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JACKSONVILLE

Nov 15 '93

DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

**TRAIL RIDGE LANDFILL
MITIGATION MONITORING REPORT NO. 2
DER PERMITS 161821182 AND SC16-184444**

September 21, 1993

PREPARED FOR:

**Mr. Jim Lukens
Trail Ridge Landfill
Waste Management of North America, Inc.
P.O. Box 548
5110 U.S. 301
Baldwin, Florida 32234**

PREPARED BY:

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October 15, 1993

Mr. Jim Lukens
Trail Ridge Landfill
Waste Management of North America, Inc.
Post Office Box 548
5110 U.S. 301
Baldwin, Florida 32234

**RE: Trail Ridge Landfill
Mitigation Monitoring
Permits No. 161821182 and SC16-184444**

Dear Mr. Lukens:

Enclosed is the second monitoring report for the wetland creation effort at the Trail Ridge Landfill site per Specific Conditions 6, 11, 12, 13 and 14 and Conditions 46, 51, 52, 53 and 54 of the above-referenced permits (see Appendix A). Data referencing tree survivorship, percent herbaceous cover and natural recruitment are included along with photographs of the mitigation area. Future reports will follow per permit specifications.

If this report meets with your approval, please forward it to the local DER office to the attention of Mrs. Lisa Adams.

Should you have any questions, please call Byron Peacock or me.

Sincerely yours,

ENVIRONMENTAL SERVICES, INC.



for Nancy C. Zyski
President

Attachments

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MITIGATION MONITORING FOR TRAIL RIDGE LANDFILL

A. INTRODUCTION

On 15 September 1993, Mitigation Services, Inc. conducted the second monitoring of the forested wetland creation effort located off Highway 301 at the new Trail Ridge Landfill site in Duval County (see Drawing 1). Pursuant to Conditions 6, 11, 12 13 and 14 of Permit # 12-031-055 (see Appendix A) this evaluation was undertaken to document the success of the creation area at the end of its first growing season. This report will discuss the status of the project in terms of the following:

- Percent survival and density of planted species
- Recruitment density and composition
- Percent cover of herbaceous species
- Recorded growth via established parameters for trees and shrubs
- Hydrological conditions
- Wildlife utilization

The earthwork phase of construction was completed during the summer of 1992. The mitigation area was over-excavated approximately 0.5 foot below the existing grade of the adjacent wetlands. The area was then backfilled with mulch consisting of the upper soil layer from impacted wetlands on-site to promote natural revegetation by herbaceous recruits. Planting of the forested creation area was completed on 16 November 1992. A mixture of 3-gallon trees and 1-gallon shrubs were planted on 10-foot centers throughout the mitigation area. A total of 2,095 native wetland trees and 125 native wetland shrubs were installed. A completion report of the species planted was submitted on 10 December 1992. Planted tree and shrub species included:

Native Wetland Trees

<u>Species</u>	<u>Size</u>	<u>Number</u>
Bald cypress (<u>Taxodium distichum</u>)	3-gallon	419
Red Maple (<u>Acer rubrum</u>)	3-gallon	419
Sweetgum (<u>Liquidambar styraciflua</u>)	3-gallon	419
Black gum (<u>Nyssa sylvatica</u> var. <u>biflora</u>)	3-gallon	95
Sweet bay (<u>Magnolia virginiana</u>)	3-gallon	295
Water Tupelo (<u>Nyssa aquatica</u>)	3-gallon	448

Native Wetland Shrubs

<u>Species</u>	<u>Size</u>	<u>Number</u>
Wax myrtle (<u>Myrica cerifera</u>)	1-gallon	31
Fetterbush (<u>Lyonia lucida</u>)	1-gallon	46
Buttonbush (<u>Cephalanthus occidentalis</u>)	1-gallon	31
Virginia willow (<u>Itea virginica</u>)	1-gallon	17

B. ANALYTICAL TECHNIQUES

A total of eight (8) permanent belt transects were established within the forested mitigation area (Figure 2) and marked with 4-foot PVC stakes for reference. Four transects were orientated north-south, and four were orientated east-west to capture a uniform cross-section of the entire creation area. Each transect is 10 feet in width. All tree specimens within each transect were counted, and the health of each specimen was observed by noting new twig and leaf growth.

