

LANDSCAPE DESIGN

This fact sheet outlines how landscape design can be integrated with housing design to modify summer and winter temperatures, improve comfort and save energy.

How landscape design can help save energy

Landscaping is an easy and inexpensive way to improve the energy efficiency of the building, enhance the appearance and value of a property, and provide screening for privacy.

Selected types of plants can be strategically positioned to protect the building from the harsh extremes of summer sun and chilling winter winds, improve comfort both inside and outside the home, and reduce the need for supplementary heating and cooling.

Deciduous trees and vines can be 'designed' to shade exposed indoor and outdoor living areas in summer while still allowing the sun through in winter. Low shrubs and ground cover around the home can reduce reflected heat and glare. Dense trees and shrubs can be positioned to deflect strong winds and channel cooling summer breezes.

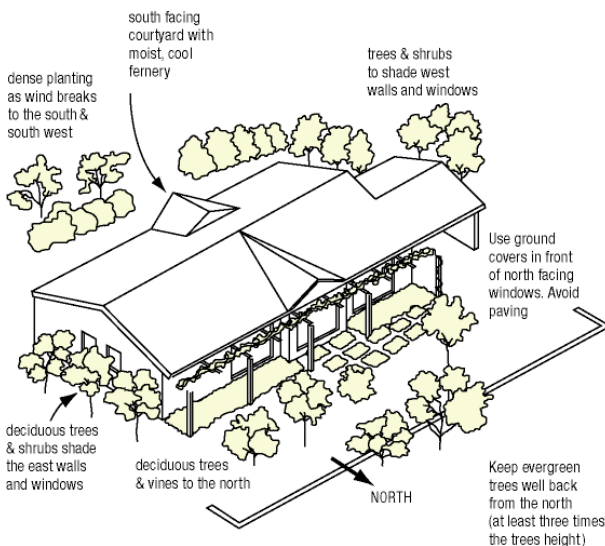


Figure 10.1: Effective landscaping can enhance energy efficiency

The landscaping of a site can be designed to modify temperatures in and around the home. Shade from trees to roofs and/or windows can reduce indoor temperatures by 6–12°C in summer. Conversely, ensuring winter sun penetration through windows can save a substantial amount of heating energy. External temperatures can be reduced up to 6°C by using ground cover or lawn instead of paving. These temperature differentials improve both comfort and the energy efficiency of the home so that heating and cooling requirements are reduced. The principles of landscape design for energy efficiency are illustrated in figure 10.1.

Integrating landscape with the building design

Too often the landscape is not considered until after a building is completed. Landscape design ideally is part of the wider design process, allowing interaction between the building orientation, building design, site conditions, and proposed landscape development. This presents the best opportunity for maximising the landscape benefits to the home and its occupants.

Once the desired performance characteristics of the proposed landscape have been identified, a local horticulturalist or nursery may be consulted about suitable plant species which meet the requirements, i.e. tall and deciduous trees, low and dense bushes, ground cover, etc. (see figures 10.1–10.7 for a guide to plant selection).

Site and microclimate analysis

While there are broad climate zones throughout the country, each site will have its own microclimate and conditions that will influence the house design and landscape development. A site and microclimate analysis provides information to assist the designer to decide on the best placement of the building on the site, and to identify what types of landscape protection are

needed. The analysis need not be more complex than an annotated diagram. The analysis should consider:

- > site size, topography, slope, soil and drainage;
- > prevailing seasonal winds, temperature and humidity;
- > relationship to sun and shade patterns in summer and winter;
- > existing vegetation and any special features;
- > location of other buildings and fences;
- > location of vehicular and pedestrian access;
- > views;
- > any legal setbacks and building restrictions; and
- > adjacent site conditions.

