



Florida Turnpike Enterprise

Roadside Vegetation Management Plan

Revised June 2020

Florida Turnpike Enterprise Roadside Vegetation Management Plan

Florida Turnpike Enterprise (FTE) understands the importance and value of maintaining our roadside vegetation in a way that will preserve, enhance and protect this natural asset while keeping our staff and patrons safe. FDOT Environmental Policy, 000-625-001-I reads that the “Department will: utilize methods to preserve, enhance, and protect trees and other vegetation as valuable natural resources” and the FTE will strive to execute this mission. FTE will adhere to all FDOT Standards, Policies, and Procedures in the development and execution of its Roadside Vegetation Management Plan.

The Florida Department of Transportation (FDOT) Procedure 850-000-015 Roadway and Roadside Maintenance requires that “each district shall prepare a comprehensive and balanced roadside vegetation management plan” and “address soil testing, seeding, soil amendments, aeration, herbicides, tree trimming, control of invasive species and proper mowing techniques.” This document was created to fulfill that requirement. The purpose of our plan is to protect and enhance our vegetative assets, to ensure a safe and aesthetic transportation system for our patrons.

The following references are the primary source of information for the plan:

- FDOT Procedure 850-000-015-j Roadway and Roadside Maintenance
- FDOT Environmental Policy 000-625-001-I
- FDOT Maintenance Handbook “A Guide for Roadside Vegetation Management” 2012 Edition
- FDOT Standard Specifications for Road and Bridge Construction
- FDOT A Guide for Tree and Palm Maintenance Along Florida Roadsides
- FDOT Design Standards
- Manual on Uniform Traffic Control Devices

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Turf management:

Consists of the range of activities used to establish and sustain a turf stand at a desired level of quality. Proper management is critical to the development of successful turf. A high-quality turf is the result of correct grass selection for the site conditions, proper establishment procedures, and effective cultural practices, such as mowing, fertilization, and pest control programs. When turf quality falls below an acceptable level, mismanagement is often the cause.

Turfgrass:

FTE strives to achieve and maintain the highest quality turf possible. Our goal is to provide an aesthetically pleasing, low maintenance, weed-free cover to mowed right-of-way area. Well established turf protects the integrity of the roadway, stormwater management systems and allows safe emergency pull-off and recovery for motorist. This goal is accomplished through judicious use of the turf management techniques.

Turf Types

The FTE manages two types of turf: lawn turf and utility turf.

- Lawn turf – is located at Service Plazas, Bold Landscape sites and toll plazas. It prevents soil erosion, provides an open area for clear visibility and serves a decorative function. Lawn turf should form a dense, low-growing uniform ground cover.
- Utility turf – most turf managed by FTE is utility turf. Utility turf is used primarily for soil stabilization along roadways. The binding effect of the below ground roots helps prevent erosion from wind and water. The leaf blades provide additional soil stabilization and help reduce temperature during periods of extreme heat. Utility turf will be managed so the root system binds to soil to prevent erosion.

Additionally, turfgrasses aid in dust stabilization, glare reduction and provide a clear view of the roadway area.

Turfgrass Selection

The primary permanent grasses used by FTE are bahiagrass and common bermudagrass.

- Bahiagrass is a low-growing exotic or non-native perennial grass that spreads slowly by short, below-ground runners called rhizomes. When mowed at its proper height and frequency, Bahiagrass forms a tough, coarse-textured, wear-resistant utility turf especially well-suited for use along roadways.
 - Argentine Bahiagrass – forms a dense, low-growing turf, and remains green longer in winter. It is commonly used around buildings and facilities.

- Pensacola Bahiagrass – has a finer leaf texture, and grows taller than the Argentine variety. It is better at withstanding drought, poor soil, and soil compaction, making it more suitable for roadside use.
- Common Bermuda is an exotic or non-native warm season perennial grass that forms a low, dense, wear-resistant turf. It spreads primarily by rhizomes and stolons. It grows best in full sun on sandy soils. Common Bermuda grass has an excellent ability to recover after drought conditions. This grass is versatile enough to be used on slopes or as a lawn turf at service plazas and other FTE facilities. It also tolerates the use of selective herbicides better than most other turfgrasses. The one drawback to Common Bermuda grass is the fertilization requirements it needs (high nitrogen).

Soils:

Turfgrass and other plants depend on soil for nutrients, physical support and moisture. How well the turfgrass grows in a certain type of soil is determined by the soil's characteristics. Soil characteristics include the soil's composition¹, texture², structure³, fertility, and pH level.

Soil Fertility

Fertility is one of the most important chemical properties of soil. The more nutrients in the soil the more fertile the soil is and the better it will be able to sustain plant growth. Unless replaced, the nutrients will decrease over time as they are used by the plants or leached from the soil. Commercial fertilizers are generally effective and efficient in restoring nutrients to the soil and maintaining a healthy turf.

Soil pH

Soil pH is the potential level of hydrogen ions. A low pH indicates the soil is acidic; a high pH indicates the soil is alkaline. Most turfgrasses thrive best in soils with a pH range of 6.5 to 8.0 (Ferrel, Unruh, & Jason, 2012)⁴. Soil pH also dictates the bioavailability of nutrients in the soil to turf.

Soil Amendments

Florida soils are mostly sand which does not absorb or hold moisture or nutrients well. Clay soils, also found within the State, retain water much better. Analysis and addition of appropriate soil amendments will increase the soil's ability to retain water. Soils with organic matter also provide beneficial nutrients to the plants. When compost is added, it should comply with Section 162 Prepared Soil Layer and Section 987 Prepared Soil Layer Materials found in the most recent edition of FDOT Standard Specifications, and properly tilled into the soil if used as an amendment. Man-made water retentive soil amendments may also be used to supplement the compost or in its place.

¹ Make up of soils organic matter to pore spaces filled with air and water

² Fineness or coarseness of soil

³ How the sand, silt, clay group together and influences the speed with which water penetrates, retentiveness of water and nutrients, and resistance to erosion and compaction.

⁴The soil pH range is determined in the Florida Department of Transportation Maintenance Handbook "A Guide for Roadside Vegetation Management" 2012 Edition

Soil Testing

Soil testing is an applied science and is to be used as one of the tools in the maintenance of a healthy turfgrass. (Sartain, 2012)

Prior to turf establishment and then on a routine basis, representative soil samples should be taken and analyzed by an accredited soil testing laboratory to determine soil pH and nutritional status. In areas with continuing turf-establishment problems, a soil analysis will be required to determine whether the problem is the result of a pH level that is either too low or too high, if nutritional supplements are needed, or some other factor is the cause for lack of turfgrass health (Ferrel, Unruh, & Jason, 2012). An accredited soil testing laboratory will produce a soil analysis from a sample submitted. A soil analysis supplies a wealth of information concerning the nutritional status of the soil and can detect potential problems that limit turfgrass growth. A routine soil analysis supplies information to soil pH, extractable phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg) status of the soil. A lime requirement determination is included in the routine analysis if the soil pH is below 6.0. Nitrogen (N) is not determined because, in most soils, N is highly mobile, so its soil status varies greatly with rainfall and irrigation events. Nitrogen recommendations are based on nutritional requirements of the turfgrass being grown, the region of the state, and the quality of the turfgrass desired. (Sartain, 2012)

- Taking a soil sample⁵
 1. Identify the area to be sampled, any problem areas should be sampled separately to avoid contaminating samples from good areas.
 2. Using a shovel or soil probe, remove soil from 10 to 15 locations within the sample area. Soil should be removed from the top 6 inches. Walk in a zigzag pattern stopping occasionally to remove soil for sample.
 3. After taking each sub-sample (individual shovel or probe sample), remove any plant material or mulch and deposit the soil into a plastic bucket. Once all sub-samples for the identified area are taken mix the soil in the bucket to ensure it is well blended.
 4. Spread the soil out on a newspaper or paper grocery bag and allow soil to dry thoroughly.
 5. Once dry, pack approximately 1 pint of soil into a soil sample bag (available free from your county Extension office) or into a zip-top plastic bag. Label bag with soil sample location site.
 6. Submit soil sample to an accredited soil testing laboratory.

⁵ Soil Sample methodology taken from UF IFAS Report “Soil Sampling and Testing”

Turf Establishment:

Site Preparation⁶

Good site preparation is key to successful turf establishment. The following site preparation steps should be followed, regardless of establishment method (sod, seed, sprigs, or plugs) used.

1. In areas being prepared for new, or restoring old turf, the contractor must provide soil analysis report indicating an acceptable quality of existing soil base prior to sod or seed installation. If soils do not meet acceptable levels of pH, organics, or depth as described in the Florida Department of Transportation Maintenance Handbook "A Guide for Roadside Vegetation Management" 2012 Edition unacceptable material must be removed to a depth of 6"-8" and replaced with soil approved by FTE.
2. Clean the site: remove any construction debris that may be present. This may include concrete or asphalt left behind after construction or road resurfacing. Eradicate any invasive or hard-to-control weeds that may be growing on the planting site using nonselective herbicides. Apply a minimum of two applications of nonselective herbicides to remove unwanted vegetation.
3. Construct Proper Grade: to permit proper drainage, grade the area to at least a 1% slopes. Too steep of a slope can lead to severe erosion problems, mowing hazards, and excessive runoff.
4. Soil Cultivation: once the grade is established, cultivate the soil to a depth of 6 to 8" using a disc or a rototiller. This will help alleviate compaction caused during the construction. Over-tilling can damage the soil structure and can increase soil compaction. If soil tests recommend soil amendments, apply them at this time.
5. Prepare Final Grade: firm the soil by rolling. The final grade should be firm enough to prevent footprints of more than 1/2" depth.

Seeding

Successful turfgrass establishment from seed depends upon seeding at the correct time, using the correct quantity of seed per unit of area, and proper distribution, covering, and soil preparation. Unsatisfactory stands often are the direct result of failure to meet these essential requirements in the seeding operation. Grasses are classed as warm-season and cool-season based upon their temperature tolerance. The potential for success is greatest when seeding is performed under conditions that favor rapid germination and vigorous seedling growth. A period of warm weather with adequate moisture after seeding promotes rapid growth. An average temperature of at least 20.0° C (68° F) is optimum for ensuring seed germination and turf establishment. Proper timing, site preparation, seeding rate, and seed placement are critical for seed germination and turf establishment. The best time for planting permanent grasses is spring through early summer. Under average conditions, seeding should not be performed later than early July for most warm-season grasses. Late summer seeding may result in germination, but complete establishment may not have time to occur before cooler temperatures prevail.

⁶ Site Preparation process developed from the Florida Department of Transportation Maintenance Handbook "A Guide for Roadside Vegetation Management" 2012 Edition

Seeding Rates

Appropriate seeding rates for various grasses used by the FDOT are provided in table below⁷:

Species/Location	North Florida	Central Florida		South Florida	
	<i>April-Sep</i>	<i>Mar-Oct</i>	<i>Nov-Mar</i>	<i>Feb-Nov</i>	<i>Dec-Feb</i>
Bahiagrass	30 lbs/ac	30 lbs/ac	30 lbs/ac	30 lbs/ac	30 lbs/ac
Bermudagrass	15 lbs/ac	10 lbs/ac	15 lbs/ac	10 lbs/ac	15 lbs/ac

- The arbitrary dividing line between north and central Florida is a straight east-west line from coast to coast through Ocala, and the dividing line between central and south Florida is a line from coast to coast through Tampa and Vero Beach.

Seed Placement

Seed can be sown using a variety of equipment including a broadcast spreader, a cultipacker seeder, hydroseeder, seed drill, or a slit-seeder. These methods are commonly used by FDOT. Research and experience have shown that best results are achieved when permanent grass seed is placed 0.25" to 0.50" below the soil surface with a seed drill, rake or other appropriate implement. If seed is not placed into the soil, it is usually washed away by surface water runoff or eaten by birds. When seed is placed too deep into the soil, the growing seedling's food reserves may be depleted before the seedling reaches the surface or before it can develop enough for photosynthesis (food production within the plant) to begin. After seeding, the planting site should be lightly rolled to ensure firm contact between the seed and soil particles. It may be necessary to use an erosion-control material during or after seeding to help protect the soil from erosion and ensure seed germination.