A total of ten (10) square meter plots were also permanently installed at each point of intersection between the various transects. The herbaceous density and growth parameters were noted by visual estimation. Recruitment of nuisance and non-nuisance species were noted throughout the mitigation area. Any observed wildlife in the vicinity of the mitigation area was also noted.

The methodology used in assessing growth and survivorship of planted trees and shrubs was as follows:

1. **Survivorship.** All trees and shrubs growing within each transect were counted. This number was divided by the total number of trees or shrubs originally planted within that belt transect to obtain the percent survivorship of planted species.
2. **Growth.** Two (2) trees in each transect were permanently marked with an identifying numbered tag.
 - a. **Caliper.** The width of tree trunks was measured six (6) inches from the ground.
3. **Recruitment.** The natural recruitment of wetland trees, shrubs and herbs in each transect was determined by visual assessment.

The methodology used in assessing growth and coverage of herbaceous vegetation was as follows:

- a. **Growth and Coverage.** The percent cover by wetland species of the total area of each square meter plot was determined and recorded.
- b. **Recruitment.** The natural recruitment of herbaceous wetland species within each plot was determined by visual assessment. Any recruited herbs observed throughout the mitigation area were also noted.

C. RESULTS

Survivorship. The creation area at Trail Ridge has shown excellent survivorship since it was initially planted. The overall survivorship for all of the transects combined is approximately 96 percent. This is a very good indicator of the entire area being very healthy and a viable ecosystem. Most of the trees and shrubs were exhibiting new twig and leaf growth. Please refer to Table 1 for the data on the survivorship.

Growth. The marked trees and shrubs in the mitigation area showed a small amount of growth, but most remained unchanged. All of the sampled species showed signs of being very healthy. Table 1 also contains the growth data from this iteration.

Coverage. The coverage of the mitigation area by natural recruits has given the area a natural appearance. The percent coverage by the recruits in the area is approximately 60 percent. This also is a very good indicator of the overall status of the creation area. Species composition within each of the fixed position quadrants is summarized below:

1. Quadrat No. 1

- 15% Spikerush (Eleocharis sp.)
- 5% Red root (Lachnanthes caroliniana)
- 80% Exposed sand

2. Quadrat No. 2

- 2% Low panicum (Panicum sp.)
- 2% St. Johns wort (Hypericum fasciculatum)
- 5% Beak rushes (Rhynchospora spp.)
- 5% Redroot (Lachnanthes caroliniana)
- 40% Spikerush
- 30% Exposed sand

3. Quadrat No. 3

- 10% Beak rushes
- 20% Spikerush
- 50% Low panicum
- 10% Exposed sand

4. Quadrat No. 4

- 5% Beak rushes
- 2% Red root
- 10% Low panicum
- 80% Spikerush
- 2% yellow-eyed grass (Xyris spp.)

5. Quadrat No. 5

- 100% Exposed sand

6. Quadrat No. 6

- 2% Spikerush
- 98% Exposed sand

7. Quadrat No. 7

- 20% Spikerush
- 20% Beakrush
- 60% Exposed sand

8. Quadrat No. 8

- 5% Low panicum
- 35% Beak rushes
- 35% Spikerush
- 25% Exposed sand

9. Quadrat No. 9

- 5% Various sedges (Cyperus spp.)
- 5% Low panicum
- 60% Spikerush
- 30% Exposed ground

10. Quadrat No. 10

- 15% Rush (Juncus sp.)
- 20% Low panicum
- 5% Beak rushes
- 50% Spikerush
- 10% Exposed sand

Recruitment. A large variety of herbaceous species have naturally recruited into the mitigation area, contributing to the formation of a diverse and thickly vegetated community. Notable recruits include beak rushes, sphagnum moss (Sphagnum sp.), various sedges, rush, pennywort (Hydrocotyle umbellata), bamboo briar (Smilax laurifolia), spikerush, redroot, low panicum (Panicum sp.), St. Johns wort, yellow-eyed grass (Xyris sp.), blue maidencane (Amphicarpum muhlenbergianum), red ludwigia, and fetterbush.

Nuisance Species. No nuisance species were observed within the mitigation area. Historically tenacious nuisance species such as cattails (Typha sp.) were notably absent from the area. However, one non-listed species of grass, a species of Panicum was noted. This species accounted for less than 10 percent coverage of the creation area and does not appear to pose any threat to the continued recruitment of hydrophytic herbs.

