I-10 Energy Conservation Study:
Fall 2009 Survey of Roadside Vegetation

Project PR4170440

Final Report

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16. Abstract

The current mowing frequency for the full clear zone on I-10 in Madison County (FDOT Maintenance District 2) is 7 times per year. To conserve energy and reduce expenses associated with mowing, a pilot study was implemented in 2009 in cooperation with District 2 maintenance personnel. The objective of the study was to evaluate the effects of reducing the area and frequency of mowing along I-10 within the most western mile of Madison County (from the Aucilla River east 1 mile). Until the time of the cleanup mowing in October, mowing was limited to a single pass, approximately 10 ft wide from the edge of pavement along the roadsides and in the median; litter control was not affected. The cleanup mowing occurred on 8 October, which was earlier than optimal for many native species. Tim Allen (FDOT State Maint. Office) and Jeff Caster (FDOT State Environ. Mgmt. Office) concluded that the modified mowing regime did not affect turf quality. Hence reducing the area and frequency of mowing did not negatively affect turf quality; likewise, no adverse effects on erosion were observed. To the best of our knowledge, safety was unaffected and no complaints were received by FDOT regarding aesthetics. Mowing on 8 October substantially limited observational data about the occurrence and extent of native and nonnative herbaceous species. *Paspalum urvillei* (median only) was the only nonnative species of immediate concern with respect to turf quality and highway operation. Based on the substantial extent of *Hydrocotyle* in the median, soil disturbance in the vicinity of *Hydrocotyle* could result in substantial spread of *Hydrocotyle*, which would reduce turf quality and could affect highway operation. The modified mowing regime was compatible with showy displays of *Salvia lyrata*, which was widespread on the south side of I-10. Direct seeding of *Sisyrinchium angustifolium* (in fall 2010; seed sown beyond 10 ft from edge of pavement) will substantially enhance aesthetics of the south side. Early spring flowering of *S. angustifolium* is compatible with the current clear zone conditions, the modified mowing regime, and normal highway operation. This pilot study should be continued for at least 1 year, but preferably 3 years, to determine long term effects of the modified

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INTRODUCTION

In 2007, interstate contract mowing costs for FDOT were about $15-20 acre. The current mowing frequency for the full clear zone on I-10 in Madison County (District 2) is seven times per year.

To conserve energy and reduce expenses associated with mowing of roadside vegetation, a pilot study was implemented in 2009, in cooperation with FDOT District 2 maintenance personnel, to evaluate the effects of reducing the area and frequency of mowing. The site of this pilot study was along I-10 within the most western mile of Madison County (from the Aucilla River east about 1 mile; the actual length based on GPS coordinates [eastbound: 30.4452/-83.7235; 30.4449/-83.7082] was 0.91 miles. Under guidance from the State Maintenance Office, mowing the full clear zone was to be no less than one time and no more than two times in 2009. For the remaining mowing cycles, mowing was limited to a single pass, approximately 10 ft wide from the edge of pavement along the roadsides and in the median. This left the remainder of the clear zone and beyond unmowed; litter control was not to be affected. The State Maintenance Office and State Environmental Management Office provided oversight of the pilot study area to determine any problems related to the change in mowing practices.

The only mowing of the full clear zone in 2009—the fall cleanup mowing—was to be conducted late in the week of 4 October, earlier in the fall than optimal for many native species.

It was concluded that reducing the area and frequency of mowing conserved energy without negatively affecting turf quality. Likewise, no adverse effects on erosion were observed, and to the best of our knowledge, neither were safety and aesthetics. The only nonnative species of immediate concern with respect to turf quality and highway operation was Paspalum urvillei, which only occurred in the median. The native wildflower, Salvia lyrata, was widespread on the south side of I-10. The modified mowing regime would facilitate sustainability of the S. lyrata population and result in a showy display of this native species in early spring.

METHODS

As part of the monitoring effort, the objective of this study was to document the following in the clear zone of the median, and along the north and south sides of I-10:

1. Presence and approximate extent of desirable and showy native wildflower and grass species that are flowering.

2. Presence and approximate extent of desirable and showy native wildflower and grass species that are not flowering but are obvious.

3. Presence and approximate extent of undesirable nonnative, invasive species, or other species that are incompatible with highway operation.