Sodding

Sodding is the preferred method to establish turfgrass on the FTE system. Sodding forms an established turf soon after planting. Sod may be planted year-round as long as conditions are favorable. Ideal planting in North Florida is from early spring (April) through late summer (August). In Central and South Florida, sod may be planted year round. However, sod should not be planted during very dry weather or when freezing temperatures are expected. Sod deteriorates very rapidly and must be laid within 24 to 48 hours after cutting. The method preferred by FTE and FDOT is the solid-sodding sod placement method. When the solid-sod placement method is used, stagger the joints between the blocks of sod perpendicular to the roadway for best erosion control. The individual blocks should be firmly fitted against adjacent blocks and lightly tamped or rolled to provide uniform contact with the soil. Placing soil in the joints between the blocks of sod will help them knit (grow) together. When sod is placed on steep slopes, secure with wooden stakes or sod staples to prevent it from slipping. Every effort should be made to secure sod free of cogon grass.

⁷ Seeding rates established in Florida Department of Transportation Maintenance Handbook "A Guide for Roadside Vegetation Management" 2012 Edition

Fertilization:

Fertilization on the roadside shall be used to establish new sod or seed after soil testing to determine the type of fertilizer required. Any routine fertilization on existing turfgrass must be documented in a written plan supported by soil tests no less than every mile, and approved by FTE District Maintenance Engineer. All Department personnel applying fertilizers shall be trained through the Green Industry Best Management Practices (BMP) Program, register the training in Training Records, Evaluation and Scheduling Systems (TRESS), and retain a copy of the completion certificate on file, but are not required to be licensed commercial applicators.⁸ All contractors and/or permittee who contract the application of fertilizer shall ensure they are licensed commercial applicators who have been trained through the Green Industry BMP Program, and have obtained a limited certification for urban landscape commercial fertilizer application under section 482.1562, F.S. with a current copy of the license on file.⁹

Fertilizer is used to add essential nutrients to the soil to support the growth of the turfgrass. Improving the vigor and density of turfgrass through a sound, systematic program of fertilization produces an environment least favorable to undesirable vegetation. Proper fertilization is a primary determinant of turfgrass persistence and quality. It is also one of the least time consuming and least costly components of a complete turf management program and should be a primary tool in roadside vegetation management. Properly fertilized grass makes more efficient use of water. A thick turf with dense root system helps slow water movement and keeps it in the root zone. Grass which is properly fertilized develops a deep root system which is very important under roadside conditions.

Timing and Frequency of Application

The need for fertilizer depends on the turfgrass species. Certain species, such as Bahiagrass have relatively low requirements, while others like Bermudagrass grow best with higher rates of nutrients.

Newly seeded sites: For newly seeded sites, research has shown that fertilizer should be applied approximately five weeks after the seed has germinated. At this time, the seedlings have sprouted and a developed root system extensive enough to allow them to capture and utilize the nutrients from the fertilizer. Applying fertilizer during the seeding operation is inefficient because the plants do not have a sufficient root system capable of taking up the nutrients. Fertilizer applied during the seeding operation will have been leached from the soil or washed away in surface runoff. The application of fertilizer approximately five weeks after germination provides the nutrients necessary for continued vigorous plant growth. Take care not to apply excessive amounts of fertilizer. Excessive fertilization may cause chemical burning or overstimulation of top growth to the detriment of the rest of the plant.

Established turf: The application of fertilizer to areas of established turf should be based on an evaluation of the turf quality and should take place only when a need has been identified. The optimum conditions for the release of nitrogen are the same as those for plant growth. Lawn turf fertilization should be based on the turfgrass species being grown and the location within Florida. For an established turf, a fertilizer with a 1:0:1 ratio of nitrogen, phosphorus, and potassium (such as a 15-0-15 analysis) is generally recommended for once a year applications. Phosphorus should be added only if a soil test recommends doing so. Properly fertilized grass use water more efficiently. A thick turf and dense root system helps allow water movement and keeps it in the root zone. Grass which is adequately fertilized develops a deep root system, which is very important under roadside conditions.

⁸ Per the Florida Department of Transportation Topic 850-000-015-I, effective January 10, 2014

⁹ Per the Florida Department of Transportation Topic 850-000-015-I, effective January 10, 2014

Recommended Fertilizer Rates for Bahiagrass and Bermudagrass¹⁰

Species/Location	North Florida	Central Florida	South Florida
	N Recommendations lbs/1000 sf	N Recommendations lbs/1000 sf	N Recommendations lbs/1000 sf
Bahiagrass	1	1	1
Bermudagrass	2	3	4

Application Rates

The maximum amount of fertilizer that may safely be applied at any one site depends on the type of nitrogen carrier. In the past, it was customary to recommend the application of 1 pound of actual nitrogen per 1000 ft of turfgrass. Due to potential environmental concerns it is now recommended that no more than one half (0.5) pound of the nitrogen in the application is in a soluble (quick release) form. Therefore, to make an application of 1 pound of actual nitrogen per 1000 ft. of turfgrass you would need to use a blended fertilizer product containing no more than 50% of total N in soluble form with the rest of the nitrogen originating from a slow-release N source.

Recommended Fertilizer Application Schedule¹¹

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
North Florida												
Bahiagrass				X								
Bermudagrass				X					X			
Central Florida												
Bahiagrass			X									
Bermudagrass			X		X				X			
South Florida												
Bahiagrass		X								X		
Bermudagrass		X		X			X			X		

All applications of fertilizers on the state right of way shall be documented using form 850-000-26

¹⁰ from FDOT Maintenance Handbook "A Guide for Roadside Vegetation Management"

¹¹ from FDOT Maintenance Handbook "A Guide for Roadside Vegetation Management"

Instructions for completing FDOT Fertilizer Application Log

Date of application: Please give as month/day/year. One log per application, per site is acceptable.

Time of Application: 12 hour or 24 hour time is acceptable.

Name of Applicator: Print the name of the Applicator.

Maintained by Local Maintenance Agreement: Indicate yes or no whether the site is being maintained by a Municipality besides the FDOT.

Date Applicator completed training with Green Industries Best Management Practices: This training is required to obtain the Limited Certification for Urban Landscape Commercial Fertilizer (LCULCF) license in Florida.

Name of Contractor Company: Put name of the business performing the fertilization.

Contact number: provide the FDOT contract number. Example: E8R68. Sub-contractors must also put this number.

Financial Project Number (FPID#): Put the FPID# for the contract.

Applicators License Number: This is their LCULCF license number beginning with letters "LF."

Expire Date: The expiration date of the license.

Fertilizer meet all the requirements of Section 982, Standard Specifications: Indicate if the Fertilizer meets all the requirement of the Fertilizer Section of the FDOT Standard Specifications for Road and Bridge Construction.

Fertilizer Manufacturer: Company name.

Wind Speed: Wind speed in MPH at the site of application.

Type of Fertilizer: Check what type of fertilizer was used.

Labeling of Percent of Fertilizer: Indicate the Fertilizer's analysis of Nitrogen – Phosphorus - Potassium (N-P-K).

Fast Release Source: Put % of fast release ingredients.

Slow Release Source: Put % of slow release ingredients.

Method of Application: Put whether the fertilizer was spread by hand, through a mechanical spreader, injected, or by another method.

Rate of Application: Put the rate. Usually as pounds per 100 square feet.

Amount of Fertilizer Applied: Put the total fertilizer applied at the site for that application. Do not say how many bags were used.

Target Area: this should be the total area that is expected to receive the fertilizer application.

Type of Maintenance Activity: This could be for routine landscape fertilization, for an initial treatment of new sod, or may be to alleviate a specific nutrient deficiency in a tree/palm/shrub, etc.

Target: Indicate what the fertilizer is used to treat.

State Road Number: What state road is the site associated with. Ex: SR 91, Turnpike.

State Road Id: Put the state road ID. This can be discerned from this website: <https://fdotewp1.dot.state.fl.us/slogis/>

Location of Application: Please put the site name, and which side of the road the application was done.

Mile Marker or GPS Location: Put the geographic extent of the application.

AERATION:

To remain healthier and to be able to absorb water from the soil, plant roots must have oxygen. The amount of oxygen which soil water can contain is rather limited and will not supply plant roots very long unless it were renewed. This renewal process is called aeration. Perhaps one of the most neglected maintenance items of roadside turf is soil aeration. The generally poor soil conditions and severe soil compaction caused by vehicular traffic and mowing equipment are factors that should be given more consideration. The quality as well as the functional value of roadside turf will be enhanced by including this operation in many roadside turf maintenance programs.

In areas where the soil has become severely compacted from heavy traffic, topsoil erosion, or continued close mowing, aeration may be required. Aeration is the process of mechanically loosening or breaking up the compacted soil to allow air, water, and nutrients to penetrate and thus to improve growing conditions. It is often performed through coring, slicing, or spiking of the soil. Benefits from aeration include the following:

- Improved wetting of dry soils
- Increased root strength
- Increased shoot growth
- Improved response to fertilizers

Aeration should be performed during periods of vigorous turfgrass growth. Because it temporarily increases plant susceptibility to desiccation and disease, aeration should not take place during periods of drought or cold stress. Care should be taken not to overly disturb the soil surface or to destroy existing turfgrasses.

Pest Management:

The most common insect pests encountered in managing the FTE turf are the red imported fire ants and mole crickets.

Red Imported Fire Ants (RIFA) commonly infest roadside turf. The large mounds of soil they excavate look unsightly, disturb the roots of the turfgrass, and may smother and damage the grass. In addition, RIFA inflict painful bites when disturbed. If only a few nests are present in an area, insecticide should be used to spot-treat around the openings of the individual nests. If a general area is infested, a broadcast treatment may be necessary. For more information on RIFA, refer to http://edis.ifas.ufl.edu/document_lh059

Mole crickets feed on the roots of turfgrass and their burrowing also uproots plants and allows the soil to dry out. Newly seeded turf can be seriously damaged by only a few mole crickets. Areas infested with mole crickets should be treated as soon as possible after the damage is noticed. Bahiagrass is particularly impacted by mole crickets. For more information on mole crickets, refer to http://edis.ifas.ufl.edu/document_lh039

Mowing:

Mowing is the primary method of controlling roadside vegetation. It should be performed on a routine basis to control grasses and weeds for safety and aesthetics. Mowing standards and procedures are established in the FDOT Maintenance Handbook “A Guide for Roadside Vegetation Management” 2012 edition. All maintenance equipment before being used on and when departing the State ROW, shall be cleaned of all invasive weed seeds, spores, and active rhizome at a designated containment area.¹² A designated containment area is an area or areas where all equipment is cleaned and which can be monitored for invasive species, treating any species found growing in the area. Contractors shall certify to the Department that all of their equipment is free of all invasive weed seeds, spores, and active rhizomes, before starting work, upon completion of work and when leaving our right of way.¹³

Mowing Frequency

Mowing frequency shall be on an as-needed basis or at the direction of the FTE District Maintenance Engineer and staff. The following factors determine frequency:

- Safety of FTE patrons, staff, contractors, integrity of roadside;
- Aesthetics;
- Weather conditions – rate of growth is determined by temperature, length of daylight, and moisture;
- Presence of nuisance weeds.

Mowers shall avoid wildflower stands and other desirable vegetation during periods of bloom until plants have gone to seed. If a contractor mows a wildflower site at the wrong time it will destroy the stand. The contractor will be required to restore the wildflower site.

Mowing Height

Mowing height is the height of the turfgrass immediately after mowing.