Hydrologic Conditions. Water elevations varied widely throughout the site depending on topography. Some standing water was observed within the submerged zones. The water table in the transitional areas was generally 1.0 to 1.5 feet below the surface, which reflects the below average rainfall levels for the preceding 6 months. The groundcover vegetation, however, indicates that the soil in the transitional areas is saturated to the surface periodically during the year for a sufficient period of time to support wetland species. The piezometer data can be seen in Table 2.

Wildlife Utilization. During the site visit various species of minnows (Fundulus sp.), mosquitofish (Gambusia sp.), frogs and tadpoles were observed within the creation area. These organisms represent pioneer species which would be expected to colonize developing wetlands, indicating the emergence of a stable ecosystem.

D. CONCLUSION

The wetland creation area at the Trail Ridge Landfill is continuing to exhibit signs of success at the end of its first growing season. Planted trees and shrubs appear to be healthy and growing as evidenced by new leaf and twig growth. Percent cover by herbaceous species has been excellent thus far, with herbaceous natural recruits accounting for approximately 60 percent coverage of the creation area. No nuisance species have been observed within the project site. Proper hydrology and the presence of pioneer faunal species indicate the early successional development of a healthy, viable wetland ecosystem.

TABLE 1
PERCENT SURVIVAL & GROWTH DATA OF PLANTED TREES

Transect Number	No. of Planted Trees	No. of Trees Living M ¹ M ² M ³ M ⁴ M ⁵ M ⁶	Percent Survival M ¹ M ² M ³ M ⁴ M ⁵ M ⁶	Tree - Number Species	Spring 1993 Caliper (Inches)	Fall 1993 Caliper (Inches)	Spring 1994 Caliper (Inches)	Fall 1994 Caliper (Inches)	Spring 1995 Caliper (Inches)	Fall 1995 Caliper (Inches)
1	37	37 36	* 97	T1-1 (<u>Taxodium distichum</u>) T1-2 (<u>Liquidambar styraciflua</u>)	0.4 0.5	0.4 0.5				
2	40	40 37	* 93	T2-1 (<u>Taxodium distichum</u>) T2-2 (<u>Nyssa sylvatica</u> var. <u>biflora</u>)	0.5 0.3	0.6 0.4				
3	45	45 44	* 98	T3-1 (<u>Taxodium distichum</u>) T3-2 (<u>Magnolia virginiana</u>)	0.6 0.5	0.6 0.5				
4	31	37 31	* 100	T4-1 (<u>Acer rubrum</u>) T4-2 (<u>Acer rubrum</u>)	0.5 0.3	0.5 0.4				
5	91	91 91	* 100	T5-1 (<u>Acer rubrum</u>) T5-2 (<u>Acer rubrum</u>)	0.4 0.5	0.4 0.5				
6	80	80 80	* 100	T6-1 (<u>Magnolia virginiana</u>) T6-2 (<u>Magnolia virginiana</u>)	0.7 0.8	0.8 0.8				
7	46	46 46	* 100	T7-1 (<u>Acer rubrum</u>) T7-2 (<u>Liquidambar styraciflua</u>)	0.4 0.6	0.6 0.6				
8	44	44 36	* 82	T8-1 (<u>Acer rubrum</u>) T8-2 (<u>Taxodium distichum</u>)	0.4 0.7	0.5 0.7				

Note: M¹ designates the first monitoring iteration, M² the second, etc.

* Since no previous survivorship data has been taken, data from the first iteration will serve as background for future comparison.

TABLE 2
PIEZOMETER DATA

Piezometer Number	Water Depth
1	>3.0'
2	-1.3'
3	-1.1'
4	-1.5'
5	At Surface
6	-1.0'
7	-1.7'
8	>-2.5'
9	+0.2'
10	-0.9'

