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ENH1156

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Right Plant, Right Place: The Art and Science of Landscape Design – Plant Selection and Siting[1]

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One of the most important steps in landscape design and management is appropriate plant selection and placement. Indeed, the principle of "the right plant in the right place" can prevent many common problems associated with landscapes and potentially reduce maintenance requirements. "Right plant, right place" is a short phrase that embodies many art- and science-based concepts for landscapes. The fundamental concept is choosing plant species, varieties, cultivars, provenances, or genotypes that are adapted to the location and situation in which they are placed. Fulfilling this concept requires knowledge of plant and site characteristics, including environmental and growing requirements, function, and aesthetics. It also is useful to remember that a successful planting design often is a compromise between the science of growing plants and the desire for artistic expression with plants.

Function, Aesthetics, and Environmental Requirements

Choosing the right plant and location requires knowledge of the site and the activities that take place there. Three questions to ask about plants are:

1. Functionally: What do you want the plant to do?
2. Aesthetically: What do you want the plant to look like?
3. Environmentally: What conditions does the plant need to grow?

A site inventory and analysis help guide plant choices by asking what environmental conditions exist on the site. The site inventory is a plan or aerial view showing the location of environmental conditions, including areas of sun and shade, dry and wet areas, soil type, views, wind direction, circulation routes, spatial dimensions, architectural features, and facilities needed for activities. An inventory also includes needs and desires of the client or users of the space. An analysis of the inventory determines the type of plants needed to fit the existing environmental conditions, the functional requirements of the space, and the aesthetic desires of the user.

Table 1 lists the functional uses, aesthetic plant characteristics, and site or environmental conditions to be considered when selecting and placing plant material.

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Table 1. Function, aesthetic, and environmental considerations

Function	Aesthetics	Environment
Climate control Visual control Physical control Erosion and water control Noise and odor control	Color Texture Form Size	Soil characteristics Light level Water quality USDA hardiness zone Temperature ranges Wind tolerance Disease and pest interactions Air pollution Maintenance and culture practices Life span

Site Conditions and Functional Characteristics of Plants

Plants serve many functions in the landscape, including human comfort, screens and barriers, and soil protection. When choosing plants for a particular function, consider characteristics such as size, shape, density of foliage, texture, root mass, and rate of growth. Plants should be selected based on their ability to create the desired functional effect and thrive in the growing conditions of the site.

Climate Control – Plants can effectively modify the microclimate for human comfort by affecting humidity, air temperature, and air movement. Trees and other vegetation cool air temperature through the reflection of solar radiation, which creates shade, and through transpiration (water evaporation) from the leaves. Trees also can provide windbreaks to block cold air or funnel air to increase cooling breezes.

Visual Control – Plants can be arranged to either partially or fully screen unwanted views from a building—such as roads, trash cans, utilities, or parking lots—or to direct views to building entrances or pedestrian zones. Plants can create privacy from outside views into a building, such as from roads or parking lots, and provide pleasant outdoor gathering areas by creating the feeling of enclosure with vegetation overhead. Visual comfort also can be influenced by the use of plants overhead to reduce glare from sunlight. Additionally, plants on vertical surfaces reduce reflected light bouncing off the surface.

Physical Control – Plants are useful for controlling the physical movement of people or animals. Tall, dense plants provide physical barriers that prevent access and cannot be seen through. Shorter, less dense, but wider plantings create implied barriers that separate areas and discourage access, while still allowing views. When using plants to control or direct pedestrian movement, wear resistance is a consideration, particularly in places where pedestrians or pets may walk on plants. Some species tolerate foot traffic well, while others do not.

Erosion and Water Control – Plants prevent erosion in several ways: leaves break the impact of raindrops, rough bark and twigs slow water flow, and fibrous roots near the surface trap and retain soil. These same characteristics control and hold stormwater on site by slowing the speed of water flow across the soil surface, allowing for greater filtration and cleaning of the water. A plant buffer is helpful along waterfronts to block the flow of pollutants carried by water, such as pesticides and fertilizer, into larger water bodies.

Noise and Odor Control – Sounds and odor can be mitigated with plantings. Effectiveness depends on the type, density, height, and location of the plants. Locating plants to block the prevailing wind that comes from the source of the odor or noise serves this purpose well.

Site Conditions and Aesthetic Characteristics of Plants

Many business owners are concerned with the aesthetic appeal of their businesses because it helps to attract customers and improve property value. Contrary to popular belief, beauty is not only in the eye of the beholder—there are common design characteristics that are generally considered to have aesthetic value. Most people enjoy nature and the variety of color, texture, and forms that plants offer. There also is a general preference for some level of organization in the landscape.