Existing populations of showy native species were further classified as:

- **Enhancement** – Has (or has the potential to be) substantial, aesthetically-pleasing impact, and if managed appropriately, the existing native herbaceous species should be sustainable, and the extent of species will probably expand.
- **Do not develop** – Sites to avoid developing into a native wildflower/grass site because of
  - The presence of nonnative, invasive species
  - Intense weed (nonnative) or turf competition

The survey, conducted on 8 October 2009, was by walking forays in the median and on the north side and south side clear zones (east and west bound, respectively).

Images and GPS coordinates (≤ 6 m) were recorded for species in the clear zone (turf areas only) that were classified into one of the three categories described previously. As the habitat of the entire pilot study area was ruderal, only the apparent soil moisture type (dry or moist) was noted.

Should FDOT decide to enhance any of the populations of native herbaceous species in the pilot study area, commercially available native species for the ecoregion of the study area are suggested for each native population classified as "Enhancement". The suggested species are available as seeds or containerized plants based on information on the Florida wildflower seed producers' co-op web site (http://www.floridawildflowers.com) or the Association of Florida Native Nurseries web site (http://www.afnn.org), respectively.

RESULTS

Results are summarized below, with Conclusions on page 8. Species details start on page 10. Included with this report is a CD with images recorded on 8 October. Embedded within the EXIF information of each image is the corresponding latitude/longitude information.

Mowing had commenced upon arrival of the observation team (Jeff Caster, EMO; Tim Allen, SMO; and myself) on 8 October. Clear zones (turf areas) on the north and south sides had been mowed prior to our arrival, and some of the median had been mowed. Nonturf areas of the north- and south side clear zones that were to be mowed with a bush hog had not yet been mowed. Native and nonnative herbaceous species observed in the clear zones, tree islands (see page 8), and woodland edges in the right-of-way are listed in Table 1 (page 15). Species are referred to by their scientific name in the body of the report; common names are noted in Table 1.

Showy, Flowering Native Wildflowers/Grasses

Mowing precluded detection of showy flowering native wildflowers or grasses in the turf of the north- or south side clear zones. However, on 4 October I observed *Ipomoea cordatotrilobata* (page 8) and several *Solidago canadensis* and occurring in the clear zone on the north side of I-10. No attempt was made to quantify the extent of these populations on 4 October as mowers were not expected until the following week. *Ipomoea* and *Solidago* were scattered and had no substantial aesthetic impact. Moreover, since flowering of *Solidago* occurs near the time of the fall cleanup mowing, establishing a showy, sustainable population of *Solidago* is not possible. Any occurrence of *Solidago* in the clear zone will be derived from the seed bank or seed rain/immigration from *Solidago* in "tree islands" (page 4) or the woodland edges. The possibility of managing for a showy display of *Ipomoea* might be possible but further study is required to determine seed set; *Ipomoea* starts flowering earlier than *Solidago*.

In the median, the only showy native species in the turf area clear zone was *Ipomoea cordatotrilobata*; however, further study is required to determine the likelihood of establishing a showy display of *Ipomoea* in the median.

Elsewhere, flowering of native wildflowers/grasses was mainly limited to woodland edges (mainly on the south side) and tree islands. While many of these native herbaceous species had showy floral displays, their aesthetic impact was minimal due to the limited extent of these species and because generally they occurred well below the road bed grade. The only exception was *Ipomoea cordatotrilobata* as noted previously.

Showy, Native Wildflowers/Grasses – Not Flowering but Obvious

Salvia lyrata (page 10) was the only widely occurring, nonflowering, showy native species; it was observed only on the south side of I-10. Preservation and spread of this late winter/early spring flowering species is compatible with the modified mowing regime as well as normal highway operation. *Tradescantia* (probably *T. ohiensis*; page 11) only was observed in the median. Although *Tradescantia* did not appear to be widespread (due to mowing), the possibility exists that it was more widespread than observed based on its substantial presence in I-10 medians east of the pilot study. Moreover, the presence of substantial *Tradescantia* populations in other portions of I-10 clear zones in Madison and Suwannee County suggests that the median can be managed to promote spread, sustainability, and showiness of *Tradescantia*; however measures taken to control *Paspalum urvillei* (page 13) might be incompatible with management practices to enhance the presence of *Tradescantia*.

