XVII - Landscaping around your SunCatcher

All construction involves disturbing the soil and vegetation in an area larger than the actual footprint of what you are building. Topsoil and whatever was growing on it was removed or buried by subsoil from trenches dug for the foundation, and soil has been compacted by the heavy equipment and foot traffic of workers. So, once the greenhouse is finished, there are several decisions to be made:

- Access to your PSG
- Run-off from roof and glazing
- Drainage around the structure
- Repairing the soil and vegetation disturbed during construction.
- Windbreaks

Accessing your PSG

Daily access to your greenhouse may be required to open and close vents, water your plants, monitor for pests and diseases, harvest or perhaps just enjoy some quiet time. Automated vent openers, fans, water timers, and remote monitoring of the interior climate can reduce the need for such daily trips. So, good access from your home is needed, but what kind? A foot path wide enough for walking, wheel barrows or garden carts? Or a wider road for vehicle access? And where else do paths need to go - garage, tool shed, other garden plots, compost pile, …? And what kind of surface - just a dirt track, or a grass, gravel, concrete tile/stone walkway, …?

Runoff from the roof and glazing

Rainwater and snow melt from the roof and glazing must be channeled away from the structure to prevent erosion and damage to the foundation. The amount of water can be substantial: One inch of rain falling on 1 square foot of impermeable surface generates 0.623 gallons of water (25.4 L/m^2). As for snow, its water content depends on the kind of snow: 1 ft (30 cm) of heavy wet snow is equivalent to 1.5 inches (37.5 L) of liquid water, whereas 1 ft light, powdery snow, equals about 1 inch (25.4 L) of water.

There are two possible options to manage the water coming off the roof and glazing: gutters at eave level or drains at ground level. If you use a gutter, you can collect the water in a rain barrel for use inside the greenhouse; metal drums will do, but their 55-gallon capacity may be insufficient in a large downpour! One or more 275 or 330-gallon pallet tanks would be a better choice. Given the size of the roof, an industrial size gutter may be a better option then standard size gutters for homes.

Without gutters on your greenhouse, you must provide adequate drainage around the structure to protect the earth on each side of the building from erosion, and from dirt splashing on the siding. A muddy area around the greenhouse is useless and unsightly, and it can damage the foundation.

For a small greenhouse, drainage is not absolutely essential and the simplest solution is to dig a trench about six inches deep and eight inches wide and fill it with gravel, which absorbs the impact of water and then allows it to drain away or evaporate. Water dripping from the eaves onto clean gravel will not cause mud splashing or erosion.

Run-off from the landscape

In addition to water from the roof and glazing, you should also consider water flowing across the landscape and from impervious surfaces (driveways, patios, …) from heavy downpours during storms, especially when build into a slope. However, even slight slopes that are not obvious to the naked eye may cause surface flows when rain comes down faster than the soil can absorb. This may be especially problematic after a long dry period on soils with a high clay content; on sandy soils, it may be less of an issue.

As you are siting the greenhouse and start work for the foundation, you may want to plan for any grading to be done at the same time to channel water away from the structure to minimize future erosion and foundation damage. This can be a swale or grassed waterway (defined by NRCS as "a constructed graded channel seeded to grass or other suitable vegetation that slows the water and conveys it to a stable outlet at a non-erosive velocity"), or a proper drainage channel (for example, a cut-in-half 12 or 14 in. HDPE dual wall culvert pipe) leading to a storm sewer, drainage ditch, dry-well, or stream. To protect the Hawk's Nest SunCatcher, two swales were dug uphill from the greenhouse to channel run-off around the greenhouse and the residence at the same time as the greenhouse site was prepared. (Figure XVII.1).

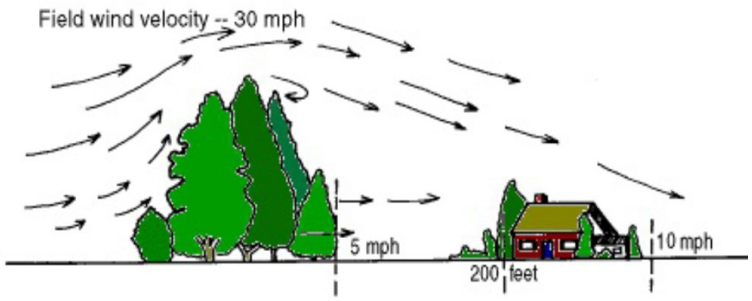


Figure XVII.1. Two slightly sloping swales following the contours protect the greenhouse and residence. An existing swale in the north east corner channels water from the road coming down the hill.

