# **DESIGN PHILOSOPHY**

FTE's landscape design philosophy incorporates landscape beautification and conservation values. Our focus as a program has shifted away from the "bold vision" design approach characterized by designing beautification projects using many large signature palms and few, if any, shrubs and returned to its historical roots of developing sustainable native landscapes. The FTE landscape program limits high intensity landscapes to landmark destinations and focuses on healing native landscapes and developing opportunities to incorporate ecosystem services enhancing and conserving Florida's natural environment.

While important, aesthetics is only part of the complex equation for producing responsible landscapes within the FTE highway system. Turnpike landscapes must also be called upon to modulate traffic behavior, stabilize steep erodible embankments, screen or emphasize views, provide environmental services, mitigate the effects of pavement and other man-made structures on the environment and minimize maintenance needs. Therefore, in keeping with the mandate issued by Department Policy Topic No. 000-650-011c, "Highway Beautification" future landscapes will provide a balance of high intensity landscapes and native or naturalistic plantings.



# LANDSCAPE **INTENSITY**

Each project must develop a landscape hierarchy based on the level of aesthetic impact and corresponding maintenance requirements. Intensity areas are to be designated as High Intensity, Moderate Intensity, and Low Intensity. High Intensity landscape areas are limited to no more than 25% of the project area. Moderate Intensity areas are limited to no more than 50% of the project area and Low Intensity areas must comprise a minimum of 50% of the project area.





### LOW INTENSITY

Low intensity areas are intended to be native or naturalistic plantings utilized for screening a view, ecosystem restoration, or as a backdrop to specimen landscapes. These low intensity areas will accordingly require less long-term maintenance.

> Low Intensity areas (buffers, sustainable landscape areas, or reforestation) and non-landscaped areas (storm water management, limits of horizontal clearance, etc.) make up 50% minimum of the project area.



### LOW INTENSITY **STRATEGIES:**

- » Landscape Buffers
- » Sustainable Landscape Areas
- » **Reforestation**
- » Slope Stabilization









## **MODERATE INTENSITY**

Moderate level landscapes require a balanced level of maintenance, to include reduced mowing, pruning, pest control, and fertilization.

Moderate intensity landscape areas shall consist of plantings complementing High Intensity landscapes, providing a variety of color and texture, slope stabilization and other functional or aesthetic aspects.



### **HIGH INTENSITY**

High Intensity landscape areas are designed for maximum aesthetic appeal and will generally require the most intensive maintenance. Although typically designed to include flowering plants and exotic palms, High Intensity areas can also be designed utilizing very large native species to achieve maximum aesthetics.

High Intensity landscape areas are located in the most visible focal points usually at overpass embankments, infield gore areas, and gantry sites for maximum aesthetic impact



It is intended that the high intensity landscape areas comprise no more than 25% of the total landscape for each project.

### **KEY HIGH INTENSITY** USES

- » Focal Points
- » Gateways
- » Gore Areas





# **PLANT DIVERSITY GOALS**

Species Diversification is a prudent goal for the establishment of man-made and managed ecosystems. Species diversification is a natural, low impact means to mitigate the potential negative effects of blight, insect infestation, and fire threat and other potentially harmful threats. It is also a means to broaden the overall aesthetic of any particular landscape providing for a range of color, texture and bloom time.

Create landscapes that have an uneven aged mix of no more than 10 percent of the same species, 20 percent of the same genus, and 30 percent of the same family.

» Landscape Design: FDM 228: https://www.fdot.gov/roadway/fdm/default.shtm

Mitigating the potential negative effects of monoculture (lack of species diversification) is also a prudent method of protecting the investment in green infrastructure FDOT makes. A modern example of the negative effects of monoculture is the near entire loss of the urban forest canopy of most towns and cities throughout the northeast and midwest due the Dutch Elm Disease. This scenario has also played out here in Florida with the recent discovery of the Texas Phoenix Palm Disease which has affected several roadway landscape projects with devastating results.



SPECIES



### THE IMPORTANCE OF USING INDIGENOUS SPECIES

Native vs. Indigenous – While we generally refer to the use of Native plants in our landscape projects, it is important to match the species to the ecosystem in which they are being planted. This insures that the landscape project will have a greater chance of success. It also means that the species selection will support the ecosystem in which it is planted. The use of Native plants is to be commended however, they should also be endemic to the surrounding ecosystem to ensure the best results.

