EES44

UNIVERSITY OF FLORIDA
IFAS EXTENSION

Landscaping to Conserve Energy: Annotated Bibliography[1]

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In the last few decades, the ability of landscaping features to improve the energy efficiency of residential, business and public buildings has garnered increasing attention, both in the scientific and professional communities. Unfortunately, the amount of attention paid to this subject tends to fluctuate with the price of the oil which fuels most of our energy needs. As petroleum prices begin a renewed upswing, interest in this subject has also been reawakened. Surprisingly, some literature on the subject predates widescale public awareness of energy related issues, particularly articles in the popular home and gardening press concerning the use of vegetation for microclimate modification.

This bibliography is an attempt to create a clearing house for a great deal of the literature relating to energy conservative landscaping which has been promulgated through extension programs, professional journals, books, and popular periodicals. Each citation is accompanied by a short commentary about its content, emphasis, and/or target audience. The literature is presented in three main categories: Landscaping for Energy Conservation, Florida (material produced in, or largely restricted in application to that state); Landscaping for Energy Conservation, Outside Florida (material relevant to other areas of the country or general in application); and Microclimate, Human Comfort, and Modelling (material with indirect application to low energy landscaping, including theoretical research geared primarily to a scientific audience). Within each of these three categories, material is further grouped by type of publication: Research and Refereed Journal Articles; Cooperative Extension and Government Publications; General Articles; and Books, Monographs and Reports.

It should be kept in mind that university and government publications may go out of print after a few years. Consequently, some of this class of publication listed below may only be available from large institutional libraries.

1. This document is EES44, one of a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date December 1991. Reviewed October 2003. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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The Florida Energy Extension Service receives funding from the Florida Energy Office, Department of Community Affairs and is operated by the University of Florida's Institute of Food and Agricultural Sciences through the Cooperative Extension Service. The information contained herein is the product of the Florida Energy Extension Service and does not necessarily reflect the views of the Florida Energy Office.

LANDSCAPING FOR ENERGY CONSERVATION, FLORIDA

(*) = currently being revised

Research and Refereed Journal Articles

Buffington, D.E. 1978. Value of landscaping for conserving energy in residences. *Proc. Fla. State Hort. Soc.* 91:92-96.

Computer simulation of the effectiveness of shading, wall and roof color, and building orientation in reducing home energy consumption. Buffington, D.E. 1979. Economics of landscaping features for conserving energy in residences. *Proc. Fla. State Hort. Soc.* 92:216-220.

Economic analysis of the effectiveness of various landscaping and structural features for reducing energy expenditures for heating and cooling residential buildings in each of 9 areas in Florida. Buffington, D.E. 1980. Passive opportunities for conserving energy in buildings. *Proceedings of Alternative Energy Sources for Florida*, Gainesville.

Explores economic effectiveness of 1) shading of walls and roofs, 2) applying varying exterior colors on walls and roofs, and 3) considering building orientation as it relates to energy conservation. Buffington, D.E. and R.J. Black. 1981. Life cycle costing of plant materials for residential energy conservation. *Proc. Fla. Hort. Soc.* 94:205-208.

Engineering economic analysis for the life cycle costing of plant materials for energy conservation in Florida, presented as effective annual returns on investment. Parker, J.H. 1978. Precision landscaping for energy conservation. *Proceedings of National Conference on Technology for Energy Conservation*. Tucson, Arizona.

Precise guidelines for using plants to minimize energy inputs for home cooling in hot humid areas, particularly during peak load hours, taking into consideration whether the residence will be primarily air conditioned or passively cooled. Energy and financial costs of maintaining the plantings are comprehensively analyzed. Parker, J.H. 1981. A comparative analysis of the role of various landscape elements in passive cooling in warm, humid environments. Pp. 365-368 in *Proc. Int'l. Passive and Hybrid Cooling Conf*, Miami, FL.