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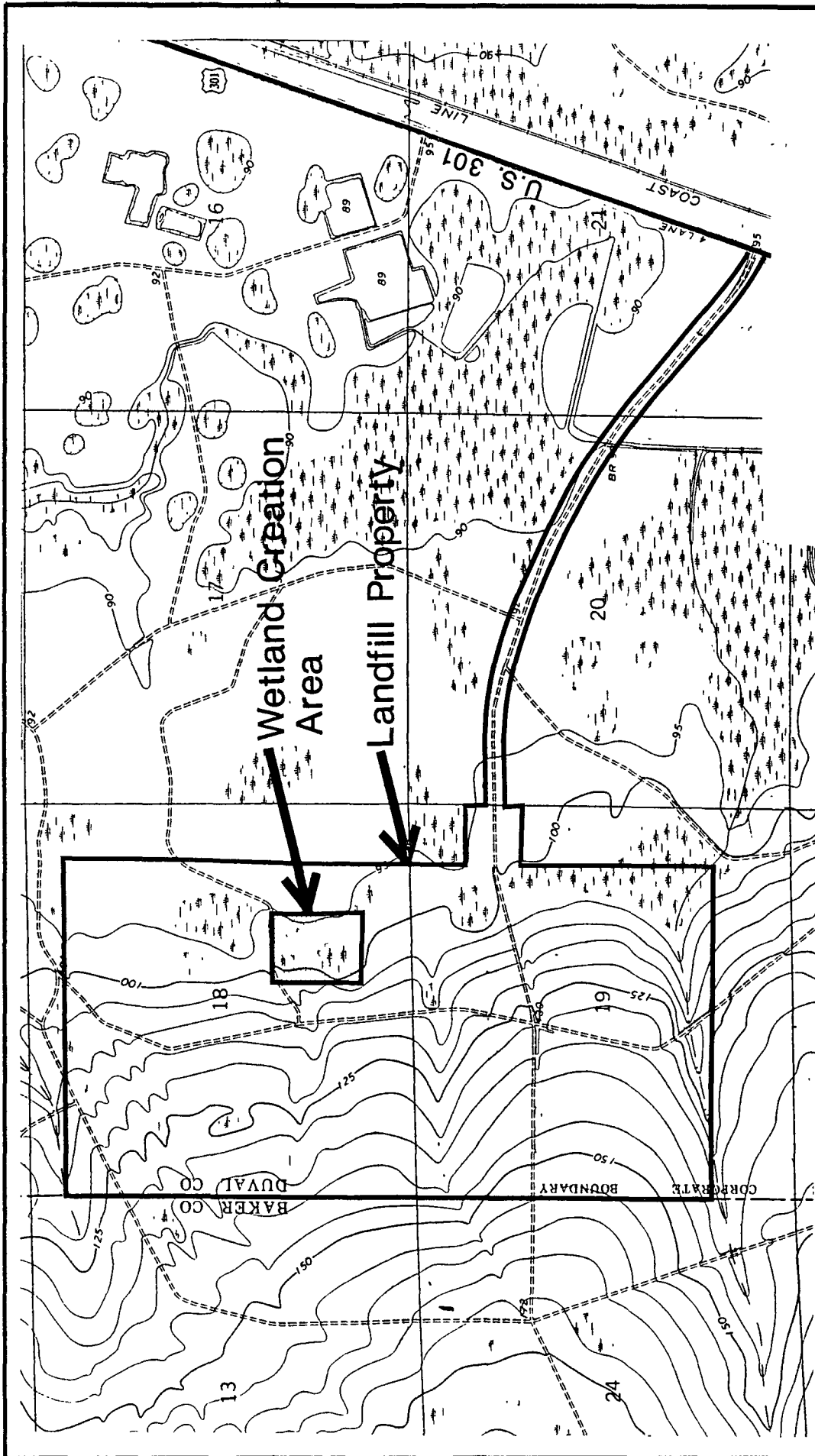


Figure 1
Location Map

Source: U.S.G.S. Topographical Survey,
Maxville, FL., Quadrangle. (1970)