In biogeography, a species is defined as native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes, with no human intervention. Every natural organism (as opposed to a domesticated organism) has its own natural range of distribution in which it is regarded as native. Outside this native range, a species may be introduced by human activity; it is then referred to as an introduced species within the regions where it was anthropogenically introduced.

An indigenous species is not necessarily endemic. In biology and ecology, endemic means exclusively native to the biota of a specific place. An indigenous species may occur in areas other than the one under consideration.





# **ECOSYSTEM SERVICES**

### INTRODUCTION

This document outlines a policy, process and means for tracking Ecosystem Services in accordance with current Federal, State and Department policies.

- » Florida Statutes 334.044 (26) states "It is the policy of the Florida Department of Transportation to conserve, protect, restore and enhance Florida's natural resources and scenic beauty when constructing and maintaining the State Highway System. FDOT policy requires FTE to develop a landscape program that: Provides safe roadsides that are durable, and ecologically and economically sustainable.
- » Develops measurable returns on investments that grow in value over time.
- » Accommodate existing and proposed trees and other longlived plants by consistently integrating landscape conservation and highway beautification into the processes that are used to plan, design, construct, and maintain roadways.
- » Develop and implement a system to track costs and accomplishments of programs contributing to highway beautification."



Ecosystem services are defined as the many and varied benefits to humans gifted by the natural environment and from healthy ecosystems. Ecosystems functioning in healthy relationship, offer such things like natural pollination of crops, clean air, clean water, resilience and productivity of food crops, extreme weather mitigation, human mental and physical well-being.

In order to support the Department's Policy the FTE Landscape Program adheres to the following nature based design solutions and post-project monitoring strategies:

- » Inventory and analyze the current state of ecosystem services along the FTE roadway system.
- » Identify existing healthy ecosystems throughout the FTE system for the purpose of ecosystem conservation and preservation.
- » Utilize nature-based design solutions to establish sustainable landscape areas utilizing techniques such as reforestation; implementation of natural systems stormwater management infrastructure; and diversification of native plant species. These solutions should result in measurable benefits such soil conservation, decreased mowable areas and frequencies, increased pollinator and avian forage areas, heat island mitigation, and carbon sequestration.
- » Program landscape projects with a focus on increasing and improving ecosystem services throughout the system.
- » Implement a scoring system that tracks measurable goals such as restoring and increasing the acreage of natural ecosystems along the FTE system which will result in maintenance cost savings due to their implementation.
- » Maintain an ecosystem services inventory updated post construction and monitored during the maintenance phase of the project.

### Cultural

Ethical values, existence values, recreation and ecotourism

### Regulating

Air quality, climate, water runoff, erosion, natural hazards, pollination

### Supporting

Nutrient cycling, water cycling, soil formation, photosynthesis

### Provisioning

Food, fiber, biomass fuel, freshwater, and natural medicines

Not all ecosystem benefits accrue to FTE landscapes. Accordingly, we will focus on the following benefits:

- » Regulating Services such as climate, water, and disease regulation (plant diseases) as well as pollination;
- » Supporting Services such as soil formation and nutrient cycling; and
- » Cultural Services such as educational, aesthetic, and cultural heritage values as well as recreation and tourism.





### **ECOSYSTEM SERVICES MONITORING METHODOLOGY**

Based on Departmental policy, both Quantitative and Qualitative data will be recorded and analyzed to establish current Ecosytem Services and the impact of improvements over time. The core elements of measurement include environmental quality, social factors, and economic impact.

The FTE Landscape Program only applies analysis and monitoring of the roadside areas within its domain and relevant categories.

CRITERIA	CATEGORY	GOAL
Economic	Maintenance Cost Containment	Decrease maintenance cost per acre
	Monetary Contributions	Increase return on investment
Environmental	Conservation/Preservation	Preserve existing vegetation and ecology
	Stormwater Management	Reduce gray stormwater infrastruc- ture systems
	Sustainable Landscape Areas	Introduce Sustainable Landscape Areas to system
	Reforestation	Increase reforested acreage
	Carbon Sequestration	Increase tons of sequestered carbon
	Species Diversity	Increase diversity of species
	Heat Island Mitigation	Remove heat islands from FTE system

Figure. FTE Landscape Program – Ecosystems Monitoring



### COMPONENTS OF FTE ECOSYSTEM SERVICES **DESIGN AND MONITORING**

#### MAINTENANCE COST CONTAINMENT

Departmental policy focuses on containing maintenance costs for landscape. The intent of each new landscape project will be to develop a system with lower maintenance costs per square yard. The summation of the different nature-based design strategies outlined in this document will result in a more valuable roadside environment that is easier and less costly to maintain.

