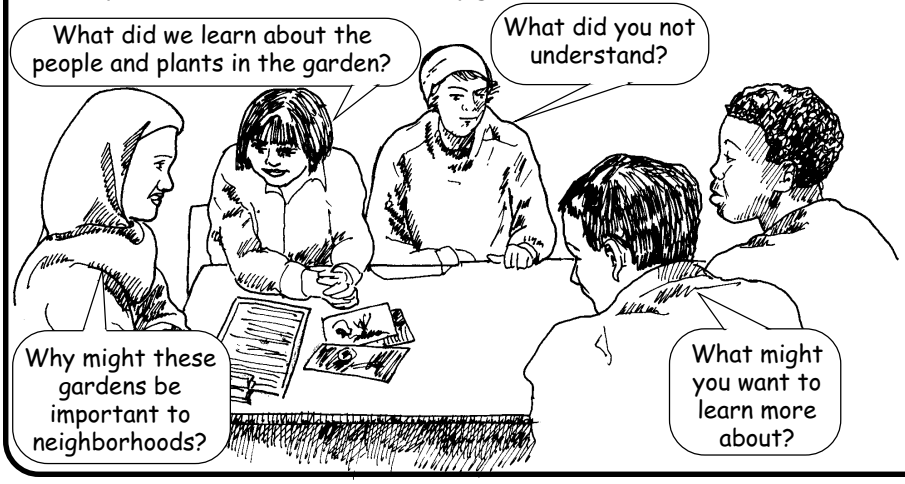
✔ Before you leave, make sure you have answered all of the questions on your checklist and on the Community Garden Inventory Form.

✔ Thank the gardeners before you leave.

WHAT TO DO...AFTER YOU LEAVE THE GARDEN

Review findings

✔ Discuss the visit to the community garden. Talk about what you learned about the community garden.



Share online

✔ Write down the answer to each question on the Community Garden Inventory Form. Then enter your data onto the online form.

Learn more

✔ Check out the online Science Pages. Click on any pages that might help you to understand more about what you learned.

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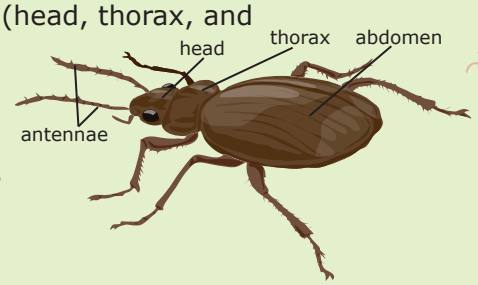
GARDEN MOSAICS (www.gardenmosaics.org)

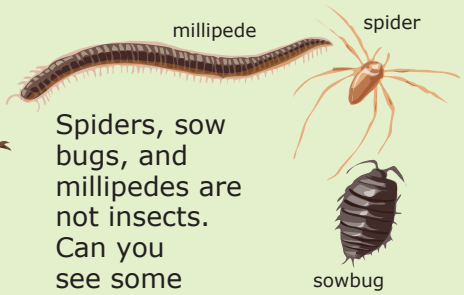
INSECTS IN THE GARDEN Science Page

Many different kinds of insects visit a garden. Some can be harmful, but most are helpful.

HOW CAN YOU TELL AN INSECT FROM OTHER ANIMALS?

All insects have 3 pairs of legs and 3 body parts (head, thorax, and abdomen). A hard outer covering protects the insect's body. This covering is called an exoskeleton.



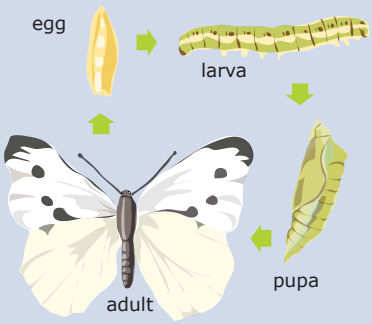


Spiders, sow bugs, and millipedes are not insects. Can you see some differences?

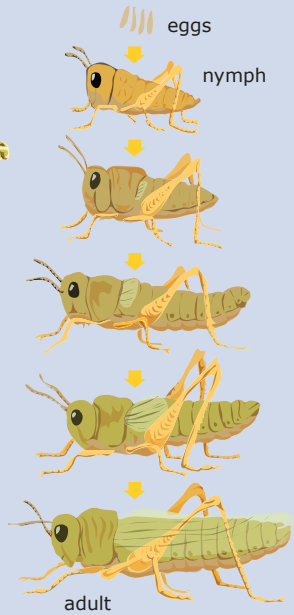
HOW DOES AN INSECT GROW?

An insect begins life as an egg and changes shape as it grows. This is called metamorphosis.

In insects such as butterflies, moths, and beetles, the egg hatches into a larva, which becomes a pupa. Then a mature adult emerges from the pupa.



In other insects, such as grasshoppers and aphids, the young insect (nymph) looks like the parent when it hatches. It sheds its exoskeleton several times as it grows.



Insects are cold-blooded animals, so the rate at which they grow depends on the temperature. Cooler temperatures slow down their growth, and warmer temperatures speed up their growth.

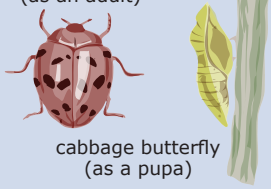
Some insects have only one generation per year. Others have up to 12 generations per year, depending upon the temperature.

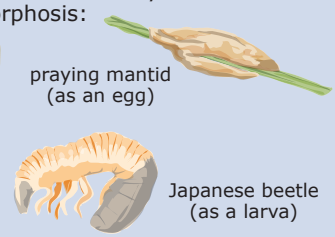

Striped cucumber beetle (1 generation/year)


Colorado potato beetle (up to 3 generations/year)


Aphids (up to 12 generations/year)

Insects do not grow in cold weather. They over-winter at different stages of metamorphosis:

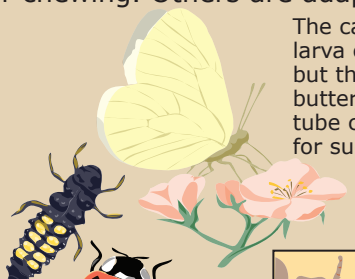




WHAT DOES AN INSECT EAT?

Lots of insects come to a garden to eat. Some come to suck nectar and eat pollen. Others chew on leaves, stems, and fruits. Some are predators and prey on insects and other small creatures. Mouthparts of most insects are specialized for a particular kind of food. Some mouthparts are adapted for biting or chewing. Others are adapted for sucking up blood, nectar, or other fluids.

A chewing insect has jaws called mandibles that move together when the insect is eating.



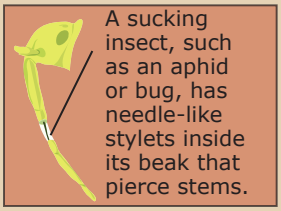
The cabbage butterfly larva chews on plants, but the mature butterfly has a long tube called a proboscis for sucking nectar.

Both the adults and the larvae of ladybug beetles have chewing mouthparts for feeding on aphids.

The proboscis of a moth or butterfly curls up when the insect is not feeding.

The honey bee has an extended proboscis to suck up nectar.

Aphids have needle-like mouthparts, which they use to make a hole in the plant stem and then suck up plant juices.



A sucking insect, such as an aphid or bug, has needle-like stylets inside its beak that pierce stems.

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GARDEN MOSAICS (www.gardenmosaics.org)

WATER IN THE GARDEN Science Page

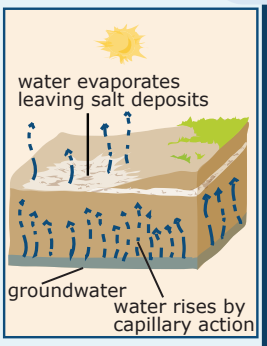
WATER CYCLE IN THE GARDEN

Water falls on the soil when it rains, or when the garden is watered. What happens to this water?

The water in clouds eventually falls to the ground as rain.

Water that is evaporated or transpired eventually forms clouds.

Leaves have thousands of tiny openings through which water vapor comes out of the plant into the air. This process is called transpiration.



Some water flows away over the top of the soil. This is called runoff.

Some water seeps into the soil, filling spaces between soil particles. Water seeps through sandy soils much faster than through clay soils or compacted soils.

Water soaks into the soil down to the roots of plants. Water taken up by roots moves through the stems to the leaves.

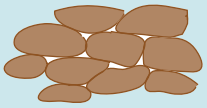
Water may seep through the soil beyond the root zone.

Some water evaporates directly from the soil surface, especially in hot, dry climates. This causes water from lower layers in the soil to be pulled to the surface. As water is pulled up through the soil, it may carry dissolved salts. When the water evaporates, salt deposits are sometimes left on the surface of the soil.

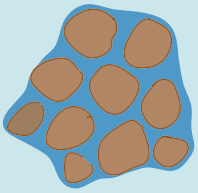
TOO MUCH OR TOO LITTLE WATER

Plants need both water and air in the soil. Ideally, half the volume of soil should be pore spaces. About half of each pore space should be filled with water, and about half with air. When soil does not have the right balance of air and water, plants may suffer from stress.

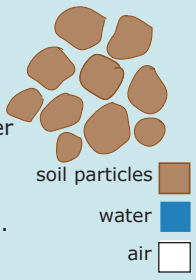
Neither air nor water can enter compacted soil.



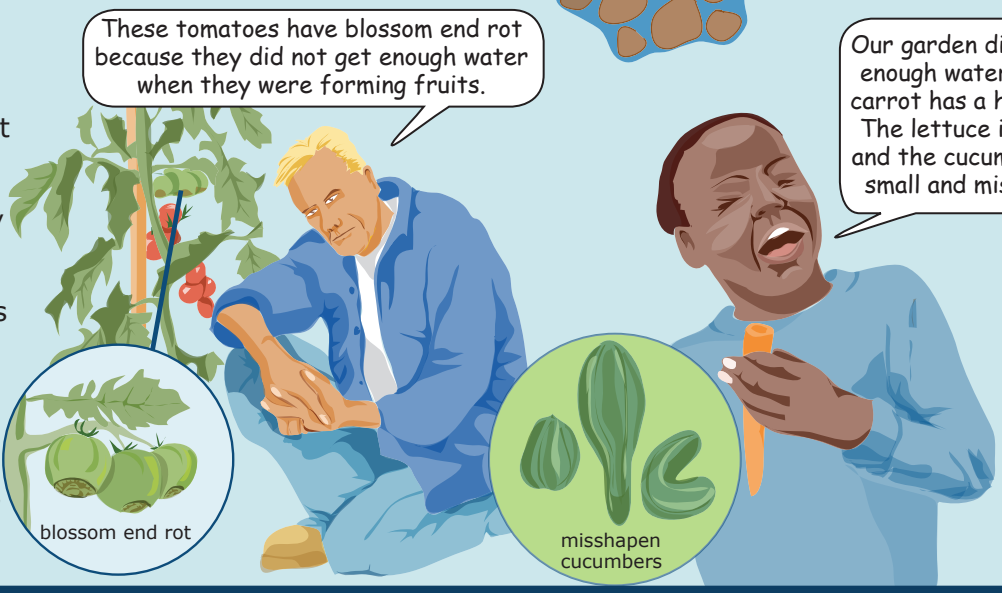
Watering the soil too much will fill all the pore spaces with water. Without air, plant roots suffocate and die.



If soil does not get enough water, the roots cannot take up water to replace what is lost through transpiration.



Plants are most affected by water stress right after they are planted or transplanted, and while fruits are forming. Root crops, such as beets and carrots, are vulnerable to water stress while the roots are growing.



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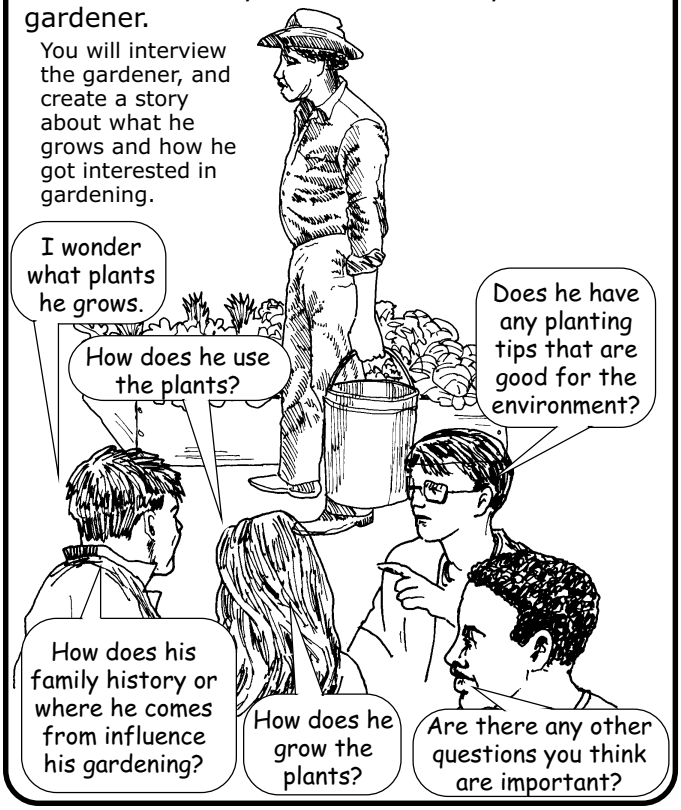
GARDENER STORY

WHAT IS A GARDENER STORY?

