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LANDSCAPE CONTRACTOR NEWS

Expanding frontiers earmark ASLA meeting

Speakers at the American Society of Landscape Architect's annual meeting in Denver stressed the awareness and involvement of the industry in a wide diversity of work.

"The scope has arrived that we are involved in every facet of life," says Bill Oyler, director of programs and administration for ASLA. The November meeting forwarded that theme to more than 1,600 attendees.

Keynote speaker John Naisbitt—publisher, author, futurist, and newspaper columnist—spoke at the opening session about the change to which landscape architects will be expected to respond in the 1980's. The 22 individual educational sessions that followed emphasized this in specific ways. The programs were divided into five major education topics—energy, economics, communications, creative management, and design quality and values—and each of these were divided into five or six sessions.

Booth space was filled and included companies selling computers, lighting, irrigation equipment, turf, indoor-outdoor furniture, bridges, recreation equipment, and management consulting services. Oyler expects that the meeting next year in Washington, DC, will contain 100 booths, a good percentage more than this year's 67.

California show will cover entire field

The California Landscape Contractors Association's 1981 Landscape Industry show, scheduled for March 26-27 at the Long Beach Convention Center, promises to be a complete show for the landscape industry.

The planning committee is hoping to gather people and products from every aspect of the industry, including the related services and products used in the offices of landscape contractors as well as those used in the field. The organizers are urging suppliers of stationery, office furniture and equipment, computer and communication systems, public relations people, and financial consultants to exhibit.

This marks the second such show sponsored by CLCA. For further information about it, contact David Concannon, 1419 21st St., Sacramento, CA 95814, 916/448-2522.

Irrigation Association plans full course

The Irrigation Association will hold its first two-week Landscape Irrigation Institute in cooperation with the University of California at Riverside, March 23-April 3.

The intensive two-week course, designed for personnel of manufacturing, distributing, contracting, and consulting firms, will comprise 11 days of instruction and field trips.

Topics of instruction include basic principles of soil and water; principles of turfgrass, adaptation, growth, and maintenance; irrigation components and types; hydraulic principles; and installation, management, and scheduling of irrigation systems. Field trips will go to an irrigation pipe manufacturer, sprinkler manufacturers, irrigation systems, and laboratories.

Registration information is available from: The Irrigation Association, 13975 Connecticut Avenue, Silver Spring, MD 20906, 301/871-1200.

by the Agricultural Services Census for 1978.

The census indicated $2.6 billion gross receipts for that year, nearly double the amount reported in 1974, although part of this increase may be due to more complete reporting. More than 36,000 landscape planting and maintenance service firms who derive their major source of income from garden services had gross receipts of $1.4 billion; over 19,500 arboricultural firms showed gross receipts of $1.06 billion; and 5,228 landscape planning and counseling services reported $.18 billion in gross receipts.

Since more limitations are being placed on the pesticides that homeowners may use, professional landscape and horticultural services are expected to be in greater demand in the future.

FERTILIZER

Fertilizer movement advances in October

Domestic market movement for fertilizers from producers increased 3% in October above the same month in 1979, even though total month-end inventories also reached higher levels, according to a report by The Fertilizer Institute.

Domestic disappearance for October of both nitrogen and potash products was well ahead of the same month last year, while exports of all finished phosphate products also advanced.

"The October report clearly shows the rapid pickup in mid-fall movement that had been expected," noted Institute President Edwin M. Wheeler. "Recent industry reports from the field indicate that this improvement has continued into November for most products."

EROSION CONTROL

Scientists study reasons for erosion

In the Pacific Northwest, flooding and erosion are most likely to be caused by rainfall on top of frozen soil.

Myron Molnau and D. K. McCool, researchers at the Idaho Water Energy Resources Research Institute of the University of Idaho, are studying erosion to determine the extent to which it occurs on frozen soils. They plan to evaluate the effect of various land use practices, such as tillage, on the severity of runoff from frozen soils.

Their preliminary data suggests that minimum tillage controls erosion best.

