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NATIVE VEGETATION ALONG CONSTRUCTED CHANNELS IN PENINSULAR FLORIDA

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Abstract. A study of 33 sites on 12 watersheds in peninsular Florida indicates that several native or naturalized plants can be used for planting and beautifying channel side slopes, berms, and spoils. The most important trees are red maple, *Acer rubrum* (L.), and willow, *Salix* spp. L. Shrubs that have significant beautification and wildlife potential are elderberry, *Sambucus canadensis* L.; *lantana*, *Lantana* spp. L.; smooth sumac, *Rhus glabra* L.; and southern waxmyrtle, *Myrica cerifera* L. The vines or vine-like plants are blackberry, *Rubus* spp. L., and wild grape, *Vitis* spp. L. Grasses that have significant erosion control potential are bahiagrass, *Paspalum notatum* Flugge; common bermudagrass, *Cynodon dactylon* (L.) Pers.; maidencane, *Panicum hemitomon* Schult.; natalgrass, *Rhynchelytrum roseum* (Nees) Stapf and Hubb.; and paragrass, *Panicum purpurascens* Raddi. An important herbaceous plant is joint vetch, *Aeschynomene americana* (L.).

Channel construction creates erosion and beautification problems because of inadequate vegetative cover on channel banks, berms, and spoils. The usual method of revegetation is to seed bahiagrass, *Paspalum notatum* Flugge., and common bermudagrass, *Cynodon dactylon* (L.) Pers. These grasses often fail to become fully established to control erosion due to planting failures or poor maintenance.

This problem and its solution through use of plant materials is recognized by the U. S. Department of Agriculture, Soil Conservation Service (SCS) (1). The initial effort included a field study in south Florida to categorize the kind and extent of native and naturalized plants occurring on channel banks, berms, and spoils. This study determined the plant species naturally adapted for use along manmade channels. It was conducted in 1974 at 23 sites through south Florida. The results were published by Craig (3) in 1975.

In 1975 and 1976 the study was expanded to include 10 additional sites in central and north Florida. These results indicate that several plants have potential for use in channel stabilization work beautification, and landscaping.

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Materials and Methods

The sites to be studied were determined by a field review of typical watersheds. Thirty-three specific channel sites were selected. It was felt that these adequately represented the type and extent of vegetation in the areas studied. The site occurred from Palm Beach to Nassau Counties. The method of study was similar to that used by Craig (4) in a 1973-1974 survey of coastal dune vegetation in Florida.

Information was obtained at each site on soil material, construction features, vegetation, and other pertinent data. The area studied was from the channel water line, up the channel bank, across the berm and spoil to the undisturbed area. Unknown plants were identified by University of Florida Herbarium personnel.

All observations were made visually and were estimated. The individual studies were then reviewed to determine dominant and commonly occurring plant species in relation to ability for vegetating the area and beautification features.

Results and Discussions

One hundred and twenty-eight plant species were identified. Eighty of these occurred on more than 3% of the sites studied. Tables 1-5 contain information on the occurrence and dominance of these plant species.

Plant occurrence and dominance were often related to conditions of channel side slopes and berm and spoil areas. Channel side slopes generally have more favorable soil moisture conditions but are unstable and native plants do not become established by seed. Berms and spoils may have less favorable soil moisture conditions but certain native plants do become established from seed sources in the vicinity of the channel.

Occurrence of plant species is related to the type of soil materials. Construction significantly modified the original soil but the natural soil material can be classified into 5 categories.

1. Acid, poorly drained, coarse textured soil conditions that have a pH of less than 6, consist primarily of fine sands, and have a water table that normally fluctuates from 10 to 40 inches.

2. Acid, poorly drained, fine textured soil conditions that

have a pH of less than 6, consist primarily of clay loams and clays, and have a water table that normally fluctuates from 10 to 40 inches.

3. Acid, well drained, coarse textured soil conditions that have a pH of less than 6, consist primarily of sands, and have a water table that occurs below 40 inches.

4. Alkaline, poorly drained, fine and coarse textured soils that have a pH of more than 6, consist primarily of a mixture of sands and loams, and have a water table that normally fluctuates from the surface to 40 inches.

5. Organic soil conditions that consist of deep organic materials and have water that normally fluctuates from the surface to 40 inches.

Fourteen plants have special significance when considering their use in vegetating channel areas. This is because of plant characteristics that afford protection against erosion and degree of occurrence and dominance in the natural ecosystem.

Seed and planting material of native plants may not be readily available from commercial sources. However, nurseries and individuals are becoming increasingly interested in native plants and several commercial sources are now offering these plants and seed.