A Gardener Story is an "oral history" about a gardener.

You will interview the gardener, and create a story about what he grows and how he got interested in gardening.



WHY THE GARDENER STORY?

Every gardener has some interesting way to plant vegetables or flowers.

Often these practices are carried on from parents and grandparents. Because many gardeners are elderly, their unique practices are in danger of being lost if they are not recorded.

WHAT WILL YOU NEED?

- ✔ copy of Gardener Story Form
- ✔ copy of the Gardener Story Guiding Questions
- ✔ 3x5 inch cards or paper
- ✔ pencils
- ✔ clipboards
- ✔ cameras and film
- ✔ drinks and snacks

WHAT TO DO...BEFORE GOING TO THE GARDEN

Background Research

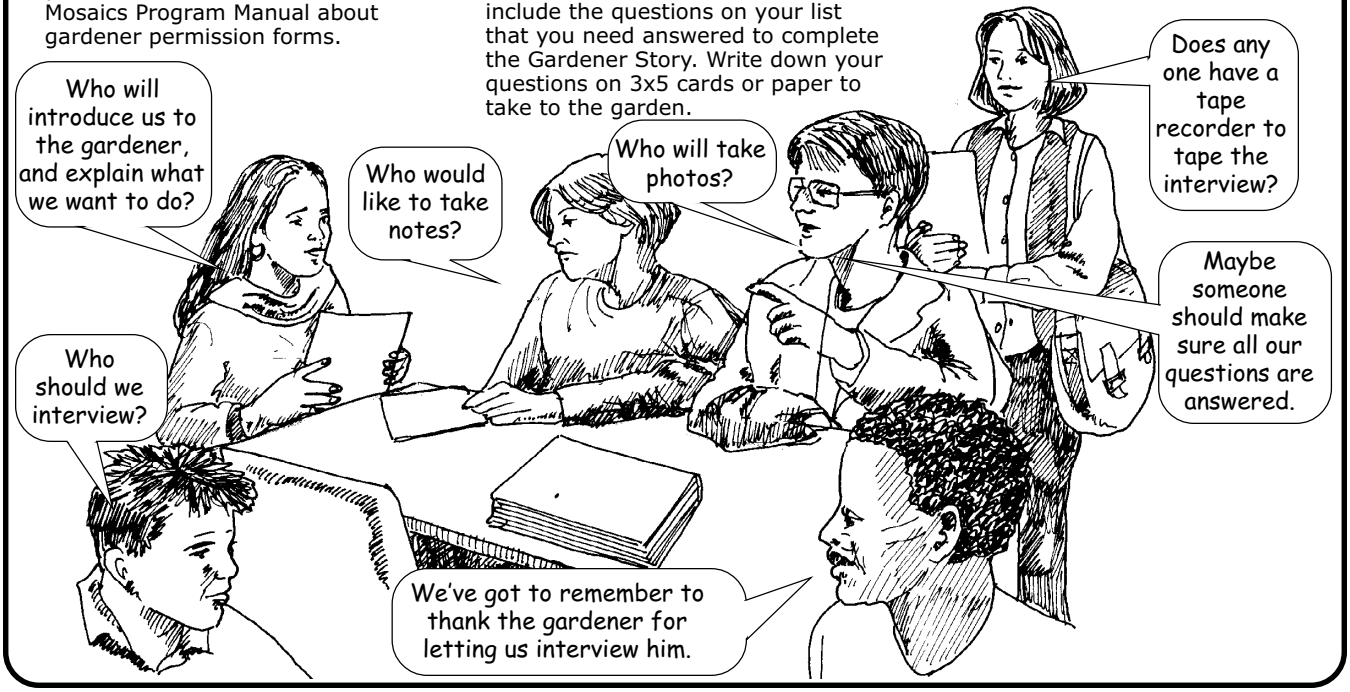
- ✔ Read some Gardener Stories on the Garden Mosaics website. What makes a good Gardener Story?
- ✔ Talk to your group leader before you start, or read the Garden Mosaics Program Manual about gardener permission forms.

Generate Questions

- ✔ Brainstorm a list of questions that you think are important to ask the gardener.
- ✔ Look at the online Gardener Story Guiding Questions. Make sure to include the questions on your list that you need answered to complete the Gardener Story. Write down your questions on 3x5 cards or paper to take to the garden.

Practice Interviewing

- ✔ Review the interviewing skills on the website. Practice interviewing with your friends.
- ✔ Decide what everyone is going to do at the interview.



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WHAT TO DO...AT THE GARDEN

Make introductions

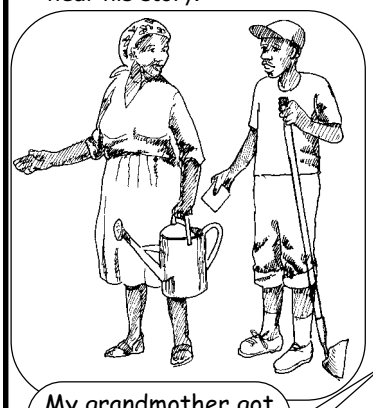
- ✔ Introduce yourselves to the gardener.
- ✔ Explain that you would like to hear his story.

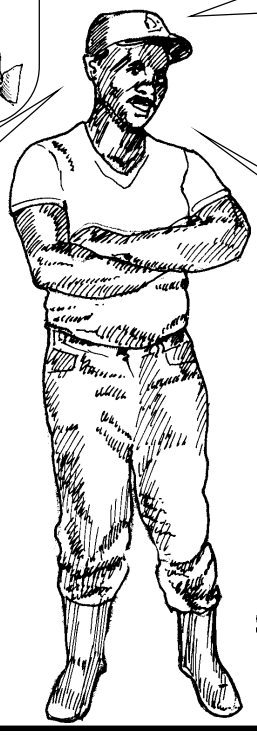
Ask questions

- ✔ Ask questions from your list.
- ✔ Also ask questions about things that seem to be important to the gardener. Your Gardener Story will be more interesting if you can capture things that the gardener is excited about.
- ✔ Don't be afraid to ask questions about things you don't understand or want to learn more about.

Collect information

- ✔ Before the interview ends, make sure you have answered all of the questions on your list and on the Gardener Story Guiding Questions.
- ✔ If it's OK with the gardener, take photos to illustrate the information.
- ✔ Thank the gardener and share your drinks and snacks.





My grandmother got me interested in gardening.

I'm growing the same vegetables my family grew for generations in the Dominican Republic.

I grow these herbs because my wife uses them to make tea.

Do you have any planting tips that are good for the environment?

May I take your photo?

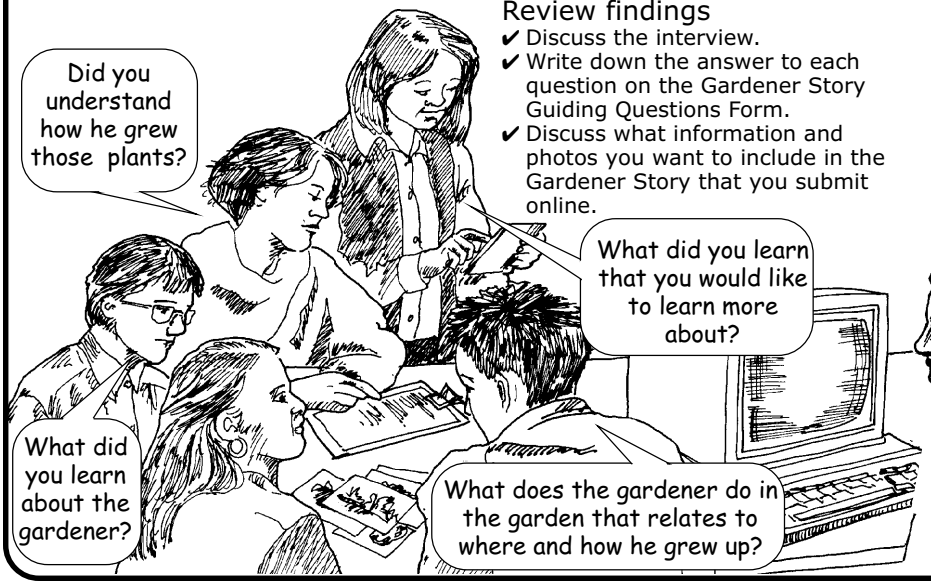
WHAT TO DO...AFTER YOU LEAVE THE GARDEN

Review findings

- ✔ Discuss the interview.
- ✔ Write down the answer to each question on the Gardener Story Guiding Questions Form.
- ✔ Discuss what information and photos you want to include in the Gardener Story that you submit online.

Share online

- ✔ Decide who will write the story.
- ✔ Write up the story and submit it online with your photos to the Garden Mosaics website. If you taped the story, you can also create a slide show with audio quotes from the gardener.



Did you understand how he grew those plants?

What did you learn that you would like to learn more about?

Who's going to write up the story?

What did you learn about the gardener?

What does the gardener do in the garden that relates to where and how he grew up?

Learn more

- ✔ Check out the online Science Pages. Click on any pages that might help you to understand more about what you learned.

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GARDEN MOSAICS (www.gardenmosaics.org)

HISTORY OF COMMUNITY GARDENS IN THE U.S. Science Page

From the late 1800's through the 1940's, the main purpose of community gardens in the U.S. was to grow food.

LATE 1800'S POTATO PATCH MOVEMENT

Cities were growing rapidly. Many people were out of work. Across the country, cities began offering garden plots to poor people so they could grow their own food.

EARLY 1900'S LIBERTY GARDENS

The U.S. government recruited people to grow Liberty Gardens during World War I. Growing your own food was a way that every American could contribute to the war effort.

1930'S RELIEF GARDENS

The Great Depression began. Relief Gardens were promoted to improve people's spirits, and to provide food and work.

1940'S VICTORY GARDENS

When the U.S. entered World War II, the government launched a Victory Garden campaign. By 1944, 20 million Victory Gardens produced 44% of the fresh vegetables in the U.S.!

Many vegetables were stored for winter.

From the late 1960's to the present day, community gardens have served many different purposes.

IMPROVING NEIGHBORHOODS

People in cities turn vacant lots into beautiful gardens. Gardens provide a quiet place to sit in the shade, or to meet and talk with friends. Children play in gardens and older people get exercise while gardening.

EXPRESSING CULTURAL TRADITIONS

Many immigrants and Americans from all ethnic backgrounds bring plants and cultural traditions to the gardens, creating multi-cultural garden mosaics.

A casita in a Puerto Rican community garden

GROWING FOOD

Many people grow their own food because they like the taste of fresh vegetables. Others are concerned about rising food prices or about chemicals in foods. Some simply want to teach their children where their food comes from.

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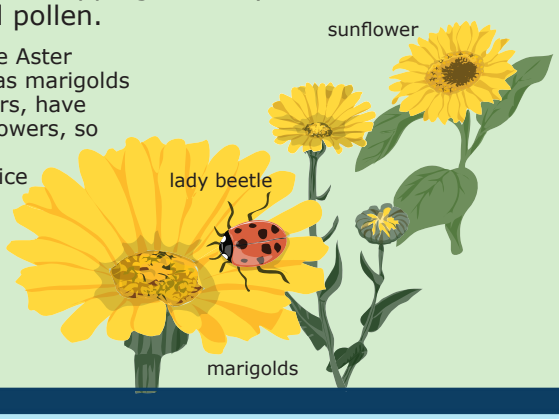
INTERPLANTING FOR PEST CONTROL Science Page

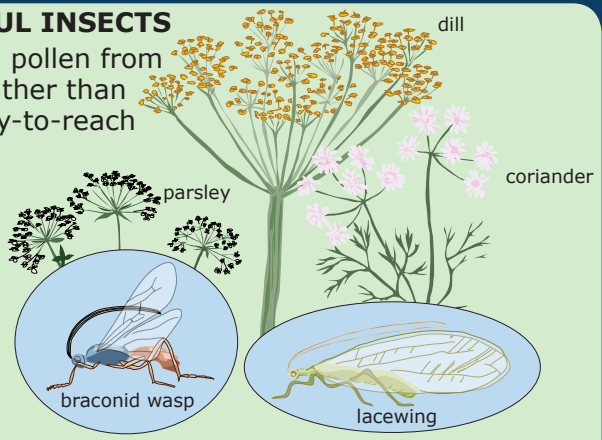
Interplanting is growing one kind of plant alongside a different kind of plant. Some plants attract helpful insects. Other plants confuse or repel insect pests. When these plants are interplanted, they can help protect your crops from insect pests.