Analyzes and compares the effects of trees, shrubs, and vines on the space cooling requirements of a building in a warm humid environment. Parker, J.H. 1982. Landscape elements and climate parameters in energy conservation design. Pp. 364-368 in *Proc. Soc. Am. For.* 1981.

Fitting the planting of landscape vegetation to local climate regimes to maximize energy savings. Parker, J.H. 1982. An energy and ecological analysis of alternate residential landscapes. *J. Environ. Sys.* 11:271-288.

Energy flow analysis of three different residential landscapes, including energy consumed for installation and maintenance, with indications of which designs minimize fuel consumption and negative environmental impacts. Parker, J.H. 1982. Do energy conserving landscapes work? *Landscape Architecture* 72:89-90.

A report on experimental research documenting the value of landscaping in reducing air conditioning costs in south Florida. Parker, J.H. 1983. Landscaping to reduce energy used in cooling buildings. *J. Forestry* 81:82-84, 105.

How 'precision landscaping' design concepts can optimize energy savings, particularly during peak demand periods. Parker, J.H. 1983. The effectiveness of vegetation on residential cooling. *Passive Solar Journ*. 2:123-132.

An experimental study on the effectiveness of landscaping in reducing air conditioning costs for a double wide mobile home in Miami is documented. Parker, D.S. and J.H. Parker. 1979. Energy conservation landscaping as a passive solar system. Proceedings of the National Passive Solar Conference. Newark, Delaware.

A report on the benefits of vegetation for passive energy conservation using mobile homes under varied Florida conditions as the model system. Shlachtman, P.J. and J.H. Parker. 1985. The effect of vegetative landscaping on the time dynamics of residential heat

gain in warm humid climates. *Proc. of the 10th Passive Solar Conf.*

An experimental study to determine the effect of landscape plantings on the time dynamics of heat transfer, interior comfort conditions, and cooling energy requirements for a residential building in the southeastern United States.

Cooperative Extension and Government Publications

Barrick, W.E. 1980. Landscape design for energy conservation. *Proceedings of Alternative Energy Sources for Florida (1979)*, Univ. Florida Cooperative Extension Service, Center for Environmental and Natural Resources Program, Gainesville.

Explores the means by which plants can be used in conjunction with structural features of the home to reduce energy consumption in Florida, including planning recommendations for new subdivisions. Research to date is summarized. *Barrick, W.E., R.J. Black, and M. Niederhofer. (no date). *Landscape Designs to Save Energy at Home: Microclimate Modification*. Univ. Florida Energy Extension Service Bulletin EES-4.

Low cost methods of using plants to significantly reduce cooling costs in summer and heating costs in winter. A few design aspects of new home construction are discussed as well. *Barrick, W.E., R.J. Black, and M. Niederhofer. (no date). *Landscaping to save energy at home: Trees for Northern, Southern, and Central Florida*. Univ. Florida Energy Ext. Serv. Bulls. EES-1,2 and 3.

Annotated lists of trees suitable as shade elements and/or wind barriers for each of three Florida climate zones. Shape, shade density, ultimate height, growth rate, and leaf persistence are given for each species. Black, R.J. 1980. Landscaping to conserve energy. *Energy conservation fact sheet 17*, University of Florida, Gainesville.

Basics of using landscape plants effectively for energy conservation around the home. Black, R.J. and D.F. Hamilton. (no date). Native Florida Plants for Home Landscapes. *Univ. Florida Cooperative Extension Ornamental Horticulture Fact Sheet OH-25*.

Annotated list of horticulturally useful Florida native plants for low maintenance landscaping. Black, R.J. and J. Midcap. (no date). Conserving water in the home landscape. *Florida Cooperative Extension Water Resources Council Circular WRC-11*.

