



Notes from the Underground

April 1

Your energy-efficient landscape

The first consideration for our new earth-sheltered home was the proper site. Unless we did this step well, all the rest would be for naught, so we looked for two years to find just the right combination of features.

We needed a southern exposure for light and solar gain with deciduous trees on the south to shade us in the summer and allow light to penetrate in the winter. Plus, we needed a hill behind us with evergreens so we could dig into it for protection from cold winter winds. And we wanted to be on a fast-flowing watercourse so we could use micro-hydro energy generation, currently the most cost-effective way of generating clean energy there is.

We finally found the site, and we have now poured footings and placed the first two courses of insulated concrete forms (ICF), which is Lego® for big boys. The forms snap together and are then filled with concrete, producing walls that are strong, insulated, and soundproof.



You can see in the somewhat-distorted panoramic photo how the house is dug into the hill behind. When the walls and ceiling are in place, the piles of earth in the background will be backfilled around and over the house.

Site planning is the first, essential step in building a new house but there are many improvements you can make in the landscaping of you existing house to make it more sustainable.

You may compost, recycle, and walk everywhere you can. Now, these are all good to do, but are not nearly enough to offset the environmental footprint of your house. According to Worldwatch Institute, buildings worldwide account for:

- 40% of world's energy consumption
- 33% of CO₂ emissions (fossil fuels)
- 40% of SO₂ emissions (fossil fuels)
- 50% of chlorofluorocarbon (CFC) production (refrigerants, plastics, and furniture)
- 25% of virgin wood harvesting
- 16% of fresh water consumption
- 40% of landfill volume (construction waste)

The first consideration is energy use. You can't really do much about the embedded energy of materials in your home, but landscaping can be designed for the purpose of conserving energy. Here are some ideas you may want to try.

Plant shrubs and trees, the right kind in the right place. Generally, you want deciduous trees on the south for shade in the summer and to let sunlight penetrate in the winter. Evergreens on the north side protect you from the cold north winds without sacrificing any sunshine.

These trees in this configuration will reduce your heating costs in the winter and your cooling costs in the summer. Trees also provide windbreaks that will reduce energy costs and provide a more comfortable yard. Windbreaks planted on the north and west sides of a building can reduce heating costs by up to 30 per cent, and a windbreak will reduce wind speed for a distance of as much as 10 times the windbreak's height. Windbreaks also help to reduce drifting snow and soil erosion on exposed sites.

The reduction in wind velocity behind a windbreak leads to a change in the microclimate within the protected zone. Temperature and humidity levels usually increase, decreasing evaporation and plant water loss. Actual temperature modifications for a given windbreak depend on windbreak height, density, orientation, and time of day. Daily air temperatures on the leeward side within 10 times the height of a windbreak are generally several degrees higher than temperatures in the open. Taking advantage of these warmer temperatures may allow earlier planting and germination in areas like ours with short growing seasons. Also, in the area next to an east-west windbreak soil temperatures are significantly higher on the south side due to heat reflected by the windbreak.

Close enough on the south side to benefit from the windbreak and far enough to be beyond the tree roots is the perfect place for your garden.

Multi-row windbreaks upwind and perpendicular to the prevailing wind are best, but even a single row of trees and shrubs can help. The windward row is what the wind hits first and should be made up of dense, fast growing trees and shrubs that prevent snow from piling up in the centre. This also helps to prevent moisture accumulation in the spring in areas where snow is trapped and is not melted by the sun. The middle row should be made up of tall, fast-growing trees and shrubs that force winds to rise up over the windbreak. Finally, the leeward row should be made up of dense-growing trees and shrubs.

Smaller hedgerows and living fences can be used for shading sidewalks and buildings. They help reduce the heat that is reflected off asphalt surfaces and, because cool air settles near the ground, air temperatures directly under trees can be as much as 6° C cooler than air temperatures above asphalt.

Select fast growing tree species (maple, ash, cedar, serviceberry and chokecherry) and dense shrub species (buffaloberry, dogwood and viburnums). Include spring flowering shrubs and wildflowers; trees and shrubs with coloured berries; trees, shrubs, and vines with fall colour; deciduous shrubs with coloured bark for winter interest; and shrubs that have seed pods throughout the winter for seasonal interest. Use vines (Virginia creeper, American bittersweet, wild grape, virgin's bower and honeysuckle) and perennials that will climb along a fence, trellis or wall. Use native roses and dense shrubs spaced in double rows to create nesting habitat for birds.

There is much more you can do with your home and yard such as overhangs, green roofs, xeriscaping, and reducing heat islands. We'll cover some more next time.

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