Design response

Concept plans for the site can be developed working with the design brief and site analysis. The site analysis will help to determine the best location for plants and the best contribution they can make. For example, should a windbreak be used to give protection from unpleasant winds and where should it be located? Are there large areas of glass to be protected from glare? Are there large areas of paving that have to be shaded? The brief may have identified the need for a paved courtyard beside the building. The site analysis might have concluded that unpleasant winter winds blow across the courtyard from the south-west, and that reflected glare may be expected from the north-west during summer. The concept plans may indicate the location of a windbreak for winter wind protection and shade trees for glare control. The detailed plan would give the precise configuration of the planting barrier.

Sun control

Modifying summer temperatures is a high priority in most climate zones. Windows facing north, east and west, will need protection from the hot summer

sun. Landscaping can provide most of this protection economically and attractively. For example, a tree shading a window can reduce a room's temperature by up to 12°C.

Summer shading

The selection of suitable plants for shading depends on the part of the building (e.g. walls, outdoor living areas, windows) to be shaded. Different types of plants (trees, shrubs, vines) can be selected on the basis of their growth habit (tall, low, dense, light permeable) to provide the desired degree of shading for various window orientations and situations. Points to note include the following.

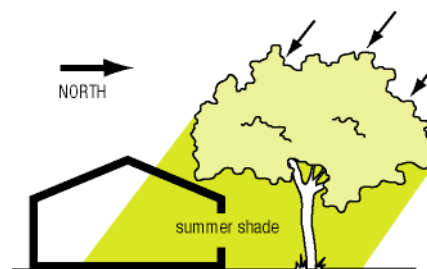


Figure 10.2: Deciduous trees on the north side provide summer shade

- > Deciduous trees and shrubs provide summer shade yet allow winter access (see figure 10.2).
- > Trees with heavy foliage such as planes and elms are very effective in obstructing the sun's rays and casting a dense shadow. Dense shade is cooler than filtered sunlight.
- > Trees with light foliage, such as most eucalypts, honey locust and birch, filter the sunlight and produce a dappled shade.
- > High branching canopy trees can be used to shade the roof, walls and windows.
- > Horizontal shading is best for north-facing windows, e.g. deciduous vines such as ornamental grape or wisteria grown over a pergola (see figure 10.3).
- > Vertical shading is best for east and west walls and windows in summer, to protect from intense sun at low angles, e.g. screening by dense

shrubs, trees, deciduous vines supported on a frame, shrubs used in combination with trees (see figure 10.4).

- > Shading and insulation for walls can be provided by plants that adhere to the wall, such as English ivy, or by plants supported by the wall, such as jasmine (see figure 10.5).

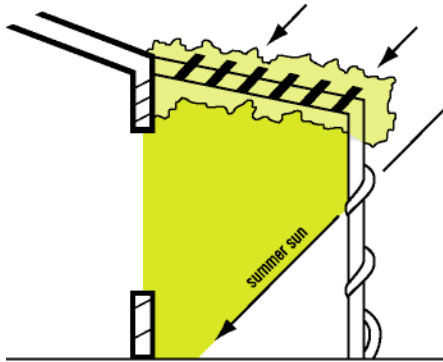


Figure 10.3: Use climbers on pergolas to shade walls and paving

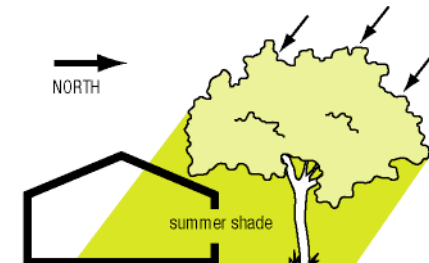
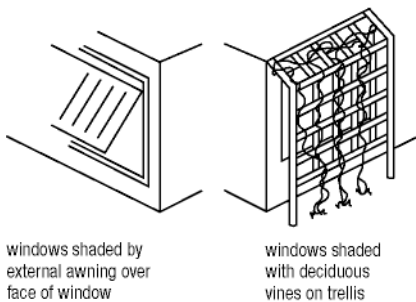


Figure 10.4: Provide summer shade to east and west aspects



windows shaded by external awning over face of window

windows shaded with deciduous vines on trellis

Figure 10.5: Awnings or deciduous vines on a trellis can shade windows

Winter sun penetration

Shading the building from direct sun is essential for summer comfort, but care should be taken that winter solar gain to windows and outdoor living areas is not excluded. To protect solar access in winter, note the following points.