Limiting water use in the home landscape with conservative irrigation practices, mulches, soil improvement, and drought tolerant plants. Buffington, D.E. 1982. Economics of residential landscaping features in Florida: Orlando and vicinity, Jacksonville and vicinity, Panama City and vicinity, Pensacola and vicinity, Miami and vicinity, Tallahassee and vicinity, Tampa and vicinity, West Palm Beach and vicinity, Daytona Beach and vicinity. *University of Florida Cooperative Extension Service Circulars No. 517-525*.

Economic analysis of the effectiveness of various landscaping and structural features for reducing energy expenditures for heating and cooling residential buildings in each of nine areas in Florida. *Buffington, D.E., S.K. Sastry and R.J. Black. 1980. Factors for determining shading patterns in Florida: Orlando and vicinity, Jacksonville and vicinity, Panama City and vicinity, Pensacola and vicinity, Fort Myers and vicinity, Miami and vicinity, Tallahassee and vicinity, Tampa and vicinity, West Palm Beach and vicinity, Daytona Beach and vicinity, Gainesville and vicinity. *Univ. Florida Coop. Ext. Serv. Circulars 505, 507-516*.

Each of these 11 publications provides tables of azimuth angles and shade factors for the covered area, as well as instructions on using this data to determine effective position and optimum height of shade trees and shade structures. Flinchum, D.M. (no date). A guide to selecting existing vegetation for low energy landscapes. *Univ. Florida Coop. Ext. Serv. Circ. 489*.

Guidelines for selecting components of existing vegetation on a home site for low energy, low maintenance landscaping. Hamilton, D.F. and R.J.

Black. (no date). Low maintenance landscapes. *Univ. Florida Coop. Ext. Ser. Orn. Hort. Fact Sheet 24*.

Guidelines for reducing upkeep and energy requirements (water, fertilizer) of the home landscape. Parker, J.H. 1981. Uses of Landscaping for Energy Conservation. Report for Florida Governor's Energy Office.

State report detailing the effective use of landscape vegetation for reducing residential energy consumption in the state of Florida. Parker, J.H. 1981. Energy Conservation Landscape Designs for Mobile Homes in South Florida. Report for Florida Governor's Energy Office.

State report detailing the proper use of landscape vegetation for reducing energy consumption in mobile home units in south Florida. Parker, J.H. 1982. The Implementation of Energy Conservation Landscaping through Local Ordinances. Report to FAU-FIU Joint Center for Environmental and Urban Problems.

Creating and enforcing municipal and county level regulations which mandate standards of landscaping for energy conservation in urban and suburban developments. *Pivorunas, D.J., R.J. Black and D. Burch. 1982-83. Ground covers for Energy Conservation... North, Central and South Florida, *Univ. Florida Cooperative Extension Service Energy Information Fact Sheets EI-51, 52, 53*.

Annotated lists of plant materials suitable for use as ground covers in North, Central and South Florida. Height, cultural requirements, color, landscape uses, and other information are supplied for all species listed. General guidelines are given for using ground covers as energy saving alternatives to turf or solid surfaces in the home landscape.

General Articles

Gann, J. 1981. Landscaping for energy conservation: plants are not just pretty, Part I. *The Garden* (Bull. Fairchild Trop. Gard., Miami) 36(2):10-20.

A practical guide for the south Florida homeowner to implementing energy conservative landscaping principles. Gann, J. 1981. Landscaping for energy conservation Part II. Lists. *The Garden* (Bull. Fairchild Trop. Gard., Miami) 36(3):6-14.

Annotated list of native plant materials suitable for use in south Florida low energy landscapes. Langewiesche, W. Your house in Florida. *House Beautiful* 92:70-81.

Designing the Florida home to maximize passive cooling. Parker, J.H. 1983. Landscaping: A key to energy conservation in Florida. *Florida Nurseryman* 30:12-15.

Guidelines for microclimate modification to reduce cooling energy in Florida with landscape plants. Parker, J.H. 1986. Energy Efficient Landscaping. *South Florida Home and Garden* 3:64-65, 84-85.

How to use landscaping to reduce energy consumption in the south Florida home.

