

Extend the Season with Plant Cover-ups

For many school gardeners, the season is all too short. In much of the country, just as the danger of spring frost is over and gardens are beginning to thrive, school lets out for the year. On the other end, in most areas fall frosts limit the time students can explore their garden oasis. In warmer climates, intense heat and drought may be limiting factors during the summer months.

Unlike many individuals, gardeners are people who don't just talk about the weather; we actually *do* something about it! That's because sometimes Mother Nature's growing season isn't long enough for us, *and* we enjoy growing plants that are not naturally adapted to our climate. (One of our favorites, the tomato, is actually native to tropical regions of South America!) For centuries, in fact, gardeners have used a variety of strategies for extending the season and protecting plants from extremes of weather.

By covering plants with contraptions ranging from glass bells to movable greenhouses, gardeners are able to start plants earlier in the spring, keep them going later in the fall, and spur plant growth so vegetables mature more quickly. In warm climates different types of coverups actually provide shade and cooling necessary to keep plants thriving during hot summers.

Engaging your students in using coverups, building them from available plans or, better yet, creating their own setups, does as much for the youth as for the plants. As they muse about design solutions, they hone math and problem-solving skills. Even simple setups can be a springboard for monitoring air and soil temperatures and otherwise exploring the physics principles behind the greenhouse effect.

MATERIALS

Materials for extending the season vary depending on the setup you're building or using. The simplest coverup requires a mere plastic milk jug. Each of the descriptions below identifies materials needed for specific setups. You can also purchase some season extenders.

CREATING PLANT COVERUPS - THE BASICS

Most plant cover-ups, such as cold frames, hoop houses, row covers, hot caps, and so on, whether commercial or homemade, work on the same general principle – they trap the sun's heat, which encourages plant growth. Some cover individual plants and others cover a row or bed of plants. Depending on your climate and gardening focus, you can use them to start or harden off seedlings for transplanting, boost plant growth, hasten fruit production, or protect plants from cold temperatures, frost, and even insects.

Whichever types of setup your students create or use, it helps to know a few basics. Although most plant cover-ups are designed to trap heat, too much defeats the purpose. It is important to have some way to vent your setup to release excess heat, and to have your keen observers monitor temperatures. Even in the middle of winter, the temperature inside a cold frame can climb above 100 degrees! Ventilation also helps prevent diseases encouraged by high humidity, such as damping off of seedlings.

Different materials have different abilities to insulate and therefore protect plants from cold temperatures. A plastic milk jug placed over spring seedlings may only offer a couple of extra degrees of protection, for instance, but a cold frame with insulated sides or a double layer of glass offers a much larger boost. The more airtight your covering is, the better protection it offers on cold nights, but the more it will heat up during the day.

It's also important to remember that some crops, such as cucumbers and squash, rely on bees for pollination, so when blossoms appear, you'll want to remove your protectors so bees can access the hidden nectar rewards.

Below, we describe several approaches to extending the season by covering plants. But don't feel limited. Once students understand the basic concepts, they can invent their own setups from recycled materials.

PROTECTING SINGLE PLANTS

One of the oldest strategies for boosting plant growth and protecting them from cold is covering them individually with a type of mini-greenhouse. French gardeners in the 19th century used glass domes or bell jars, called cloches, the French word for bells. Today, commercial versions of these individual coverings are made of lighter weight materials and are easier to vent. These include umbrella- and lantern-shaped cloches, plastic “bells,” and waxed paper “hot caps.”

Rather than buying such devices, why not challenge your students to invent their own from recycled materials? Plastic gallon milk jugs with bottoms cut out can get garden seedlings off to a good start. (Removable lids or holes in the sides make great vents.) Tomato cages covered with plastic are an elegant solution for protecting larger plants. What else can your young designers come up with? As plants grow larger, be alert for heat-damage that can occur as leaves touch the sides.

COVERING GARDEN BEDS

When you want to extend the season, or urge it onward, and have wide rows or beds, you have a few general options, which are described below.

