

Rubber Gardens

Developers:

Mary Ann Hepner
William B. Hanna Elementary School
School District of Philadelphia
Philadelphia, PA

Scott Killam
Research Scientist
Rohm and Haas Company
Spring House, PA

Carol Yvonne Roberts
Elementary Science Helping Teacher
Camden City Public Schools
Camden, NJ

Grade Levels:

K – 8 (Can be adapted for secondary grades 9 –12)

Disciplines:

Life Science, Ecology (Environmental Science)

Goal:

To recycle discarded automobile tires and create gardening sites for limited space areas.

General Introduction:

Planet earth has become a depository for an abundant entity that will be here for generations to come, i.e., rubber tires. Industry can recycle some of the tires into new products. However, this only accounts for a small percentage of discarded tires. Municipalities and townships often charge a fee to remove old tires or refuse to take them with regular trash collections. Landfills do not want them. Those that are stacked in open field “tire depositories” are prone to vandal-set fires. Many are dropped in waterways, open fields, roadsides, and vacant lots. Planting in tires is one way to remove them from the trash heaps and turn them into green habitats in urban areas where there is limited greenery or on land that contains polluted soil. The construction of a garden is an activity that could involve students, parents, and local community people in a project that would benefit and educate all concerned.

Specific Objective:

Adults and children will work together to design and construct an indoor - outdoor gardening area using recycled materials.

Science Processes:

Observing, classifying, communicating, inferring, predicting, measuring, recording, drawing conclusions, experimenting, constructing models.

Math Skills:

Measuring (metric and standard), topology, geometry, counting, charts and graphs

Language Skills:

Drawing conclusions, inferring, speaking, writing, researching, sequencing, vocabulary development

Art:

Design, color patterns, texture, shape

Social Studies:

Geography, local and state recycling regulations, community planning

Flower and Vegetable Gardens

Materials:

1. Discarded tires – may be obtained from service stations, tire stores, vacant lots, roadsides, garages, farms, truck stops.
2. Soil – many localities run their own park recycling centers and have soil and mulch available for pick up. Farms and construction sites may also provide soil.
3. Construction Equipment: buckets and/or wheelbarrow, shovels, water, rake, broom, trowels, plastic sheets (4 mil) or rubber 4 liner, rocks, pebbles.

Procedure:

4. Seeds or mature plant specimens.
5. Optional materials: bird house, weather vane, rain gauge, outdoor thermometer, bird bath, scarecrow
1. Select a site with a firm base. Line the tire placement area with plastic (optional) if you do not want it stained by the soil.
2. Collect tires. Use standard sized tires on each layer, e.g. 6 size 13's, 6 size 14's, 6 size 15's. If you want to paint the tires, use a good quality exterior latex paint.
3. Design an arrangement that best suits your site. (against a wall, free-standing, cornered)
4. Fill the bottom layer of tires with soil. Firmly pack the soil into the interior of the sidewalls then fill the center of the tire. At this time, mix in compost.
5. Smooth and level the soil over the base with a rake and tamp down.
6. Proceed to the next level of tires until each layer is finished.
(Repeat steps 4 and 5.)
7. Add plants, seeds, water, mulch and any decorative touches if desired.
(Rocks, edgings)
8. Trellises can be constructed from odd pieces of light weight wood.
9. Small fences can be made from used plastic forks and knives and plastic supports in new shoes.
10. Label plants with both botanical names and common names.
11. Recycle plastic flower pots. Sterilize first with a mild chlorine bleach solution. (5% bleach to 95% water, e.g., in a 500-mL beaker, mix 25 mL bleach and 475 mL of water) to eliminate any possible contamination of previously diseased soil.

Plants For Flower and Vegetable Gardens:

Perennial Ground Covers

Botanical Name	Common Name	Specifications
1. <i>Juniperus</i>	Blue Rug Juniper	(Sun or partial shade)
2. <i>Vinca minor</i>	Periwinkle or Trailing Myrtle	(Shaded area)
3. <i>Sedum spurium</i>	Dragon's Blood	(Sun or partial shade)
4. <i>Potentilla</i>	(Several varieties)	(Sun)
*Note: May be used as a ground cover or a shrub		
5. <i>Hosta or Funkia</i>	Plantain or Shade Lily	(Partial shade)

Perennial Shrubs

1. Roses		Plant two tires deep
2. <i>Hibiscus moscheutos hybrid</i>		(Sun)
3. Blackberry or Raspberry		(Sun)

Common Annuals:

1. Marigolds
2. Begonias
3. Celosia
4. Impatiens

Indoor Plants For Outdoor Summer Growing

1. <i>Coffee arabica</i>	Coffee tree	(Partial shade)
2. <i>Mimosa pudica</i>	Sensitive plant	(Partial shade)
3. <i>Citrus plants</i>	Dwarf varieties	(Sun)

Water Gardens

Materials:

4 mil. or heavier plastic sheeting for liner, staple gun, staples, netting with 1/2 inch square openings (type used to cover fruit trees- optional)

Background:

In a pond, plants absorb carbon dioxide (CO₂) and produce oxygen (O₂). Fish absorb oxygen and produce carbon dioxide.

They also control insects that could be detrimental to plants and control mosquito larvae. Scavengers, i.e., tadpoles and water snails consume algae, uneaten fish food, and organic matter.

Try to place the "pond" away from a tree, as many leaves are toxic to fish. Plants and the tire rim will provide shade for the fish. (Some leaves, such as oak leaves, are poisonous to fish.)

A well-balanced "water garden" is self-maintaining. If an electrical outlet is available, a small pump and filter can be used to ensure further cleaning of the water. Additional water will have to be added to the "pond" if there is insufficient rainfall.