Trees

Thirteen tree species occurred and two of these have special significance for use in beautification of channel areas. Table 1 contains information on the occurrence and dominance of the 8 species that occurred on more than 3% of the sites studied.

The 2 dominant trees were red maple, *Acer rubrum* L., and willow, *Salix spp.* L. Both occurred on side slopes and berms. The best growth was on acid, poorly drained soils.

The red maple can be used to provide shade and beauty. Propagation is by seed or transplanting. Plants may also be purchased from commercial nurseries.

Willows are best used for erosion control and beautification on channel side slopes. Propagation is by planting finger-sized hardwood cuttings or seed.

Shrubs

Twenty-two shrub species occurred and 4 of these have special significance for use in beautification and vegetation of channel areas. Table 2 contains information on the occurrence and dominance of the 14 species that occurred on more than 3% of the sites studied.

Table 1. Percentage of occurrence and dominance of native and naturalized trees on channel side slopes and berm and spoil areas.

Scientific Name	Channel Side Slopes % of Sites		Berm and Spoil Areas % of Sites	
	Occurred	Dominant	Occurred	Dominant
<i>Acer rubrum</i> (L.)	15	—	18	—
<i>Carya aquatica</i> (Michx. f.) Nutt	6	—	—	—
<i>Liquidambar styraciflua</i> L.	3	—	6	—
<i>Pinus elliotii</i> Engelm.	6	—	3	—
<i>Quercus laurifolia</i> Michx.	6	—	3	—
<i>Quercus nigra</i> L.	3	—	3	—
<i>Sabal palmetto</i> (Walt.) Lodd	3	—	3	—
<i>Salix spp.</i> L.	24	0	6	3

Table 2. Percentage of occurrence and dominance of native and naturalized shrubs on channel side slopes and berm and spoil areas.

Scientific Name	Channel Side Slopes % of Sites		Berm and Spoil Areas % of Sites	
	Occurred	Dominant	Occurred	Dominant
<i>Baccharis halimifolia</i> L.	24	—	3	15
<i>Callicarpa americana</i> L.	9	—	3	—
<i>Cephalanthus</i> <i>occidentalis</i> L.	3	—	6	3
<i>Daubentonia punicea</i> (Cav.) DC.	3	—	3	—
<i>Jussiaea peruviana</i> L.	24	3	6	3
<i>Lantana spp.</i> L.	15	3	12	3
<i>Myrica cerifera</i> L.	21	—	12	—
<i>Opuntia spp.</i> Mill.	6	—	—	—
<i>Psidium guajava</i> L.	6	—	6	—
<i>Rhus glabra</i> L.	6	—	9	—
<i>Sambucus canadensis</i> L.	9	—	6	—
<i>Schinus terebinthifolius</i> Raddi	18	—	3	—
<i>Serenoa repens</i> (Bartr.) Small	9	—	3	—
<i>Yucca filamentosa</i> L.	3	—	3	—

Three of the dominant shrubs which occurred have undesirable characteristics, they are: eastern baccharis, *Baccharis halimifolia* L.; primrose willow, *Jussiaea peruviana* L.; and brazilian pepper, *Schinus terebinthifolius* Raddi.

The more desirable shrubs which occurred are elderberry, *Sambucus canadensis* L.; lantana, *Lantana spp.* L.; smooth sumac, *Rhus glabra* L.; and southern wax myrtle, *Myrica cerifera* L. All of these occurred on channel side slopes with poorly drained soil conditions.

Elderberry is best utilized for beautification and wildlife purposes. Propagation is by cuttings or planting stratified seed.

Lantana is an evergreen, aromatic shrub and has attrac-

Table 3. Percentage of occurrence and dominance of native and naturalized vine and vine-like plants on channel side slopes and berm and spoil areas.

Scientific Name	Channel Side Slopes % of Sites		Berm and Spoil Areas % of Sites	
	Occurred	Dominant	Occurred	Dominant
<i>Ampelopsis arborea</i> (L.) Koehne	9	—	6	—
<i>Campsis radicans</i> (L.) Seemann	—	—	6	—
<i>Cracca virginiana</i> (L.)	3	—	6	3
<i>Desmodium canum</i> (Gmel.) Shintz and Thellong	3	—	3	—
<i>Ipomoea pandurata</i> (L.) G. F. W. Meyer	3	—	3	—
<i>Lippia nodiflora</i> Michx.	3	—	6	—
<i>Parthenocissus</i> <i>quinquefolia</i> (L.) Planch	12	—	3	—
<i>Rhus toxicodendron</i> L.	3	—	6	—
<i>Rubus spp.</i> L.	24	6	6	3
<i>Smilax spp.</i> L.	12	—	18	—
<i>Vigna marina</i> (Burm. f.) Merrill	6	—	—	—
<i>Vitis spp.</i> L.	18	9	21	6

Table 4. Percentage of occurrence and dominance of native and naturalized grasses and channel side slopes and berm and spoil areas.