• Using Floating Row Covers

You can lay floating row covers made from lightweight spun-bonded polyester or polypropylene fabric right on top of most plants, securing the edges with rocks or boards, or burying them in soil. These covers are available in a variety of thicknesses. All let water pass through. The lightest weight covers (under 0.5 oz/sq yard) let the most light through but provide little heat retention and are used mainly to exclude insect pests during the growing season (be sure to completely seal edges at the soil to keep pests from sneaking under). Mid-weight covers (0.5 to 1.25 oz/sq yd) offer good frost protection in spring and fall while still letting a reasonable amount of light through (they also exclude pests). Covers made of the heaviest weight fabric (over 1.75 oz/sq yd) are used for nighttime frost protection, but need to be removed during the day because they let little light pass through. You can leave lightweight covers on in summer, depending on your plants' heat and pollination needs. Mid-weight covers offer good frost protection and warmth in spring and fall. While most plants will grow fine with these row covers laid directly on top of them, there are a couple of exceptions. Young tomato, pepper, eggplant, and squash plants are prone to damage when row covers flap in the wind; these do better grown in low tunnels with hoops that keep the fabric from direct contact with the plants.

• Building a Low Growing Tunnel

Perhaps a more interesting (and challenging) means of extending the season for beds and rows full of vegetables, flowers, and herbs is to create tunnels or hoop houses. This typically entails placing semi-circular hoops over garden beds and covering them with plastic sheeting or garden fabric. Hoops can be made of heavy-gauge galvanized wire or plastic or metal tubing that are inserted 6-8 inches into the soil at each end or are fastened to the frame of a raised bed. For covering, you can use solid plastic sheeting (1.5 to 3 mil thick), pre-slitted plastic row covers, or garden fabric (described above). Be aware that if you use solid plastic sheeting without ventilation holes or slits, you'll need to ventilate the tunnels during the day as the weather warms. To provide ventilation, you can pre-drill or slit aeration holes in the roll of solid plastic before unfurling it. If you're growing heat-loving crops in a cool climate, consider using a clear plastic growing tunnel over a bed mulched with black plastic, but be sure to provide ventilation during the day once temperatures reach around 45-50 degrees F. Here are instructions for creating a basic tunnel.

1. Decide the length and width of your growing tunnel. For every 2 to 3 feet of length you'll need one section of 1/2-inch PVC pipe, black polyethylene pipe, or 9-gauge galvanized wire to form a “hoop” to support your covering. The length of each section of pipe or wire will depend on the width of your beds and height of the plants you'll be covering. The height of the hoops should be at least 6 inches higher than the tallest plants you plan to grow in the tunnel. You'll also need enough row cover material for the length of your bed plus 4 to 8 feet on either end for ventilation and wide enough to cover the hoops with enough extra to secure the edges at soil level.

Bend the plastic or wire to form hoops and push them into the ground as far as possible at 2- to 3-foot intervals. (It is helpful to cut the ends at a diagonal.) If your ground is too hard, you can pound in small stakes or lengths of rebar at 2- to 3-foot intervals, and push the ends of the pipes onto them. Or create a wooden perimeter frame with dowels spaced at the same intervals and push and secure the plastic hoops over them.

2. Unroll the plastic sheeting or row cover fabric over the hoops and bury the edges in the soil or anchor them securely with rocks or earth staples (available at garden supply and hardware stores). To keep the covers from flapping in strong winds, purchase or have your students create clothespin-like clips to secure the fabric to the hoops. To close the ends, gather up the covering, cinch it together with rope or a spring clamp, and secure it to the ground.
3. Student gardeners can keep track of temperatures inside the tunnel and decide what they need to do to maintain an environment to help plants thrive. You will probably want to leave at least one end open for ventilation most of the time, but if frost or cold temperatures threaten, you might close it up at night.

Don't be limited by the types of bed coverups described here. Challenge students to invent their own means of providing shelter and extra warmth for the school garden beds.