Books

Parker, J.H. 1986. *Landscaping: Energy Conservation in the Air Conditioned House*. Miami Dade Community College Press, Miami, FL.

Addresses the unique strategies for energy effective landscaping around homes which will be primarily cooled by air conditioning. Workman, R.W. 1980. *Growing Native: Native Plants for Landscape Use in Coastal South Florida*. Sanibel Captiva Conservation Foundation. Sanibel, FL.

Guidelines for obtaining and utilizing native plants for energy conserving landscapes.

LANDSCAPING FOR ENERGY CONSERVATION, OUTSIDE FLORIDA

Research and Refereed Journal Articles

Bates, C.G. 1956. The value of shelter belts on house heating. *J. Forestry* 54:399-400.

Lowering heating costs with windbreaks. Deering, R.B. 1956. Effect of living shade on house temperatures. *J. Forestry* 54:399-400.

A demonstration of the effectiveness of shade trees in reducing temperatures in the home. DeWalle. D.R. 1978. Manipulating urban vegetation for residential energy conservation. *Proc. Nat'l. Urban Forestry Conf.*, Washington, D.C.

Maximizing the benefits of city landscaping to reduce winter heat consumption and increase passive summer cooling. DeWalle. D.R. 1982. Energy conservation through urban forestry (Landscape vegetation), pages 119-123 in D.G. Gangloff and G.H. Moeller (eds.), *Proceedings of the 2nd National Urban Forestry Conference*, American Forestry Association, Washington, D.C.

Using trees to ameliorate extremes of climate in urban areas; guidelines for the professional planner. DeWalle, D.R. and G.M. Heisler. 1983. Windbreak effects on air infiltration and space heating in a mobile home. *Energy and Buildings* 5:279-288.

How windbreak trees reduce cold air infiltration and increase the efficiency of space heaters in a mobile home. DeWalle, D.R., G.M. Heisler and R.E. Jacobs. 1983. Forest home sites influence heating and cooling energy. *J. Forestry* 82:84.

Heating and cooling expenditures of homes situated on heavily forested sites. Federer, C.A. 1976. Trees modify the urban microclimate. *J. Arboriculture* 2:121-127.

How trees contribute to the energy balance of urban areas, and their ameliorative effects on local environment. Gardener, T.J. and T.D. Sydnor. 1984. Interception of summer and winter insulation by five shade tree species. *J. Am. Soc. Hort. Sci.* 109:448-450.

Experimental study in which the amount of sunlight penetrating the canopy of five shade trees was measured in both winter and summer as a means to determine the optimal choices for year round energy savings. Heisler, G.M. 1974. Trees and human comfort in urban areas. *J. Forestry* 72:466-469.

How trees contribute to the energy budget of urban areas and substantially raise human comfort levels. Heisler, G.M. 1975. How trees modify metropolitan climate and noise. *Soc. Am. For. Proc.* 1974:103-112.

A review of studies to date on the effects of trees on human thermal and auditory comfort, and energy conservation in urban areas. Heisler, G.M. 1982. Reductions of solar radiation by tree crowns. *The Renewable Challenge* (Progress in Solar Energy, vol. 5), G.E. Franta, K. Haggard, B.H. Glenn, W.A. Kolar, and J.R. Howell (eds.). American Solar Energy Society, New York.

An empirical review of the shade effects of tree canopies. Heisler, G.M. 1985. Measurements of solar radiation on vertical surfaces in the shade of individual trees. *The Forest Atmosphere Interaction: Proceedings of the Forest Environmental Measurements Conference.*, B.A. Hutchison and B.B. Hicks (eds.). D. Reidel Publ. Co., Utrecht.

Studies of the amount of sunlight transmitted to a vertical structure through the canopy of various trees. Heisler, G.M. 1986. Effects of individual trees on the solar radiation climate of small buildings. *Urban Ecol.* 9:337-359.