Continues on page 16

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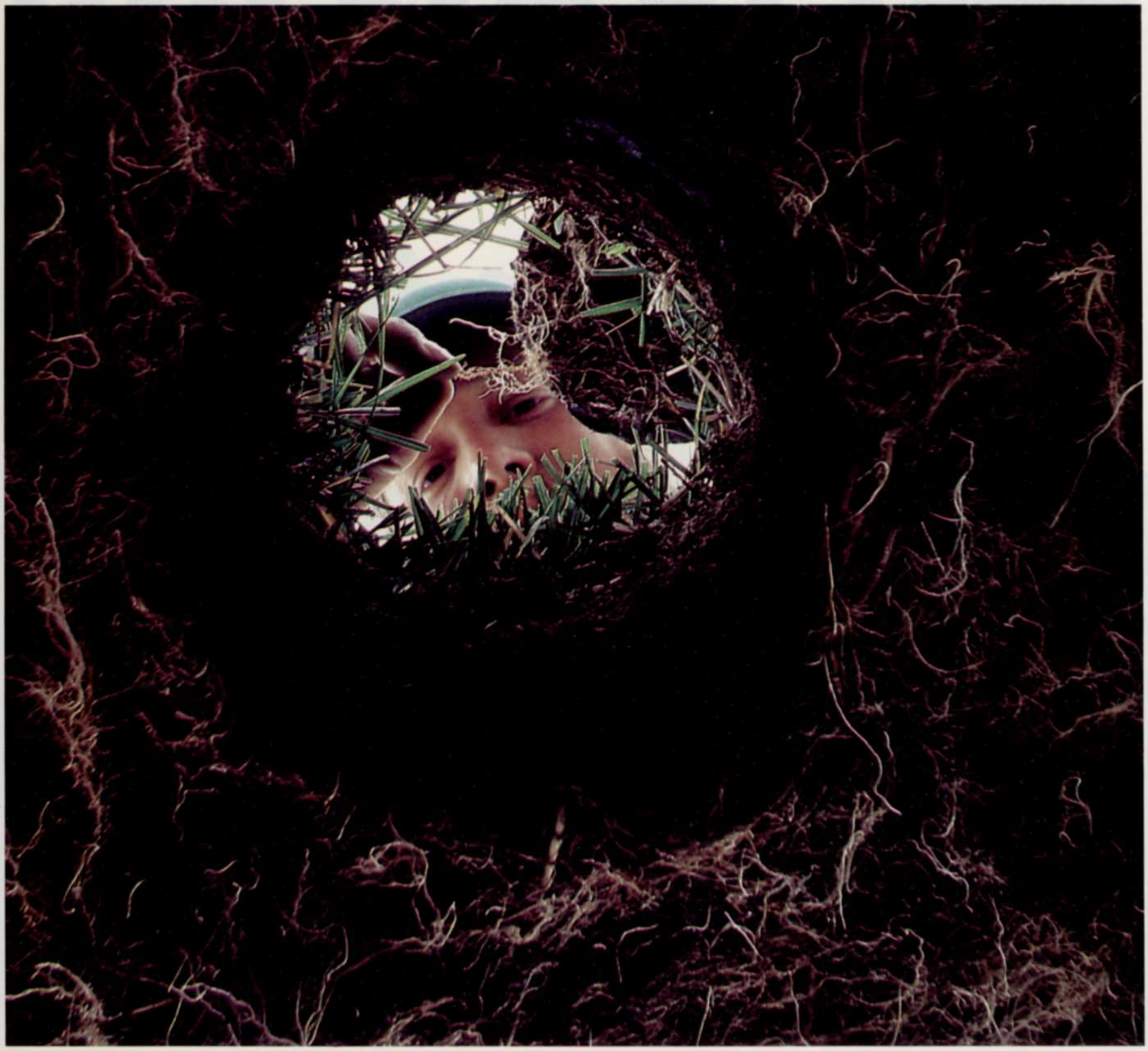

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GOVERNMENT UPDATE

EPA says no RPAR against chlordane

The Environmental Protection Agency's Office of Pesticide Programs has recommended there be no RPAR against chlordane, says an officer for Velsicol Chemical Corp., a manufacturer of the substance.