- **Providing Shade in Hot Weather**

Hot weather can stress and stunt plants and cause cool-weather crops (like lettuce) to go to seed. Shade netting or wood lathe attached to a tunnel or frame can provide cooling shade. Rain umbrellas anchored to the ground, but raised to allow good air movement are another option for shorter plants.

BUILDING COLD FRAMES

Simply put, cold frames are mini greenhouses that are close to the ground. They are typically used to start or harden off seedlings in containers or grow cool-weather crops, such as lettuce, directly in the soil in spring, fall, and winter (depending on the region). You can also use them to root cuttings of perennial flowers or shrubs, store root crops in the winter, or chill bulbs for forcing. Here we describe basic cold frame structure, placement, and uses.

- **Basic Construction**

A standard cold frame is 3 feet deep and 4 to 6 feet wide rectangle made from hay bales (the simplest system), 1- to 2-inch lumber made from rot-resistant wood (such as cedar), concrete blocks, or lumber made of recycled plastic. The front is 10 to 12 inches high and the back is 18 inches high. (This slope is not necessary, but having a sloped lid helps catch more sunlight during cooler months.) A couple of inches usually extend below the ground level for extra insulation. It is covered by a lid made of glass, rigid plastic, plexiglass, or 3-mil plastic sheets. This top either slides off or opens up via hinges. Old window sashes and doors make great lids. In any case, you'll need to vent the cold frame by sliding the lid off propping it up, or buying thermostatically controlled arms that open the lid when temperatures reach a specified level. Be sure to attach a thermometer so your students will know when to vent the frame. There are certainly many possible variations on this theme. An internet search can supply young minds with creative ideas or step-by-step plans.

- **Location and Use**

Ideally, you like to place your cold frame with its lower side facing south in a spot that is somewhat sheltered from the wind. Consider placing it up against a wall or fence, or even using a wall as the back part of the structure. If you want to grow plants directly in soil in your grow frame, loosen the soil 4 to 8 inches deep and add compost.

One of your students' challenges will be to ensure that plants do not overheat on sunny days and that temperatures inside the frame don't drop too low on cold days or at night. In general, if the temperature goes above 75 degrees F, vent it. You'll typically want to close the lid before sundown. If cold temperatures threaten, you can cover the lid with a blanket, roofing paper, a tarp, or rigid foam sheets weighted down with rocks. Another way to hold in heat is to keep plastic milk jugs of water inside against the back (the north side). If you paint them black, they'll absorb even more heat and release it at night.

If you want to use your cold frame to store root crops, such as carrots and beets, so you can harvest them, unfrozen, into the winter months (the length of the storage season will depend on the severity of your climate), dig a hole a foot deep in the bed and line it with straw. Put in the vegetables and cover them with 12-18 inches of additional straw, then cover the frame with a tarp.

ADDITIONAL SEASON-EXTENDING STRATEGIES

- If you put mulch on your garden in the winter, pull it off early in the spring so the soil warms up and dries out more quickly. (Raised beds also dry and warm quickly, enabling you to plant earlier.)
- Use black plastic or IRT (infrared transmitting) mulch to warm the soil prior to planting in the spring. Cut holes in the plastic for planting seeds or seedlings.
- Choose plant varieties suited to your climatic extremes (e.g., broccoli suited for spring and fall or heat-tolerant spinach). Even in the cold north frost-tolerant crops such as Brussels sprouts, kale, leeks, and collards will last through hard frosts, and in some years and climates, through the entire winter.
- Store root crops, such as carrots, beets, parsnips, right in the ground. Cover a section of a bed with at least 12 inches of organic mulch (chopped leaves or straw), extending the mulch out about a foot and a half on either side of the planting. To harvest, pull off the mulch and dig them, unfrozen, into or even through the winter months, depending on your climate.
- In arid areas, consider using drip irrigation or soaker hoses to get water directly to plant roots so they can keep on keepin' on!

As you build and/or use plant coverups, students' questions should provide fertile ground for further research and investigations.