INTERPLANT TO ATTRACT AND SHELTER HELPFUL INSECTS

Most insects that eat insect pests also eat nectar and pollen from flowers. They have short mouth parts for chewing, rather than long tubes for sipping, so they need flowers with easy-to-reach nectar and pollen.

Flowers in the Aster family, such as marigolds and sunflowers, have wide, open flowers, so they are an excellent choice for attracting helpful insects.

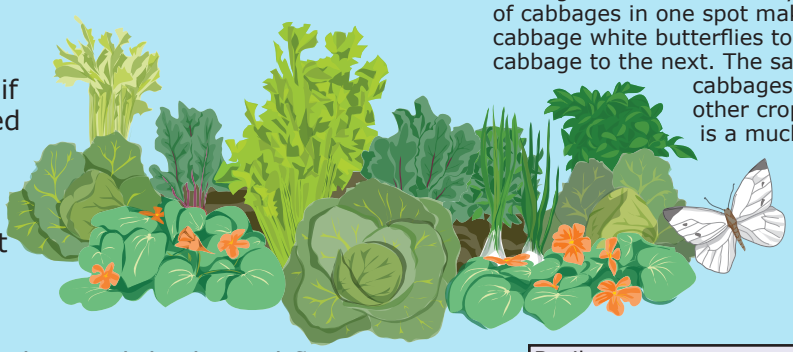




Herbs like parsley, dill, and coriander have flat-topped clusters of small flowers. They also have strong fragrances that attract beneficial insects.

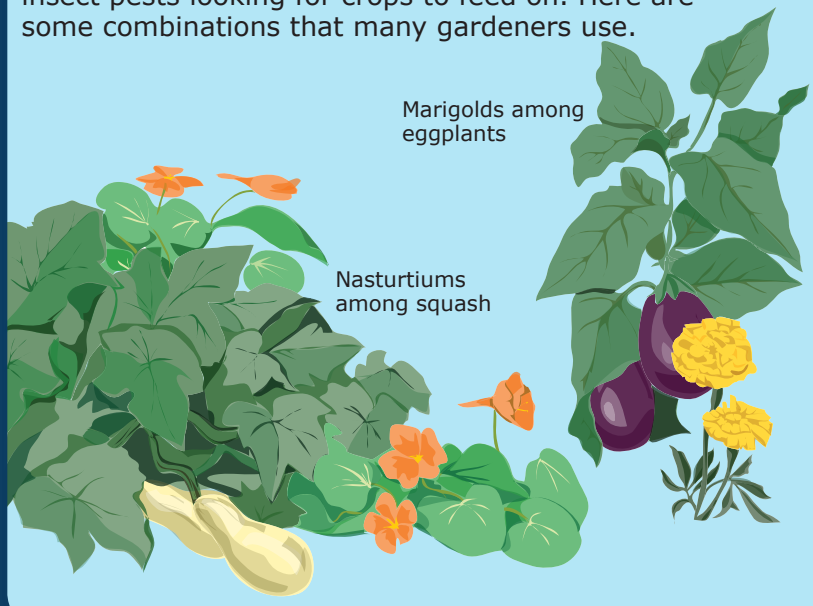
HOW TO CONFUSE OR REPEL INSECT PESTS

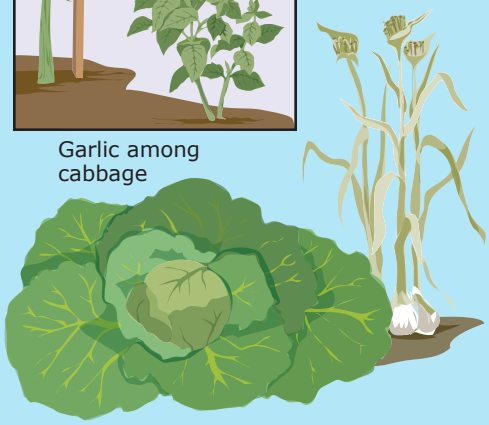
Many insect pests attack only certain kinds of crops. They spread more quickly if a large area is planted with only the kind of crop they eat. If you interplant crops, it's not as easy for insect pests to spread and cause damage.



A large cabbage patch presents a big target for cabbage white butterflies flying by. Also, lots of cabbages in one spot make it easier for the cabbage white butterflies to move from one cabbage to the next. The same number of cabbages scattered among other crops over a larger area is a much less obvious target.

Many gardeners interplant with herbs and flowers that have strong scents, which may confuse or repel insect pests looking for crops to feed on. Here are some combinations that many gardeners use.





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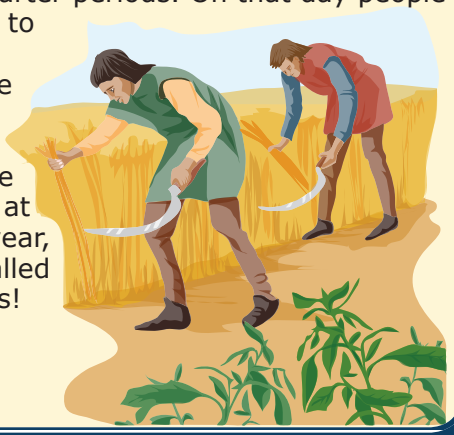
COMMON LAMBSQUARTERS Science Page

DID YOU KNOW?

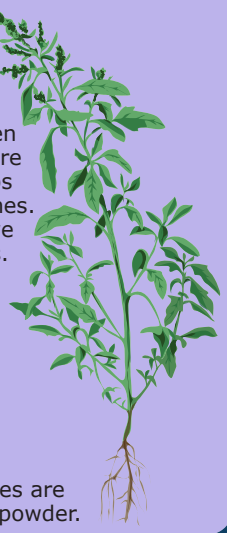
In 9th century England, the yearly calendar was divided into four quarters. August 1st, called Lammas Quarter, marked the start of one of the quarter periods. On that day people had a festival to celebrate harvesting the first wheat of the season. They often ate a leafy green at that time of year, which they called lambsquarters!



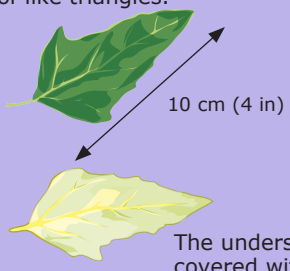
THE COMMON LAMBSQUARTERS PLANT

Lambsquarters is an annual. It grows from about 1 to 2 meters (3-6 ft) high in one growing season.

Tiny green flowers are at the tips of branches. They have no petals.



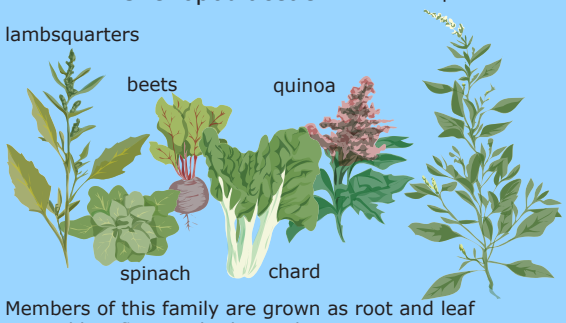
Leaves are shaped sort of like triangles.



The underside of leaves are covered with a white powder.

CLASSIFYING COMMON LAMBSQUARTERS

FAMILY
Chenopodiaceae



Members of this family are grown as root and leaf vegetables, flowers, herbs, and grains.

GENUS
Chenopodium

In Greek, this means "goose foot." Some members of this family have leaves shaped like a goose foot.

SPECIES
album

In Latin, "album" means white. The flowers and undersides of leaves are whitish.

A FRIEND...

Young lambsquarters can be eaten raw or cooked like spinach. It contains more iron, protein, vitamin B2, and vitamin C than either spinach or cabbage. Seeds can be eaten raw. They can also be dried and ground, and then used in hot cereals or baked goods.

In winter, song birds eat the tiny lambsquarters' seeds.

...OR FOE?

One lambsquarters plant can produce 75,000 seeds. The seeds can sprout and grow in almost any soil. Lambsquarters can outgrow most crop plants, and quickly take over any bare soil.

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MULCH Science Page

MULCH MATERIALS

Mulch is a covering that is placed on top of bare soil. Some materials that are used for mulching include:

hay, straw, or wood chips

compost

black plastic

yard wastes, such as grass clippings and leaves

WHAT ARE THE BENEFITS OF MULCHING?

* Mulch protects the soil.

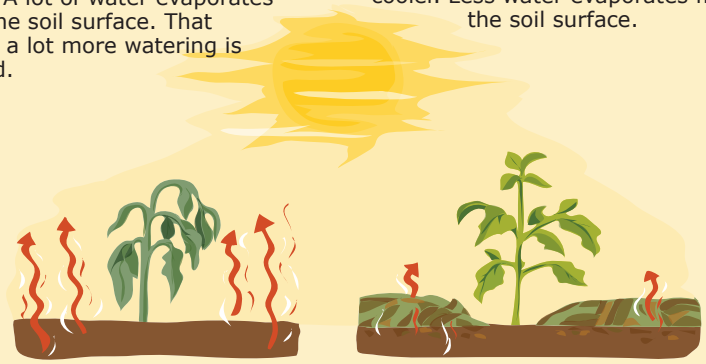
When it rains on bare soil, water washes away taking a lot of soil with it. The soil also gets compacted and crusty when hit by hard rains. Then neither air nor water can enter the soil and get down to the roots of plants.

Rainwater trickles through a mulch, and slowly seeps into the soil rather than washing away. The soil stays loose, and the soil surface does not get crusty. Mulch keeps muddy rainwater from splashing crops, so they are cleaner and less likely to get diseases.

* Mulch prevents loss of water from the soil surface.

Under a hot sun, bare soil gets very warm. A lot of water evaporates from the soil surface. That means a lot more watering is needed.

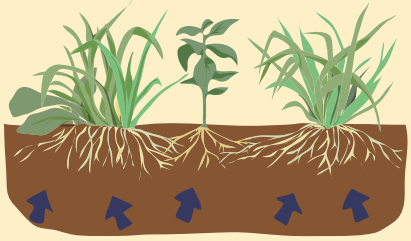
Mulch shades the soil, keeping it cooler. Less water evaporates from the soil surface.

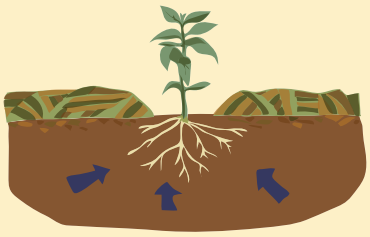


* Mulch prevents weeds from growing.

Weeds can sprout and grow on bare soil. That means a lot of weeding is needed.

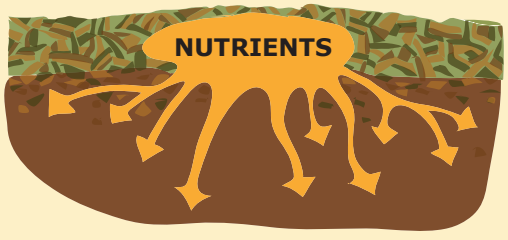
Mulch shades out weeds, which compete with crops for nutrients, water, and light. The few weeds that grow are easy to pull out.





* Mulch improves the soil.

Over time, organic mulch materials decay, adding nutrients and humus to the soil.