Maintenance Cost Containment will be measured by establishing a baseline maintenance cost for the currently installed and maintained landscape projects and adjusted over time as new landscape projects that adopt a regenerative approach to the ecology and new less invasive maintenance practices are put into effect throughout the system.



#### **MONETARY CONTRIBUTIONS**

Landscape projects provide considerable, measurable monetary contributions to Florida's economy along with providing the less tangible benefit of enhanced aesthetics. Enhanced aesthetics support one of the top three contributors to Florida's Gross Domestic Product, Tourism.

A Department commissioned study in 2014 determined that FDOT landscape projects contributed \$3.10 per \$1 invested. Accordingly, each new landscape project will be required to calculate this monetary contribution. These costs are summarized on an annual basis.





### **CONSERVATION/PRESERVATION**

Ecosystem conservation considers entire communities of species and their interactions with the physical environment and aims to develop integrated plans involving wildlife, physical resources, and sustainable use. Conservation and preservation of natural ecosystems are a cost-effective means of reducing maintenance costs of the FTE roadway system. Careful roadway alignment and placement of supporting utilities and infrastructure in previously disturbed areas prevents the spending of capital and long-term maintenance responsibilities. Additionally, it preserves the monetary value of the ecosystem services that are being provided by the preserved area and reduces landscape construction costs.



#### STORMWATER MANAGEMENT

The U.S. EPA defines stormwater management as the effort to reduce runoff of rainwater or melted snow into streets, lawns and other sites. The goal of managing stormwater is to control flooding and treat water pollution at the source, allowing water to infiltrate back into the ground and keeping pollutants in managed basins where they can be collected rather than flowing downstream and polluting water bodies.

The FTE roadway system utilizes a combination of closed and open system to manage stormwater. By planting the slopes and bottoms of the basins with appropriate plant material, the efficiency of the stormwater management facility can be increased by rainfall interception, evapotranspiration, and enhanced infiltration; larger quantities of carbon and nutrients could be fixed in the soil at the source of pollution.

The benefits include additional water quantity infiltrated on site, better water quality downstream, reduced maintenance costs, and higher value of ecosystem services being provided by stormwater facilities.



#### SUSTAINABLE LANDSCAPE AREAS

The FTE Landscape program has adopted the strategy of creating Sustainable Landscape Areas (SLAs) throughout the FTE Roadway system. SLAs are composed of predominantly native plants endemic to the region of the state where projects are located. By simply changing management practices for these areas, long term maintenance costs will be reduced.

In addition to providing economic benefits, they are also expected to provide ecosystem services such as increasing species diversity, improving air and water quality, mitigating heat island effect, increasing pollinator forage areas, soil conservation, and enhanced aesthetics.



FLORIDA'S TURNPIKE ENTERPRISE

#### REFORESTATION

Reforestation is the natural or intentional restocking of existing forests and woodlands that have been depleted by right of way clearing. An integrated strategy; each FTE landscape project will explore the potential for including reforestation of areas which are not critical to the function of the roadway.

This integrated reforestation strategy helps to reduce overall capital improvements and maintenance costs because smaller native trees are used in greater quantities. The trees would be maintained for an establishment period and left to their own devices with minimal maintenance to take place in these areas. As the trees grow, they provide the benefits of shade, habitat, improvement of air and water quality, and carbon sequestration providing more valuable ecosystem services as they mature.



### **CARBON SEQUESTRATION**

Carbon sequestration or carbon dioxide removal is the long-term removal, capture or sequestration of carbon dioxide from the atmosphere to slow or reverse atmospheric CO2 pollution and to mitigate heat island effect and global warming. Plants sequester carbon through photosynthesis. They respire carbon dioxide and anchor carbon through their root systems into the soil. The roadside landscape area of the FTE system provides an opportunity to sequester more carbon through the replacement of sodded roadside areas outside of the recovery zone with trees.

The benefits of carbon sequestration include heat island mitigation; reduction in air temperature; improved air and water quality; increased ecosystem services.



Source: U.S. Environmental Protection Agency

Carbon is lost back to the atmosphere through respiration and decomposition of organic matter.