Undesirable Nonnative, Invasive Species, or Other Species that are Incompatible with Highway Operation

Paspalum urvillei was widespread as a broken row in the center of the median, where soil seemed moistest. The longest segment of this row was >1100 ft (page 13). Control of *P. urvillei* should be considered as it could eventually reduce turf quality over time by excluding *Paspalum notatum* (J. Ferrell, personal communication).

Hydrocotyle (page 14) observed in the median was probably *H. umbellata*, a native species (J. Ferrell, personal communication); it was widespread. While *Hydrocotyle* prefers moist soils it also occurred on the upper portion of the median slope. *Hydrocotyle* does not pose an immediate threat to turf quality (J. Ferrell, personal communication); however, it would probably become more of a threat to turf quality if

NOTE 1: For the three sites classified as "Enhancement" only one species, *Sisyrinchium angustifolium*, could potentially be added (via seed) to enhance aesthetics. *Sisyrinchium* is showy (in large populations), and would be compatible with normal highway operations, adaptable to the modified mowing regime of this study, observable by motorists, and capable of being sustainable over the long term.

the soil were to be disturbed, which would allow *Hydrocotyle* to spread into the disturbed areas. Spread of *Hydrocotyle* would be most likely when *Paspalum notatum* is dormant and the weather is cool and wet.

Tree Islands

"Tree Islands" occurred on both north and south sides of I-10. Showy native herbaceous species that occurred in these "islands" included *Agalinis* sp., *Ipomoea hederifolia*, and *Solidago canadensis*. The extent of woody understory growth, limited habitat suitable for herbaceous species, and traffic traveling at 70 mph precludes the economically sustainable development of "tree islands" into sites for showy displays of native wildflowers that would be noticed by the majority of motorists.

CONCLUSIONS

1. Mowing prior to this survey substantially limited observational data about the occurrence and extent of native and nonnative herbaceous species.

2. Tim Allen and Jeff Caster concluded that the reduced area and frequency mowing did not affect turf quality; moreover, erosion was not adversely affected. And to the best of our knowledge safety was not compromised and no complaints were received by FDOT regarding aesthetics. Hence the modified mowing regime conserved energy without adversely affecting normal highway operation.

3. Based on the substantial extent of *Paspalum urvillei* (median only), *P. urvillei* is the only nonnative species of immediate concern with respect to turf quality and highway operation.

4. Based on the substantial extent of *Hydrocotyle* in the median, soil disturbance in the vicinity of *Hydrocotyle* could result in substantial spread of *Hydrocotyle*, which would reduce turf quality and could affect highway operation.

5. The modified mowing regime is compatible with showy displays of *Salvia lyrata* (south side) and *Tradescantia* (median). The extent of *S. lyrata* was substantial; the extent of *Tradescantia* might be substantial (mowing precluded determining its extent). Direct seeding of *Sisyrinchium angustifolium* (fall 2010 beyond 10 ft from edge of pavement) will substantially enhance aesthetics of the south side. Early spring flowering of *S. angustifolium* is compatible with the current clear zone conditions, the modified mowing regime, and normal highway operation.

6. The pilot study should be continued for at least 1 year, but preferably 3 years, to determine long term effects of the modified mowing regime on:
   - Safety, erosion, motorist acceptance, and highway operations in general
   - Occurrence and extent of nonnative species incompatible with normal highway operation
   - Occurrence and extent of showy native species compatible with normal highway operation

SPECIES DETAILS

Salvia lyrata

Type	Showy native wildflower Enhancement
Season	Spring
Location	Eastbound
Soil moisture	Slightly moist
Lat./long.	+30.445 -83.715667

Extent — Occurred frequently in mow zone; density of *Salvia* was inversely related to turf density; for example, *Salvia* density increased with proximity to the woodland edge.

Management Recommendation

Avoiding mowing February thru April will enhance density and showiness of *S. lyrata*; based on anecdotal evidence, such practices should be compatible with normal highway operations. Potential showiness is shown below (images recorded on I-10: Suwannee County [left]; Madison County [right]).

***Tradescantia* sp.**
(probably *T. ohiensis* but possibly *T. hirsutifolia*)

Type	Showy native wildflower Enhancement
Season	Spring
Location	Median
Lat./long.	+30.445194 -83.708722

Extent Not able to determine extent as most of median had been mowed; **density should be re-evaluated in January 2010.**

Management Recommendation

Avoiding mowing late November thru April will enhance density and showiness of *Tradescantia*; based on anecdotal evidence, such practices should be compatible with normal highway operations. Potential showiness of *T. ohiensis* is shown below (image recorded on I-10 in Madison County).