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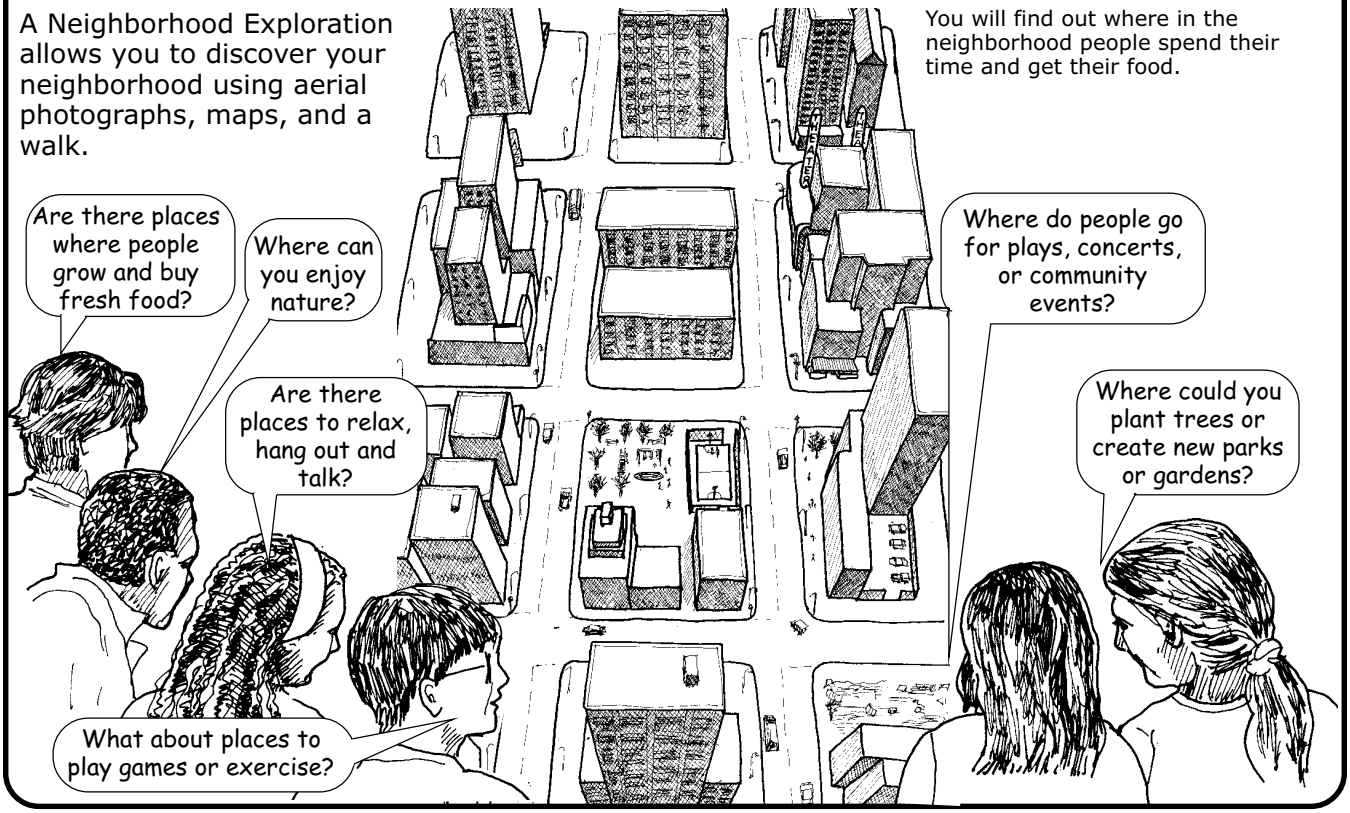
NEIGHBORHOOD EXPLORATION

WHAT IS A NEIGHBORHOOD EXPLORATION?

A Neighborhood Exploration allows you to discover your neighborhood using aerial photographs, maps, and a walk.

You will find out where in the neighborhood people spend their time and get their food.



WHY THE NEIGHBORHOOD EXPLORATION?

You can learn what is in the neighborhood and what is missing. Then you can share what you learn with others, and even develop a plan for improving the neighborhood.

WHAT DO YOU NEED?

- ✔ aerial photograph (airphoto)
- ✔ map
- ✔ paper
- ✔ pencils
- ✔ clipboards
- ✔ cameras and film
- ✔ poster board, glue, and other supplies for making collage
- ✔ drinks and snacks

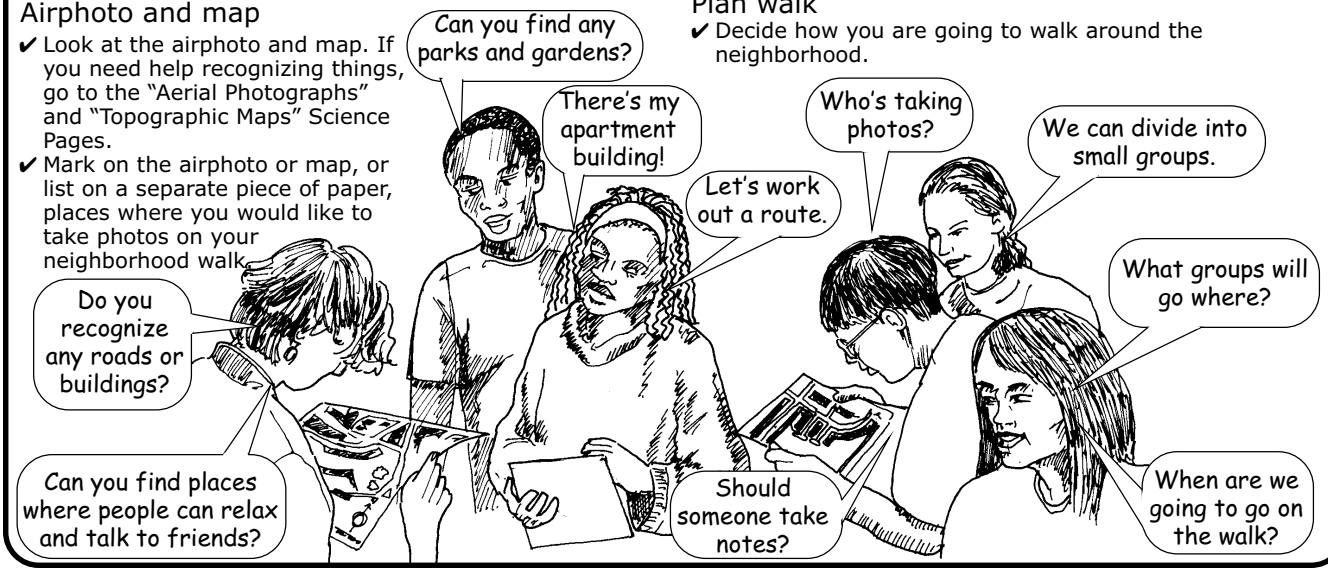
WHAT TO DO...BEFORE THE WALK

Airphoto and map

- ✔ Look at the airphoto and map. If you need help recognizing things, go to the "Aerial Photographs" and "Topographic Maps" Science Pages.
- ✔ Mark on the airphoto or map, or list on a separate piece of paper, places where you would like to take photos on your neighborhood walk.

Plan walk

- ✔ Decide how you are going to walk around the neighborhood.



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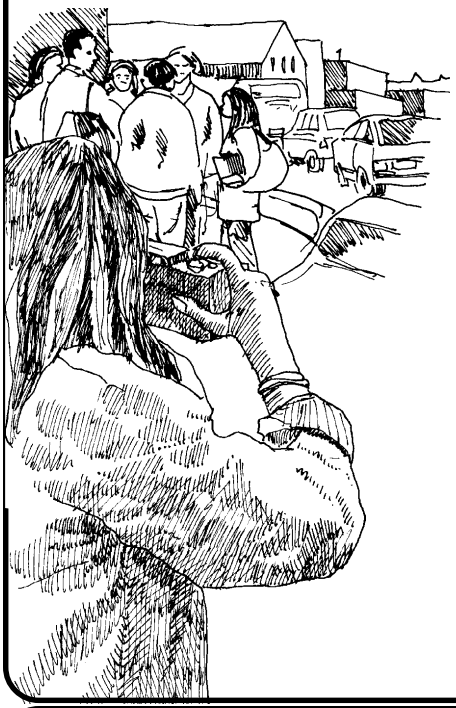
WHAT TO DO...DURING THE WALK

Walk around the neighborhood

✔ Walk to the sites marked on your maps and airphotos, or on your list.



Take photos

✔ Take photos of places where people can get fresh food, enjoy nature, relax and talk to friends, get exercise, and see concerts.

✔ Also take photos of vacant lots and other places that could become gardens or small parks, or where trees could be planted.

✔ Take photos of places that interest you!

Make notes

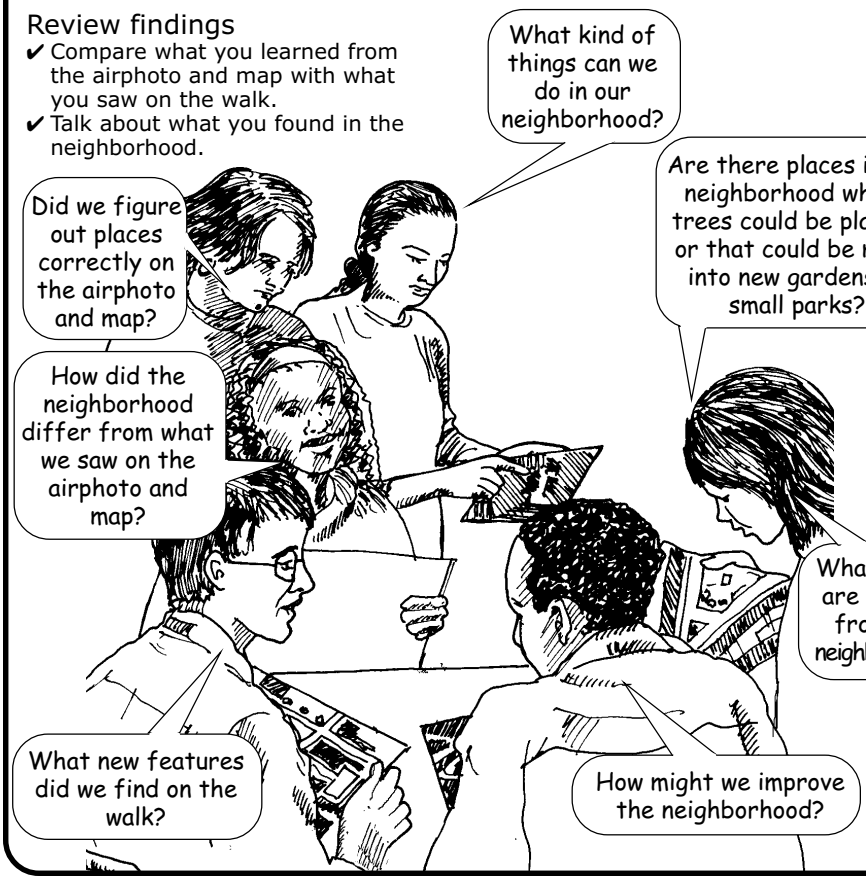
✔ Jot down notes about where you take the photos.

WHAT TO DO...AFTER THE WALK

Review findings

✔ Compare what you learned from the airphoto and map with what you saw on the walk.

✔ Talk about what you found in the neighborhood.



Make collage

✔ Make a neighborhood collage with airphotos, maps, and the photos you took. Add comments about what you saw. Be creative!

Learn more

✔ Check out the online Science Pages. Click on any pages that might help you to understand more about what you learned.

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PAPALO Science Page

DID YOU KNOW?

In Mexico, papalo branches are kept in water on café tables, so diners can tear up fresh leaves and add them to beans or tortillas.

Because cooking destroys the flavor, papalo leaves are only used fresh or added to meals at the last moment.

CLASSIFYING PAPALO

Papalo is a member of the Asteraceae, or Compositae, family. The composites make up the largest family of flowering plants, with about 20,000 species, including sunflowers and daisies.

FAMILY

Asteraceae (or Compositae)

The flower head of a plant in this family is commonly mistaken for a single flower, but it really is many flowers grouped together.

GENUS

Porophyllum

In Latin, this means "leaves with pores."

Pores are tiny openings. You can see the pores on papalo leaves without a microscope. Oil comes out of the pores,which gives papalo leaves a strong scent and flavor.

SPECIES

ruderale

means "growing in rubble or waste places."

Papalo grows well on dry slopes, ravines, and roadsides. It has even been known to grow on nearly bare rock.

ORIGINS

Papalo is native to Mexico, Central and South America, growing as far north as Texas. Papalo is being introduced to gardeners in the U.S. as "a great new herb from Mexico."

In places where temperatures are always warm, papalo grows year-round for many years. But because papalo cannot cope with frost, in the U.S., you may have to grow the plant from seed every year.