Scalping (mowing too close to the ground line) is **extremely** detrimental to turfgrass. When too much leaf area is removed through mowing, the plant loses its carbohydrate reserves and the ability to replace those reserves. Removing too much leaf area also stops root growth. Plants that are cut too close to the ground line are less able to tolerate heat, cold, and drought; more prone to disease; less able to compete with undesirable vegetation; and more dependent on a carefully implemented and managed cultural program. **Never** scalp the turf. Rural areas: For rural areas the mowing height should be six inches or higher. Plants at this height can retain enough leaf growth to carry out photosynthesis and adequate food reserves to persist through stress periods. They also can help abate the erosion of the soil from rain and wind. In addition, this height range provides a visually pleasing roadside for motorists traveling at highway speeds.

Urban areas and lawn turfs: A higher standard of maintenance is usually desired for service plazas, Bold Landscape sites and toll plaza locations. A general rule for determining the mowing height and frequency for moderately to intensively cultivated turf areas is to remove no more than one-third of the blade height per mowing. Removing more than one-third of the blade height suppresses plant growth and makes the plant more susceptible to disease and stress. For Bold Landscape sites mowing height shall be 4".

¹² Per the Florida Department of Transportation Topic 850-000-015-I, effective January 10, 2014

¹³ Per the Florida Department of Transportation Topic 850-000-015-I, effective January 10, 2014

Tree Management

Tree Planting:

FDOT Design Standards, most recent edition, Index 544 will be used as the guide for proper tree planting for FTE. All trees planted on FTE ROW shall be Florida #1 Grade, or better, per FDOT Standard Specification 580-2.1.1.

Tree Pruning/Trimming:

Perform all tree pruning/trimming to meet the requirements of recognized and approved arboriculture principles with the emphasis on tree health and symmetry as set forth in the ANSI A300, Part 1 (most recent edition) for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning)¹⁴ and International Society of Arboriculture (ISA) Best Management Practices: Tree Pruning, a companion publication to the ANSI 300, Part 1, A Guide for Tree and Palm Maintenance Along Florida Roadsides.

Objectives of pruning/trimming:

- Safety – reduce risk of tree failure
- Provide clearance
- Maintain tree health
- Improve aesthetics

Safety – trees will be pruned/trimmed to create structurally sound trunk and branch architecture that will sustain the tree for a long period of time. If there is dead or dying trees/vegetation, next to or over travel way or clear zone, that could fail or otherwise present a hazard to pedestrian or vehicular traffic then pruning/trimming and removal operations must be undertaken¹⁵. When conditions occur from trees outside of the right-of-way, permission must be gained from the property owner, unless disposition of tree limbs are a critically serious hazard or there is an emergency involved¹⁶. Trees shall be routinely checked for abnormal conditions such as insects, diseases, mechanical damage, wind resistance, and storm damage. If abnormal conditions are found a plan of action will be put into place to ensure tree health, safety for staff, patrons, and roadside.

Provide Clearance – trees will be pruned/trimmed to provide clearance of 14.5’ over travel way, clear zone and guardrail. Signs shall not be blocked by tree limbs or vegetation¹⁷. Pruning trees for clearance will also comply with FDOT Design Standards (most recent edition) Index 546.

Maintain tree health – Because each cut has the potential to change the growth of the tree, no branch should be removed without a reason. Trees will be pruned to remove dead branches, crowded or rubbing limbs, to improve trunk and branch structure, thin canopy to allow better air flow, remove co-dominant main leaders, and direct growth.

Improve aesthetics – trees will be pruned to help influence flowering, develop full well shaped crown, and develop a strong dominant central leader.¹⁴ ME580-40 Tree Trimming and Removal

¹⁵ FDOT Florida Highway Landscape Guide Tree

¹⁶ FDOT Florida Highway Landscape Guide

¹⁷ FDOT Maintenance Handbook “A Guide for Roadside Vegetation Management” - See figure 23, pg. 40

All pruning cuts shall be in accordance with ANSI A300, Part 1 (most recent edition) and the following pruning techniques used:

- **Cleaning** – removes dead, dying, diseased, damaged, rubbing, broken, and out of place branches. This pruning technique is most commonly practiced on mature trees because it improves their value, appearance, health, and reduces risk. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- **Thinning** – has been the conventional method to minimize damage caused by storm winds. Thinning removes lateral and parallel branches, especially from the end portion of limbs. It allows the wind to pass through the canopy and improve durability in a storm. Proper thinning retains crown shape and size and should provide an even distribution of foliage throughout the crown. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- **Reduction** – the selective removal of branches and stems to decrease the height and/or the spread of a tree. This technique is used to minimize risk of failure, to reduce height or spread, to clear vegetation from buildings or other structures, and improve the appearance of the tree. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- **Raising** – is the selective removal of branches to provide vertical clearance. Crown raising shortens or removes lower branches of a tree to provide clearance for buildings, signs, vehicles and pedestrians. When raising, the desired clearance must be specified. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- **Structural** – is the removal of live branches to influence the orientation, spacing, growth rate, and strength of attachment and ultimate size of branches. Structural pruning is used on young and medium-age trees to help engineer a sustainable trunk and branch arrangement. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- **Pollarding** – is a training system that involves maintaining a tree at a specified height by annual pruning to a single point on main branches. Once begun, it is essential that pollarding continue. Pollarding is not topping and will only be used on Crape Myrtle tree. *For more detail about this technique review Best Management Practices: Tree Pruning from the International Society of Arboriculture, ANSI 300, Part 1, An Illustrated Guide to Pruning 2nd Edition by Dr. Ed Gilman.*
- No topping, lions-tailing, flush cuts, hat racking will be allowed
- When removing a live branch at its point of origin on the trunk or from a parent branch the final pruning cut shall be made in branch tissue just outside the branch bark ridge (bbr) and collar. No stubs shall be left. Do not make flush cuts.

- When removing a dead branch, the final cut shall be made outside the collar of the living wound wood¹⁸ tissue. If the collar has grown out along the dead branch stub, only the dead stub shall be removed; the living collar shall remain intact and uninjured regardless of its length.
- Pruning cuts shall be smooth and clean, leaving the bark at the edge of the cut firmly attached to the wood.
- Only sharp pruning tools will be used to ensure cuts will not leave jagged, rough, or torn bark around cuts.

Boom mowers with rotary or flail cutting heads shall not be used for tree pruning/trimming or brush control. At no time shall boom mower cutting heads be operated higher than 12” about the ground level.

Palms:

Palm Pruning

All palms will be pruned to remove dead fronds (dead fronds are those with less than 50% green tissue), flowers, fruits, and all seedpods including those originating among remaining fronds. Do not remove live healthy fronds above the horizontal. Remove fronds that are lower than horizontal (9-3 o’clock) that are dead or more than half chlorotic¹⁹. When pruning palms, care must be taken not to damage, nick, or wound remaining fronds and petioles. Leaves should be cut close to trunk, but never cut into trunk as this can result in wounds that have been shown to allow Thielaviopsis trunk rot. Never pull off leaves that do not pull off easily because this could strip off trunk tissue and allow disease entrance into plant. Palm pruning is done primarily for aesthetic reasons. When pruning Canary Island Date Palms, disinfect pruning tools between individual each palm to prevent transmittal of Fusarium wilt. There is no one time of year that is better than another for pruning to take place. The use of climbing spikes for pruning palms is prohibited. Coconut palms should be pruned to ensure mature Coconuts are not allowed to remain on the tree through hurricane season.

Palm Planting

Follow FDOT Design Index 544, FDOT Standard Index 580, and FDACS²⁰ Florida Grades and Standards (minimum Florida #1 Grade).

Fertilization of Trees & Palms:

All contractors and/or permittee who contract the application of fertilizer shall ensure they are licensed commercial applicators who have been trained through the Green Industry BMP Program, and have obtained a limited certification for urban landscape commercial fertilizer application under section 482.1562,F.S. with a current copy of the license on file.

Palm Fertilizing

Follow Dr. Timothy K. Broschat’s, University of Florida, recommendations for formulation, application, etc. as found in the following documents:

Fertilization of Field-grown and Landscape Palms in Florida - <http://edistt.ifas.ufl.edu/ep261>

Nutrient Deficiencies of Landscape and Field-grown Palms in Florida - <http://edis.ifas.ufl.edu/ep273>

¹⁸ ANSI 300, 4.60, Wound wood – partially differentiated tissue responsible for closing wounds. Wound wood develops from callus associated with wounds.

¹⁹ The yellowing or whitening of normally green plant tissue because of a decreased amount of chlorophyll, often as a result of disease or nutrient deficiency

²⁰ FDACS – Florida Department of Agriculture and Consumer Services

Herbicide Management

Herbicides should only be considered for use on vegetation which cannot be controlled by mechanical methods. The use of herbicides is allowed around obstructions when the cost of controlling by other means is prohibitive. General guidelines for herbicide use and handling are included in the FDOT Maintenance Handbook “A Guide for Roadside Vegetation Management”, Pesticide Safety, Storage and Disposal (pg. 52-68) and FDOT Procedure 850-000-015 Roadway and Roadside Maintenance (most current edition).

Special consideration shall be given to the following:

- Herbicide applications - High volume broadcast application of herbicide is prohibited, unless a special request is granted by the Director of the Office of Maintenance. Broadcast applications to control certain invasive species may allowed if requested to and approved by the Director of the Office of Maintenance.
 - Proper application techniques for Cut Stump treatment, hack and squirt injection, basal bark, and low volume foliar directed spray can be found at the following link - <http://www.dowagro.com/vm/application/applications.htm>, also see University of Florida publication “Herbicide Application Techniques for Woody Plant Control” - <http://edis.ifas.ufl.edu/ag245>
- Restricted use herbicides²¹ shall not be used in the FTE roadside vegetation management program.
- Herbicides shall not be used as a seed head suppressant or plant growth regulator without obtaining approval from the Director of the Office of Maintenance
- Herbicides in the sulfonylurea family of chemicals shall not be used in the FTE roadside vegetation management plan
- All unlicensed herbicide applicators shall work directly under a licensed applicator. Licensed applicators shall comply with all rules and regulations defined by FDACS, and must be certified in Right-of-way and Aquatic Pest Control. The licensed applicator will take full responsibility for all actions for those who apply pesticides under his/her license.

²¹ When a pesticide is classified as restricted, the label will state “Restricted Use Pesticide” at the top of the front panel. Below this heading will be a statement describing the reason for the restricted classification. There are various reasons determined by the U.S. EPA why a particular pesticide is classified as restricted and the pesticide may be hazardous to human health or to the environment even when used according to the label.

- The FDOT Maintenance Handbook “A Guide for Roadside Vegetative Management” pgs. 84-92 provides a well-researched list of herbicides and should be used as a reference in picking the right herbicide for the right job.

Herbicide Application Log:

The Roadway and Roadside Maintenance Procedure section 3.6 states: “a daily Herbicide Application log (form No. 850-000-15) shall be required for any herbicide application.”

In order to conform to the requirement the following plan will be followed:

1. Establish standards so logs are completed accurately, completely, and uniformly;
2. Establish a log review process for quality assurance.

Instructions for completing FDOT Herbicide Application Log

Date: Date of application. Please give as month/day/year. One paper per day is acceptable unless the rate of application, chemical mixture, target species or site significantly changes. A site change is not switching from the south bound side to the north bound side, neither is it skipping an area and going ahead to a different milepost.

Contact number: provide the FDOT contract number. Example: E8R68. Sub-contractors must also put this number.

Herbicide Information

Manufacturer: The company who makes the herbicide. Ex: DowAgro, Nufarm, Syngenta, etc. **Trade**

Name: Put trade name of each herbicide. Ex: Round-up Custom, Milestone.