- Aboveground carbon:
- » Stems
- » Branches
- » Foliage

Carbon is lost to the atmosphere through soil respiration.

Some carbon is transferred from below-ground carbon (e.g., root mortality) to the soils.

#### SPECIES DIVERSITY

Species diversity refers to the number of different species represented in an ecological community. A goal of the landscape program is to increase the use of native plant species to enhance naturally occurring ecosystems.

The benefits of species diversity include creating greater resilience to ecosystem collapse, better air and water quality, increased forage area for pollinators and wildlife, increased ecosystem services and lower maintenance costs for introduced landscape materials.



#### **HEAT ISLAND MITIGATION**

Heat Island Effect describes built up areas that are hotter than nearby rural areas. Roadway surfaces invariably create heat islands since they are paved surfaces that capture heat and maintain higher temperatures affecting surrounding areas. The roadside landscapes of the FTE system can assist in the mitigation of heat islands by introducing more trees to capture carbon, moderate air temperature by evapotransipration, and cast more shade over the system as opposed to sod or paved surfaces.

The benefits of addressing Heat Island Effect include the introduction of more beneficial ecosystem services in the form of sustainable landscape areas or reforestation projects. These interventions capture more carbon; improve air and water quality; and provide a friendlier user experience along the FTE roadway system.

### **URBAN HEAT ISLAND PROFILE**



# REFORESTATION

Reforestation is intended to be proposed for areas which have been previously cleared and have no other roadway function. Reforestation serves to reestablish the indigenous forest canopy and may be utilized to screen undesirable views or stabilize slopes.

Benefits of reforestation include oxygen production, carbon sequestration, and reduction of stormwater. The establishment of reforestation requires little to no maintenance.





# **SLOPE STABILIZATION**

FDOT Embankment specifications provide for a wide variety of soil types which are primarily intended for structural support of the roadway system. This, combined with excessive runoff of rainwater and southwestern exposures makes them particularly inhospitable for plant life and aesthetically unappealing.

Mowing operations on steep slopes is expensive and dangerous and consequently, slopes are not mowed with the same frequency as flat areas. The result is poor turf grass establishment and excessive erosion.

FTE landscapes must address these issues by providing plant cover which will survive these conditions, eliminate the need for mowing, stabilize the embankment and provide enhanced aesthetics.

Designers are encouraged to explore alternative methods for mitigating steep embankment such as terracing or Concrete Masonry Unit (CMU) revetment.



# HARDSCAPE

Due to the increasing widening of FTE facilities, right of way is becoming more constrained. This limits the use of landscape plantings to achieve enhanced aesthetics. Accordingly, the use of hardscape, paint applications and graphics are often times the only way to beautify the corridor.

Roadway structural elements such as bridge columns and support elements, retaining walls, noise abatement walls and stand alone hardscape structures should be considered as an opportunity to provide required roadway aesthetics.

For more information:

» Noise walls and Perimeter walls: https://fdotwww.blob.core.windows.net/ sitefinity/docs/default-source/roadway/ fdm/2020/2020fdm264noiseperimwalls. pdf?sfvrsn=3962e82a\_2

» Retaining walls:

https://fdotwww.blob.core.windows.net/sitefinity/docs/ default-source/roadway/fdm/2020/2020fdm262retwalls. pdf?sfvrsn=6e1e0804\_2

» Form Liners: https://www.concretenetwork.com/architectural-form-liners







# **ADDITIONAL DESIGN CONSIDERATIONS**

- » Emphasize naturalistic design, staggered heights, and groupings rather than straight lines.
- » Emphasize large groupings to provide a high intensity and immediate visual impact.
- » Minimize use of shrubs except in specific applications.
- » Utilize indigenous and hardy non-native plant species suitable to the project site's environmental conditions.
- » Reinforce native canopy when possible.
- » Respect adjacent land uses and their rural, urban or suburban characteristics.
- » Utilize Xeriscape (Florida-friendly) planting principles.
- » Use low maintenance and sustainable plant materials.
- » Provide a lasting and memorable visual statement with the use of seasonal flower or foliage color and unique and contrasting plant types that reflecting Florida's climate.
- » Promote large displays of wildflowers or meadow in large dry retention areas as an alternative to sod.
- » Remove Category 1 Invasive exotic plant material threatening our native plant communities. Refer to <u>www.fleppc.org</u> for current listings.
- » No category I invasive exotic plants shall be proposed on a FTE system. Category II invasive exotics are considered on a case by case basis subject to FTE approval.