Ipomoea cordatotrilobata

Type	Showy native wildflower Enhancement*
Season	Summer , fall
Location	Median (also observed on north side prior to mowing)
Lat./long.	+30.445167 -83.713611

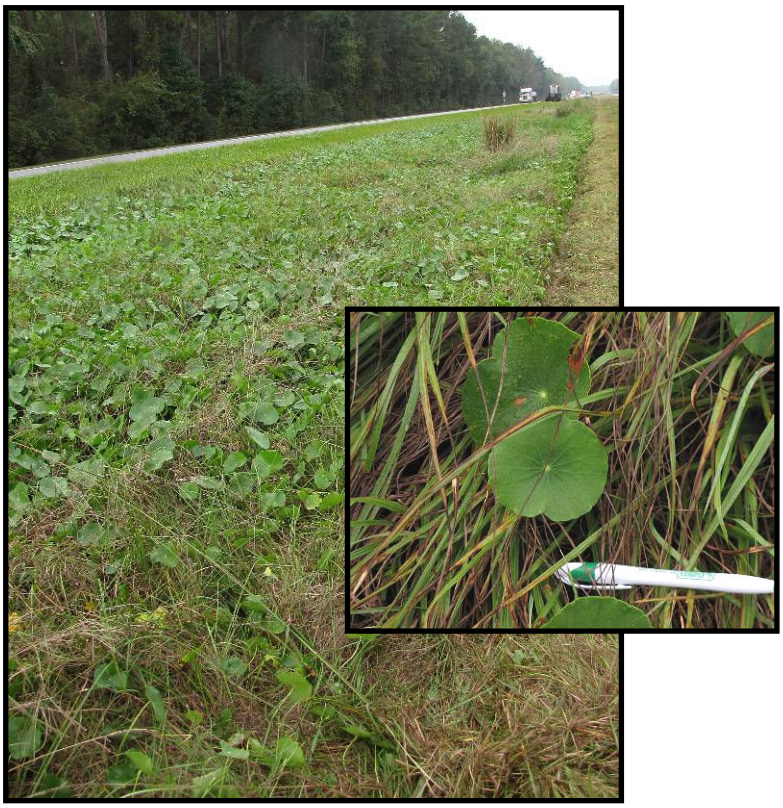
Extent Sporadic on slopes, but maybe more widespread; most of median had been mowed

Management Recommendation

*The creeping nature of *I. cordatotrilobata* is compatible with the reduced mowing specifications of this Energy Conservation study, and based on anecdotal evidence, some increase in density and spread of *Ipomoea* might occur. Increases in spread and density would be compatible with normal highway operations. *However, further study is required to determine the likelihood for establishing a showy display of Ipomoea in the median*.

***Hydrocotyle* sp.**
(probably *H. umbellata*)

Type	Native broadleaf Possibly incompatible
Season	Spring to fall
Location	Median
Soil moisture	Slightly moist
Lat./long.	+30.445222 -83.715028



Extent 1000-2000 sq. ft; mainly in swale but also extending up slope; much of it contiguous

Management Recommendation

According to Jason Ferrell, Univ. of Florida/IFAS, Extension Weed Specialist: "As for the *Hydrocotyle*, not a big issue unless it excludes the bahiagrass. …some work with this weed a few years ago … found it was most sensitive to clopyralid. But, I rarely recommend clopyralid and think that aminopyralid (Milestone VM) would probably be a better choice ". *Hydrocotyle* is not likely to become a problem unless soil is disturbed, and/or there is a wet winter/early spring (bahiagrass is dormant, and *Hydrocotyle* thrives under moist soil conditions). Milestone is a DowAgroScience product.

Paspalum urvillei

Type	Nonnative grass Probably incompatible
Season	Spring to fall
Location	Median
Soil moisture	Slightly moist
Lat./long.	+30.4452 -83.7119 to +30.4452 -83.7156

Extent	>1100 ft; mainly in swale; much of it contiguous

Management Recommendation

According to Jason Ferrell, Univ. of Florida/IFAS, Extension Weed Specialist: "The vasey grass can be a big issue. It will exclude bahiagrass, with time…. Fortunately, it is quite sensitive to Plateau." Plateau (BASF) will also affect bahiagrass so it is suggest that Plateau be applied as a directed spray, including use of wet blade technology.