Charles Frommer, director of regulatory affairs for Velsicol, says, "Instead, EPA plans a comprehensive review of all compounds with termite labels. Some 30 active ingredients are involved."

Speculation over the status of chlordane spread last summer when the General Accounting Office sent a letter to EPA Adminstrator Douglas M. Costle, calling for a formal RPAR of the pesticide. GAO cites information from the Defense Department that showed high concentrations of chlordane in some homes where heating ducts became contaminated. They contend that there may be millions of homes in the U.S. affected in this manner.

Velsicol contends that such air plenum contamination is the result of misapplication and that no health hazard exists when proper application procedures are followed.

OSHA Book tells full story of agency

All About OSHA, 1980 edition, contains much information about the agency and is available for no cost. To obtain a free copy, write: OSHA Publications Office, Rm. S-1212, Department of Labor, 200 Constitution Ave., N.W., Washington, DC 20210.

Government agencies find dioxins in 2,4-D

The Environmental Protection Agency and Agriculture Canada have found dioxins in 2,4-D samples, but have taken no regulatory action. EPA and Agricultural Canada officials said that decisions on regulatory action, if any, would be made before the next 2,4-D season, March in the U.S. and June in Canada.

EPA's response to the findings was to prepare a request to all 2,4-D manufacturers for technical samples of the pesticide used in the U.S. and descriptions of 2,4-D manufacturing processes. Some EPA officials suspect the dioxin contamination might be keyed to a particular manufacturing process. Dow Chemical, Diamond Shamrock, and PBI Gordon have already submitted samples.

Agriculture Canada emphasized that it had not found the "most acutely toxic member of the dioxin family, the 2,3,7,8-TCDD isomer" in 2,4-D samples tested.

Social Security, minimum wage increases

On January 1, the tax base for Social Security rose to $29,700 and the rate to 6.65% This means an employee earning $29,700 will pay $1,975.05 in Social Security taxes, and the same amount will be paid by his employer. Also, the minimum wage has increased to $3.35 an hour.

National Arboretum begins bonsai holding

The chief of the U.S. Department of Agriculture's Forest Service, R. Max Peterson, presented the National Arboretum with the first tree to be included in a new American bonsai collection.

The presentation was part of a series of national activities held last year to commemorate the 75th anniversary of the Forest Service.

Ralph J. McCracken, USDA associate director of Science and Education, accepted the bonsai on behalf of the National Arboretum's managers—USDA's Science and Education Administration.

The tree, a naturally dwarfed Ponderosa pine about 150 years old, was found growing on the Gifford Pinchot National Forest in Washington.

"Freeze cycles in the Pacific Northwest, especially, have a lot to do with erosion," says Molnau. "They first break down soil clods, creating a smooth surface for the water to run over." He explains that after a rain and freeze-thaw cycle, water collects on top of the rough frozen surface rather than infiltrating the soil. Since it is warmer than the underlying soil, it slowly breaks down frozen clods and forms a thin layer of mud on the surface. Then, if there is a large amount of precipitation, the thin layer of sediment is washed off and erosion occurs.

EQUIPMENT

Tiller shipments up; mowers show decline

Rotary tiller shipments by domestic manufacturers rose 9.8% during the year ended August 31, 1980, while factory shipments of walk-behind and riding mowers, lawn tractors, and riding garden tractors declined for the first time in four years, according to recent estimates of the Outdoor Power Equipment Institute.

In 1980, 621,000 tillers were shipped, compared with 565,400 in the previous year. Factory value increased from $123.3 million to $148.4 million, or 20.4%.

Shipments of riding garden tractors declined 16.9% to 196,000 units with an F.O.B. factory value of $312.5 million. Last year's 236,000 units were valued at $339.3 million.