A greening of the water is caused by algae growth and is a normal stage a pond goes through. It is usually self-correcting over a period of a few weeks. If the green water proves bothersome, enzymes or an algaecide can be added.

Water Garden or Pond Construction

Procedure:

1. Use two large tractor tires plus one smaller tire as the base, This will provide a depth that is required for maintaining fish and water lilies outdoors year round. One large tire will suffice, but fish will have to be removed prior to the onset of cold weather.
2. Partially fill the bottom tire with soil. This will add weight to the tire and provide a cushion for the liner. Position the other tires.
3. Line the tires with 4 mil. plastic sheeting. (black preferred) Cut at least twice the size of the tire structure. Fit liner into the interior sidewalls and smooth the bottom.
4. Fill the tire with water and staple liner to the outside of the sidewall and trim the excess plastic. (Note: Do not staple or trim liner until structure has been filled with water. Let the water stand for a few days to dechlorinate the water. A 28 inch diameter tractor tire holds 40 gallons of water.
5. If the tires were not painted, the pond tire(s) can be covered with indoor-outdoor carpeting which can be stapled through the liner into the sidewall. Use a square of carpeting 2 square feet larger than the diameter of the tire plus the width of the sides to be covered.
6. Fold up and staple the outside edge of the carpeting around tire opening. This provides a lip to anchor small stones that can be placed around the tire edge for a decorative effect.
7. Add bog plants, water lily, and oxygenating plants. Pot plants in heavy soil in plastic pots and weight down with stones before adding to the water. It is not necessary to dechlorinate the water before adding the plants. Bog plants can be placed in 4 inches to 6 inches of water. To achieve the proper depth, place them

on overturned pots, bricks or cement blocks. Water lilies must have 18 inches to 23 inches of water in order to grow. Anchor oxygenating plants with pebbles in small plastic pots or cups. Hardy plants may be kept outdoors all winter.

8. Add common goldfish. (Comets, Shubunkin, American fantail) Avoid the slow-swimming, fancy-tailed tropical goldfish, as they will not usually survive the stress of outdoor living. To acclimate goldfish into the water garden, float the plastic bag containing the fish for 20 minutes. Open the bag and float for another 20 minutes while gradually adding the pond water into the water in the bag. After which, release the fish. Add scavengers at this time also. Goldfish will survive the winter with a little care. Stop all feeding when the air temperature is 55° or below. The fish will then become dormant. When the surface area freezes, a hole should be made in the ice to allow the accumulated gases to escape. Chopping the ice is detrimental to the fishes' nervous system. Instead, place a coffee can on the ice and fill with hot water. A hole will soon appear in the ice.

* Formula for determining the number of fish the "pond" will hold: 6 inches (15 cm) of fish for every square foot (929 sq. cm.) of surface water area. (Lotus Water Garden Manual)

9. In outside tires, plant perennial bog plants, ground covers and annuals.
10. Label plants with both botanical and common names.
11. If there is a possibility that predators may enter the "pond", cover the water area of the pond with netting

Tires As Indoor Planters

Tires can be used as indoor planters if they are placed on heavy plastic or lined with plastic to prevent water and dirt seepage. Grow lights can be placed over the tire structure to extend light during winter months. Seeds can be started indoors and then transplanted to the outdoor garden. If tires are to be filled with water to simulate a pond indoors, remember a gallon of water weighs 8.5 lbs. (pounds).

Background:

Extended Activities:

1. Start seeds indoors in containers in late winter and transplant seedlings into outdoor gardens in spring.
2. Design a construction for a rubber garden using white Life Savers (peppermint, spearmint, wintergreen) as "tires" and powdered Kool-Aid as "soil".
Note: How soil flows among the circular areas and how circles fit into triangular and rectangular areas.
3. Compare and contrast between soil and similar substance.(Edible Dirt) Record Observations

Materials:

Recipe: Edible Dirt (Soil)

Large mixing bowl, food processor or rolling pin, wax paper for cookie crushing, large spoon a medium size mixing bowl, either a hand mixer, a portable electric mixer or muscle power.

Ingredients:

2 pounds (lbs) Oreo type cookies
2 boxes instant vanilla pudding
The amount of milk called for on the package
1 8 ounce (oz) package (pkg) of cream cheese
or
1 cup powdered sugar
1 stick margarine
1 16 ounce (oz) container of cool whip
*1 or more packages (pkgs) of Gummy worms
(As many as you think the mixture will require)

Procedure:

1. Cream margarine and either cream cheese or powdered sugar in the large mixing bowl.
2. Process cookies in either a food processor or place them on the wax paper and crush with the rolling pin. until they look like soil.
3. Place the crushed cookies (soil) in the large mixing bowl with the creamed mixture.
4. Mix the pudding in the medium size mixing bowl.
5. Blend the pudding into the cookie mixture.
6. Fold in the cool whip.
7. Add gummy worms for that "real" effect.

Suggestions:

- A. Dramatize with another adult. Ask teacher assistant, instructional assistant or teacher to taste the soil (edible) in the presence of the students. Be sure you place the edible soil in its container inside a bucket or pail so it appears that you are spooning out the real soil. After this, take student responses. Then allow students to taste the soil.
- B. For pre-school, kindergarten, or first graders, soil can be prepared with their assistance. Let students observe and predict and describe during each step. Compare the ground cookies with the potting soil, dirt, etc, before mixing with the other ingredients.
- C. Don't forget to collect data, (results) and draw conclusions.

Additional Materials:

Additional materials on Rubber Gardens may be obtained from Sister Helen M. Burke, Ph.D., Chemistry Department, Chestnut Hill College, Philadelphia, PA 19118; (215) 248-7194