THE PAPALO PLANT

The flower looks like an unopened marigold bloom, and then it opens into a ball that looks like a dandelion flower.

Papalo has egg-shaped leaves, which have a lovely, spicy, sharp scent and flavor.

In the U.S., the plant grows up to 1 meter tall during one growing season. In warmer climates, the plant can grow over 2 meters high.

GROWING AND HARVESTING PAPALO

Papalo is easy to grow in sunny places where the soil is well-drained.

You can use papalo instead of cilantro in cooking, Papalo has the advantage that it does not go to seed in the early summer, like cilantro does.

Pick papalo leaves when young for a milder flavor. The flavor gets stronger the older the leaves are.

USES

Papalo leaves are used to flavor soups and stews, grilled meats, beans, salsa, and salads. The leaves also are used as a medicinal herb for many ailments, such as high blood pressure, upset stomach, and infections.

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PEPPERS Science Page

DID YOU KNOW?

When Christopher Columbus set out for the New World, he hoped to find black pepper, a spice that grew in Asia. Instead he found the Arawak Indians eating another plant that was spicy, but not related to black pepper. He called it "red pepper" because it had red pods.

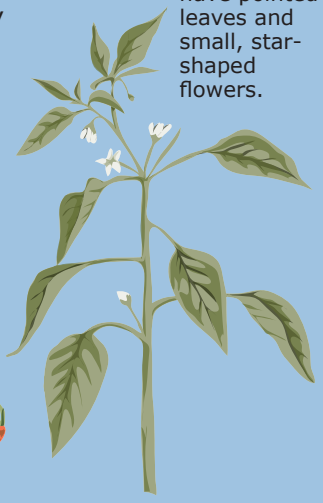
ORIGINS

Peppers are native to South America. People there ate wild peppers nearly 10,000 years ago, and farmers began growing the plant over 7,000 years ago.

THE PEPPER PLANT

In temperate climates, pepper plants last only one growing season. In tropical areas, they are woody shrubs that grow from year to year.

Pepper plants have pointed leaves and small, star-shaped flowers.



The fruits come in a variety of shapes, sizes, and colors.

NUTRITIONAL VALUE OF PEPPERS

Peppers are an excellent source of vitamins A and C.

As green pods turn red, the vitamin content increases. One red bell pepper has ...

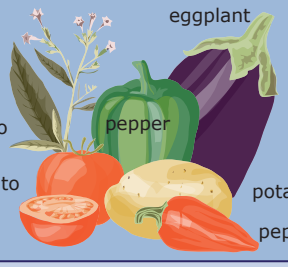
... the same amount of vitamin A as 1/3 of a carrot.
... the same amount of vitamin C as 3 oranges.

CLASSIFYING PEPPERS

FAMILY

Solanaceae

The Latin name "solanum" means "nightshade."



GENUS

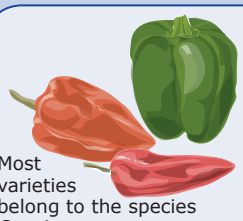
Capsicum

This name comes from the Greek word "kapto" meaning to bite. Hot peppers have a taste that bites your mouth!

The heat in hot pepper is from capsaicin, a substance mostly found in the tip of the fruit, in the ribs, and in the seeds.

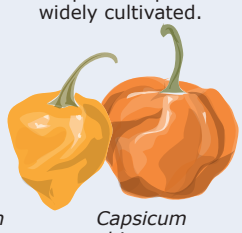
SPECIES

Three capsicum species are widely cultivated.



Most varieties belong to the species *Capsicum annuum.*

Capsicum frutescens



Capsicum chinense

GROWING AND HARVESTING PEPPERS

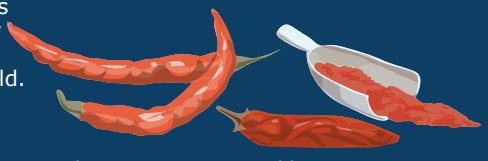
Peppers thrive in well-drained, fertile soil. They must have a constant supply of water in order to set fruit.

USES

Peppers are used raw in salads or in cooking. They can be used fresh or dried, whole or ground into spices. The capsaicin in hot peppers is also used in medicine.

Paprika is a spice that is made from any dried red pepper that is not hot.

Fresh, dried, whole or crushed, cayenne peppers are used in fiery dishes in many parts of the world.



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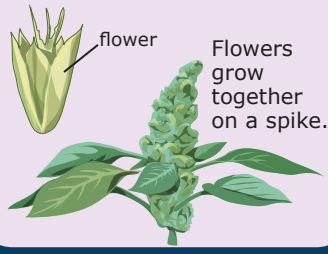
REDROOT PIGWEED Science Page

DID YOU KNOW?

One redroot pigweed plant can produce over 100,000 seeds! Some can live up to 40 years in the soil.

Tiny seeds are inside the fruit.

The fruit grows from the flower.



ORIGIN

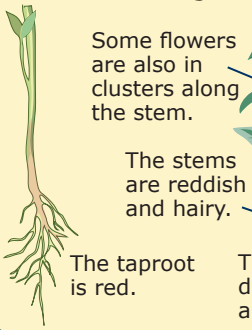
Redroot pigweed is native to tropical America. Today it can be found on every continent.

Native Americans of North America have traditionally used redroot pigweed as a vegetable and a grain crop.

THE REDROOT PIGWEED PLANT

Redroot pigweed is an annual. The plant can reach to 2 meters ($6^1/_2$ ft) high in one growing season.

The black, shiny seeds sprout and grow in late spring and early summer when the soil becomes warm.

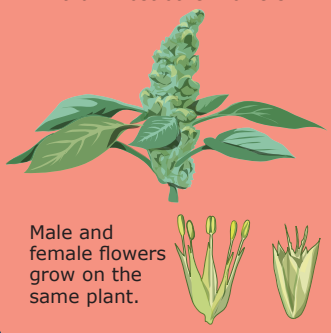


CLASSIFYING REDROOT PIGWEED

FAMILY

Amaranthaceae

In Greek, this means everlasting. Amaranth flowers last much longer than most other flowers.

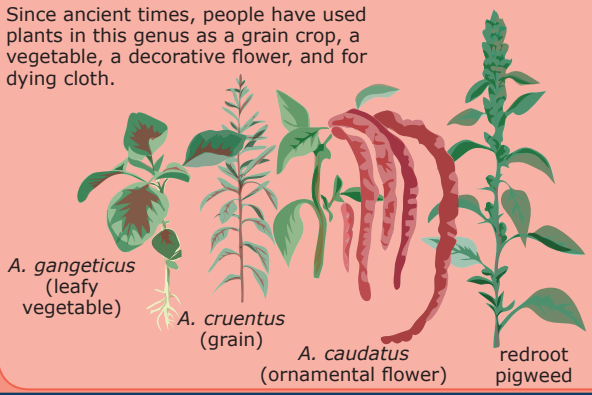


Male and female flowers grow on the same plant.

GENUS

Amaranthus

Since ancient times, people have used plants in this genus as a grain crop, a vegetable, a decorative flower, and for dying cloth.



SPECIES

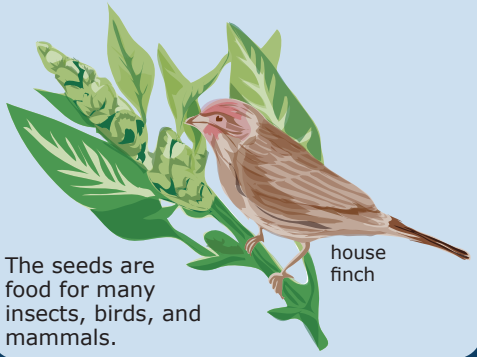
retroflexus

In Latin this means "bent back."

The species was given this name by Swedish naturalist, Carl Linnaeus, in 1753. We still use the name today.

FRIEND. . .

Small plants that do not yet have flowers are used in salads or are cooked like spinach. The seeds can be roasted and ground to make flour. The whole seeds can be cooked to make cereal.



The seeds are food for many insects, birds, and mammals.

house finch

. . .OR FOE?

Farmers and gardeners consider redroot pigweed to be one of the worst weeds. Each plant can produce thousands of long-lasting seeds that can sprout and grow in almost any soil.

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RAISED BEDS Science Page

WHAT IS A RAISED BED?

A raised bed is a mound of soil in which gardeners plant their crops and flowers. Many raised beds are framed or enclosed. Frames help keep the soil in place during rainstorms and watering.

WHAT ARE THE BENEFITS OF A RAISED BED?

* Once the soil is prepared, you don't have to walk on it again during the growing season.

Make sure the beds are no more than two arm lengths wide, so that you can reach everywhere within the bed without stepping in it.

You can work in the garden in wet weather without getting your feet wet or compacting the soil.

* If you have contaminated or poor soil, it's easier to bring in good soil to create a raised bed than to amend the soil in the whole area. In soggy areas, the soil in raised beds will drain more quickly.

Raised beds are ideal for gardening on rubble-filled city lots.

* The soil in raised beds warms up earlier in the spring and stays warm longer in the fall. This extends the growing season.

* It's easier to tend the garden when it is raised above ground level, because you don't have to do as much bending.

Gardening in raised beds that are 30 cm high is easier for disabled and elderly gardeners.

HOW DO YOU BUILD A RAISED BED?

1. Making a raised bed on a city lot

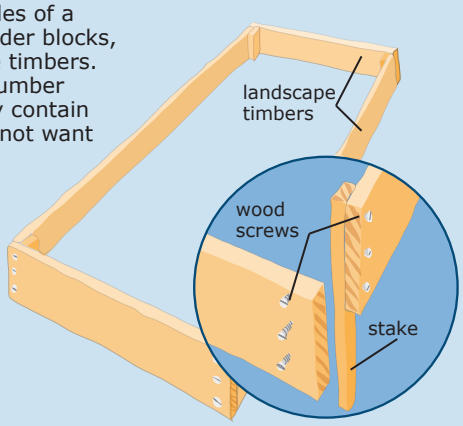
Use string to mark off where the bed will be. Use a pickaxe to loosen up hard, compacted soil and rubble in the bed. This will help the bed drain, and will allow roots to grow deeper. Have good topsoil delivered to the site. Work some of the topsoil into the existing soil to a 15 cm depth. Build the frame around the bed, and fill it with soil.

2. Making a raised bed using existing soil

Rake the soil from the walkways to the top of the bed. Make the soil mound about 15 cm high. To make the bed more permanent, build an edge with wood planks, or another material that will keep the soil in place.

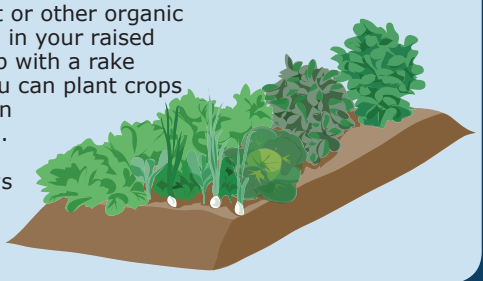
3. Making a raised bed frame

You can build the sides of a raised bed out of cinder blocks, stones, or landscape timbers. Do not use treated lumber or railroad ties. They contain poisons that you do not want in your garden soil. Hold the planks in place with stakes or steel rods or pipes. You can also use wood screws to fasten the corners together. Do not use nails, as they might split the wood.



4. Preparing soil

Mix lots of compost or other organic matter into the soil in your raised bed. Flatten the top with a rake before planting. You can plant crops closer together than in a regular garden. You do not need space between rows of plants, because you walk outside the beds.



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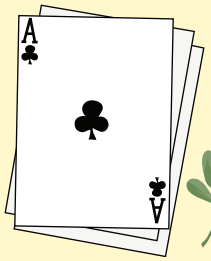
RUE Science Page

DID YOU KNOW?



The club on a deck of cards is a rue leaf.

THE RUE PLANT

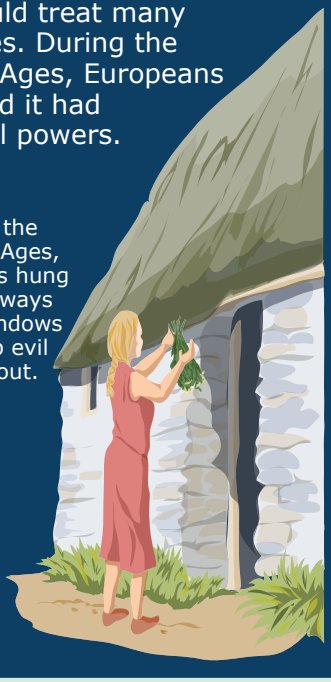
Rue is a small evergreen shrub that is shaped like a mound. It grows up to 60 cm high.

