



Aligning School Garden Activities with the Academic Calendar: Basics of Low Tunnels and Season Extension

Much like a car on a sunny July afternoon, a greenhouse structure without any supplemental heat can easily run 20° F above outdoor air temperature on a clear day in January. Even when the sun isn't shining, the plastic covering can retain heat and buffer air temperature changes.

School gardens in New Hampshire face many challenges, including the region's short growing season. Planting in the spring for a fall harvest allows students to observe a number of warm-season crops, such as tomatoes and melons, but it does require work over the summer, and it will be too late in September to harvest some vegetables, such as lettuce and radishes, if they are planted in May or June.

Using inexpensive greenhouse-like structures, schools can extend the growing season enough to plant certain greens in early September for an October or November harvest, or they can plant in September for a successful harvest the next spring (Fig. 1). This document provides an overview of how season extension can be used in school gardens, and the associated publications provide step-by-step instructions for constructing season extension structures and successfully growing vegetables.



Fig. 1. A low tunnel structure protects crops from periods of cold weather. The dimensions of the tunnel can be adjusted to meet the needs of school gardens.

What are low tunnels?

In the field of horticulture, a distinction is often made between greenhouses, which are typically permanent and have supplemental fans, heating, and cooling mechanisms, and the simple plastic structures sometimes called hoop houses or high tunnels. Despite the lack of fancy equipment, simply covering a crop in one or two layers of plastic can deliver significant benefits. The capture of thermal energy might be the most important of these, and controlling the amount of water plants receive is also useful. When leaves have prolonged exposure to water, they may begin to rot, and excess soil water can damage root systems or cause fruits like tomatoes and peppers to split in rainy years.

High tunnels are typically constructed with U shaped pieces of hollow steel or aluminum, called bows, a straight piece of metal joining the bows together at the apex, called a purlin, and other structural elements depending on the dimensions of the tunnel and whether it will be covered in the winter (Fig. 2). Smaller tunnels are sometimes built on site using specialized tools for bending metal pipe.



Fig. 2. High tunnels are somewhat temporary structures that typically do not have heating or cooling systems, unlike most greenhouses.

Small hoop structures known as low tunnels can also be constructed to achieve similar effects at a fraction of the cost of their taller counterparts. High tunnels can easily cost over \$3 per square foot and require significant labor for construction, while low tunnels cost closer to \$0.75 per square foot. Instead of walking into low tunnels to monitor crops, gardeners simply remove their coverings. In the middle of winter, watering and weeding are often unnecessary because of the lower temperatures, so the access limitations are usually not too inconvenient.



Fig. 3. Ten foot lengths of electrical conduit pipe that have been bent to form hoops for a low tunnel structure. These hoops are about six feet wide and three feet high, but dimensions are flexible. Assembly can be as simple as pressing the hoops into the soil, covering then with plastic, and securing the plastic with sandbags or rocks.

Building the Structures

Low tunnel materials depend somewhat on the snow load that the structure will have to withstand. When tunnels are used to extend the growing season into October and November, wire or PVC plastic hoops buried a few inches in the soil are adequate, while in the winter, metal electrical conduit hoops or PVC hoops with rebar footings may be preferable. Material requirements are described in more detail in the associated document titled “Getting Started with Low Tunnels in the School Garden: Step by Step.”

What to Plant

The vegetables that are able to survive freezing temperatures are primarily greens and certain root crops. Spinach and kale, for example, are very cold hardy, and they can survive most winters with only minimal covering. Under some conditions, the leaves of spinach will be killed, but the root system will survive, and the plant will rebound quickly in the spring. Lettuce is slightly less hardy, and some baby lettuce greens survive better than others. Carrots and parsnips can be wintered over, but they typically need to be planted before the school year has started for them to reach full size. An accompanying document titled “Planting Common Crops for Late Fall or Spring Harvest” walks through the details of growing each crop.

Tunnels and Teaching

The curriculum page of the [New Hampshire School and Youth Garden Network website](#) aggregates an extensive collection of curriculum resources for school gardens that relate to

science, math, history, and other fields.¹ One notable link is to [New Hampshire Harvest of the Month](https://www.nhharvestofthemonth.org/), which provides recipes, multi-subject lesson plans, and other tools for teaching about and serving a different crop each month.² In many cases, the vegetables fit well with winter growing, such as the selection of carrots in April and mixed greens in May. Season extension also presents unique opportunities to make connections with the Next Generation Science Standards. At the middle school level, [MS-LS1-5](https://www.nextgenscience.org/topic-arrangement/ms-growth-development-and-reproduction-organisms) states that students who demonstrate understanding can “construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.”³ This presents a great opportunity to grow multiple varieties of a crop like spinach, and cover some plants with a low tunnel while leaving others exposed to snow. Similarly, at the third grade level, [3-LS4-3](https://www.nextgenscience.org/topic-arrangement/3-independent-relationships-in-ecosystems-environmental-impacts-organisms) states that proficient students can “construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.”⁴

¹ New Hampshire School and Youth Garden Network Webpage.

<https://www.nhschoolgardens.org/>

² New Hampshire Harvest of the Month.

<https://www.nhharvestofthemonth.org/>

³ Next Generation Science Standards. MS. Growth, Development, and Reproduction of Organisms.

<https://www.nextgenscience.org/topic-arrangement/ms-growth-development-and-reproduction-organisms>

⁴ Next Generation Science Standards. 3. Independent Relationships in Ecosystems: Environmental Impacts on Organisms.

<https://www.nextgenscience.org/topic-arrangement/3interdependent-relationships-ecosystems-environmental-impacts-organisms>