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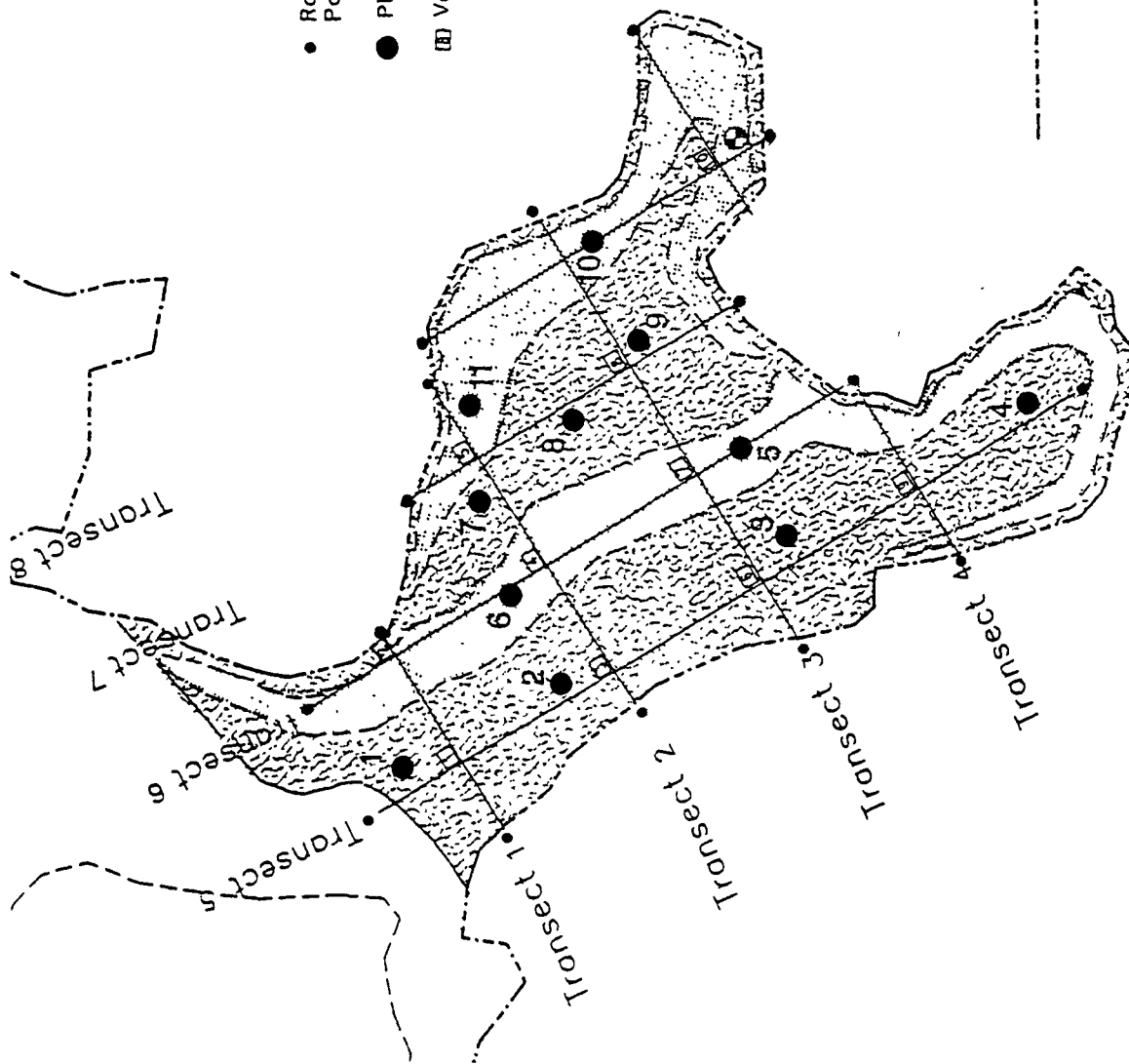
Trail Ridge Landfill Mitigation Monitoring

Project No. 91-297.3

Date 5/26/93

Scale 1"=2000'

Drawing No. 1 of 2



Trail Ridge Landfill Mitigation Plan 4.76 Acres



Project No.	91-297.3
Date	5/26/93
Scale	1"=150'
Drawing No.	2 of 2

APPENDIX A

PROJECT INFORMATION

Date: September 21, 1993	
Project Name: Trail Ridge Landfill	Project No: 91-297.3
Monitoring Period: Fall 1993	Monitoring Rep: 2 of 6
Permit No: <u>161821182 and SC16-184444</u>	
Total Wetlands Created: <u>± 4.76 acres</u>	
Monitoring Conditions: <u>Permit No. 161821182 - Specific Conditions 6, 11, 12, 13 and 14 (46, 51, 52, 53 and 54 for Permit No. SC16-184444).</u>	
6(46).	The mitigation plan, "Trail Ridge Landfill Wetland Impacts and Mitigation Plan," submitted on June 18, 1990, shall be appended as a Specific Condition of this permit. Any specific condition requirements listed herein, shall supersede or modify any requirements contained in the appended mitigation plan.
11(51).	The permittee shall furnish the Department with monitoring reports on the wetland creation areas describing: <ul style="list-style-type: none">a. Percent survival and diversity of planted species within each stratum;b. Recruitment density and composition within each stratum;c. Recorded growth via established parameters for planted trees and shrubs;d. Percent cover of herbaceous species;e. Surface water elevations referenced to N.G.V.D., or if surface water is not present, groundwater elevation referenced to N.G.V.D. <p>The first monitoring year shall start as of the planting date and data shall be collected and submitted in accordance with Specific Condition Number 6. Reports to the Department must also include photographs, descriptions of problems encountered and solutions undertaken.</p>