The silver-green leaves have a strong smell.

The tiny yellow flowers are in loose clusters above the leaves.

ORIGINS

Rue is native to the Mediterranean region. Ancient Egyptians, Romans, and Greeks believed that rue could treat many illnesses. During the Middle Ages, Europeans believed it had magical powers.

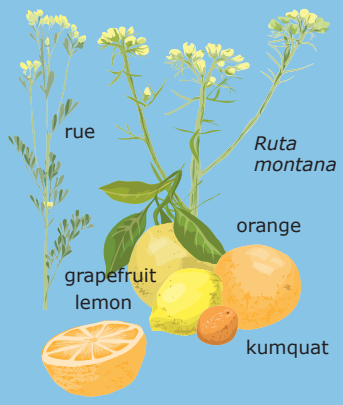


During the Middle Ages, rue was hung in doorways and windows to keep evil spirits out.

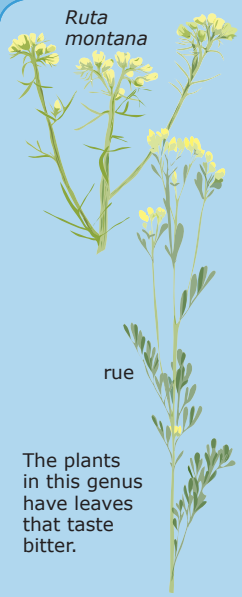
CLASSIFYING RUE

FAMILY
Rutaceae
(Citrus family)

There are more than 1,600 species of shrubs and trees in this family. Most have strong scents.



The best-known members of this family are those that produce edible fruits.



The plants in this genus have leaves that taste bitter.

GENUS
Ruta
In Latin, this means "bitter."

SPECIES
graveolens
In Latin, this means "strong smelling."

GROWING RUE

Rue thrives in well-drained soil in full sun.

Rue is a bush that grows year after year. You can start new rue plants from seeds. You can also start a new plant by cutting a piece of stem and sticking it in potting mix. Sometimes little plants start growing around a rue plant. They can be dug up and replanted.

USES

Today, rue is mostly used as an ornamental plant in rock gardens and herb gardens. It has also been used as a medicine for earaches, an insect repellant, and an herb for flavoring foods. Some processed foods are flavored with rue. Some cosmetics and perfumes also contain rue.

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SNAP BEANS Science Page

DID YOU KNOW?

Snap beans and dry beans come from the same species of plant. Different varieties are harvested at different stages of growth.

Snap bean varieties are harvested when the pods are young and tender.

Dry bean varieties are harvested when the bean pods are dry and the seeds are hard.

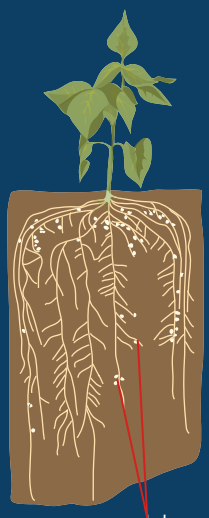
ORIGINS

Snap beans come from a plant that is native to Central and South America. People were growing beans in Peru over 7,500 years ago — before they were growing corn or making pottery.

threshing bean pods for their seeds

CLASSIFYING BEANS

Snap beans, also called green or string beans, belong to the Legume family.

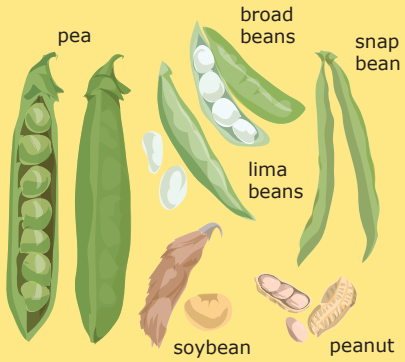


nodules

Many legumes have root nodules where special bacteria, called Rhizobia, live. These bacteria can take nitrogen from the air and change it into a form that plants can use.

FAMILY

Fabaceae
(Legume family)



There are about 18,000 species in the legume family, which includes peas as well as many other vegetables that have seeds in pods.

GENUS

Phaeseolus
In Latin this means "small boat."

The bean pod is shaped like a little boat.

SPECIES

vulgaris
means "common."

This bean species is commonly grown, both as a snap bean and a dry bean.

THE SNAP BEAN PLANT

There are two main types of snap beans - bush beans and pole beans.

The small flowers are white, red, or purple.

Pole beans need support.

The pods come in green, yellow, purple, or red.

The leaves have three leaflets. Leaflets are rounded at the stem ends and pointed at the tips.

GROWING AND HARVESTING SNAP BEANS

Snap beans are very easy to grow. Do not plant until all danger of frost has passed and the soil is warm. They like full sun and well-drained soil. Keep well-watered.

USES

Snap beans are used in stir fry, stews, and soups. You can also steam them and eat them right away, or add them to a salad.

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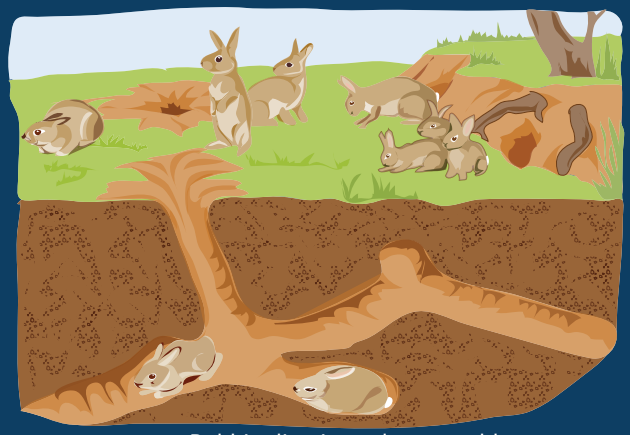
SOIL LIFE Science Page

The soil is home for billions of living things. They are working all the time, helping to create healthy soil for growing plants.

ANIMALS

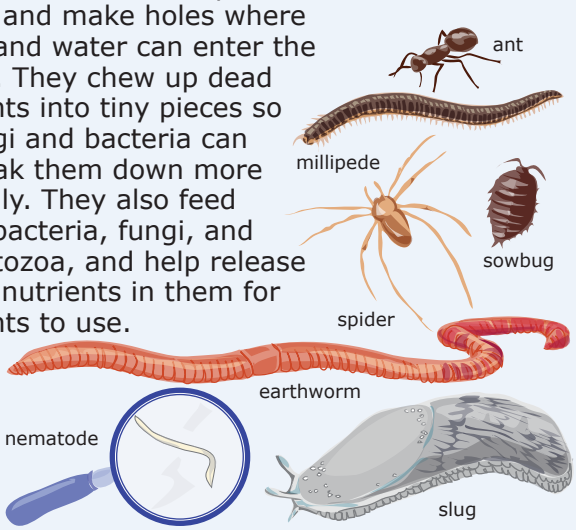
Animals, such as rabbits and moles, dig holes and help mix up the soil. Their tunnels let air reach plant roots, let water drain through soil, and provide spaces where plant roots can grow.



Rabbits live in underground burrows.

SMALL CREATURES

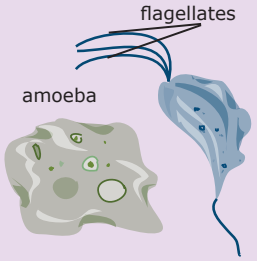
Small animals stir up the soil and make holes where air and water can enter the soil. They chew up dead plants into tiny pieces so fungi and bacteria can break them down more easily. They also feed on bacteria, fungi, and protozoa, and help release the nutrients in them for plants to use.



Nematodes are tiny worms that you can barely see. Their wastes are rich in nutrients that plants can use.

PROTOZOA

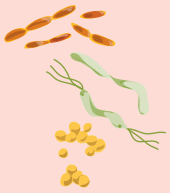
Protozoa are tiny organisms that can only be seen with the aid of a microscope. When they feed on bacteria, fungi, and other protozoa, they release nutrients that plants can use.



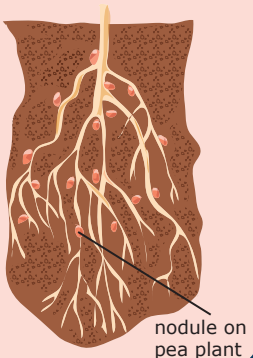
BACTERIA

One teaspoon of topsoil may contain 50 million one-celled bacteria! They help to break down dead plant and animal matter. In doing so, they release nutrients for use by other microbes, small animals, and plants.

Bacteria are shaped like rods, spirals, and spheres.

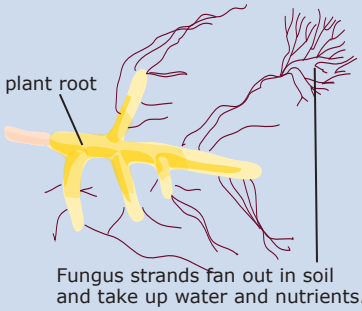


Nitrogen-fixing bacteria can take nitrogen gas from the air, and convert it into a form that plants can use to grow. Some of these bacteria live in nodules on the roots of beans, peas, and other plants called "legumes."



FUNGI

Fungi start the decay of fresh organic matter. They soften up plant matter, and make it easier for bacteria to join in the decay process.



Fungi usually have two parts. Their thin, thread-like strands grow in soil, rotting logs, and roots. In some fungi, the strands spread from the roots through the soil. In this way, the fungi help plants get nutrients from the soil.

The underground strands are connected to the mushrooms you can see growing on top of the soil. The mushrooms contain the spores that reproduce the fungi.

HELPING SOIL LIFE

You can help provide soil life with food, water, and air. When their needs are met, soil organisms will grow and multiply, and keep your soil healthy.

Add organic matter to the soil, and use organic mulch on the surface. Turn over soil as little as possible and do not compact the soil.

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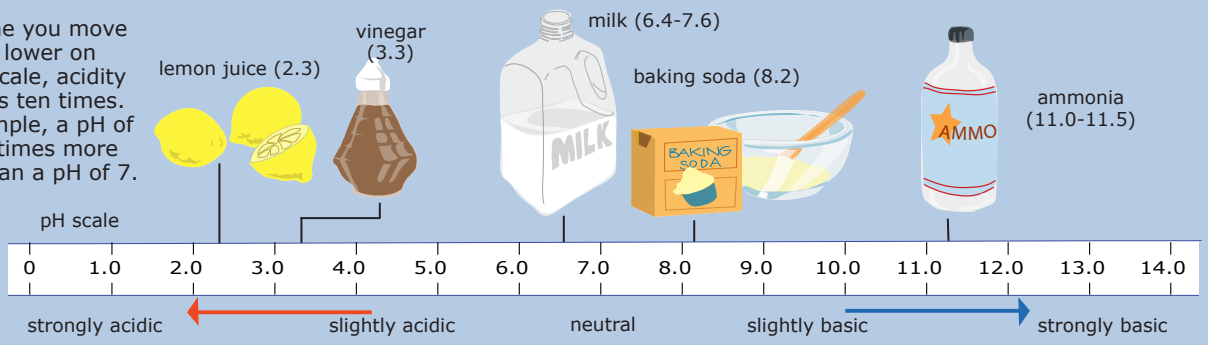
SOIL pH Science Page

WHAT IS SOIL pH?

Some substances, like lemon juice, are acids. Acids have a sour taste. Other substances, like aspirin, are bases. Bases have a bitter taste. Substances that are neither acidic nor basic are said to be neutral.

The pH of a substance, such as soil, is a measure of how acidic or basic it is. The pH scale goes from 0 to 14. The halfway point, pH 7, is neutral. A pH value below 7 is acidic; a pH value above 7 is basic.