- > Use deciduous trees and plants, particularly to the north of the building, to allow the access of winter sun to north windows (see figure 10.6).
- > Tall, low-branching evergreen trees should be kept at sufficient distance from north-facing windows to avoid overshadowing in winter (refer to *Siting and solar access* fact sheet).
- > Where evergreen trees are used for shading the home, they should have branches high enough to permit the entry of as much sunlight as possible in winter.

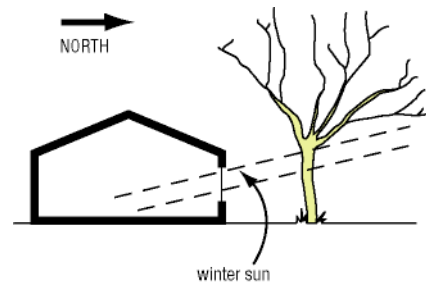


Figure 10.6: Deciduous trees on the north side allow winter sun entry

Reducing glare and ground temperature

Glare is produced when strong sunshine is reflected from a surface such as light-coloured paving, walls, from water or a shiny object. Lawns, ground cover and low-growing shrubs absorb more sunlight and re-radiate less heat than a paved surface. Ground cover planting not only reduces glare but can lower the temperature near the ground by approximately 6°C. In summer, an asphalt surface can be twice as hot as grass. By increasing the proportion of non-paved areas, there is the added environmental benefit of increased stormwater absorption.

To reduce glare:

- > use low-growing shrubs, ground cover or grass to absorb reflected glare (see figure 10.7);
- > avoid large areas of paving near the home to reduce reflected glare and ground temperature, especially north-facing windows; and
- > shade large areas of paving with trees or pergolas and planting (see figure 10.8).

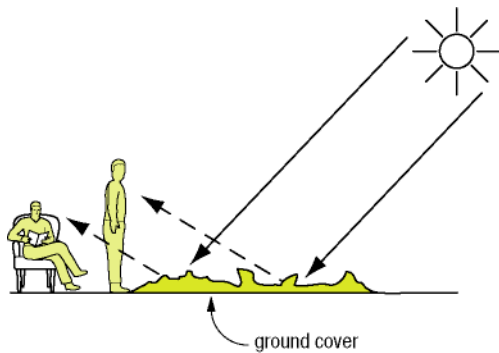


Figure 10.7: Low shrubs and ground covers can be used to reduce glare

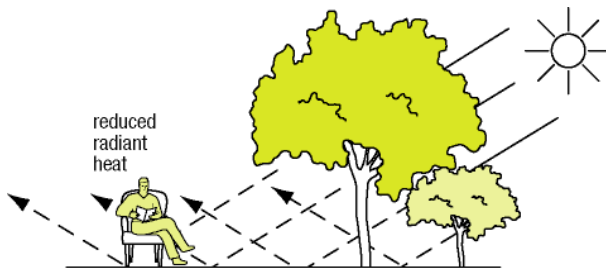


Figure 10.8: Glare control by interception

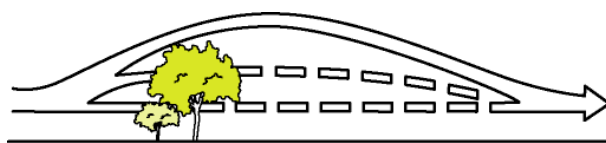


Figure 10.9: Permeable barrier reduces wind speed without turbulence

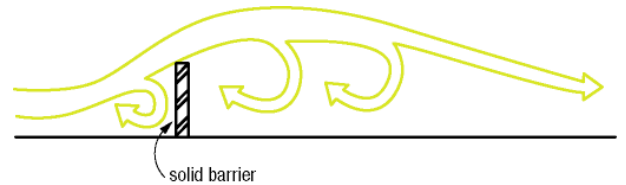


Figure 10.10: Non-permeable barrier creates turbulence

Wind control

Trees and shrubs can be selected and positioned to moderate the chilling effects of penetrating winter winds, particularly on large or exposed sites, and can also assist in capturing cooling summer breezes. In general, planting trees and shrubs as windbreaks, windscreens and breezeways may control airflow over, around and through buildings.