Estimated shipments of lawn tractors/riding mowers totaled 721,000 for 1980, down 9.6%. F.O.B. factory value increased 3.2% from $458.5 million to $473.3 million.

Walk-behind power mower shipments fell 3.5% to 5.7 million units, a decline of 200,000 units from the 5.9 million shipped in 1979, while factory value increased 7%, from $656 million to $701 million.

AWARDS

AAN governors present Green Survival Awards

The Governor's Green Survival Award, established by the American Association of Nurserymen for a superb contribution to environmental improvement through the use of living plants, was presented in recognition of two outstanding outdoor plantings in the States of Michigan and Illinois.

John Light, II, governor of the Michigan chapter of the AAN, presented one award to the City of Marshall for its

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ENERGY SAVING CONCEPTS APPLICABLE TO LANDSCAPES

The goal of all contemporary building design, whether it falls under the heading of architecture, landscape planning, or interior decoration, is to increase human comfort and reduce energy needs for space heating and cooling. The physical strength and mental activity of all people are improved within a specific range of climatic conditions. Outside this comfort zone, efficiency plummets; discomfort, stress, and the threat of disease increase.

There is a slight variation in the perception of comfort, either because of inherited or cultural characteristics. Most women choose a temperature a few degrees warmer than do men, young people prefer a temperature a few degrees cooler than do the elderly, and Eskimos thrive in a cooler climate than do Africans. But there are accepted, worldwide standards for human comfort.

This article analyzes the sensation of comfort and describes how the great climatic forces—sun, wind, and precipitation—affect it. It also demonstrates how plants may enhance comfort while reducing energy consumption.

The four factors that affect human comfort are: the energy contained in objects that radiate heat, the temperature of air, its movement, and humidity. Precise definitions of each are needed to understand how they influence comfort.

Heat, which is a form of energy, is distinguished from temperature, which is a measure of how much energy is stored. For example, two freshly poured cups of tea, one half-full and the other filled to the brim, are the same temperature. But the full one contains more heat energy. Different materials require different amounts of energy to be raised to the same temperature. "Specific heat" refers to the energy needed to raise a given volume of a substance by one degree Fahrenheit. The higher a material's specific heat, the more heat it holds, and the longer it takes to cool down. For example, air has an extremely low specific heat and heats up rapidly; metals such as gold and lead have higher specific heats. Water has a very high specific heat; it takes a lot of energy to reach a certain temperature, acts as an excellent reservoir of heat, and releases a lot of heat when cooling down. This is why large bodies of water such as lakes and oceans have a pronounced effect on climate. They heat up and cool down slowly, and moderate extremes of temperature.

Heat energy itself can be transferred by four methods: radiation, conduction, convection, and changes of state. Heat always travels from warmer to cooler substances, attempting to remove temperature differences.

Radiation transfers heat in space from object to object. It requires no contact between the object emanating the heat and the receiving substance and may take place in a complete vacuum. Radiation is responsible for the heat you feel when you stand in front of a fireplace or lie on a beach and soak up the sun's energy. Radiant heat can be collected from the sun independent of the air temperature. A sun-filled room collects radiant heat and warmth through a window, even in midwinter. Conversely, at night heat energy that has been absorbed during the day will be reradiated back into the sky and lost, if it is not blocked. In arid regions that have cloudless nights there is the potential for enormous radiational cooling at night. In cities, however, the low overhead smog often prevents nighttime radiational cooling. Radiation can be blocked by opaque barriers such as walls, heavy drapes, or plants with dense foliage; it can be filtered by translucent objects such as clouds, light shades, or vines on trellises.

In contrast, conduction transfers heat by direct contact. It is responsible for the heat you feel when you touch a hot iron or press a hot-water bottle to an aching part of your body. Conduction of heat away from the body produces the shivering sensation following a plunge into a cool swimming pool. Blocking conduction is more difficult than blocking radiation and requires specialized insulating materials with air cells that inhibit heat transfer such as wood, wool, polystyrene foam, rock wool, or thermopane windows.