Table 1. Scientific and common names of herbaceous species observed on 8 October 2009. The common names are those listed by the Atlas of Florida Vascular Plants (http://florida.plantatlas.usf.edu/; accessed 20 October 2009.) BL = Broadleaf; GR = Grass; SG=Sedge; FN=Fern.

Species			Location: **M**edian, or woodland edge or tree island of **N**orth side / **S**outh side	GPS coordinates of at least one location (latitude / longitude)
Scientific name	Common name	Type		
Native				
Agalinis sp.	False Foxglove	BL	N, S	+30.445417 / -83.707917
Andropogon virgincus OR *Schizachyrium scoparium*	Bluestem	GR	M, N	+30.445194 / -83.711167 +30.4455 / -83.710472
Bidens alba	Beggarticks	BL	N, S	+30.445472 / -83.713611 (also around Call Box at MM236, east bound)
Bidens mitis	Smallfruit Beggarticks	BL	N	+30.445472 / -83.713611
Chamaecrista fasciculata	Partridge Pea	BL	N, S	+30.445417 / -83.709111 +30.44475 / -83.709806
Conoclinium coelestinum	Blue Mistflower	BL	N, S	+30.444889 / -83.713361

Dichondra caroliniensis	Carolina Ponysfoot	BL	M	+30.445 / -83.716833
Digitaria ciliaris	Southern Crabgrass	GR	M	+30.445111 / -83.708834
Eupatorium capillifolium	Dogfennel	BL	M	+30.445194 / -83.71275
Eupatorium perfoliatum	Common Boneset	BL	S	+30.445472/ -83.713611
Gaura angustifolium	Southern Beeblossom	BL	N	+30.445472/ -83.712583
Hydrocotyle sp.	Pennywort	BL	M	+30.445222/ -83.715028
Ipomoea cordatotrilobata	Tievine	BL	M	+30.445167/ -83.713611
Ipomoea hederifolia	Scarletcreeper	BL	N	+30.445472 / -83.713611
Oxalis corniculata	Common Yellow Woodsorrel	BL	M	+30.445083 / -83.708861
Pityopsis graminifolia	Narrowleaf Silkgrass	BL	N, S	+30.445 / -83.7137
Salvia lyrata	Lyreleaf Sage	BL	S	+30.445 / -83.715667
Solidago canadensis	Canada Goldenrod	BL	N, S	+30.445472 / -83.712583
Symphyotrichum pilosum	White Oldfield Aster	BL	S	+30.444972 / -83.713722

Tradescantia sp.	Spiderwort	BL	M	+30.445194 / -83.708722
Trichostema dichotomum	Forked Bluecurls	BL	N, S	+30.4455 / -83.710472 +30.444833 / -83.710556
Nonnative				
Desmodium incanum	Zarzabacoa Comun	BL	N, S (mainly edge of shoulder)	+30.445472 / -83.715667 +30.445167 / -83.716472
Hyptis mutabilis	Tropical Bushmint	BL	M	+30.444833 / -83.708917
Lygodium japonicum **(Category I invasive species)**	Japanese Climbing Fern	FN	S	+30.444972 / -83.717806
Paspalum urvillei	Vaseygrass	GR	M	+30.4452 / -83.7119 to +30.4452 / -83.7156
Paspalum notatum	Bahiagrass (predominant component of the roadside turf)	GR	M, N, S	N/A
Phyllanthus urinaria	Chamber Bitter	BL	M	+30.4451 / -83.1084
Unable to Determine Nativity				
Cyperus sp.	Sedge	SG	M	+30.4451 / -83.70865

Table 2. Images of some species listed in Table 1. Full size images are on the CD included with this report.

		
Agalinis sp.	*Conoclinium coelestinum*	*Desmodium incanum*
		
Dichondra caroliniensis	*Eupatorium perfoliatum*	*Gaura angustifolium*
		
Hyptis mutabilis	*Ipomoea cordatotrilobata*	*Ipomoea hederifolia*

		
Lygodium japonicum	*Oxalis corniculata*	*Solidago canadensis*
		
Symphyotrichum pilosum	*Trichostema dichotomum*	