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Colors and textures of the architectural material of the building or landscape elements, such as plazas or courtyards, often influence plant choice for aesthetic value. Choices also depend on personal preferences and the availability of landscape plants. Plants should be selected to enhance the architecture, hardscape, and existing vegetation by contrasting or complementing the color, form, or texture. Organization is achieved through repetition of color, form, or texture at specific locations in the landscape to create a recognizable pattern. Plants should be chosen for their ability to personalize the business, enhance the surrounding buildings, shift attention away from less desirable views, and bring a sense of beauty to the environment.

Color – Color is the most attractive and visual characteristic of plants, but it also is the most fleeting, as most plants display prominent color only during short bloom periods. Light qualities of the site—sunny or shady areas—affect the perception of color. Warm, bright colors, such as yellows and whites, are best for shade, and all colors work well in sunny areas. Color theory—the science of color combinations—can help guide the selection of a color scheme for mixed plantings.

Texture – Plants have a wide range of textures, from soft and furry to stiff and thorny. Textures are typically described as coarse, medium, or fine. Texture is the most variable quality of a plant—it can change with the seasons when plants lose their foliage, and it can change with viewing distance. Many trees, such as oaks, have a rough texture when viewed close up, but the small leaves create a finer texture when viewed from a distance. Texture provides contrast and interest, but the use of the space is a very important consideration when choosing plant texture. Plants with stickers or thorns should be avoided in pedestrian walkways or sitting areas for patrons.

Form – Form, or growth habit, is the most recognizable or obvious quality of a plant. Form and size are the primary determinants of location. Choose the plant form most appropriate for the desired function and the shape and size of the space. For example, sprawling vines are not appropriate by walkways where they require constant trimming for safety; however, trees with a wide, sprawling canopy are appropriate for shade over the walkway. It is important to remember that plant proportions change over time. A tree may be upright and columnar when it is young, but develop into a broad spreading specimen with age. Consideration of form also helps determine if plant material should be used in masses or as individual specimens.

Size – Plants grow, obviously, but this fact is sometimes forgotten when plants are selected and installed at a site. It is very important to consider the size of the plant when it is fully mature. The one-gallon arborvitae planted along the foundation of the building may look right at the time of installation, but given time, it will outgrow its location. Finally, the relative size of plants in a design changes; some grow faster than others. Remember, a landscape is a dynamic system of living plants that grows and changes with time. Indeed, plant size is one of the most often overlooked characteristics when plant materials are selected. Selected plant materials frequently are too large for the space in which they are planted. Examples include planting a row of live oaks, which may grow to 70' tall, under overhead power lines, or planting a sweet viburnum hedge that will eventually grow 25' tall in front of windows. This leads to the need for extensive and often unsightly pruning to keep plants at the appropriate size.

Another common mistake when siting a plant is placing it too close to a structure. For example, a tree species may be selected that only grows to 25', which is in scale with most commercial lots. However, a tree of this size should not be planted too close to a building. This can lead to damage to the structure as the tree grows too large for the space in which it was planted.

Plants also can be too small for the space or application. A privacy hedge that only grows to 5' tall is not adequate for most situations. Dwarf crapemyrtles on a large commercial site may not grow large enough to provide the effect intended and can be lost in an open area.

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Site Conditions and Environmental Requirements for Plants

Soil Characteristics

Soils are one of the most frequently overlooked site characteristics when plant materials are selected, yet they are critical to a plant's survival. The soil's pH, salinity, and fertility often are difficult to manipulate, so it is important to select plant materials that tolerate natural soil conditions. Soil moisture must be considered, even if an irrigation system is available. Try to select plants that match the site's natural moisture regime. Swales and low areas are wetter, while berms and high spots are not good locations for plants with high water requirements. Selecting plants suited to the natural moisture conditions of the soil decreases or eliminates the need for artificial irrigation or drainage.

Light Level

The amount of light a site receives is an important consideration when selecting plant material. Buildings and other structures may affect how much light a site receives. Generally, the south and west sides of a building are exposed to more light than the north and east sides. Trees and other plants in the landscape also can alter the amount of light on a given site. Some trees provide denser shade than others, and this helps determine the performance of plants growing underneath. Plants that do not receive enough light often grow weakly and become "leggy." Plants adapted to shade and lower light usually show signs of sunburn or scald when planted in too much sun.

Water Quality

Water quality issues, like salinity and alkalinity, play an important role in determining plant performance. Alternative water sources, such as reclaimed water and greywater, may have elevated salinity levels. If the salinity of the irrigation water is high enough, it can damage plant materials. Salt spray is a problem in many coastal landscapes, and care should be taken to select salt-tolerant plants. Water splashed from swimming pools, spas, and chlorinated fountains also can damage landscape plants.