Convection is similar to conduction, but it conveys heat in movable, fluid media, including air and water. It is a form of mixing and occurs simply because most materials expand and rise when heated. For example, warmed air rises, which is why smoke from fires drifts skyward. If you stand over a gravity-feed hot-air grate, the warm air currents transfer heat to your feet via convection. This mode of heat transfer can be blocked by physical barriers that inhibit the movement of air and other fluids.

Finally, heat can be transferred through a change of state, also called latent heat. It refers to the amount of heat taken up when a substance melts from a solid to a liquid or evaporates from a liquid to a gas. Changes of state consume vast quantities of energy. For example, it takes 180 British thermal units of heat energy to heat one pound of water from freezing to boiling.* One thousand additional Btus are required to evaporate the same pound of water into steam, without increasing the temperature of the steam at all. The enormous capacity of water for latent heat explains why a filled teapot cooing over a redhot burner doesn't explode. The energy of the flame is used to convert water into steam. This principle also explains an important aspect of the human body's system for temperature regulation. The body releases excess heat by sweating, and the evaporation of this fluid uses up and draws away from the body large amounts of heat energy. Latent heat is also responsible for the air-conditioning influence of plants. Plants evaporate huge amounts of water, drawing heat from the air in the process and storing it as latent heat in gaseous, water vapor. This process lowers the ambient air temperature and increases humidity. In one sunny, summer day an acre of turf can transfer more than 47,000,000 Btus of energy, enough to evapo-

*The definition of a British thermal unit is the amount of heat energy needed to heat one pound of water one degree Fahrenheit. Therefore, it takes (212-32) or 180 Btus to heat a pound of water from freezing (32°F) to boiling (212°F).

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rate about 6,800 gallons of water. One square meter of grass can return half a ton of water to the atmosphere in the course of a growing season, transferring tremendous amounts of energy. Temperatures over grassy surfaces are about 10 to 14 degrees Fahrenheit cooler than temperatures over exposed soil because grass evaporates water and transfers heat energy of the air into the latent heat of water vapor. Obviously, plants must draw upon vast supplies of water to produce this dramatic cooling effect.

If you have a good understanding of heat, temperature, and heat transfer, the other factors contributing to comfort—humidity and air movement—are easier to understand.

Relative humidity is the ratio of the actual amount of moisture in the air compared to the maximum amount it could hold at a given temperature. As humidity increases it approaches the saturation point, the point at which it can hold no more moisture, and precipitation as snow or rain occurs.

With increasing humidity, it becomes harder to add more water to the air. It is more difficult to evaporate sweat in humid environments because the air is already approaching its saturation point. That is why you feel more uncomfortable in humid environments; it is more difficult to unload excess body heat by sweating and evaporation. When a relative humidity of 60 percent or more accompanies a temperature of more than 80°F., it feels uncomfortable, muggy, and humid. In an arid, desert climate, the same temperature would not be uncomfortable because body heat could be easily transferred into the air by sweating and evaporation. On the other hand, high humidity at low temperatures accentuates the impact of cold because it speeds heat loss and gives an unpleasant, raw feeling. When the air temperature is much lower than body temperature, conduction takes over. The air's specific heat is higher when moist, and it rapidly draws heat away from the body.

Air movements also contribute significantly to comfort and are measured by recording their velocity and direction. They have their greatest impact on comfort by increasing heat transfer. In hot, humid climates air movements are desirable because they increase evaporation and heat loss, but in hot, arid climates winds may be undesirable because they carry away precious water. Air movements in cold weather are undesirable and even dangerous because they carry away heat. The notorious "wind-chill" factor describes the accelerating impact of air movement on heat loss. For example, at zero degrees a casual well-clothed hiker need not worry about frostbite if the air is still. But at 20°, if a gusty 40-mile-per-hour wind is blowing, cautions should be taken to guard against excessive heat loss from the body's extremities, which may lead to frostbite.