Active Ingredient (%): Put the common name for the active ingredient of the herbicide. Putting the entire chemical name is not necessary. Also put the % of active ingredient contained in the herbicide. Example for Round-up: **Glyphosate (41%)**

Formulation: This is the herbicide’s physical make-up, for the purpose of application. This is whether it is a liquid, granular, wettable powder, etc.

Method of Application: How was the herbicide applied. Examples: Foliar, Boom sprayer, spot treatment, drip mowing, etc.

Application Rate: This is the amount of undiluted herbicide product applied per acre. This is not asking for the amount of mixed spray solution per acre.

Target species: Put the target species. If the application is for general unwanted vegetation add the location. Example: “Cogon grass” or “unwanted vegetation under guardrail” or “weeds on MSE walls.”

Adjuvant: Indicate what you added to the spray mixture to aid the application: drift control, surfactant etc. Please put trade name.

Equipment

Description of Equipment Used (Include DOT #.): State what vehicles were used, what type of spray equipment and nozzles were used, and any other pertinent information. This could also be if backpack sprayers or spray bottles were used.

Calibration

Calibration is used to determine how much herbicide to mix in a particular size tank. It can also be used to find how many acres you spray per tank. Equipment should be calibrated regularly to determine if proper rates are being used.

Other resources should be consulted for a more thorough instruction of calibration.

Tank Mix System

Tank size: Size of spray tank in gallons.

Tip Size: Size of the orifice. Generally in GPM or given by manufacturer.

Pressure: Pressure when you did your calibration in PSI

Gallons per Acre of Solution: This number (GPA) is the goal of calibration. It is arrived at by figuring out the Gallons Per Minute divided by Acres per Minute. The following shows how to calculate Gallons per Acre:

- Get Gallons per minute collected: How many gallons does your spray system put out in one minute. This should be determined using water first.
- Acres per minute: This is calculated using your speed and your spray swath.
Ex: 2 mph speed, spraying an 8ft swath.
 $2 \times 5280 \text{ ft} = 10560 \text{ ft/hr}$
 $10560 \text{ ft} \times 8 = 84480 \text{ sq ft./hr}$
 $84480 \text{ sq ft.} / 43,560 \text{ sq ft/A} = 1.94 \text{ acres /hr}$
 $1.94\text{A/hr} / 60 \text{ min/hr} = .0323 \text{ Acres per minute}$

o Another less precise but acceptable way to get Acres per minute is the formula:
 $\text{Acres/min} = 2 (\text{swath in feet} \times \text{speed}) / 1000$
With the above example $2 (8 \text{ ft} \times 2 \text{ mph}) / 1000 = .032$ acres per minute

- Gallons per Acre (GPA) = Gallons per minute (GPM) / Acres per minute

Example: Say your GPM as measured is 3.25.
 $3.25 \text{ gallons per minute} / .0323 \text{ acres per minute} = 100.6 \text{ gallons per acre}$
This is your rate of total spray solution per acre (GPA).

Acres Treated per Tank: This is dependent of your GPA and tank size.
If your tank size is 200 gallons and your calculated Gallons Per Acre is 100 gallons, then your
Acres to be treated per tank = $200/100 = 2$ acres per tank. The formula is

Acres per tank = Tank size / Gallons per Acre

Injection System

This would be used if you had a direct injection system.

Mixing

Location of Herbicide Mixing and Loading Area: Where the chemical was mixed. Be specific. Indicate what milepost and side of road if applicable.

Amount of Herbicide (a) per tank: Fluid ounces or gallons of herbicide a.

Amount of Herbicide (b) per tank: Fluid ounces or gallons of herbicide b.

Amount of Herbicide (c) per tank: Fluid ounces or gallons of herbicide c.

Amount of water in tank: Typically in gallons.

Amount of Adjuvant per Tank: Fluid ounces or gallons of adjuvant.

Application

County Section Number/Facility: Put the county where the herbicide was applied or the County Section Number. The County Section Number is the first two digits of the roadway ID. Roadway ID can be discerned from this website <https://fdotewp1.dot.state.fl.us/slogis/> The facility is whether the road is

roadway is a Rural Limited Access, an Urban Limited Access, Rural Arterial, or Urban Arterial. All Turnpike facilities are either Rural Limited Access or Urban Limited Access. Example: Broward/Urban LA.

State Road Number: Do not just put the name of the road, like “Turnpike”, but include State Road number. Ex. SR 91.

From/To GPS Location or MP: It is acceptable to put GPS points here or Mileposts where application started and finished. Ex: NB, from MP 208 to 236.

Times of application: Time when application was taking place. Ex: 7:00am – 5:30pm If the applicator takes a break during the day (lunch, for instance), indicate it. Ex: 7:00am – 5:30pm, lunch from 12:00 – 12:30; or 7:00am – 12:00pm, 12:30pm – 5:30pm.

Hourly Wind Speeds (MPH)

Wind speed and direction should be measured hourly at the site of application, during the treatment. Generally, if winds are higher than 10 mph, spraying should be discontinued until calmer time.

- **Time:** The time when the wind was measured. These times should be spaced at regular intervals no less than once per hour. 12 hour or 24-hour time may be used.
- **Speed:** This should be an exact speed in MPH. Do not give ranges such as 2-4 MPH. Digital wind-meters can give exact measurements. Average wind speed should be used.
- **Direction:** Put which direction the wind is coming from: Ex – NW.

Amount of Solution applied: This is the total gallons of mixed sprayed solution applied on the site.

Applicator Information

Name of Applicator (Printed): The person who actually sprayed the herbicide. If an unlicensed individual, or one without all proper license categories (Right-of-way and Aquatics), works under another’s license, the applicator will sign here.

Name of License Holder Responsible: If the applicator is unlicensed, print the name of the license holder who is supervising. If the applicator and license holder are the same person, still print the license holder’s name here.

License Number: Provide the Commercial Application License number. Ex: CM18836

Signature of Applicator: Signature of the applicator/sprayer of herbicide. This cannot be an electronic photocopy.

License Holder Approval (Signature): The license holder must initial here to signify that he/she agrees with the contents of the log and acknowledges that he/she is responsible for supervising the applicator (if a separate person). This cannot be an electronic photocopy.

Check and see if your log makes mathematical sense!

Here are a few ways to check your math.

For calibration, the *tank size* (if you fill up the whole tank) divided by your *acres per tank* should equal the *gallons per acre*.

$Tank\ size / acres\ per\ tank = gallons\ per\ acre.$

Also, to check if you have mixed properly, your *amount of herbicide per tank* should equal the *acres per tank* times *amount of product applied per acre* divided by 128.

$Amount\ of\ herbicide\ per\ tank = acres\ per\ tank \times (product\ per\ acre / 128)$

Herbicide Log Review Process

Herbicide logs will be submitted and reviewed by a single designated person for the entire system. Logs will be examined, and deficiencies found will be noted and returned to contract manager for correction by the contractor. The reviewer will ensure that the applicator has or is supervised by someone with the proper FDAC pesticide license, as determined by contract and 850-000-15. Types of herbicides used will be checked to ensure no FDOT prohibited herbicide is being used on FTE ROW. **Herbicide logs shall be turned in for review at a minimum monthly sch**

FTE Invasive Plan

The development and execution of the FTE Invasive Plan is to ensure FTE compliance with FDOT Procedure 850-000-015 Roadway and Roadside Maintenance. FTE will also adhere to FDOT Environmental Policy 000-065-001-I to “cooperate in the State’s program to control the spread of invasive exotic plants’ and FDOT Voluntary Code of Conduct to Minimize the Spread of Invasive Plants by supporting “the development of environmentally sound methods to manage invasive plants.”

The FTE Invasive management plan has two main segments, Prevention and Control/Management. Prevention will consist of prioritization of invasive species and early detection by a yearly inventory.

Inventory:

“The first line of defense and most cost-effective strategy against invasive species is preventing them from invading and becoming established in the first place. Once an infestation becomes well-established, management is expensive and eradication is difficult and unlikely. One of the most important components of prevention is the detection of individual plants of small groups of plants”.

All turf and vegetative areas within FTE ROW will be monitored to identify areas where exotic invasive weed species are becoming established. Attention will be focused on, but not limited to, cogon grass (*Imperata cylindrical*), Johnson grass (*Sorghum halepense*), tropical soda apple (*Solanum viarum*), lygodium (*Lygodium japonicum* & *Lygodium microphyllum*), skunk vine (*Paederia foetida*), air potato (*Dioscorea bulbifera*) and castor bean (*Ricinus communis*).

A District-wide inventory to identify location of cogon grass, tropical soda apple and lygodium sites will take place each year and be completed by February 28th to remain compliant with FDOT Procedure 850-000-015 Roadway and Roadside Maintenance. The inventory will document and/or create the following:

- **A unique identifying number for each location (Label)**
 - Example number = 1-001, 1st number identifies zone the corresponding numbers (001) are unique to the site. If the location becomes controlled number can be retired from surveying and not reused.
 - 1-002, 1-003, 1-004, etc.
- **Status of location (Status)** - this identifies the current status of the location which assists in the classification of data. The two choices for status of locations are:
 - Active – an existing site that needs to be treated with herbicide
 - Non-Active – site shows no signs of invasive plant originally documented. If site is classified as non-active for 3 continuous years with no recurrence of invasive plant it will be considered controlled, site number is retired. Further monitoring of location is discontinued.
- **Number of facility (facility)** - in which species is located (SR570, SR91, etc.)
- **County** - record/report entire name of county in all cap letters
- **GPS coordinates for each location** (record latitude and longitude)

- o GPS coordinates will produce a single point, the point will be taken nearest to the center of the site location
- o GPS receivers will be set to use reference NAD83 datum, North American Datum 1983 is the official horizontal datum for use in the North and Central American geodetic networks. NAD83 was developed using satellite and remote sensing imagery and is the default datum on most GPS units today.
- o GPS coordinates will be recorded/reported in decimal degrees for both latitude and longitude readings. Example – Lat = 28.72706, Long = -81.90948
- ***Invasive plant name (Invasive)***- identify target invasive plant by common name
- ***Size of area in square feet (Area)*** - record/report size in total square feet in number format only, no commas. Example 2013

The inventory will document the distribution and abundance of the species targeted, provide qualitative and quantitative data that will be used in making well-informed management decisions has to prioritizing work efforts and improve cost effectiveness. All inventory data collected by or reported to FTE Roadway Maintenance Environmental staff will be in MS Excel spreadsheet format (see example below):

ID	Status	Facility	County	Latitude	Longitude	Size (ft2)	Species
3-0277	Active	SR91	Orange	28.43441	-81.4104	100	Cogon grass
3-0278	Active	SR91	Orange	28.43448	-81.4105	10	Cogon grass
3-0279	Active	SR91	Orange	28.43455	-81.4106	100	Cogon grass
3-0280	Active	SR91	Orange	28.43467	-81.4106	300	Cogon grass
3-0281	Active	SR91	LAKE	28.75758	-81.9427	1400	Cogon grass

The QA/QC process for the inventory data will consist of:

- Producing a random sample of 10% of points in each maintenance zone, each year to be inspected to ensure correct location, correct species identified, correct current status, and correct size of area
- Upload all GPS coordinates into FTE GIS database to plot locations on aerial maps to certify accuracy of coordinates.

Control/Management:

Control and management means eradicating, containing, suppressing spread, reducing population size, or reducing the effects of invasive species and preventing new invasions into the right-of-way. The control and management of invasive species is important due to safety issues, and current and future cost.

Safety – invasive species can cause a substantial risk to patrons (fire, clear zone contamination), equipment, and staff.

Cost – invasive species have significant cost to public entities “more than \$240 million has been spent in Florida by state, federal, and local agencies since 1980 to control invasive non-indigenous plants”(State of Florida, 2003) and the cost will only rise with time. The best way to control cost is to prevent infestations.