Alkalinity is another problem frequently encountered with alternative irrigation sources. The long-term application of irrigation water with a high level of alkalinity can cause a rise in the soil pH. If the pH of the soil becomes too high, many essential plant nutrients become unavailable and plants begin to show nutrient deficiencies. Plant materials that are tolerant of alkaline soils should be used on sites with alkaline irrigation water. The levels of salinity and alkalinity in irrigation water can be determined by a simple water test available from the University of Florida IFAS Extension Soil Testing Lab (http://soilslab.ifas.ufl.edu/ESTL%20Tests.asp).

The type of irrigation system available influences plant selection. Overhead irrigation systems are the most efficient for large areas of turf, while beds of ornamental plants are most efficiently irrigated with micro-irrigation (i.e., drip irrigation). The size of the irrigation system also dictates the maximum amount of water it delivers and must be considered when selecting plant material. If water quality is an issue for your landscape, micro-irrigation is best to help avoid salt damage to foliage.

USDA Hardiness Zone

Florida has a broad range of USDA cold hardiness zones extending from zone 8 to zone 10. It is important to select plant material that is cold hardy for the region in which you live. The urban heat island effect refers to urban areas being warmer than surrounding rural areas. Buildings and pavement retain more heat than land surfaces in rural areas. The difference can be as much as 10°F. This effect often is more pronounced at night and in the winter. This may allow for plants that are not cold hardy in surrounding rural areas to survive in more urban areas.

Temperature Ranges

Daytime temperatures play an important role in determining the performance of a plant at a given location. When temperatures are too low, many plants, especially tropicals, perform poorly. Alternatively, high temperatures limit the growth of many plants. The high summer temperatures in

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Florida are what limit many annual species to the cool season.

Nighttime temperatures are a commonly overlooked consideration when selecting plant material. Many plants have nighttime temperature requirements that are different than their daytime temperature requirements. This is one reason many desert plants may perform poorly in a humid environment. They may be adapted to 110°F during the day, but they are adapted to much lower nighttime temperatures than we experience in Florida. These warmer nights speed up a plant's metabolism so much that it cannot produce enough food through photosynthesis to maintain itself.

Reflected heat from surfaces in a landscape also affects the choice of plant material for a site. For example, the reflected heat from a west-facing wall may be too intense for some species, but it also may provide adequate warmth for others to survive in the winter.

Wind Tolerance

When we think of wind as a problem in a landscape, we usually think of high winds associated with storms. If the landscape is in a location where this type of storm is likely, plants that stand up to this type of wind should be used. Planting techniques, such a grouping trees close together to buffer each other, also can be used. Less intense and prevalent winds are a consideration for plant selection in certain situations. Hilltops and coastal areas often require plants that can contend with frequent winds. Buildings channel wind across portions of a landscape, creating windy conditions. In these situations, care should be taken to select plants that perform well where it is windy.

Disease and Pest Interactions

If there is a limiting disease, or if a pest is present on a site, select plants that are disease and pest resistant. For example, if you know powdery mildew is a common problem in a landscape, select one of the newer crapemyrtle varieties that are resistant.

Air Pollution

Air pollution can be a limiting factor for plants in some situations. Landscapes in areas that experience high levels of air pollution for at least part of the year should use plant materials that are tolerant of pollutants like ozone, sulfur oxides, and nitrogen oxides.

Maintenance and Cultural Practices

Maintenance requirements of plant material are another important consideration. Choose low-maintenance plants for areas that are difficult or inconvenient to access and avoid materials that require frequent chemical application in areas frequented by people and pets. It is much easier to maintain plants that require more attention when they are grouped together and are easy to access.

Life Span

Many plants have a certain life expectancy. It is important to remember that the plants in a landscape may complete their natural or effective life span and have to be removed. For short-lived species, keep in mind that they decline. The decline and removal of plants is not necessarily a problem; it should be a planned part of the dynamic life of the landscape. Short-lived plants can act as placeholders until other species grow large enough to have the desired impact or effect. Short-lived plants provide an opportunity for change in the landscape when the old landscape becomes too familiar. A smart way to plan for change is to use long-lived, larger plants in most of the landscape and smaller plants with a shorter life span in highly visible areas, such as entryways or pathways, where most homeowners are likely to desire change.

Benefits of "Right Plant, Right Place"

Consideration of the growing needs of plants, the site characteristics, and the functional and aesthetic needs of the user will guide the selection and siting of plants and result in a healthier, long-lived, low-maintenance, and less costly landscape that is functional and enjoyable for the user. The characteristics and requirements of many common

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Florida landscape plants can be found in the Florida-Friendly Plant List available at http://fyn.ifas.ufl.edu/materials/list.pdf or through your county Extension office.