However, the ability of humans to adapt their physiology to extremes of climate is limited. Our ability to survive depends on our aptitude for analyzing climates, and then manipulating our environment and building shelters that adapt to the available conditions. The following sections analyze the forces sun and wind —and indicate how our homes and offices can be designed to minimize the impact of adverse weather. We emphasize the value of using the landscape to temper extremes of climate and to promote human comfort.

The Sun

The sun commands the daily genesis of weather and is the greatest single force affecting climate. Its radiant energy drives the machinery of climate all over the world. Annually, the earth makes a 600-million-mile orbit around the sun in an elliptical path and, at the same time, rotates on its own axis from west to east, making the sun appear to move from east to west. Knowledge of these two types of motion enables us to predict the sun's "position" in the earth's celestial dome. This permits some manipulation of the environment to utilize the sun's energy to best advantage. During warmer periods, the goal is to block the sun's radiant energy from entering living areas. But at other times, all available radiation should come into the home.

Acquiring an understanding of the sun's path, the arc it travels in the sky, is the first step to planning energy-efficient design. The solar path has two components: its absolute height in the sky, measured by the altitude angle; and the distance it travels on its path between the eastern sunrise and the western sunset, called the bearing angle. All positions in the solar hemisphere can be described by these two measurements. The bearing angle is defined in reference to due north because most people learn to read maps from this perspective. (However, in some disciplines, including architecture and some branches of engineering, it is customary to measure bearing angles from due south.)

You will notice that the seasonal changes in the sun's arc are most striking as you travel away from the equator. As you travel north, the period of daylength increases dramatically in the summer, until you reach the extreme of midnight sun in the arctic. In northern regions in the summertime, the sun rises farther to the northeast and sets farther to the northwest. In the winter the sun's shorter path originates farther southeast and sets farther southwest and barely rises over the horizon.

But in the extreme north, no matter the length of the sun's arc, it never climbs very high into the sky. One must travel south, toward the equator and into the tropics, to witness the sun directly overhead.

The ability of the sun to add radiant heat to a building depends both on its position in the sky and on the intensity of sunlight. The intensity of radiant energy reaching the earth depends on a number of variables, including the presence of clouds, smog, and, most importantly, the density and thickness of the atmosphere. During winter the sun is lower in the sky than it is during the summer, and radiant heat must pass through a larger slice of the atmosphere to reach the earth than it does during summer. The longer trip through the atmosphere diminishes the sun's intensity. That is why the winter sun is generally weaker than the summer sun. However, if we use proper building design the winter sun can still contribute valuable radiant energy, despite its diminished intensity.

As light and heat in the form of solar radiation penetrate the atmosphere to the earth, a variety of things may occur. A fraction is reflected back into space from high clouds; part is scattered into the sky vault as it strikes small particles in the atmosphere; and part is absorbed and reradiated by the gases in the atmosphere. The remaining radiation penetrates to the earth's surface where it is either absorbed or reflected by the ground, buildings, plants, and animals. Absorbed radiation heats the objects, which can then reradiate the heat. Reflected radiation is not absorbed and is bounced back into the immediate atmosphere. In nature, most surfaces absorb some radiation and reflect another portion.

Control of Radiation by Plants

Control of both absorbed and reflected radiation is necessary to maintain human comfort, and this can be achieved by complete obstruction or filtration of direct radiation, or by the reduction of reflected radiation. Trees, shrubs, grasses, and other ground covers are among the best materials for the control of solar radiation.

They offer climate control in tropical regions, where solar radiation is almost always oppressive, and in temperate regions, where solar radiation requires only seasonal control. Plants interact with solar radiation to influence microclimates in two ways. First, plants absorb solar radiation and cast shade. Second, most of this captured, radiant energy is used to transpire and evaporate water from plants. This converts most of the captured sunlight into latent heat, and relative humidity is increased instead of air temperature. The remaining captured radiation is used in photosynthesis. In particularly dry air, plants may actually lower ambient air temperature if they have sufficient water to transpire.