Scientific Name	Channel Side Slopes % of Sites		Berm and Spoil Areas % of Sites	
	Occurred	Dominant	Occurred	Dominant
<i>Andropogon glomeratus</i> (Walt.) B.S.P.	9	—	12	—
<i>Andropogon virginicus</i> L.	15	—	9	—
<i>Arundo donax</i> L.	12	—	3	—
<i>Cenchrus</i> spp. L.	—	—	6	—
<i>Chloris petraea</i> Swartz	—	—	6	—
<i>Cynodon dactylon</i> (L.) Pers.	9	6	24	15
<i>Distichlis spicata</i> (L.) Greene	15	—	—	—
<i>Echinochloa</i> spp. Beauv.	12	—	6	3
<i>Panicum hemitomon</i> Schult.	30	15	9	3
<i>Panicum maximum</i> Jacq.	8	3	12	6
<i>Panicum purpurascens</i> Raddi.	64	58	21	15
<i>Panicum repens</i> L.	21	9	3	3
<i>Panicum</i> spp. L.	6	—	9	—
<i>Paspalum notatum</i> Flugge.	36	21	78	42
<i>Paspalum urvillei</i> Steud.	6	6	9	3
<i>Pennisetum purpureum</i> Schumacher.	12	—	6	—
<i>Rhynchelytrum roseum</i> (Nees) Stapf and Hubb.	21	18	36	18
<i>Spartina bakeri</i> Merr.	3	—	3	—
<i>Sporobolus poiretii</i> (Roem. and Schult.) Hitchc.	—	—	6	—
<i>Tripsacum dactyloides</i> (L.) L.	6	—	3	—

tive red, yellow, and lavender flowers which make it an especially useful plant for beautification purposes. The seed are toxic. Bush (2) recommends propagation by cuttings or seed. It is often available at commercial nurseries.

Smooth sumac is a deciduous shrub with bright red leaves which appear in the fall. Propagation is by seeding or transplanting of seedlings. Seed can be sown in the fall or spring after pretreatment with sulfuric acid or hot water for 1 to 3 hours to soften the seedcoats (4).

Southern wax myrtle is an evergreen, aromatic shrub. It is used for beautification and has important wildlife uses. Propagation is from seed, cuttings or transplanting. Wax myrtle plants are available commercially.

Vines

Fourteen vines or vine-like species occurred and 2 of these have special significance when considering their use as vegetation on channel areas. Table 3 contains information

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Table 5. Percentage of occurrence and dominance of native and naturalized herbaceous plants on channel side slopes and berm and spoil areas.

Scientific Name	Channel Side Slopes % of Sites		Berm and Spoil Areas % of Sites	
	Occurred	Dominant	Occurred	Dominant
<i>Aeschynomene americana</i> (L.)	—	—	15	6
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	6	—	—	—
<i>Alysicarpus vaginalis</i> (L.) DC	9	—	3	—
<i>Ambrosia artemisiifolia</i> L.	6	—	18	—
<i>Bidens pilosa</i> L.	18	—	21	—
<i>Cassia obtusifolia</i> L.	—	—	9	—
<i>Crotalaria spectabilis</i> Roth.	3	—	12	0
<i>Cyperus</i> spp. L.	15	—	33	3
<i>Eupatorium capillifolium</i> (Lam.) Small	6	—	30	—
<i>Heterotheca subaxillaris</i> (Lam.) Britt. and Rusby	—	—	15	—
<i>Hibiscus moscheutos</i> L.	6	—	9	—
<i>Indigofera hirsuta</i> L.	—	—	6	—
<i>Lactuca graminifolia</i> Michx.	17	—	9	—
<i>Lepidium virginicum</i> L.	6	—	—	—
<i>Oenothera</i> spp. L.	3	—	3	—
<i>Phytolacca americana</i> L.	18	—	21	—
<i>Polygonum</i> spp. L.	21	—	3	—
<i>Pteridium aquilinum</i> (L.) Kuhn	9	—	—	—
<i>Ricinus communis</i> L.	6	—	3	—
<i>Rumex</i> spp. L.	3	—	3	—
<i>Sesbania exaltata</i> (Raf.) Rydb.	3	—	12	—
<i>Solanum</i> spp. L.	—	—	6	—
<i>Solidago</i> spp. L.	3	—	3	—
<i>Typha</i> spp. L.	12	—	—	—
<i>Urena lobata</i> L.	15	—	12	—
<i>Vinca rosea</i> L.	13	—	4	—

on the occurrence and dominance of the 12 species that occurred on more than 3% of the sites studied.