Experimental study of the irradiance reduction capabilities of several tree species at different times of the year and at different exposures of a small structure. Holmes, W.W. 1979. A comprehensive categorization for passive cooling techniques. *Proceedings of the 4th National Passive Solar Conference*. Newark, Delaware.

Structure and design adjustments to be made in order to facilitate passive cooling. Techniques involve location and type of structure, earthwork, and effective placement of vegetation. Self explanatory diagrams are included. Hoyano, A. 1984. Effects of rooftop turf planting layers upon building thermal environment. *Mem. Fac. Engineering*, Kyushu Univ., Higashiku, Fukuoka, Japan.

Experimental study investigating the insulative properties of turf grass when installed on a building rooftop. Hoyano, A. 1985. Solar control by vine sunscreen and its passive cooling effects. Pp. 271-276 in *Proc. Int'l. Symposium on Thermal Applications of Solar Energy*, Tokyo, Japan.

Experimental study of the shading and passive cooling effects of an ivy sunscreen covering a west facing wall, and a dishcloth gourd sunscreen on a

veranda. Hoyano, A. 1985. Climatological uses of plants and the sun control effects. *Proc. Fifth Int'l. PLEA Conf.*, PECS, Hungary.

A review of the uses and mediative effects on local climate of landscape plants. Hutchison, B.A. and F.G. Taylor. 1983. Energy conservation mechanisms and potentials of landscape design to ameliorate building microclimates. *Landscape J.* 2:19-39.

A guide for the landscape professional on incorporating energy conserving plantings into site designs. Mattingly, G.E. and E.F. Peters. 1977. Wind and trees: air infiltration effects on energy in housing. *J. Industrial Aerodynamics* 2:1-19.

Discusses how air infiltration reduces the heating and cooling efficiency of buildings, and the modifying effects of vegetation on air infiltration. Mattingly, G.E., D. Harrje, and G. Heisler. 1979. The effectiveness of an evergreen windbreak for reducing residential energy consumption. *ASHRAE Trans.* 85.

How windbreaks diminish the negative effects of air movement on heating and cooling efficiency. McPherson, E.G. 1981. Effects of orientation and shading from trees on the inside and outside temperatures of model homes. Pp. 369 in *Proc. Int'l. Passive and Hybrid Cooling Conf.*, Miami, FL.

The positive effects of shade trees on ambient temperatures around the home. Parker, J.H. 1981. Landscaping to conserve cooling energy. *Proc. Southeastern Electric Exchange Conf.*, New Orleans.

Discusses the ways that vegetative landscaping can be used to reduce both energy consumption and demand associated with space cooling needs. Parker, J.H. and S. Panzer. 1986. A model energy conservation landscape ordinance for reducing cooling requirements. *Proc. 11th Nat'l. Passive Solar Conference*. Boulder, CO.

Proposal for a municipal landscaping ordinance that would set specific standards for energy conservation. Includes an energy conservation analysis of 34 operating ordinances in the United States. Shlachtman, P. and J.H. Parker. 1981. Peak load energy conservation. Pp. 19-29 in *Proc. 4th Miami Int'l. Conf. Alternative Energy Sources*, Miami Beach, FL.

Curtailing both energy consumption and demand during peak load hours with vegetation and other passive means. Thayer, R.L., Jr., J.A. Zanetto and B. Maeda. 1983. Modeling the effects of deciduous trees on thermal performance of solar and conventional houses in Sacramento, Ca. *Landscape Journal* 2:155168.

A model for determining the degree to which deciduous trees affect the heat budgets of various type of residential structures with either solar or conventional heating systems. Wagar, J.A. 1984. Using vegetation to control sunlight and shade on windows. *Landscape Journal* 3:2435.

Guidelines for shading windows. Wagar, J.A. and G.M. Heisler. 1986. Rating winter crown density of deciduous trees. *Landscape Journal* 5:9-18.