Prioritization Scheme for management strategies and control options:

1. Prevention – prevent new infestations from becoming established by using a early detection/rapid response protocol
 - a. Early detection is the identification of new infestation sites as early after entry on to right-of-way as possible by monitoring high-risk areas such as new construction projects that moved large amounts of soils, bare ground sites, adjacent property owners with an infestation. By using both active (yearly inventory and monitoring or ROW) and passive (daily driving of ROW) surveillance to find and verify new infestation sites control will be more feasible and less costly.
 - b. Rapid response is the responding to an infestation within a timeframe and manner that will prevent, eliminate, or contain the spread and permanent establishment on the right-of-way
2. Eradication – eradicate small and/or isolated “satellite” infestations. Satellite infestations are those that are 100 sq ft in area or less and will be the priority sites for each control cycle initiated.
3. Containment – contain the perimeter of large “core” infestations. The aim is to restrict the spread
4. Suppression – suppress the interior of large core infestations
5. Restoration – restore once infested sites where desirable plant populations are not vigorous enough to reclaim area

A variety of management techniques can be used to control invasive species. These range from mowing to hand pulling to herbicide applications. It is important to understand the biology and ecology of invasive species in order to select effective management techniques.

The FTE cogon grass/TSA invasive herbicide plan (based on the University of Florida guidelines): Cogon grass:

- Jan - Feb = conduct system-wide gps/gis inventory, we will wait until the bahiagrass is completely dormant so cogon grass is easy to identify & seed heads have begun erupting;
- April – May = 1st herbicide application (glyphosate);
- June – mow to 1” (if needed for better control);
- July – August = 2nd herbicide application (glyphosate);
- October – November = 3rd herbicide application (imazapyr).

TSA:

- Mowing – mowing regularly to suppress growth and kill seedling plants. **Never** mow a fruited plant.
- Spray infestations monthly with a post-emergence herbicide. When spot spraying cover entire plant with spray solution to ensure herbicide uptake and maximum control.
- Regular scouting must take place after treatment. TSA can produce fruit at almost any time during the growing season and each fruit can give rise to hundreds of additional plants. It is important to monitor roadside ensure no plants are allowed to reestablish and produce fruit.

To remain compliant with FDOT Procedure 850-000-015 Roadway and Roadside Maintenance chemical applications used in the control and management of invasive species will be documented in the following MS Excel format and placed within the same worksheet as inventory information:

Chemical	Adjuvant	% of Solution	Last Treatment Date
GLYPHOSAT	COHERE	2.50%	5/20/2013
GLYPHOSAT	COHERE	2.50%	5/20/2013
GLYPHOSAT	COHERE	2.50%	5/20/2013
GLYPHOSAT	COHERE	2.50%	5/20/2013

FTE invasive plan strives to drastically reduce invasive populations and achieve a monitoring and maintenance mode in which ongoing monitoring will identify isolated infestations and minimal maintenance will be required control them before they further expand into a long-term problem. All maintenance equipment before being used on and when departing the State ROW, shall be cleaned of all invasive weed seeds, spores, and active rhizome at a designated containment area. A designated containment area is an area or areas where all equipment is cleaned and which can be monitored for invasive species, treating any species found growing in the area. Contractors shall certify to the Department that all of their equipment is free of all invasive weed seeds, spores, and active rhizomes, before starting work, upon completion of work and when leaving our right of way.

For more information on FDOT invasive species program visit the following website: <http://www.dot.state.fl.us/statemaintenanceoffice/invasivespecies.shtm>

Appendix A will illustrate how to use the Turnpike Cogon Grass Controller App to inventory, document herbicide applications, and QA/QC cogon grass sites.

FTE Wildflower Plan

Purpose:

The Florida Turnpike Enterprise desires to provide the best travelling experience for our patrons. Wildflower areas contribute to the realization of this goal, making the right-of-way aesthetically pleasing, engaging, and unique. This plan serves to set up procedures for protecting, establishing, maintaining and inspecting wildflower areas along FTE right of way. Per FDOT policy 650-030-001 the District Wildflower Coordinator (DWC), which is assigned by the District Maintenance Engineer (DME), will be responsible for the roadside wildflower and natural area management activities.

Protection:

Natural wildflower stands occur within FTE right-of-way. They are extensions or remnants of neighboring natural areas that contain high densities of showy wildflowers or populations of rare plants. These areas have a high ecological value and can include a mosaic of native species.

In determining whether a site should be protected as a natural stand, several factors or qualities of the site must be considered:

- **Ecological Value**
 - o Certain areas have intrinsic ecological value, that is, they may be composed of rare species, be an extension of an adjacent natural area, or be used by wildlife. Areas of high ecological value will be protected and encouraged to propagate.
- **Species Composition**
 - o A suitable site will be composed of at least 20% showy wildflowers during bloom period.
 - o Determinations of the extent and species of invasive weeds that are present needs to be completed. This analysis will reveal if the concentration or species makeup would hinder or out-compete the wildflowers Sites with particularly aggressive weeds, or high concentrations will not be good candidates for preservation.
 - o The focal species should not be a known invasive exotic plant. Plants that are listed by the Florida Exotic Pest Plant Council as category 1 or 2 will not be considered for protection.
- **Aesthetic Value**
 - o The area must be bright and showy when in bloom. Wildflower areas, whose view is blocked by obstacles such as guardrail or other landscaping, should be given careful consideration to whether or not they are worth preserving.
- **Location**
 - o The nature of the stand in relation to its surroundings is another factor. It is favorable for the shape of the stand to be more linear along unbroken highway stretches, and more block shaped at interchanges and infields. Also, determine if the natural wildflower stand is in/ bordering a natural area. Will it enhance the natural boundary aesthetically and ecologically? Can we help the natural stand to expand?

- **Feasibility of Maintenance**

- In order to designate a site as a natural stand, we must be able to commit to managing the site differently than it was before. Mowing schedules will change, signs will be erected, and periodic weeding may be in order. Determine if the area will need heavy or light maintenance intervention.
- Factors to consider concerning maintenance are maintenance budgets and safety. Does the location of the site permit safe entrance for maintenance workers? Will it still provide for a safe recovery zone for travelers if mowing schedules are altered?

Establishment:

- **Site Selection**

All sites will be evaluated prior to planting for determination of existing conditions. During this evaluation, the following attributes of the site will be explored. Overly weedy sites or sites with particular species present will be considered for traditional wildflower plantings after one season of weed control takes place to reduce and control weeds. All planted sites will be visible from the road. It has been found that viewing planted beds from an elevated position provides the best view and gives the highest aesthetic impact. Gateways, interchanges and large open areas are ideal locations for planting wildflowers.

- **Seed**

As stated in FTE's Wildflower Program, "The key element to the success of plantings at FTE will be the use of Florida Eco-type seed." Preference will be given to seed that meets this requirement before seed from any other source will be considered acceptable to use. All seed will be clean, dry, and free of any noxious and/or invasive seed. Prior to installation seed will be stored in a temperature and humidity consistent environment and protected from becoming forage. Seed selection for a site will be based on the conditions present during the site assessment and verified by the District Wildflower Coordinator. Species will be selected based upon growth requirements.

- **Preparation**

Wildflower planting areas are to be prepared for seed installation by one of the following methods:

Full Site preparation by removal of existing turf

This method requires 2 applications of a nonselective herbicide applied a minimum of 14 days apart. The herbicide applications will be followed by mechanical scalping, to a height of 1 inch or less, and removal of excess material from the seed bed. Disturbances to the planting area prior to seed drilling should be minimized to limit unwanted germination. This preparation method is suitable for any planting as it removes all vegetative competition.

Sequence of Operations:

1. Treat project site with a non-selective herbicide twenty-two calendar days prior to planting. Herbicide treatment should follow manufacturer directions and all other labeling.
2. Re-treat project site with a non-selective herbicide twelve calendar days later. Herbicide treatment should follow the manufacturer directions and all other labeling.
3. Mechanically scalp, and then remove all clippings and other debris from site two days prior to planting or ten days after second application of herbicide. Areas are to be cut to a height of 1" or less. All cuttings, clippings and debris are to be removed from site at time of scalping.
4. Application of seed shall be completed within three days after mechanical scalping.

o Seeding

Seeding will be performed with a no-till seed drill like a J-Thom 42 Wildseeder, Great Plains Model 3P605NT, or equivalent equipment. Seed Drill will have the ability to plant at an adjustable depth. Deepest setting utilized shall be for between 1/8 and 1/4 inch. Every effort will be made to minimize soil disturbances before, during, or after seeding.

All seeding operations will start no sooner than the 2nd week of September and be complete no later than the 2nd week in December. This mimics the natural growth cycle of spring & summer blooming species which comprise the bulk of species used. Planting times should be adjusted to match the climatic conditions of the planting location. Timing of herbicide treatments should be made while turf is still actively growing. Seed should be installed prior to cyclic drop in precipitation.

Management:

Properly conducted maintenance activities are paramount to preserve a site's appearance, sustainability and ecological integrity. Activities necessary include various herbicide applications, hand weeding, mowing, watering, and re-seeding. Activities and their frequencies will vary by site but at a minimum maintenance activity will take place every 60 days. Those sites identified as high impact or associated with Bold Landscape projects shall be reviewed every 30 days to assess maintenance needs. In most sites the chief objective will be weed control. Weed competition is the primary cause of stand deterioration. Weeds not only appear very unsightly, but also they compete with wildflowers for light, water, and nutrients. These consequences effectively eliminate any function that the wildflower area is purposed to have. All wildflower designated sites will be kept free of cogon grass (*Imperata cylindrical*), tropical soda apple (*Solanum viarum*), Johnson grass (*Sorghum halepense*), castor bean (*Ricinus communis*), Natal grass (*Melinis repens*), torpedo grass (*Panicum repens*), dog fennel (*Eupatorium capillifolium*) and wedelia (*Sphagneticola trilobata*). High impact wildflower sites and those associated with Bold Landscape projects cannot have more than 15% of total area covered with weeds and all other wildflower sites will have no more than 25% of total area covered with weeds.

The following are descriptions of each type of maintenance.

Herbicide Application - Pre-emergent

Pre-emergent herbicide application will be used to prevent weeds from germinating. Pre-emergent weed control reduces the efforts and associated costs with controlling established weeds. A pre-emergent herbicide will be used after wildflower plants have grown to at least 4 inches in height or have become well established. Application before wildflower plants are established is prohibited and will result in injury and failure of wildflower planting. Application will be made over the top of the wildflowers, throughout the entire bed. Before application, stringent measures will be taken to thoroughly clean out the chemical application system being used, ensuring that residues from other chemicals/herbicides will not contaminate the herbicide solution and affect wildflower plantings.

Chemicals with the sole active ingredient Pendimethalin shall be used, following the manufacturer's label for recommended rates. Rates will be adjusted to provide pre-emergent weed control for a specific period of time. This length of time will depend on the site and must be determined by the Engineer prior to application. Higher rates will result in diminished numbers of late season wildflowers. Label instructions for managing off-target movement will always be followed. The product label will be consulted for all actions related to the application. All chemicals will be submitted to the Engineer for approval before application.

Herbicide Application – Grass specific

Grasses are primary competitors with wildflowers and contribute to the failure of a wildflower plot. Grass specific herbicides will be used to control undesirable grass species in wildflower plots, without causing harm to an established stand. They will be applied post-emergence to problematic grasses as a

spot treatment or as an application over the entire area. The Engineer will direct the contractor on the extent of treatment.

Before application of a grass specific herbicide, measures will be taken to thoroughly clean out the chemical application system being used, ensuring that residues from other chemicals/herbicides will not contaminate the herbicide solution, and affect wildflower plots. Invasive grasses, such as torpedo grass (*Panicum repens*), will be the primary targets, but any competing grass species may be targeted for control.