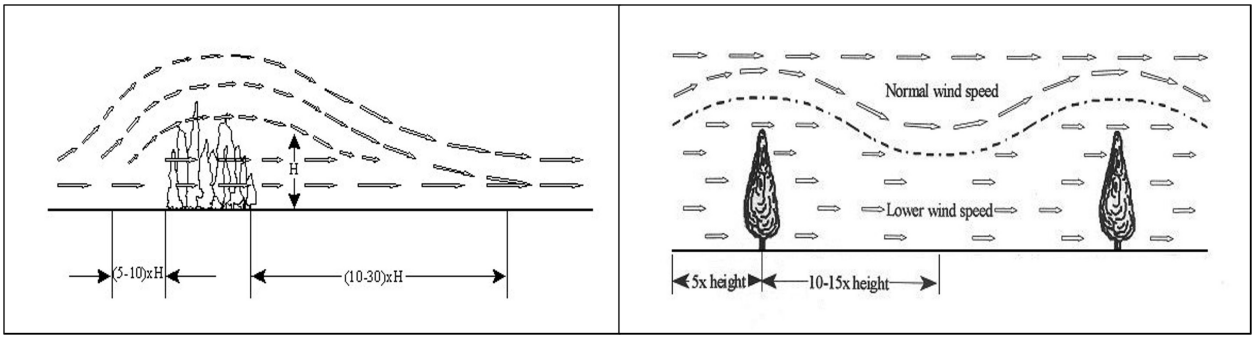
Any construction will leave bare, compacted soil around the building that limit water infiltration that creates muddy conditions. Seed the area with hardy low growing grasses after loosening the top 1-2 inches of soil and applying a good layer of compost. You can also plant perennial flowers, bulbs, berries etc, as long as they are low growing and do not shade the glazing.

Wind Breaks

Protecting a [green]house from the strongest and coldest winter winds with a windbreak may translate into a few degrees less heat loss and can save up to 25% of the energy for heating. In a greenhouse, an average gain of a few degrees can be very important. Trees provide useful windbreaks which reduce the heat loss from the greenhouse in winter, thereby cutting energy consumption. The average heat loss through a glass wall increases by as much as 50 percent when the wind blows across it. A major factor in the rate of heat loss (U value) is the speed of air moving across the glazing or walls. Thus, it is worth choosing a site for a greenhouse that, though exposed to sunlight, is sheltered from winds. Trees and hedges form the best kind of windbreak since they absorb the force of the wind in their branches. Solid walls and dense foliage tend merely to deflect the wind, causing it to gust and actually increase its force as well as causing turbulence on the lee side. A good windbreak will provide shelter over a distance of about ten times its height, before the wind picks up its previous speed again.



Windbreaks reduce wind currents as part of the air is diverted over the top of the trees and part of it filters through the trees, lowering wind speed. Farm and home windbreaks should be relatively dense to give maximum protection close to the trees.

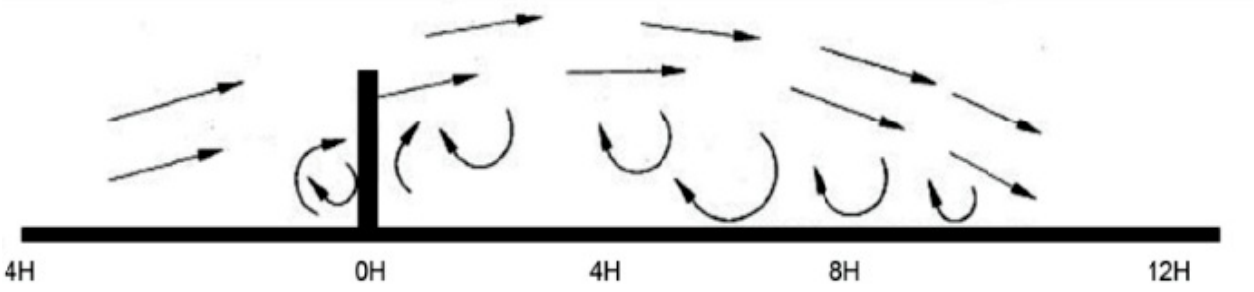


The size (width) of the area protected by a windbreak depends on the width and height of the windbreak, so it changes over its life. Multiple row windbreaks provide a protection zone 10-30x tree height, whereas single tree row windbreaks provide a protective zone 10-15x tree height, whereas.