A photographic procedure to accurately determine the degree to which various deciduous trees block incoming, winter solar radiation during their leafless period. White, R. 1955. Landscape development and natural ventilation. *Landscape Architecture* 45:72-81.

The effect of moving air on buildings and adjacent areas, and air flow tests of various plant windbreak combinations. Youngberg, R.J. 1983. Shading effects of deciduous trees. *J. Arboriculture* 9:295-297.

A study monitoring the amount of solar radiation penetrating the canopy of six deciduous trees both in winter and summer over a two year period. Zaneto, J. 1978. The location and selection of trees for solar neighborhoods. *Landscape Architecture* 68:514-519.

Balancing shading requirements with solar energy collection.

Cooperative Extension and Government Publications

Anonymous. 1976. *Solar Dwelling Design Concepts*. U.S. Dept. of Housing and Urban Development. Office of Policy Development and Research.

Efficient design guidelines for homes outfitted for solar collection. Anonymous. 1977. Design Your Landscape to Conserve Energy. *Extension Bulletin E-1122*. Cooperative Extension Service, Michigan State University.

Basic ideas for landscape planning to modify climatic extremes, and reduce landscape related energy consumption. Anonymous. 1978. *Energy conservation with landscaping*. Connecticut Energy Extension Service Bulletin 78-48.

Using plants as energy conserving landscape elements. Anonymous. 1978. Landscaping to Cut Fuel Costs. *USDA Fact Sheet 2-3-5*.

Tips on planting for wind control and shade in a temperate climate. Anonymous. 1978. Energy conservation in the rural home: *Landscaping to cut fuel costs*. Tex. Agric. Ext. Serv. of Texas A & M Univ., College Station.

Cutting residential energy costs with windbreaks, shelterbelts, and shade. Anonymous. 1978. Options for passive energy conservation in site design. U.S. Dept. of Energy, *Division of Buildings and Community Systems Publ. TID-28520*.

A compendium of site design options that maximize low energy climate control. General principles are first considered, followed by regional guidelines for coo/, temperate, hot humid, and hot arid areas. Information is professionally oriented, but accessible to the interested layperson. Includes useful bibliography. Anonymous. 1979. Energy conservation in the rural home: Landscaping to cut fuel costs. *Windbreaks*. Coop. Ext. Serv. Coll. Agric. Wash. State Univ. Pullman.

Using windbreaks to reduce home heating expenditures. Anonymous. 1981. *Landscaping*. Ohio State University Agricultural Extension Service. Available from: Agricultural Extension Service Office of Information, 2120 Pyffe Road, Columbus, Ohio 43210.

This publication discusses planting trees around the home to reduce heating and cooling costs. Anonymous. 1985. *Using trees to reduce urban energy consumption: transferring technology to users*. NE. INF. U.S. Forest Serv., Northeast For. Exp. Stn., Upper Darby, CT.

Implementation of energy conserving programs using trees in the urban environment Anonymous. (no date). *Climate Control*. Cooperative Extension Service Bulletin, University of Georgia College of Agriculture, Athens.

Briefly illustrates a few basics of energy nserving landscape practices. Anonymous. (no date). *Landscape to Save Energy*. Cooperative Extension Service Bulletin, New York State College, Albany.

Using plants as wind barriers and for shade. Anonymous. (no date). *Regional Guidelines for Building Passive Energy Conserving Homes*. U.S. Dept. of Housing and Urban Development Publication. Office of Policy Development and Research.

Detailed guidelines for energy efficient homes in 16 different areas of the United States. Climatic summaries, design priorities, and recommendations are given for each reference city. Equally geared to professionals and homeowners. Anonymous. (no date). Site Planning for Solar Access. *A Guide for Residential Developers and Site Planners*. U.S. Dept. of Housing and Urban Development. Office of Policy Development and Research.