Herbicides with active ingredients fluazifop-p-butyl, clethodim, sethoxydim, or fenoxaprop will be used, following all instructions from the manufacturer's label. Combining these products is permitted if allowed by the product label. These herbicides will only be applied when sites are dry because they are not labeled for aquatic use. A surfactant will be used if recommended by the product label, and if it is shown to be safe for use on wildflowers. Label instructions for managing off-target movement will always be followed.

Herbicide Application – non-selective

If damage to existing wildflowers can be avoided, weeds will be treated with a non-selective herbicide such as glyphosate. Specific weed species will be targeted, some of which will include Spanish needle, dog fennel, Canadian horseweed, ragweed, and other invasives. The treatment will be directed as a spot spray, using a low volume pump such as a backpack sprayer. This type of maintenance may not be reasonable during peak blooming time. Herbicides that have any residual effects, such as imazapyr will not be permitted.

Generally, in the fall, after wildflowers have bloomed, set seed, and about 3-4 weeks have past, it may be beneficial to spray the entire site. This is to kill any perennial weeds that have survived through wildflower season and will again be a problem in the next season. This will open up any occupied space for new wildflower seeds to germinate the following spring.

Mowing

Mowing will be done at strategic times depending on the nature of the site. The primary goal of controlling the mowing schedule is ensure seed can be set. Mowing will be directed when wildflowers have finished blooming, and 3 -4 weeks after setting seed. Mowing in the middle of the bloom period or before seed is ready can harm the sustainability of the wildflower area.

The first measure that should be implemented on a natural stand is to withhold mowing. The mowing schedule should then be re-worked to favor the proliferation of wildflowers in the area. Mowing may be as few as once per year in these areas.

Meadow installations should not be mowed while wildflowers are growing and blooming; and not until 3-4 weeks after peak bloom, to be determined by the Engineer. After at least 3-4 weeks after peak bloom a site may be mowed regularly.

High impact sites may need to be mowed more frequently to address aesthetic problems. Bloom periods can be planned based on species selection, and mowing may safely occur in between bloom

Weed Removal by Hand

Weeds shall be removed manually by hand, with minimal soil disturbance, when growing in and around wildflowers that precludes the use of herbicides. The physical removal of the entire weed plant, including roots, is expected. Weeds shall then be disposed of off-site.

Maintenance seeding

Maintenance seeding will be used to fill in bare spots that occur due to environmental conditions. Seed sowing will take place in one of the two following ways;

1. Seed will be mixed with a weed-free substrate (e.g. sand) in 5-gallon buckets, water will be added to mixture to moisten. Mixture will then be sowed into bare spots by hand and press into soil with feet. Ratio of seed/sand/water for each 5-gallon bucket will be determined by the Engineer since each wildflower site will have unique characteristics.
2. Seed will be placed in a rotary type spreader, commonly used for fertilizer, and applied in overlapping rows, 1' overlap, in a checkerboard pattern. Rate and setting will be determined by Engineer.

Watering

Usually, watering wildflower areas is not necessary. However, in limited instances if rainfall is not available, watering will be employed after a maintenance seeding event to promote germination. Post seeding watering will be done at $\frac{1}{4}$ inch, or 6790 gallons per acre, per day for up to 14 days. Watering will also be done after an application of pre-emergent herbicide to facilitate its effectiveness. This shall be done once, at

$\frac{1}{2}$ inch, or 13,577 gallons per acre. Watering must be done within 30 days of application or less, depending on recommendations from the product label. Watering will be done to ensure all areas receive uniform coverage, that run-off is minimized, and plants will not be damaged by the force of the water or the equipment being utilized.

Inspections:

High Impact Wildflower sites and wildflower sites associated with Bold Landscape projects shall be inspected on a monthly basis and all others inspected bi-monthly. A report prepared with the following information will be created and delivered to the District Wildflower Coordinator:

- Roadway number and name (SR589 SunCoast Parkway)
- Location – milepost, county and site number (MP23, Pasco County, Site 4-010)
- Condition Status – excellent, great, good, fair, poor
- Site Status – Active or Non-active
- Wildflowers species present (*Coreopsis lanceolata*, *Gaillardia pulchella*, *Rudbeckia hirta*)
- Weed species present (Dog Fennel, Sedge, Thistle)
- Overall Site % of Wildflowers
- Overall Site % of Weeds
- Description of work completed at last maintenance cycle
- Next maintenance cycle due and the activities to take place
- Comments
- Inspection Date
- A minimum of four dated photographs illustrating the overall condition of wildflower site

Florida Turnpike Wildflower Planting Plan

20 20

In accordance with the Florida Department of Transportation's 650-030-01 Wildflower Management Program and 850-000-015 Roadway and Roadside Maintenance Procedure the Florida Turnpike Enterprise (FTE) presents its 2020 Wildflower Planting Plan. This year's plan will concentrate our planting efforts in Zones 1, 2 & 3. We have 40 candidate sites consisting of 46.8 total acres. FTE has purchased Florida eco-type seed and procured, through contract, a firm to install and maintain the 2020 plantings. The wildflower species we will be planting this year are:

Canna flaccida
Coreopsis basalis
Coreopsis leavenworthii
Coreopsis lanceolata
Gaillardia pulchella
Phlox drummondii
Rudbeckia hirta

Each candidate location with wildflower species to be planted can be found on the Turnpike Wildflower GIS site. Access to review Wildflower GIS will be given upon request.

Broschat, T. K. (2011). *Fertilization of Field-grown and Landscape Palm in Florida*.

Broschat, T. K. (2011). *Nutrient Deficiencies of Landscape and Field-grown Palms in Florida*.

Ferrel, J., Unruh, B., & Jason, K. (2012). *Guide for Roadside Vegetation Management*. Tallahassee: Florida Department of Transportation.

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Gilman, E. F. (2002). *An Illustrated Guide to Pruning Second Edition*. Delmar Thomson Learning.

International Society of Arboriculture. (2008). *Best Management Practices: Tree Pruning, a companion to ANSI A300 Part 1*.

Sartain, J. (2012). *Soil and Tissue Testing and Interpretation for Florida Turfgrass, SL 181*. Gainesville: University of Florida.

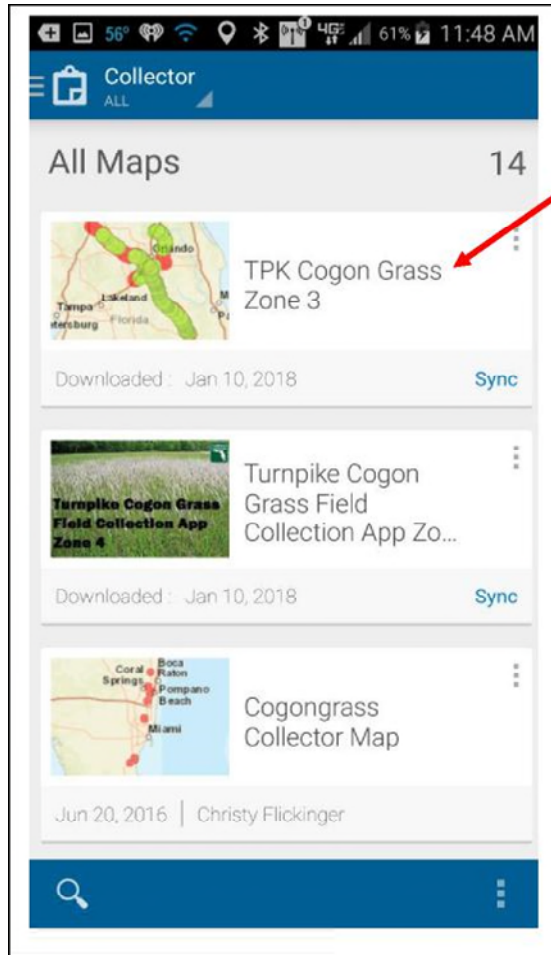
Shober, A. L., & Mylavarapu, R. S. (2012). *Soil Sampling and Testing*. Gainesville: University of Florida.

State of Florida. (2003). *The Statewide Invasive Species Strategic Plan for Florida*. State of Florida.

Tree Care Industry Association. (2008). *ANSI A300 (Part 1) for Tree Care Operations*.

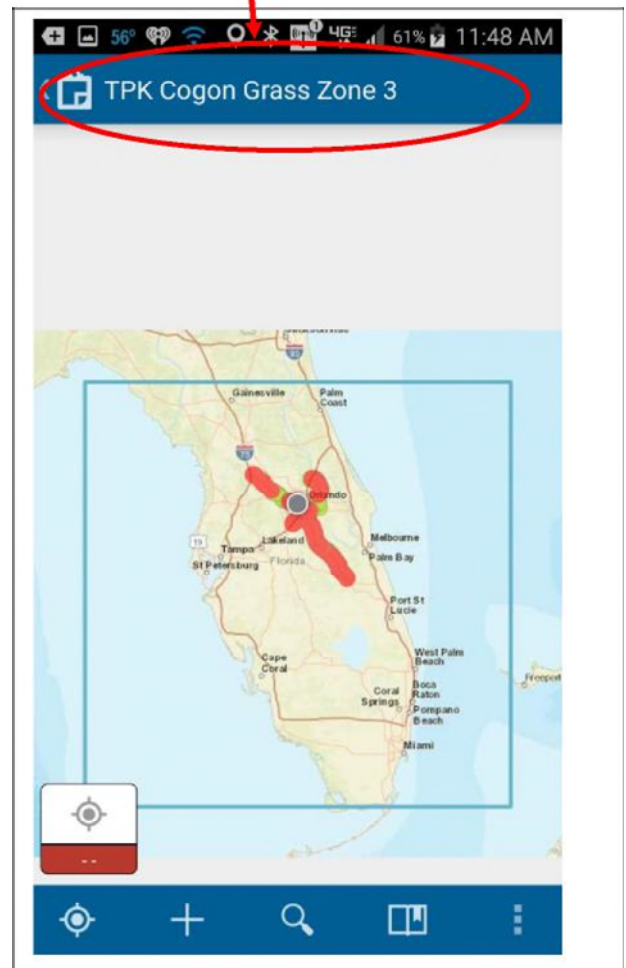
Blair, S., D.C. Mclean, D.R. Hilbert, A.K. Koeser, E.F. Gilman, and B. Kempf (2019). A Guide for Tree and Palm Maintenance Along Florida Roadsides. University of Florida IFAS/Extension, Wimauma, Florida 103pp.

