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Microclimate Modifications for Energy Conservation[1]

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Florida has a hot-humid climate. Daytime temperatures can be above 90°F (32.2°C) for 4 to 7 months a year and humidity, at the same time, can rise to 50-70% (2). Only about one fourth of the year's climate is naturally comfortable. During a small portion of the year, particularly in north Florida, temperatures are too cool for comfort.

Generally, wind is an asset for a hot-humid region. Wind aids good air circulation that reduces build-up of heat and humidity. Besides the need to provide for adequate air circulation, there is a need for blocking solar radiation in order to reduce heat build-up. Two factors are essential for a comfortable microclimate in Florida: 1) air movement for evaporation and cooling, and 2) shade for reduction of surface temperature and heat build-up.

The idea of using landscaping to reduce the effects of a harsh climate is not new, although the idea is referred to by a new term, microclimate modification. Today's high cost of energy makes it more important than ever to take a new look at using nature to reduce these energy costs. Nearly one fourth of energy consumed in Florida is for residential use and nearly 30% of that energy could be saved through passive energy conservation measures.

NEW CONSTRUCTION

Orientation

The orientation, or the way the house is positioned in relation to the angle of the sun, is the first factor to consider when modifying the microclimate. If the long axis of the house runs north and south, the surface of long east and west walls will receive solar radiation. An east and west axis will expose only the narrow end walls to the hot Florida sun.

A 1979 computer model based on a typical concrete block home in northeast Florida predicted that the east-west orientation would result in more than a $50 savings on the annual cooling bill (1). The savings will be even greater as energy costs continue to rise.

Shade

Positioning a house to preserve and use shade from existing shrubs and trees will save the energy used for removing existing vegetation, selecting and planting new shrubs and trees, and waiting for new

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plants to grow large enough to provide effective shade.

RETROFITTING EXISTING HOMES

Trees

Trees effectively provide needed shade. With proper pruning or desirable canopy height, trees may also have a favorable effect on air circulation. Proper placement of trees relates to the location of the sun during the time of high heat load. Latitude, time of day, and time of year are determinants for the location of the sun and for the sun's effect on shade direction.

Shrubs

Mass plantings of shrubs may direct or deflect wind direction. Shrubs may also provide shade to reduce glare and reflected radiation while the sun is low in the sky. Additional benefits may be derived from moderate reduction of noise and air pollution by using mass shrub and tree plantings. Skilled design avoids the problem of blocking needed air flow. Cold winter winds, however, can and should be deflected.

Vines and Espaliered Plants

When space may not allow tree plantings for shade, vining plants may provide relief from solar radiation. Trained on a trellis or arbor, vines may provide a canopy similar to tree canopy. Vines, however, do not require the ground space required by a tree. Of course, proper selection is essential to avoid excessive maintenance. The trellis or arbor should be placed to allow adequate air circulation.

Ground Covers and Surface Materials

Vegetated soil surfaces affect the air temperature in a favorable manner. Brick and concrete, on the other hand, reflect solar radiation and often cause discomfort from glare and heat. Asphalt absorbs solar radiation and re-emits the energy as long wave radiation. Surfaces that absorb more moisture, such as pine straw and wood chip mulch, reflect or re-emit very little radiation.

Concrete patios reflect and re-emit considerable amounts of solar radiation. A raised wooden deck is cooler because wood is a poor heat conductor and the raised design allows air to circulate underneath.

Driveways and walks are often concrete, brick, or asphalt. Use of mulching materials, treated wood, or brick with interspersing ground cover will produce less heat build-up than large areas of hard, reflective surfaces.

Mulched areas and ground covers such as lily turf, mondo grass, ivy, and dwarf confederate jasmine require less energy for maintenance than turf. When using turf, select a lawngrass most suitable to the site in order to reduce energy used for maintenance.

COLOR

Color of roof and walls will affect the amount of energy required to cool and heat a house. In a 1979 computer study (1), a "typical" Florida house with light colored paint and shingles cost less to cool and slightly more to heat than a similar house with dark colored paint and shingles. The savings in cooling the house with light colored paint and shingles was far greater than the increased heating costs. The computer study recorded a $55 difference between the two houses or a savings of nearly 7 1/2%.

SCREENS AND FENCING

Except when a screen is designed to divert cold winter wind, screening and fencing in Florida should not block air flow. In a hot-humid climate, good air circulation is essential to evaporation and related cooling. Solid structures block the needed air flow, deflecting breezes away from the residence. Open fence design, particularly where there is some clearance at the bottom, allows cooling breezes to pass through. Vegetative screening may also block air movement. Thinning out dense growth and trimming lower branches will promote natural cooling.

SUMMARY

Microclimate modification may be achieved by shading and by enhancing air circulation. In Florida, blocking solar radiation for at least 80% of the year is advisable for human comfort. Enhancing air circulation is needed for at least 60% of the year. Skilled landscaping can achieve such modifications efficiently and economically.

LITERATURE CITED

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