Monitoring Conditions 6, 11, 12, 13 and 14 (46, 51, 52, 53 and 54) Continued

- 12(52). Within the wetland creation areas, non-native vegetation and nuisance vegetation such as Typha sp. shall be controlled by hand clearing or other methods approved by the Department so that they constitute no more than 10% of the areal cover at any monitoring period.
- 13(53). Successful establishment of the wetland creation shall occur when:
- a. On an annual basis at least 80 percent of the planted individuals in each stratum have survived and are showing signs of normal annual growth, based on standard growth parameters such as height and base diameter, or canopy circumference; and
 - b. The above criteria has been achieved and maintained for a three (3) year period following initial planting.
- 14(54). In the event that the success criteria as stated in Specific Number 13 are not achieved by the expiration date of this permit, the permittee shall enter into a long term agreement with the Department so as to insure the success of the mitigation plan.

Trail Ridge Landfill



Transect 1 Looking East



Transect 1 Looking West

Trail Ridge Landfill



Transect 2 Looking East



Transect 2 Looking West

Trail Ridge Landfill



Transect 3 Looking East



Transect 3 Looking West

Trail Ridge Landfill



Transect 4 Looking East



Transect 4 Looking West

Trail Ridge Landfill



Transect 5 Looking North



Transect 5 Looking South

Trail Ridge Landfill



Transect 6 Looking North



Transect 6 Looking South

Trail Ridge Landfill



Transect 7 Looking North



Transect 7 Looking South

Trail Ridge Landfill



Transect 8 Looking North

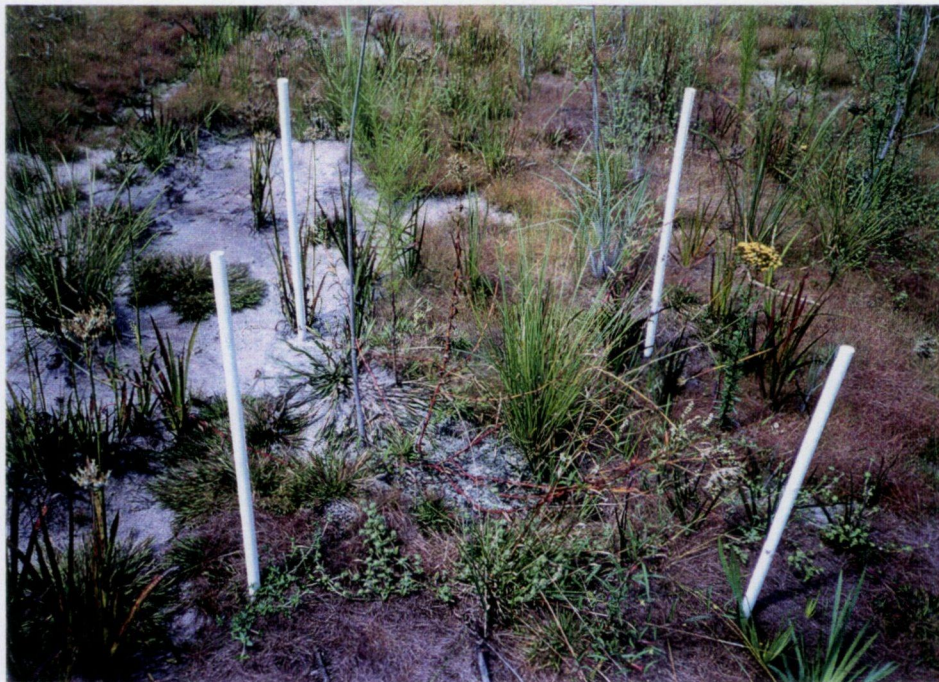


Transect 8 Looking South

Trail Ridge Landfill



Sample Quadrant 1



Sample Quadrant 2

Trail Ridge Landfill



Sample Quadrant 3



Sample Quadrant 4

Trail Ridge Landfill



Sample Quadrant 5



Sample Quadrant 6

Trail Ridge Landfill



Sample Quadrant 7



Sample Quadrant 8

Trail Ridge Landfill



Sample Quadrant 9



Sample Quadrant 10