Appendix A - Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple

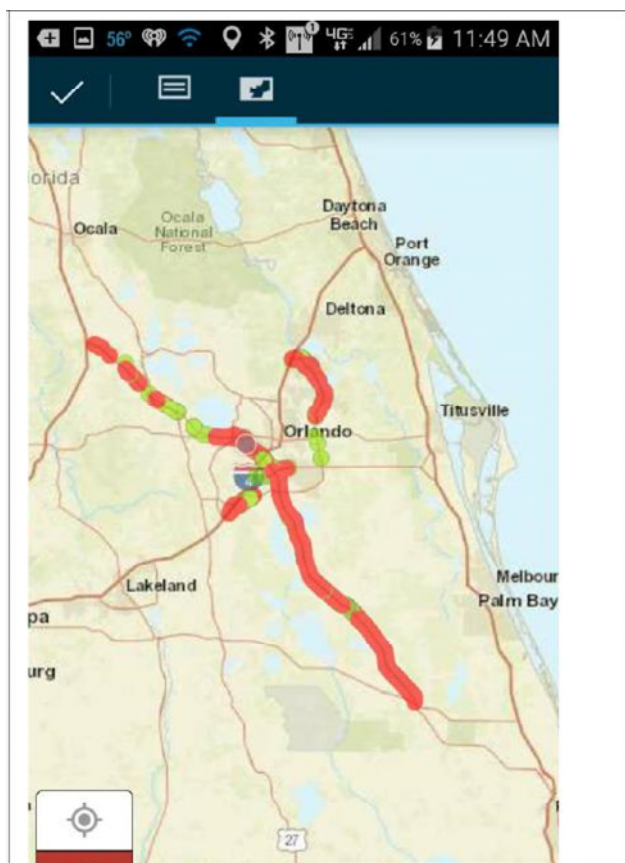


Step 1 – open collector app to the zone you will be working in

Main page for Zone

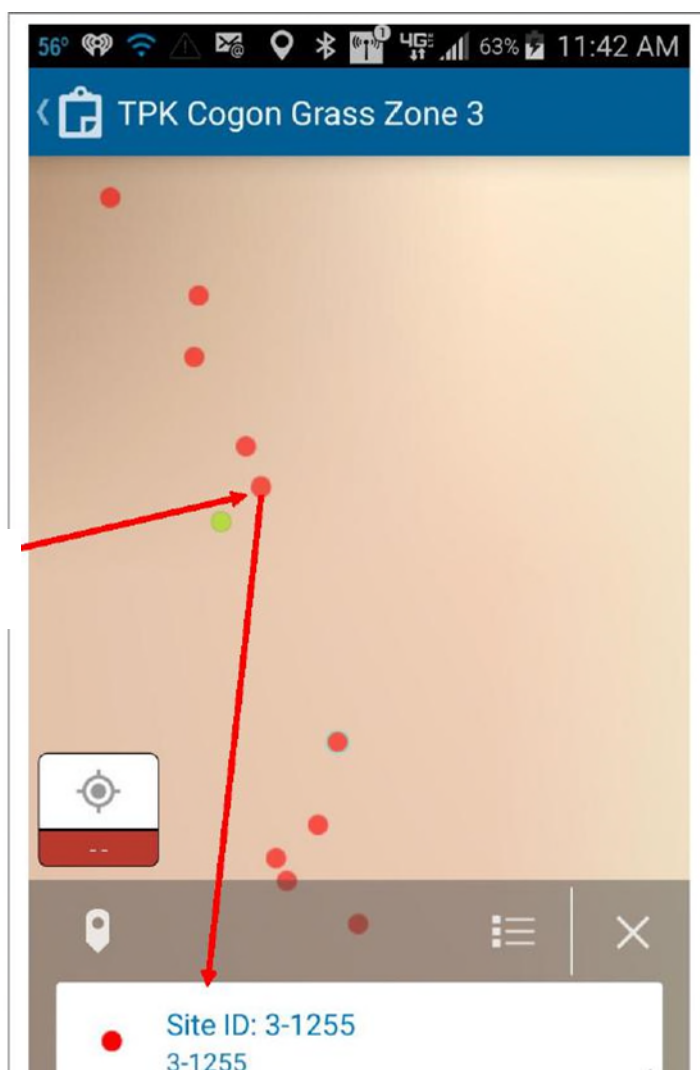


Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple

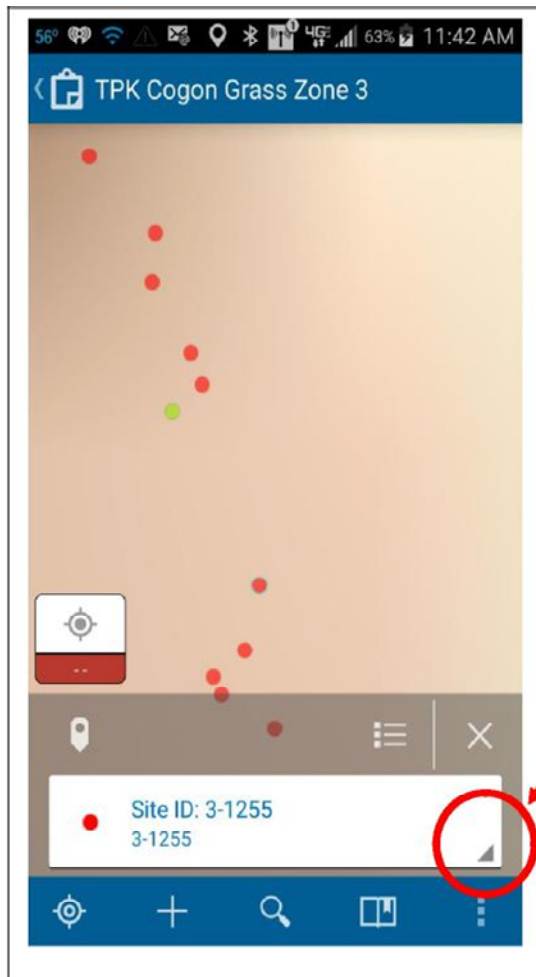


Step 2 – zoom in to area

Tap point and information box will come up

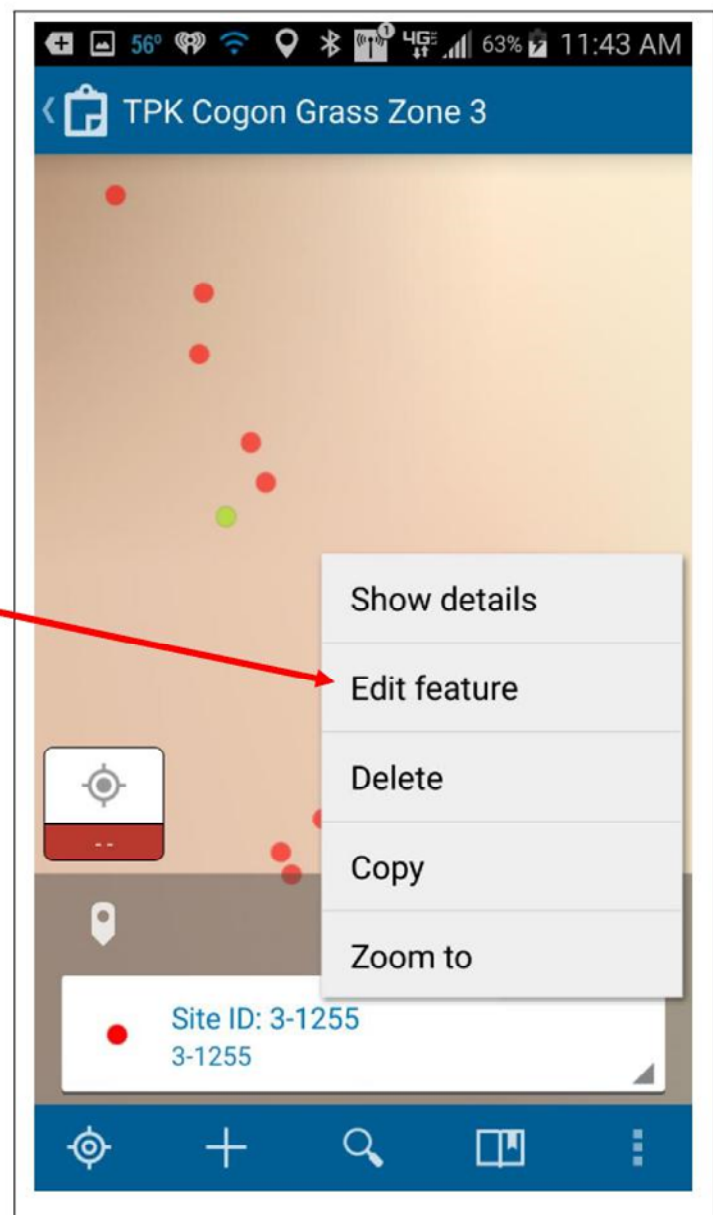


Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple



Step 3 – Edit point. Tap down arrow at bottom left of point information box .

Now you can edit all the features associated with that cogon grass point. Tap “Edit feature”.



✓ Details

Site ID: 3-1255
long:-81.39129400 lat:28.41617083

ZONE
3

SITE ID
3-1255

STATUS
Active

FACILITY
SR 91

COUNTY
Orange

LAT
28.42

LONG
-81.39

SPECIES
Cogon Grass

2017 SIZE

✓  

2016 SIZE
0

2015 SIZE
100

2014 SIZE
0

CHEMICAL
Glyphosate

ADJUVANT
Tatic

PERCENT SOLUTION
2

LAST TREATMENT DATE
July 22, 2015  Use current

LAST INVENTORY DATE
April 09, 2017  Use current

All features can be edited by tapping on feature and typing in information required.

Features include:

Zone

Site ID

Status

Facility (Roadway)

County

LAT (automatically entered by app)

Long (automatically entered by app)

Species

Size of infestation (last 3 years)