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## SHRUB UTILIZATION

Shrub utilization may be utilized under the following circumstances:

- **A.** Screen gantry equipment from travel ways.
- **B.** Shrub beds beneath trees and palms to protect from mower damage.
- C. Placement on steep slope conditions to minimize mowing maintenance efforts (i.e. interchanges, overpasses or cross road embankments).
- **D.** Reduce maintenance efforts in isolated areas where it is difficult or dangerous to access.





D





## SHRUB UTILIZATION

- To provide color and visual Ε. interest.
- Screening undesirable views, **F**. such as industrial areas, where no noise walls are present.
- **G.** Soften or accent noise walls.
- H. Addressing Community commitments agreed to during the public involvement process or other jurisdictional requests.





### DRY STORMWATER MANAGEMENT AREAS

Rains can wash exposed soil, landscape debris, fertilizers, and pesticides off the landscape becoming part of the stormwater runoff. Stormwater runoff makes its way to rivers, lakes and canals and, ultimately connects to Florida's groundwater supplies. Groundwater comes from the aquifer, which is the source of almost all of the water we use in our daily lives.

Sustainable stormwater areas describe areas and ecosystems that function to collect, temporary hold and filter stormwater. These areas can provide many ecological benefits in filtering stormwater and also require very little to no maintenance when planted with the appropriate native material. It should be noted that exotic, non-native plant material generally require large amounts of fertilizer to maintain their health. Inevitably, this fertilizer finds its way into our surface and ground water supplies.



### DRY STORMWATER MANAGEMENT AREAS

Detention areas and other low-lying areas can be opportunities for plantings that reduce and filter stormwater runoff. Planting these areas with Florida native plant material means that constant trimming (producing debris), fertilizing, and pesticide treatment is unnecessary. Shallow areas can be planted with grasses and other plants to filter water before letting it flow naturally into the ground. Water kept within a landscape this way return to the aquifer, helping to replenish Florida's water supplies with cleaner water.

For more information on planting within Transitional Areas, visit:

- » https://ffl.ifas.ufl.edu/handbook/Protect\_the\_Waterfront\_ vSept09.pdf
- » https://ffl.ifas.ufl.edu/handbook/Reduce\_Stormwater\_Runoff\_ vSept09.pdf.

For more information on native plant choices for Transitional Areas, visit:

- http://publicserver2.sjrwmd.com/waterwise/search.jsp »
- http://www.floridayards.org/fyplants/index.php **》**



#### FLORIDA'S TURNPIKE ENTERPRISE

### SUSTAINABLE LANDSCAPE AREA

The Sustainable Landscape Management Area designation is intended for areas within the Limited Access Right of Way which are typically comprised of under-performing turf and areas that do not have any direct functional characteristic for the roadway excepting dry stormwater management facilities.

The intent is to manage these areas as sustainable fields comprised of desirable herbaceous plant materials in an effort to promote aesthetics, sustainability, and reduce maintenance costs. These areas will be comprised of a variety of grasses and other non-woody plants which aid in storm water runoff management and promote biodiversity such as forage for desirable pollinators.

Sustainable Landscape Management Areas can be achieved with little or no effort beyond controlling the maintenance activities associated with the desired effect. Specific areas will be designated in the Landscape Design plans and the Post Establishment Maintenance Plan which will document quantified maintenance activities and cycles.

Each landscape project will be required to include a percentage of these areas in the design and estimate the amounts and maintenance costs. These items will be tracked cumulatively each fiscal year.



### **WILDFLOWERS**

Wildflower areas are intensively managed areas designed for maximum aesthetic value.

Wildflowers along Florida's Turnpike roadway are an important element that are enjoyed by millions of residents and visitors every day. To comply with Florida's Wildflower Program, FTE continues to plan for and fund wildflower plantings within each project.



### **WILDFLOWERS**

Using the guiding principles of protection, establishment and management, FTE identified the following wildflower planting designations:

- » Natural Stands Extensions or remnants of neighboring areas that contain wildflowers.
- » Roadside Meadows Long blooming areas with a species mix that is best suited for a site.
- » High Impact Presenting an intense visual statement for high profile locations.

The Landscape Architect of Record (LAOR) shall consider potential and future wildflower sites within their projects. Contact the FTE Roadway Maintenance Department to coordinate appropriate wildflower seed species, locations and installation/ establishment techniques.