Selected plants can almost completely block the sun's rays. Species such as Norway maple *(Acer platanoides)*, red ash *(Fraxinus pennsylvanica)* and the small-leafed European linden *(Tilia cordata)*, which have dense foliage, multiple leaf layers, or a dense canopy, can absorb and block at least 95 percent of the sun's energy in the visual spectrum and 75 percent across all radiation spectrum combined. A more modest filtration of solar energy occurs when plants with open, loose foliage, including vines and trees such as honey locust *(Gleditsia triacanthos)* and pin oak *(Quercus palustris)* are used. One advantage of vines is that they offer shade almost immediately after planting while trees take longer to mature.

In temperate climates deciduous plants in full leaf are generally the best interceptors of direct solar radiation. They offer their strongest sun-blocking potential in summer, and in winter, when their leaves have been shed, they permit desirable sunshine to penetrate. The dynamics of seasonal foliage variation provide natural sun control. When evaluating plants as sun filters the species' shape must be considered along with its density. Each plant casts a distinctive shadow, which may be round, oval, pyramidal, or columnar in form. Consider the form of the area to be protected before selecting plants to cast shade.

Reflected radiation from the sun is best controlled by plants with coarse surfaces. The multi-faceted surfaces of leaves are much better at reducing reflection than the light, smooth surfaces of man-made pavements or architectural materials. Dark plants with smaller leaf surfaces such as conifers (*Pinus* species, for example), or plants with pubescent, fuzzy surfaces, such as elm (*Ulmus* species), greatly reduce reflection. Vines growing up walls or trellises and ground covers such as grass, pachysandra, or ice plant *(Mesembryanthemum)* also buffer against unwanted reflection.

By blocking or filtering direct or reflected sunlight, plants can temper local climates in a powerful fashion. In the daytime, the ground temperature in a forest may be as much as 25°F. cooler than the top of the tree canopy. At night the foliage mass prevents reradiation into the sky, and the temperature at the forest floor will be warmer than the temperature at the canopy. At midday, a vine-covered wall is always cooler than a bare wall. Dramatic proof of how plants relieve the sun's impact by casting shade was gathered by researchers in California's Imperial Valley, who found that bare-surface ground temperatures ranging from 136° to 152°F. cooled an average of 36°F. in only five minutes after the arrival of the shadow line from overhead foliage.

Wind

The sun provides the energy that drives atmospheric motion or winds. They start blowing when warm air, expanding, rises and cooled air, contracting, sinks. From this simple beginning the behavior of winds grows almost inconceivably complex. Air movements, if at low velocity, are usually pleasant and desirable. However, when the velocity increases, they are capable of causing great discomfort and destruction to life and property.

Winds are grouped into three categories: local and regional persistent winds; global persistent winds such as the trade winds of the tropics; and maverick winds such as cyclones, tornadoes, and hurricanes. Local persistent winds are almost invariably small-scale convection winds—the sea breeze, the land breeze, the mountain wind, and the valley wind. They are of great importance in influencing human comfort, and they can be controlled with careful landscape design.

Air flows in much the same way as water. Cold air settles to the lowest level and hot air rises. It will flow over, under, and around anything that is sturdily engineered, and will be bent, bounced, and resisted by obstructions such as buildings, fences, hills, valleys and other earth forms, and plants. Air movements, again like water, exert pressure against any surface that inhibits their flow. Whenever the wind flows over a solid barrier there is increased pressure upwind (where the wind blows from) and a protected, low pressure area immediately downwind or leeward (where the wind blows to). However, the low pressure area pulls the boundary layer of air flowing over the barrier into it. Thus, the lee side of a slope receives protection and contains a pocket of relatively still, quiet air. But this protected region has a limited range because the low pressure region sucks wind back into place.