Determining layout and configuration of residential developments that will be using both active and passive solar heating technology, including a chapter on trees and other landscaping. Oriented for the professional developer and planner. DeWalle. D.R. 1978. *Mobile home energy costs conserved with shade trees*. Penn. Agr. Exp. Sta. Sci. Agric. 26:16.

Saving mobile home heating and cooling costs by judicious use of shade trees. Hoeven, G.A. van der. 1982. *Energy efficient landscaping*. Kansas State University, Manhattan.

Discusses using plant material in combination with other home design principles to help you design an energy efficient home and landscape. Howell, E. 1980. *Landscaping for energy conservation*. Publ. Coop. Ext. Programs Univ. Wisc. Ext., Madison.

Basic guidelines and a planting design for shading and channelling winds around the home. Kunze, R.J. 1977. Energy conservation through better irrigation practices for homeowners. *Michigan State University Extension Bulletin E-1142*.

Limiting water use in the garden. Leonard, R.E. 1972. Making our lives more pleasant — plants as climate changers, pp. 5-9 in *Landscape for living*, U.S.D.A. Yearbook.

How plants modify microclimate. Little, S. and J.H. Noyes (eds.). 1971. *Trees and forests in an urbanizing environment*. Univ. Mass. Coop. Ext. Serv., Amherst.

The benefits of green space and well designed residential tree plantings in passively increasing human comfort levels in the urban environment. Niedenthal, A. 1985. *Landscape design to conserve energy*. Purdue Univ. Coop. Ext. Serv., West Lafayette, Ind.

Using plants to decrease home energy expenditures. Niering, W.A. and R.H. Goodwin. 1975. *Energy conservation on the home grounds: The role of naturalistic landscaping*. Bull. Conn. Arbor. Conn. Coil. 21.

Alternatives to energy intensive lawns using native plants in low maintenance, naturally stable landscapes. Pope, T.E. 1980. *Landscaping for energy conservation*. Louisiana Coop. Ext. Serv.

How to effectively landscape the home for reduced heating and cooling costs. Putnam, B. and C.H. Sacamano. 1984. *Effective shading with landscape trees*. Coop. Ext. Serv. Univ. Ariz. Coll. Agric.

Using trees properly to maximize their shading potential. Welch, W.C. 1979. *Landscaping for energy conservation*. Tex. Agric. Ext. Serv. of Texas A & M Univ., College Station.

Low energy landscaping in Texas, including a list of recommended trees. White, R. 1954. Effects of landscape development on the natural ventilation of buildings and their adjacent areas. *Research report 45*, Texas Eng. Exp. Station, College Station, TX.

Interactions of vegetation and air movement.

General Articles

Anonymous. 1949. Good site planning can double your outdoor living. *House Beautiful* 91:172-174.

Home site planning and landscaping pointers for passive climate control. Anonymous. 1950. Good lawns keep you cooler. *House Beautiful* 92:108-109.

The benefits of lawns for lowering ambient temperatures in the home environment. Fizzell, J.A. 1983. Landscape designers must put energy conservation in their plans. *Am. Nurseryman* 157:65-71.

The author calls on the landscape design industry to adopt basic principles of passive energy conservation in new residence planning, and offers a few recommendations for site evaluation and microclimate considerations. Flemer, W. 1974. The role of plants in today's energy conservation. *Am. Nurseryman* 139:10, 59.

The benefits of trees, shrubs, and vines used properly to reduce winter heat consumption and increase passive summer cooling. Flemer, W. 1982. Why and how to use plants for energy conservation (Wind barriers). *Am. Nurseryman* 155:89-101.

Constructing windbreaks and shelter belts. Flemer, W. (no date). How to save energy and money with nature's growing gifts. *American Association of Nurserymen Bulletin*.

A brief guide to using plants for microclimate modification. Hamilton, D.F. 1982. Landscape design for energy conservation. *Am. Nurseryman* 156:93-95.

Understanding site and local climatic conditions to promote landscape designs that maximize energy conservation. Iwata, L.B. 1987. Step by step design plan for ecologically sound landscapes. *Am. Nurseryman* 165:174-185.