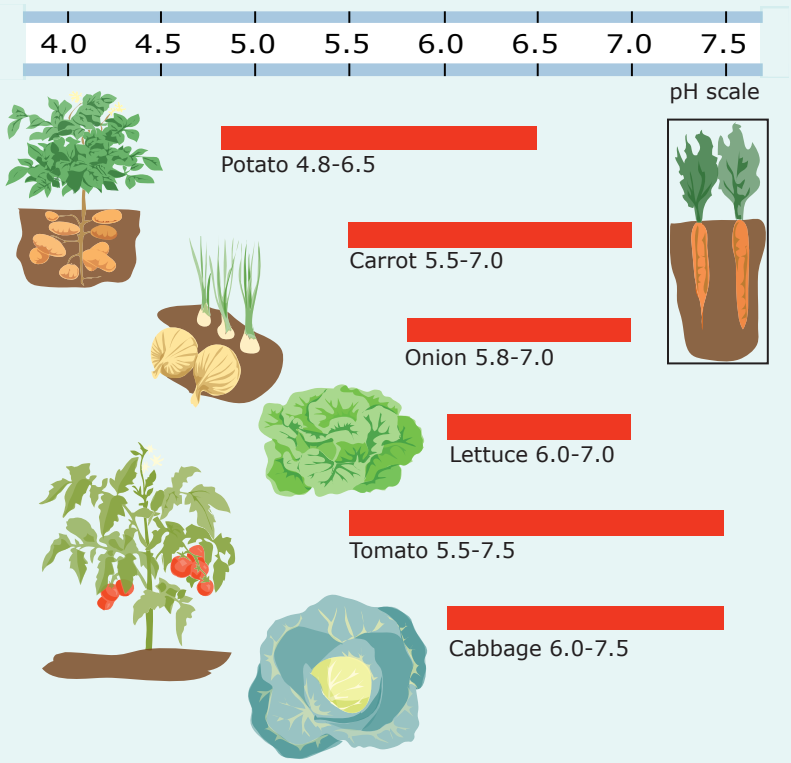
Each time you move one unit lower on the pH scale, acidity increases ten times. For example, a pH of 6 is ten times more acidic than a pH of 7.



WHY IS SOIL pH IMPORTANT?

Soil pH is important because it affects the health of plants. Before a nutrient can be used by plants, it must be dissolved in soil water. Most plant nutrients dissolve when the soil is slightly acidic. Many plants do well at a pH range of about 6 to 7.

Soil pH levels for best growth of common vegetables



When soil is acidic, minerals, such as iron and manganese, dissolve in soil water. In small quantities, these minerals help plants to grow. However, when the soil is too acidic, these minerals become so abundant that they can harm, or even kill, plants.

HOW DO YOU MEASURE THE pH OF SOIL?

Many liquid dyes change color when they come into contact with acids or bases. You can measure the pH of a soil by saturating the soil with dye for a few minutes, and observing the color of the liquid.

HOW DO YOU CHANGE THE pH OF SOIL?

You can add substances to soil to make them more or less acidic.

You can add lime or wood ash to acidic soils to make the soil less acidic.

You can add sulfur or peat moss to basic soils to make the soil more acidic.

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SOIL TESTING Science Page

WHY TEST SOIL?

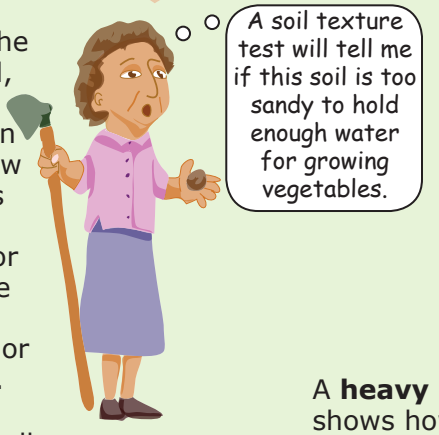
By testing the soil, you can determine how suitable your soil is for growing different types of plants. You can also find out if you need to add fertilizer, lime, or other soil amendments to help plants grow.

Some tests help you find out if your soil is polluted with toxic substances. High levels of lead and other heavy metals are a health risk, especially for small children.

TYPES OF TESTS AVAILABLE

A **pH test** measures the acidity of the soil. It tells you how much lime or sulfur should be added to make the soil suitable for growing plants.

A **soil texture test** measures the amounts of sand, silt, and clay in your soil. You can also measure how fast water drains in soil using the soil percolation or **"perc" test**. The results suggest how to best use or improve the soil.

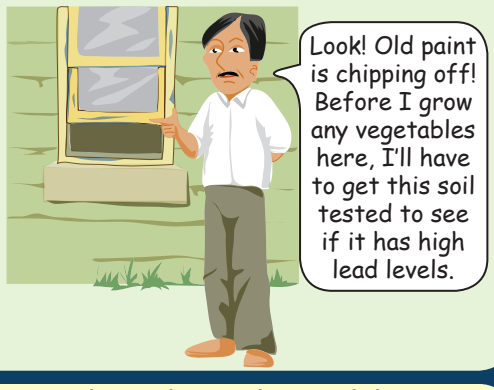


A **salinity test** tells you if your soil is too salty for plants to grow well.

A **soil nutrient test** measures the levels of phosphorus, potassium, and other plant nutrients in soil. It tells you how much fertilizer is needed to make up for the lack of certain nutrients in your soil.

You can test your soil for **organic matter**. If levels are too low, you will be given suggestions for adding organic matter.

A **heavy metal test** shows how much lead and other heavy metals are in your soil. If toxic amounts are found, you will be given some safety tips.



HOW TO TEST YOUR SOIL

Garden stores sell kits that you can use to measure the pH and nutrient levels of your soil. These kits will give you fairly accurate results. You can send a soil sample to a lab for more accurate measurements of pH and nutrient levels.

You can also send a soil sample to a lab to test for heavy metals, texture, salinity, and organic matter content. Get a soil sample box and information sheet, and follow the directions carefully. Fill in the soil information sheet, and send it with your soil sample to the lab.

The lab sent me the results of my soil test. Now I know what I have to do to improve my soil.

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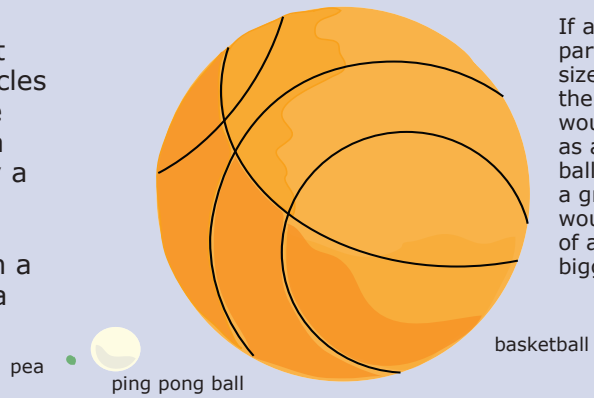
SOIL TEXTURE Science Page

SOIL PARTICLES

Soil is made up of particles of rock that have broken down over time. These particles vary in size. They are classified into three sizes—sand, silt and clay. Soil texture is a measure of how much sand, silt, and clay a soil contains.

Soil texture is important because it determines how fast water drains through a soil. It also determines how much water a soil can hold, and can be used by plants.



If a large clay particle were the size of a pea, then a silt particle would be as big as a ping pong ball or bigger, and a grain of sand would be the size of a basketball or bigger.

CLAY

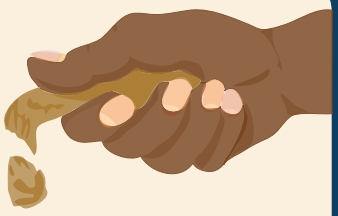
Clay is less than 0.002 mm in diameter. Clay particles are extremely small, and can be seen only through an electron microscope.

Clay feels sticky when wet. It easily forms into a ball and a ribbon at least 5 cm long.

Water drains very slowly through clay soil. Therefore, clay soil remains saturated after a heavy rain. When this happens, there is little air in the soil, and plant roots cannot find oxygen. Clay soils can be difficult for gardeners to plant in.

SILT

Silt is 0.002-0.05 mm in diameter. You can see silt particles only through a microscope.



Silt feels like flour. It forms into a ball that easily breaks apart. If you squeeze it between your thumb and fingers, it will not form ribbons.

SAND

Sand is the largest size rock particle in soil—0.05-2 mm in diameter. You can see sand particles without a microscope.

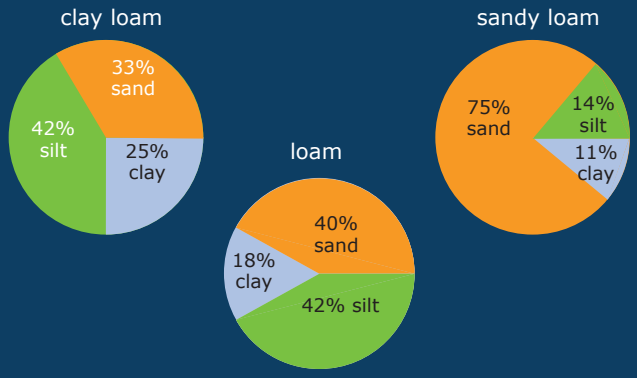
Sand feels gritty. You cannot make wet sand form a ball that holds together.

Sandy soils have lots of air spaces between particles, so water drains quickly through these soils. Because they do not hold water and nutrients very well, you must water and fertilize sandy soils frequently.

LOAM

Loam is a mixture of sand, silt, and clay particles. It is ideal for gardeners. Usually loam is easy to dig, and is neither too dry nor too wet during the growing season.

Composition of different types of loam soils



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TOMATOES Science Page

DID YOU KNOW?

Spanish explorers brought tomato seeds to Europe in the early 1500's. At that time, most Europeans thought tomatoes were toxic, and would not even taste them. Italians were the first Europeans to use tomatoes as a key ingredient in their cooking.

ORIGINS

Tomatoes are native to the Andes Mountains in South America.

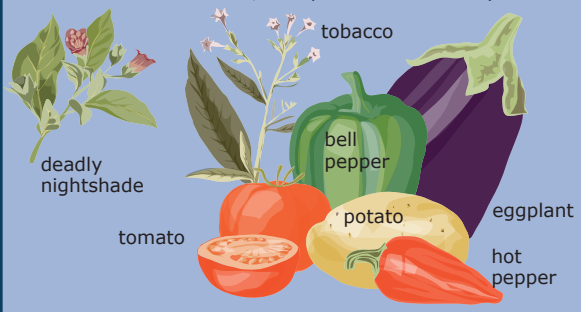
By the time the Spanish arrived in Mexico, the native Mexicans were growing and eating tomatoes. The name "tomato" comes from the Mexican word "tomatl."

CLASSIFYING TOMATOES

FAMILY

Solanaceae
(Nightshade family)

There are about 3,000 species in this family.



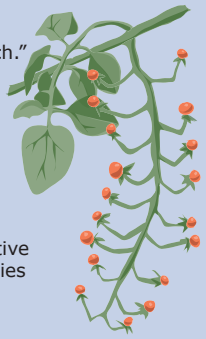
This family includes many poisonous species, such as deadly nightshade, as well as many edible species.

GENUS

Lycopersicon

In Greek this means "wolf peach."

Scientists gave tomatoes this genus name at the time when most people thought they were poisonous.



This wild tomato relative is one of several species in this genus found in Ecuador and Peru.

SPECIES

esculentum

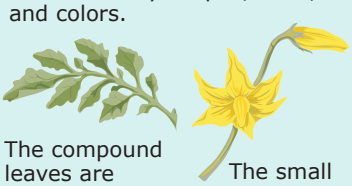
means "something that can be eaten."

Scientists gave tomatoes this species name after people realized that they were not poisonous.

THE TOMATO PLANT

There are more varieties of tomatoes than of any other vegetable.

Some varieties are bushy, with fruit produced at the tips of branches. Other varieties are more like vines. The fruits come in many shapes, sizes, and colors.

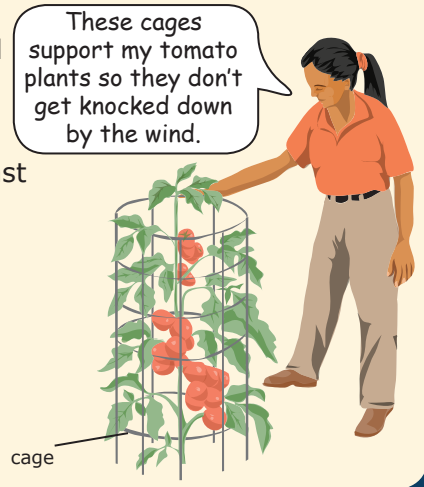


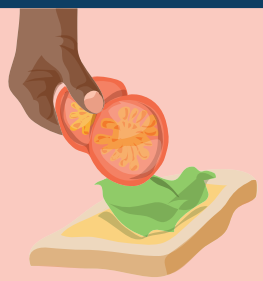
The compound leaves are divided into a number of leaflets.

The small flowers are yellow.

