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# Greenhouses

A simple greenhouse can be used to grow greens in the winter, start warm season seedlings, propagate landscape plants, or provide shelter to frost tender plants during winter. Conversely, a more advanced greenhouse can be used to grow year-round vegetables or tender specimen plants. The costs of building a hobby greenhouse can vary from several hundred dollars to several thousand, and operating costs can also be high if year-round heating and cooling are required.

Before buying, decide on the features you want, then start compiling your information and prices. If you plan to use the greenhouse year-round, it is highly recommended to take a class and research the idea in depth. Most of Arizona (including Yavapai County) is much too hot to rely on air vents and shade cloth to keep the growing environment cool enough for summer growing.

Greenhouse styles vary widely. A bright, sunny location, electricity, and water availability are critical. Remember to consider the lower sun angle in the winter months and avoid placing a greenhouse where light will be limiting. A-frame models are inexpensive but have little usable space. Lean-tos or attached greenhouses can introduce moisture to the main structure and cause problems if not properly designed and maintained. The Quonset, gothic arch, and pitched roof are the most common designs with ample usable space.

The size of the greenhouse depends on needs and space. If you think you want to get serious about greenhouse growing, then bigger is better. Unused space may initially seem like a waste. Later, you may wonder how you did without it. 80 square feet (8' x 10') should be a minimum starting point. If you have any doubts, you may consider a design that can be expanded. In a greenhouse, you must think about growing space in all three dimensions. Vertical space use can be optimized with shelves, hanging baskets, or providing support to vining crops like tomatoes.

Each type of covering material has advantages and disadvantages. Common materials are glass, polyethylene film, fiberglass reinforced panels, and polycarbonate double layer panels. Glass is the gold standard against which all other materials are judged. It transmits light well, is attractive with a formal appearance. Disadvantages are breakability, expense, and weight (it needs a strong frame). Polyethylene film (PE) is a good choice for home-built greenhouses and hoop houses. It is inexpensive and light weight, but lasts for two or three years. Fiberglass reinforced panels (FRPs) come in many grades and may be acrylic or polycarbonate. They are also lightweight and retain heat better than glass. FRPs are often used on Quonset style greenhouses. Double-layer structured panels provide insulation but this results in decreased light transmission.

If you are considering year-round growing, you will need a cooling system such as a swamp cooler or other evaporative system (simple vents on the roof or walls are not sufficient to cool a greenhouse in our climate). A good rule of thumb for cooling is to have the capacity to completely exchange the air inside the greenhouse within one minute. Heating and heat loss should also be considered. Be especially mindful of how well the roof and upper areas are sealed. Heat rises and can escape easily if these joints are not tightly sealed. There are many excellent books with greenhouse plans as well as cooling and heating systems.

The most critical factor in greenhouse location is available sunlight. This is not usually a limiting factor, but the south side of your house or property is best. Furthermore, the long side of the greenhouse should also face south. In lower elevations of Yavapai County too much sun can be a problem. Avoid the west side where the afternoon sun will be too hot. Trees can also shade a greenhouse for part of the day. This can be good or bad depending on your desired crop. Leaves, branches, and limbs can also fall from trees.

The site should also be level and well-drained. Easy access to a driveway will make it easier to transfer supplies and plants. Of course it should be accessible to your outdoor garden, water, gas (if needed for heating), and electricity. An effective wind break will decrease the need for winter heating. Finally, consider room for expansion as your hobby grows.

Will you grow in soil, soilless organic media, or hydroponically (growing plants using nutrient solution flowing through an inert media)? Considerations here include crops to be grown, their tendency for disease problems, and expense. Crops like tomatoes and peppers are susceptible to a host of soil-borne diseases and are suited to hydroponic culture. Cacti and flowers can be easily grown in pots. Cuttings can be started in sand or a custom soil media.

Providing an optimum environment for plant growth also creates an optimum environment for insect pests. Common greenhouse pests include mealy bugs, thrips, whiteflies, spider mites, aphids, and scale. Cleanliness and sanitation will help prevent many problems, but these pests will most certainly find their way into your greenhouse over time. Most greenhouse gardeners use natural enemies rather than pesticides to keep these pests in check.

## Images



Simple hobby greenhouse with one roof vent and narrow door. These types of greenhouses can be a disappointment if the purchaser thought they could use it to grow year-round in Arizona (photo from: Greenhouse Manual: An Introductory Guide for Educators, United States Botanic Garden).



High-end greenhouse with heating, cooling, glass glazing, sturdy aluminum framework and concrete foundation. This type of greenhouse will provide a year-round growing environment, but will be much more expensive to build, operate, and maintain (photo from: Greenhouse Manual: An Introductory Guide for Educators, United States Botanic Garden).



Homemade Gothic arch greenhouse with charm and character. This design tolerates heavy snows, but will still have limitations during Arizona's summer heat. If equipped with a large evaporative cooler and exhaust vents, it could provide a summer growing environment in Arizona (photo from: Greenhouse Manual: An Introductory Guide for Educators, United States Botanic Garden).



A low-tech hoop house used for season extension during cooler weather. With a few modifications (roll-up side walls and bigger doors), it could provide summer growing space. Hoop houses are more versatile because the plastic can also be removed during the summer season (photo from: Greenhouse Manual: An Introductory Guide for Educators, United States Botanic Garden).

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