In contrast, a pierced barrier allows some wind to penetrate through it and creates less pressure differential between the upwind and the downwind. This penetrable windbreak has less wind reduction

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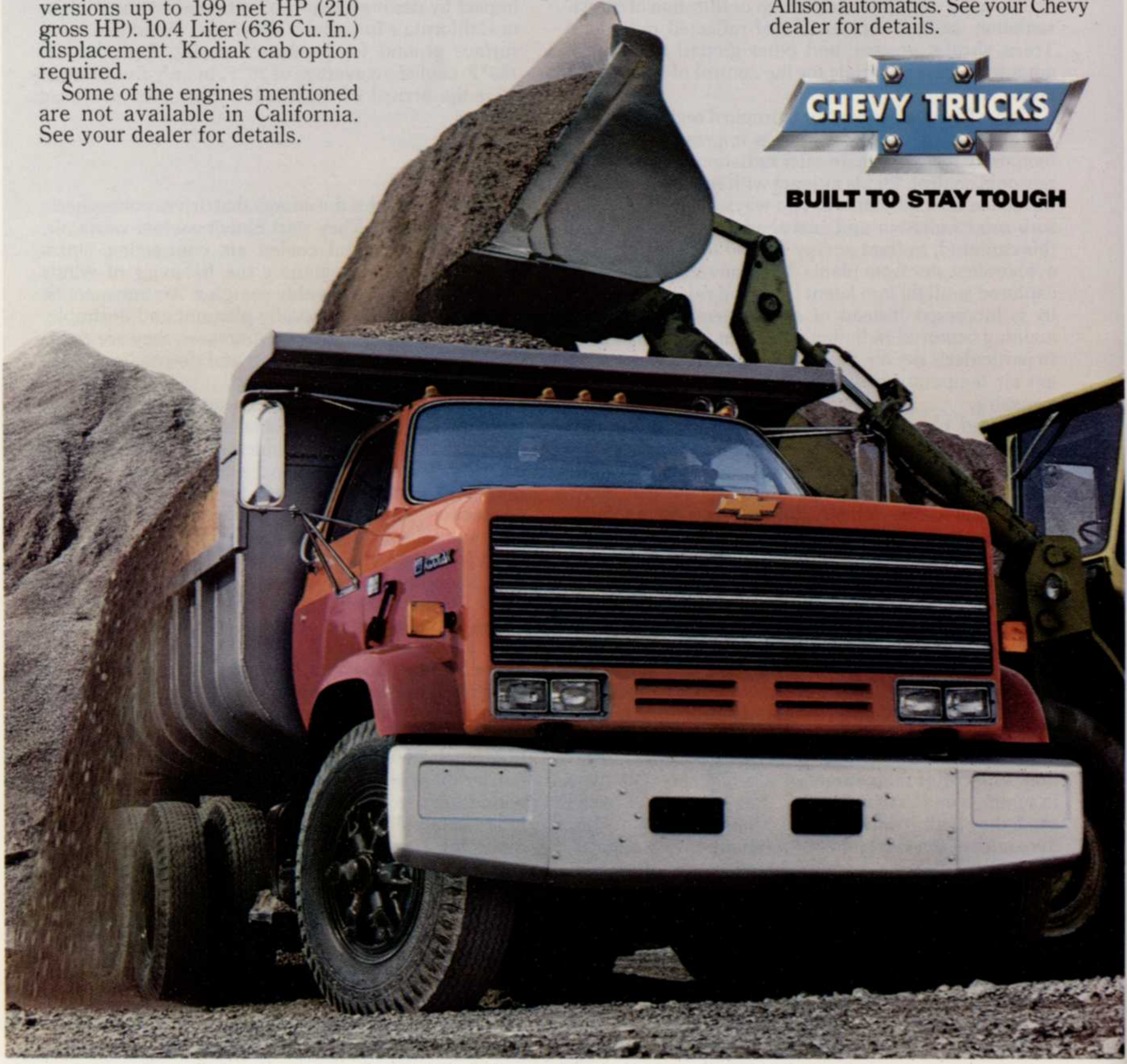

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