GROWING AND HARVESTING TOMATOES

Tomatoes thrive in full sun in well drained, fertile soil. Set out transplants one week after the last frost date. Most varieties need to be supported by stakes or cages. Keep well watered. Once fruits begin to ripen, pick them daily.

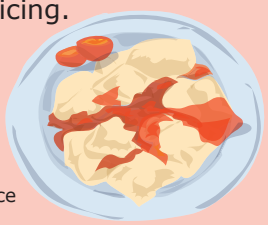




tomato slices

USES

Most tomato varieties can be used for both fresh eating and cooking. However, Italian paste tomatoes are best for cooking into sauces. Large beefsteaks are good for slicing.



ravioli with tomato sauce

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TOMATES O JITOMATES — Página de ciencias

A ENTERARSE

Los exploradores españoles llevaron semillas de tomate o jitomate a Europa a principios de siglo XVI. Allá la gente creía que el tomate era venenoso y no lo comían hasta que los italianos lo hicieron ingrediente importante en su cocina.

ORÍGENES

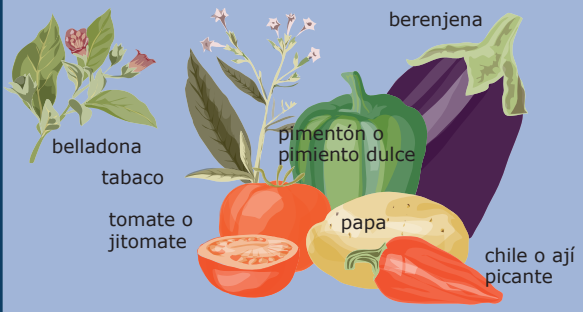
El tomate es originario de los países andinos en Suramérica.

A la llegada de los españoles a México, ya los pobladores lo cultivaban y lo comían. El nombre se deriva de la palabra náhuatl, lengua hablada en México, "tomatl".

CLASIFICACIÓN DEL TOMATE

FAMILIA

Solanaceae
(Familia solano)
Existen unas 3,000 especies en esta familia.

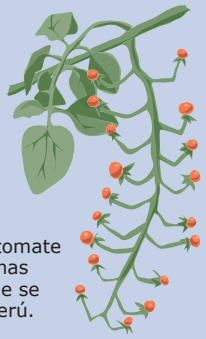


Incluye numerosas especies venenosas, tales como belladona, así como muchas especies comestibles.

GÉNERO

Lycopersicon
En griego, significa "durazno o melocotón de lobo".

Los científicos le pusieron este nombre al género porque en ese tiempo casi todos creían que el tomate era venenoso.



Este pariente silvestre del tomate pertenece a una de la muchas especies de este género que se encuentran en Ecuador y Perú.

ESPECIE

esculentum
significa "que se puede comer".

Los científicos le pusieron este nombre a la especie cuando se dieron cuenta que no era venenosa.

LA TOMATERA

Existen más variedades de tomates que de ninguna otra hortaliza.

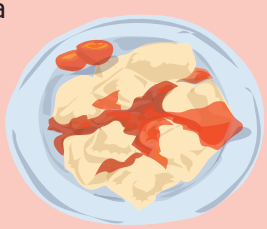
Ciertas variedades son tupidas, con frutos en la punta de las ramas. Otras son más parecidas a parras. Las frutas son de formas, tamaños y colores distintos.

CULTIVO Y COSECHA DEL TOMATE

Los tomates se dan muy bien a pleno sol en suelo fértil bien drenado. Los trasplantes se hacen una semana después de la última fecha de helada. Casi todas las variedades necesitan soporte de estaca o enalambrado. Hay que mantenerlos regados. Cuando los tomates empiezan a madurar hay que recogerlos todos los días.

USOS

Casi todas las variedades de tomate o jitomate se pueden comer frescas o cocidas. Pero las italianas que se emplean para pastas son las mejores para salsas de cocina. Los tomates "bistec" son buenos para comer en rodajas.



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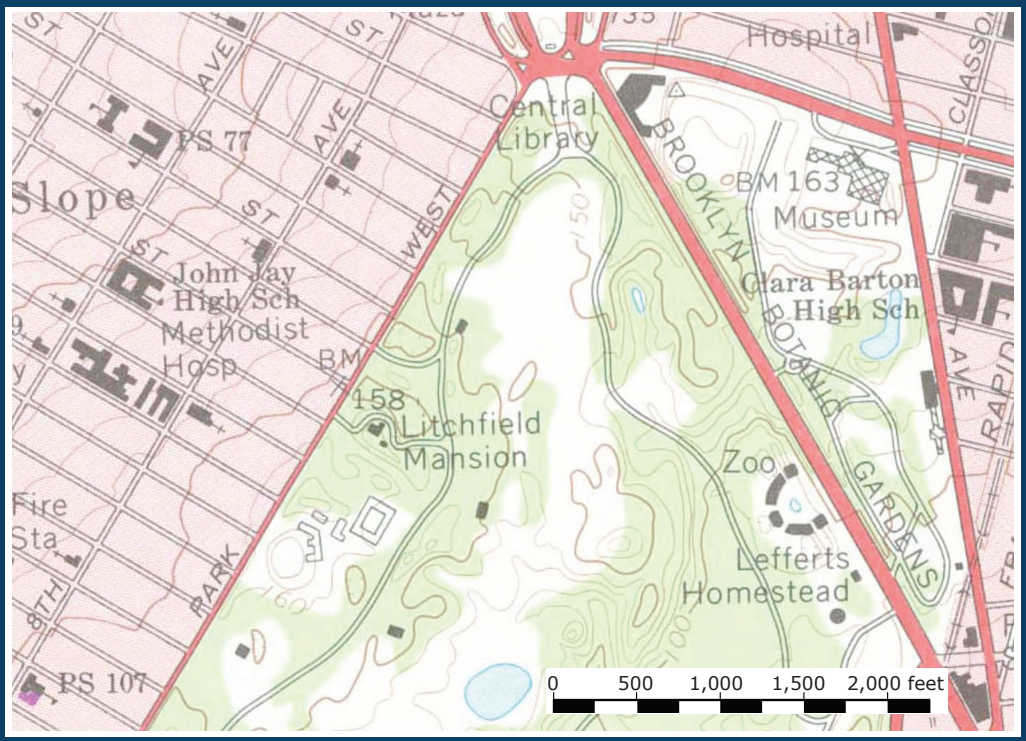
TOPOGRAPHIC MAPS Science Page

WHAT IS A TOPOGRAPHIC MAP?

A topographic map is a very accurate and detailed map of a region. It includes natural features, such as rivers, lakes, valleys, and hills, and human-made features, such as roads, bridges, and buildings.

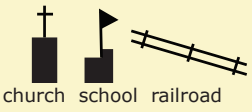


Here is a topographic map of Prospect Park, Brooklyn, New York City.

COLORS AND SYMBOLS

To read a topographic map, you need to know what the colors and symbols represent. Vegetation, such as grass and trees, is green. Water, including lakes and rivers, is blue. Contour lines are brown. Towns and cities are pink or gray. Symbols are used to represent features, such as churches and schools. The meanings of symbols are explained in a key, which is sometimes called a legend.

Here are some symbols used on the map above:

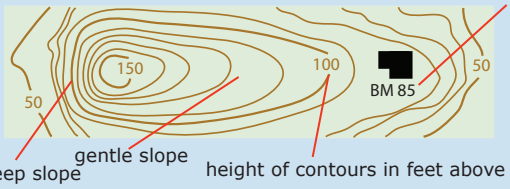


Can you find these symbols?

CONTOURS

Topographic maps show the shape or relief of land—where it goes up and down, as in hills or valleys. Contour lines join up places that are the same height—or elevation—above sea level.

The diagram below shows contour lines at every 10-foot change in elevation. Where spacing between contour lines is close, it means the land is steep. Where spacing is wide, the slope is gentle.



The letters BM followed by a number stands for benchmark. A benchmark on a building or post shows its exact height in feet above sea level.

On the topographic map of Prospect Park, there is a contour line at every 10-foot change in elevation. Numbers along the lines show actual elevation (for example, 150, 100).

SCALE

The scale of a map indicates how much actual features are shrunk or scaled down. The scale may be shown as a ratio such as 1:12,000. This means 1 unit of length on the map equals 12,000 units of distance on the ground. The scale may also be written in words or shown as a line:

1 inch represents 1,000 feet.

The scale of the map above is 1:12,000. One inch on themap equals 12,000 inches, or 1,000 feet, on the ground. Or 1 cm on the map equals 12,000 cm, or 120 m on the ground.

USING MAPS

Many different people use topographic maps.

Scientists use topographic maps to study the environment. City planners use the maps to help locate suitable places for buildings, roads, or parks. Aircraft pilots need topographic information for flight planning and navigation. Topographic maps are also used by hikers.

Using the scale and contour lines on a map, you can not only measure how far you have to travel to get from one place to another, but also how far up and down hill you have to go to get there.

GARDEN MOSAICS (www.gardenmosaics.org)

Garden Mosaics is funded by the National Science Foundation Informal Science Education program, and by the College of Agriculture and Life Sciences at Cornell University.

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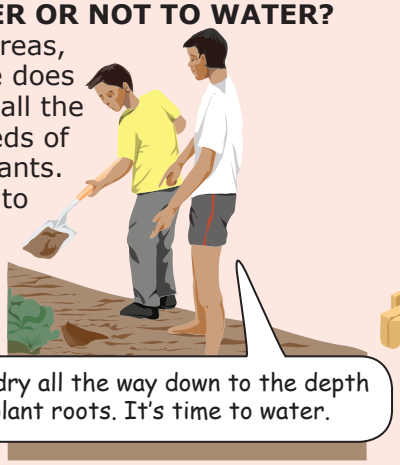
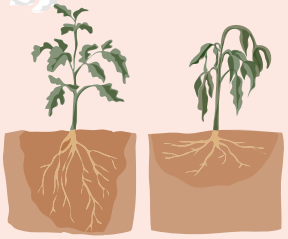
WATERING GARDEN PLANTS Science Page

TO WATER OR NOT TO WATER?

In most areas, rain alone does not meet all the water needs of garden plants. You need to water the garden.



You need to add enough water so that it seeps all the way down to the plant roots. If you just water the soil surface, the roots will grow close to the surface and then the plants will wilt more quickly.

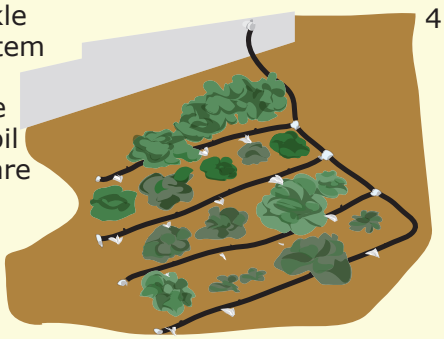


WATERING METHODS

1. A watering can and hose are useful for small gardens.

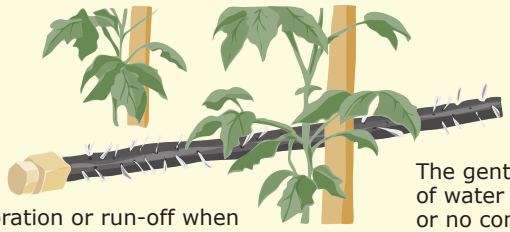
2. Sprinklers are cheap and convenient, but they waste a lot of water to evaporation, especially on hot, windy days.

3. A drip or trickle irrigation system applies water directly to the area in the soil where roots are growing.



Many farmers in hot, dry places use drip or trickle irrigation.

4. A soaker hose is a plastic or canvas hose with holes all along its length. It is placed along one side of plants or underneath mulch. Water seeps out slowly.



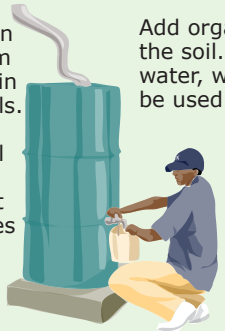
The gentle stream of water causes little or no compaction of the soil.

Little water is lost to evaporation or run-off when you use the drip or soaker hose methods because the water goes into the ground near the plant.

SAVING WATER IN THE GARDEN

Make the most of available water in the garden.

Collect rain water from roof-tops in rain barrels. Keep the rain barrel covered to prevent mosquitoes from breeding.



Add organic matter to the soil. It holds the water, which then can be used by plants.

Water during early morning. At this time temperatures are cooler and it is less windy, so there is less evaporation.

Cover the soil with mulch, which smothers weeds and allows water to seep slowly into the soil. A mulch cover also reduces evaporation of water from the soil.

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