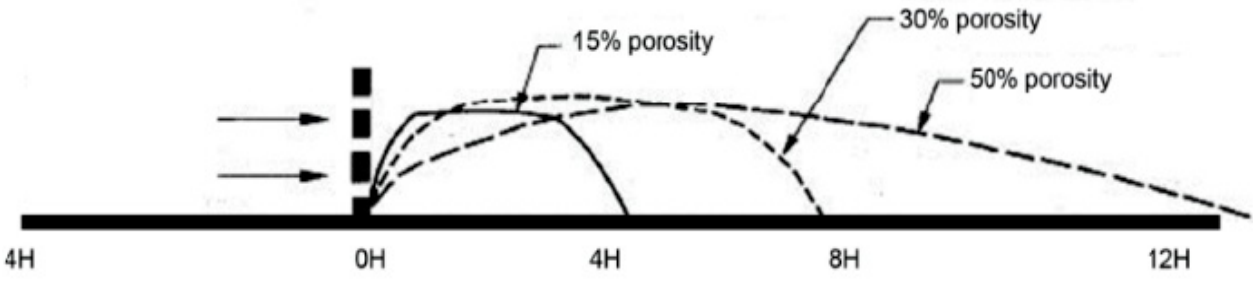
A windbreak should be planted to protect structures (house, barn, greenhouse, …) from the *prevailing* winter and early spring winds, which, in the northern hemisphere, come from the north and northwest. Given these wind directions, wind breaks should be planted on both the west and north side of your PSG in an L or boomerang shape. Their 'legs' should extend some distance beyond the NE and SW corners of your greenhouse to limit turbulence from strong wrap-around air currents hitting the structure. The windbreak should be a sufficient distance from

your home and greenhouse to prevent the possibility of trees falling on them during strong storms. A distance of 2-5 times the height of mature trees is recommended. It should be born in mind that full protection is not instant, as trees and shrubs take time to grow to reach their maximum protective function. A combination of fast and slow-growing evergreen and deciduous trees and shrubs is recommended, with shorter trees and shrubs on the outside, windward side to facilitate air movement over the top of the windbreak. Ornamental, fruit and nut-bearing species for human consumption and wildlife can be part of the windbreak.

If you do not have sufficient land or room for a living windbreak, an artificial one can be constructed as well. Solid barriers are, however, not recommended as they create turbulence in front of and behind the barrier and they may be blown over in strong winter storms. The idea is not to ***stop*** the wind, but to ***reduce*** its speed. So, if building an artificial wind break, use slat-type wooden fences (either vertical or horizontal) with 0.5-0.75 in. (1.3-1.9 cm) space between the slats as shown in the diagram below. Windbreak height and slat spacing determine the length of the area being protected from strong winds.



Solid Windbreak



Porous Windbreak

The zone of turbulence or protection from the wind depends on the distance and height from the windbreak structure. The distance between slats (% porosity) determines the length of the zone protected from the wind. Source: Panagiota Athanailidi, Ava Fatah gen. Schieck, Vlad Tenu and Angelos Chronis. Tensegrity Systems Acting as Windbreaks: Form Finding and Fast Fluid Dynamics Analysis to Address Wind Funnel Effect. Conference paper, Symposium on Simulation for Architecture and Urban Design, Tampa, FL, April 2014.



The site of the Hawk's Nest SunCatcher illustrates both ideas. The (partially) forested hill and excavated earth north and the east of the greenhouse form a natural windbreak shielding the building from prevailing winds. The earth surface behind the structure was contoured before construction even began to channel surface run-off and rainwater from the greenhouse roof around the building (Photo: Google Earth, 2 March 2025).

Further Reading

Clegg and Watkins, pp 17-20.

US Department of Energy. Energy efficient landscaping and Landscaping for windbreaks

University of Missouri Extension. Landscape Plantings for Energy Savings

Windbreak design - Maximize your landscape's potential