A guide to matching landscape designs with local ecological parameters, geared primarily to water conservation concerns, but including discussion of wind control and heat load reduction. Langewiesche,

W. 1949. How to pick your climate. *House Beautiful* 91:146-217.

Choosing a home site on the basis of microclimatatic considerations. Langewiesche, W. 1949. How to fix your private climate. *House Beautiful* 91:151-204.

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Basic principles for most effectively using plants to conserve energy use. Niering, W.A. and R.H. Godwin. 1975. Naturalistic landscaping and energy conservation. *Plants and Gardens* 31:24-28.

Alternatives to energy intensive lawns using native plants in low maintenance, naturally stable landscapes. Rich, S. 1973. Trees and urban climate. *Nat. Hist.* 82:70.

How trees modify the metropolitan microclimate. Tinga, J.H. and R. Bray. 1984. Place trees property for a cooler house. *Am. Nurseryman* 159:155-157.

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Balancing sun and shade in the home throughout the year. Yoklic, M.R. 1982. Landscaping for energy conservation. *Desert Plants* 3:119-123.

Energy conservative landscaping in and regions.

Books, Monographs and Theses

Anonymous. 1977. *Microclimate, Architecture, and Landscaping Relationships in an Arid Region: Phoenix, AZ*. Center for Environmental Studies, Arizona State University.

Structural and landscape design parameters for microclimate modification in and regions. Conklin, G. 1958. *The Weather Conditioned House*. Reinhold, New York.

Home design and retrofitting in harmony with local climate. Foster, F.S. 1978. *Guide to Landscaping That Saves Energy Dollars*. David McKay Co.

A basic guide for the homeowner on reducing energy costs with landscaping materials. McClendon, C. and G.0. Robinette. 1977. *Landscape Planning for Energy Conservation*. Environmental Design Press, Reston, VA.

A detailed, professional level guide to maximizing energy conservation with intelligent landscape design, including careful site selection and planning. Detailed case histories are presented for differing climates in the United States. McPherson, E.G. 1980. *The use of plant materials for solar control*. MS Thesis. Utah State University, Logan.

Mitigating the effects of sunlight with proper use of landscape materials; site design and plant selection. McPherson, E.G., ed. 1984. *Energy Conserving Site Design*. American Association of Landscape Architects, Washington, D.C.

A guidebook for landscape architects on maximizing the energy efficiency of landscape designs. Moffat, A.S. and M. Schiler. 1981. *Landscape Design That Saves Energy*. William Morrow and Co., New York.

Oriented for the homeowner, this book provides simple, energy conservative landscape designs and plant selection guides for temperate, cool, hot arid, and hot humid climates of North America. Olgyay, V. 1963. *Design with Climate: Bioclimatic Approach to Architectural Regionalism*. Princeton Univ. Press, Princeton, N.J.

Classic text on architectural design in harmony with regional climate, covering both structural and landscape elements. Robinette, G.0. 1972. *Plants/People/and Environmental Quality*. U.S. Dept. of Interior, National Park Service Publications.

A well documented and illustrated overview of how plants interact with the human environment, including — but not limited to — their use for

climatological control. The chapter on microclimate modification offers many practical design considerations for wind, heat and precipitation control. Robinette, G.0. 1985. *Home Landscaping to Save Energy*. Van Nostrand Reinhold, New York.

A homeowner's guide to using landscape plants to reduce seasonal heating and cooling costs in the home. Westergaard, C.J. 1982. *The relative ability of various shade trees to block or filter direct solar radiation in the winter*. MLA thesis. Cornell University, Ithaca, NY.

Analysis of the degree of sunlight penetration through the canopies various landscape trees during the winter, when passive solar heating is desirable.

MICROCLIMATE, HUMAN COMFORT, MODELLING

Research and Refereed Journal Articles

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