Chemical used to treat site

Adjuvant used

% of Chemical used

Last Treatment date

Last inventory Date

✓  

SPECIES
Cogon Grass

2017 SIZE
0

2016 SIZE
0

2015 SIZE
100

2014 SIZE
0

CHEMICAL
Glyphosate

ADJUVANT
Tatic

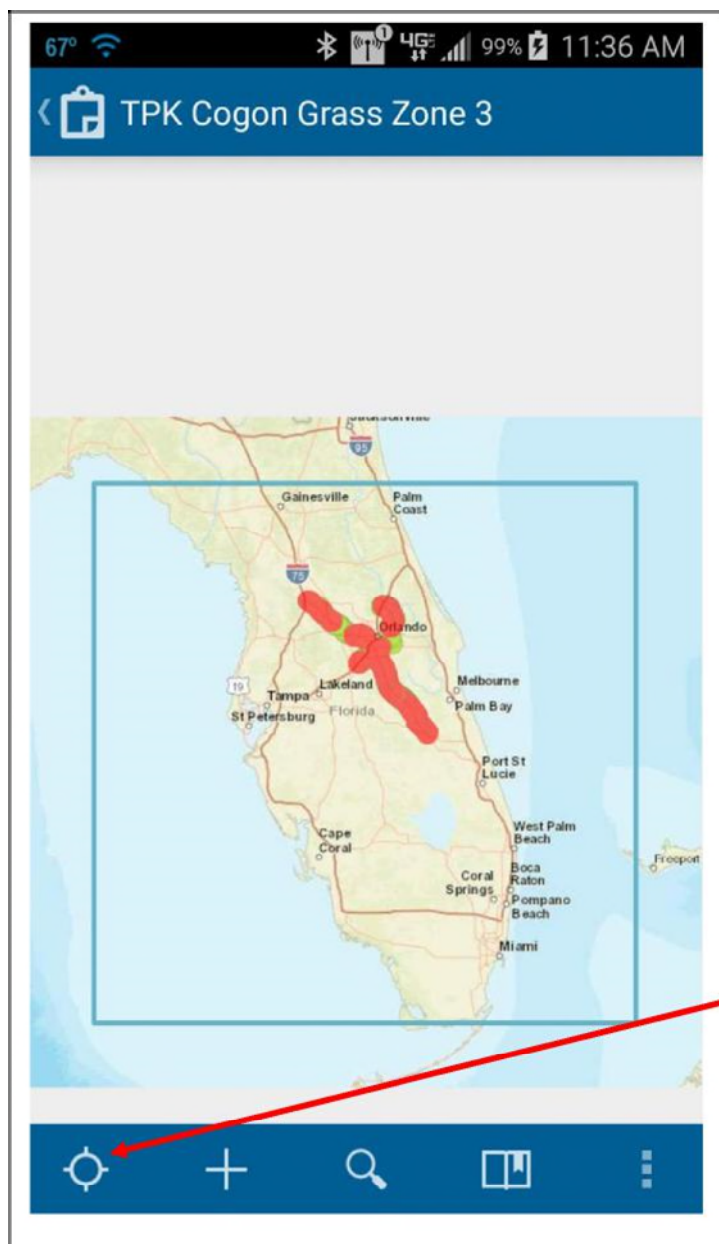
PERCENT SOLUTION
2

LAST TREATMENT DATE

Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple

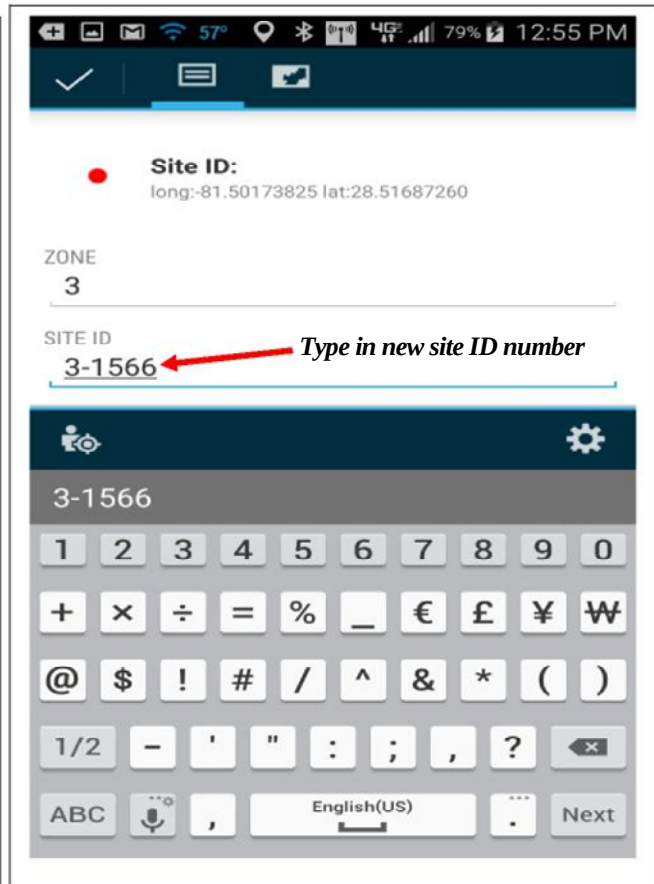
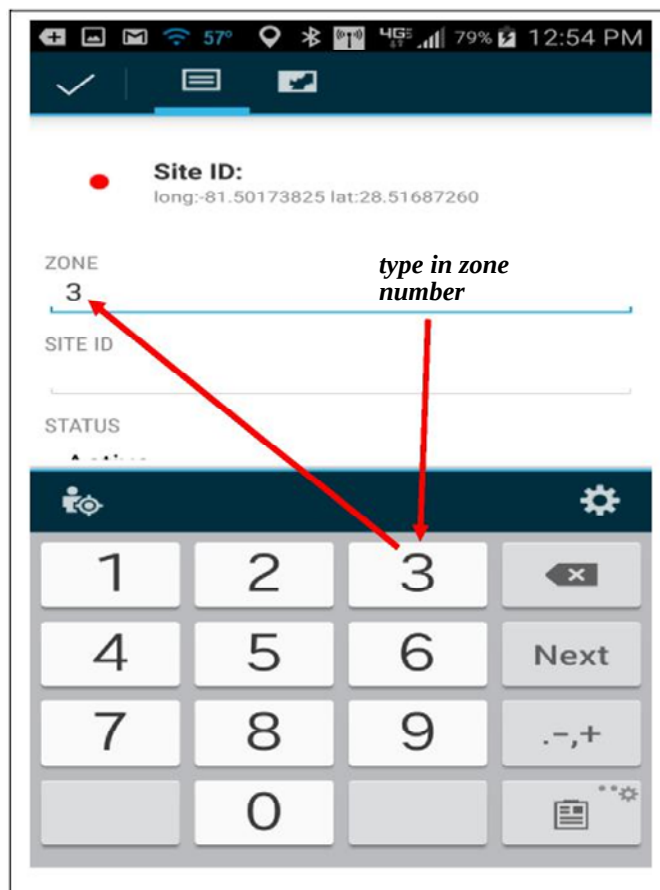
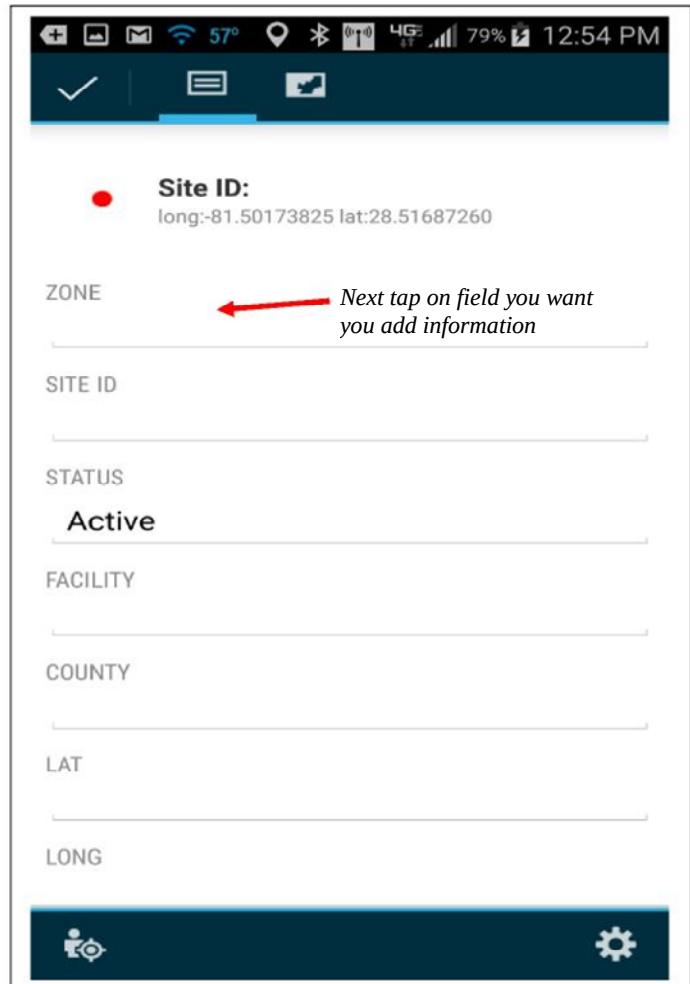
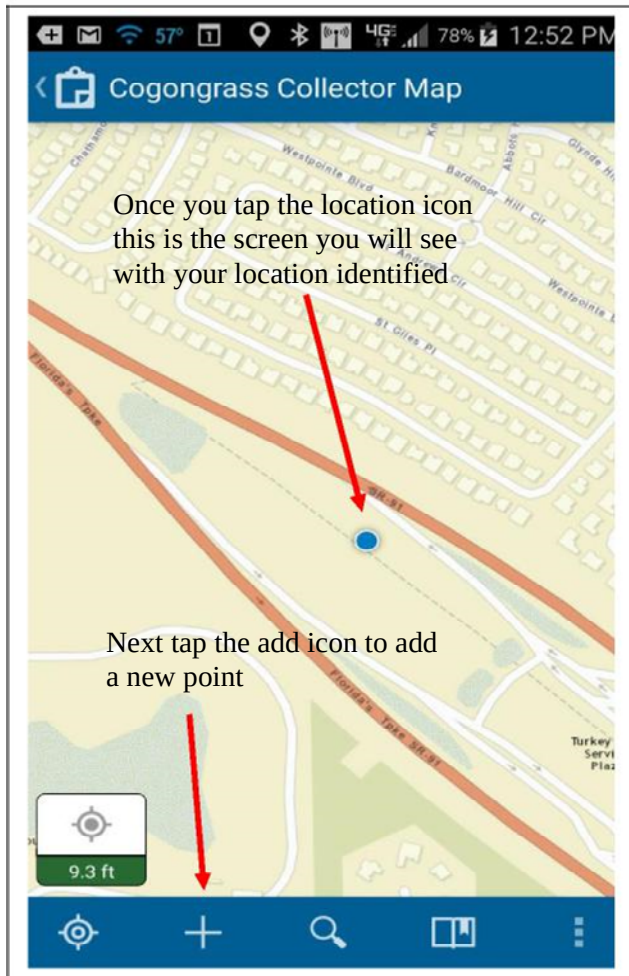
Using Collector App to establishment a new cogon grass point:



Open collector app to the zone you are working in.

Tap location icon

Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple



Using Collector App to inventory and document herbicide application to cogon grass & tropical soda apple

Fill out rest of information fields as needed.

3-1566

SITE ID

Active

STATUS

FACILITY

SR91

COUNTY

LAT

LONG

SPECIES

2017 SIZE

3-1566

STATUS

Active

FACILITY

SR91

COUNTY

Orange

LAT

LONG

SPECIES

2017 SIZE

2016 SIZE

Orange

LAT

LONG

SPECIES

Cogon grass

2017 SIZE

2016 SIZE

2015 SIZE

2014 SIZE

CHEMICAL

LAT

LONG

SPECIES

Cogon grass

2017 SIZE

1000

2016 SIZE

2015 SIZE

2014 SIZE

CHEMICAL

2016 SIZE

2015 SIZE

2014 SIZE

CHEMICAL

ADJUVANT

PERCENT SOLUTION

LAST TREATMENT DATE

Enter a date

Use current

LAST INVENTORY DATE

Enter a date

Use current

Last Inventory Date

Feb 07 2016

Mar 08 2017

Apr 09 2018

11 55 AM

12 : 56 PM

1 57

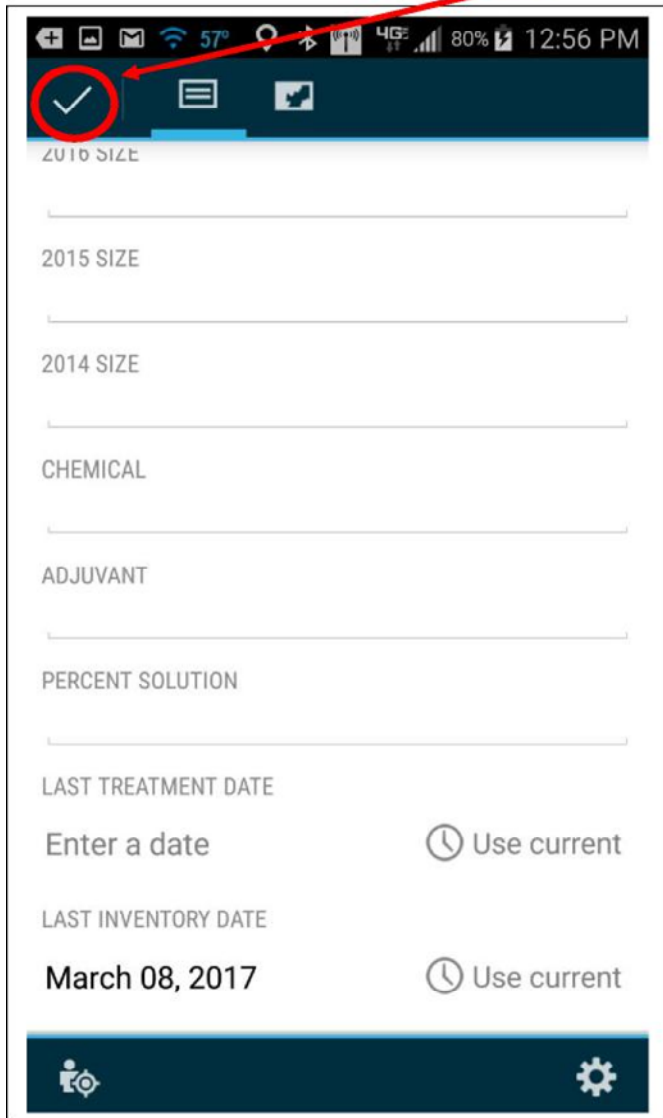
OK

Cancel

We you tap enter date the current date and time come up.

Tap OK.

Once you have completed all the information fields tap check mark tab to save new point.



2010 SIZE

2015 SIZE

2014 SIZE

CHEMICAL

ADJUVANT

PERCENT SOLUTION

LAST TREATMENT DATE

Enter a date ⌚ Use current

LAST INVENTORY DATE

March 08, 2017 ⌚ Use current

The screenshot shows a data entry form with various input fields. A red circle highlights the checkmark icon in the top left corner of the form, indicating the save button.