The two dominant vines were blackberry, *Rubus* spp. L., and wild grape, *Vitis* spp. L. Blackberries occur on all channel conditions and are often dominant plants on acid, well drained, coarse textured and acid, poorly drained, fine textured soil conditions. They grow in dense thickets and their fruit mature in summer. Blackberries can be used for erosion control and wildlife food and cover. Propagation is by cuttings or seed.

Wild grape is an important woody plant on all channel conditions with the exception of those with organic soil conditions. It is a vigorous vine with dark blue to black fruit

which matures in the fall and persists into winter. The abundant foliage and fruit provide good wildlife food and cover. Propagation is by seed, transplanting, or cuttings.

Grasses

Thirty grasses occurred and 5 of these have special significance for use in erosion control. Table 4 contains information on the occurrence and dominance of the 20 species that occurred on more than 3% of the sites. The 5 most dominant grasses were: bahiagrass, *Paspalum notatum* Flugge.; common bermudagrass, *Cynodon dactylon* (L.) Pers.; maidencane, *Panicum hemitomom* Schult.; natalgrass, *Rhynchelytrum roseum* (Nees) Stapf and Hubb.; and paragrass, *Panicum purpurascens* Raddi.

Bahiagrass is a dominant plant only on the poorly drained soil conditions. It does not compete with the native vegetation on the better drained sites, unless management practices are applied. Propagation is by seed which can be purchased commercially.

Common bermudagrass is a dominant plant on channel side slopes with organic soil conditions. It is an important plant on berms and spoils except where better drained soil conditions occur. Propagation is by seed which readily germinate and provide good temporary plant cover.

Maidencane has good potential for use on channel side slopes because it does not grow far out into the channel. On channel side slopes it occurs to some extent on all soil conditions. Collections from throughout Florida have been made and 3 accessions have been selected for study at the SCS Plant Materials Center near Brooksville.

Natalgrass is a bunch type grass which grows to heights of about 3 feet. It is one of the most important and widespread plants on berms and spoils except on the organic soil conditions. It is also an important plant on channel side slopes where it occurs most extensively on the dryer parts of the side slopes with acid soils. Initial work at the SCS plant Materials Center indicates that seed can be harvested easily and good stands established from seed.

Paragrass is one of the most important widespread plants

on channel side slopes. Good growth occurred regardless of soil conditions. The decumbent stems which root at the nodes and spread rapidly make it an effective erosion control plant. Due to its growth out into the channels, it is sometimes considered to be a pest (6). Excessive vegetative growth can be controlled by weed control practices or grazing. Paragrass is not a problem in fast flowing water or where water depth exceeds 3 feet. Propagation is by vegetative means.

Herbaceous Plants

Forty-eight herbaceous plants occurred but only one has special significance when considering use in vegetating channel areas. Table 5 contains information on the occurrence and dominance of the 26 species that occurred on more than 3% of the sites studied.

The most important plant was joint vetch, *Aeschynomene americana* (L.). It is a summer growing, annual native legume and occurred on berms and spoils. The best growth was on acid, poorly drained, fine textured soil conditions. Studies at the SCS Plant Materials Center have proven its usefulness as a forage and wildlife plant. Propagation is by seed which can be purchased commercially.

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FLUID DRILLING OF PRE-GERMINATED SEEDS FOR VEGETABLE GARDENING

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Abstract. Fluid drilling of pre-germinated seeds is a new concept which involves: (1) seed germination in controlled optimum environmental conditions; (2) mixing selected germinated seeds with a gel type media having the consistency of wallpaper paste to protect and suspend the seeds for uniform distribution, and (3) sowing the seeds and gel through a specialized fluid drill seeder or a modified plastic bag. Procedures for germinating the seeds, mixing the pre-germinated seeds with gel, and sowing are illustrated and advantages and problems of sowing pre-germinated seeds are discussed.

The idea of mixing seeds in a gel carrier and pumping the mixture through a planter into a seed furrow in the soil was conceived by Mr. J. G. Elliot from the Weed Research Organization near Oxford, England fifteen years ago (3). Research with the fluid drilling system was begun at the National Vegetable Research Station (NVRS) in Wellesbourne, England in the early 1970's. Since then a wide range

Additional index words. seeding, sowing.

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