Blocking cold winds

- > Windbreaks are most effective when located at 90° to the direction of the wind.
- > A vertical, somewhat permeable windbreak with 50–60% density is generally more effective than a solid one, such as a wall, which can create turbulence (see figures 10.9 and 10.10).
- > Wind velocity can be reduced on both the windward and leeward side of a windbreak.
- > Although wind velocity can be reduced by 50% for a distance of ten to 20 times the height, the maximum protection on the leeward side of a windbreak is provided for a distance of three to seven times the height (e.g. a windbreak of 6 m in height should be planted between 20–40 m from the area to be protected [see figure 10.11]).
- > Earth mounds may be utilised to deflect winds.
- > Large dense shrubs can be used as windbreaks to the south-west to counter cold winter winds, and channel cooling summer breezes (see figure 10.12).

- > Medium to large-sized shrubs or trees clipped to form a hedge can provide useful still air insulation and shading when grown close to a wall (see figure 10.13).
- > Planting can be utilised to promote natural ventilation by positioning to deflect air flow through the building (see figure 10.14).

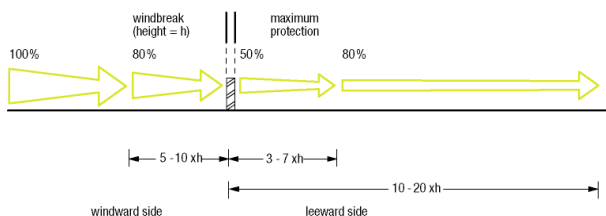


Figure 10.11: Wind velocity reduces by windbreaks

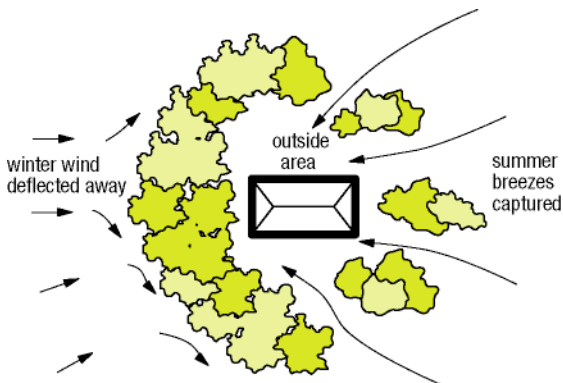


Figure 10.12: Use shrubs to deflect cold winds and channel summer breezes

Capturing summer breezes

- > Careful positioning of windbreak planting can encourage the entry of desirable summer breezes.
- > Low shrubs, lawn and ponds to the north will help cool hot summer winds.

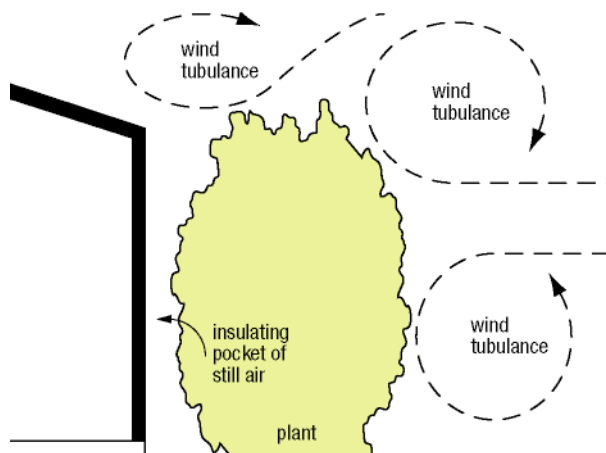


Figure 10.13: Planting can provide still air insulation beside walls



Figure 10.14: Planting to promote ventilation