

TRAIL RIDGE LANDFILL
MITIGATION MONITORING REPORT NO. 3
DER PERMITS 161821182 AND SC16-184444

April 6, 1994

PREPARED FOR:

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

PREPARED BY:

Mitigation Services, Inc.
8711 Perimeter Park Boulevard, Suite 11
Jacksonville, Florida 32257

**FOR
TRAIL RIDGE LANDFILL**

A. INTRODUCTION

On 16 March 1994, Mitigation Services, Inc. conducted the third monitoring of the forested wetland creation effort located at the 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 beginning of its second 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 continues to remain at approximately 96 percent. This is a very good indicator of the entire area being very healthy and a viable ecosystem. All 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, as compared with data collected in Spring 1993 and little change during the 1993/1994 winter season. 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 success of the creation area. Data from the sample quadrats are provided in Table 2.

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 (Rhynchospora spp.), sphagnum moss (Sphagnum sp.), various sedges (Cyperus sp.), rush (Juncus sp.), pennywort (Hydrocotyle umbellata), bamboo briar (Smilax laurifolia), spikerush (Eleocharis sp.), red root (Lachnanthes caroliniana), low panicum (Panicum sp.), St. Johns wort (Hypericum fasciculatum), yellow-eyed grass (Xyris sp.), blue maidencane (Amphicarpum muhlenbergianum), red ludwigia (Ludwigia repens) 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.

Hydrologic Conditions. Piezometer data is provided in Table 3. The submerged zones contained ponded water and saturated soil. The water table in the transitional zones ranged from 0.5 to 1.7 feet below the surface. The water levels in the mitigation area reflect the below average rainfall conditions for the preceding month and the fact that March and April are normally dry months.

Wildlife Utilization. During the site visit various species of minnows (Fundulus sp.), mosquito fish (Gambusia sp.), frogs and tadpoles were observed in the areas of standing and flowing water within the creation area. These organisms represent pioneer species which would be expected to colonize developing wetlands, indicating the emergence of a stable ecosystem. Evidence of armadillo (Dasypus novemcinctus) was also observed.

D. CONCLUSION

The wetland creation area at the Trail Ridge Landfill is continuing to exhibit signs of success at the beginning of its second 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.

(BP\kh\91-297.04\91-297.MR3)

Attachments

TABLE 1
Percent Survival & Growth Data of Planted Trees

Transect Number	No. of Planted Trees	No. of Trees Living					Percent Survival					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)
		M ¹	M ²	M ³	M ⁴	M ⁵	M ⁶	M ¹	M ²	M ³	M ⁴	M ⁵	M ⁶					
1	37	37	36	35				•	97	95				T1-1 (<u>Taxodium distichum</u>) T1-2 (<u>Liquidambar styraciflua</u>) 0.4 0.5	0.4 0.5	0.5 0.5		
2	40	40	37	37				•	93	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	0.6 0.5		
3	45	45	44	44				•	98	98				T3-1 (<u>Taxodium distichum</u>) T3-2 (<u>Magnolia virginiana</u>) 0.6 0.5	0.6 0.5	0.7 0.7		
4	31	37	31	31				•	100	100				T4-1 (<u>Acer rubrum</u>) T4-2 (<u>Acer rubrum</u>) 0.5 0.3	0.5 0.4	0.6 0.4		
5	91	91	91	91				•	100	100				T5-1 (<u>Acer rubrum</u>) T5-2 (<u>Acer rubrum</u>) 0.4 0.5	0.4 0.5	0.4 0.5		
6	80	80	80	79				•	100	99				T6-1 (<u>Magnolia virginiana</u>) T6-2 (<u>Magnolia virginiana</u>) 0.7 0.8	0.8 0.8	0.8 0.9		
7	46	46	46	46				•	100	100				T7-1 (<u>Acer rubrum</u>) T7-2 (<u>Liquidambar styraciflua</u>) 0.4 0.6	0.6 0.6	0.6 0.7		
8	44	44	36	36				•	82	82				T8-1 (<u>Acer rubrum</u>) T8-2 (<u>Taxodium distichum</u>) 0.4 0.7	0.5 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
Data From Sample Quadrats at Trail Ridge Landfill

Quadrat #	Species	Percent Coverage					
		M1	M2	M3	M4	M5	M6
Q-1	<u>Eleocharis</u> sp. <u>Panicum</u> sp. <u>Lachnanthes caroliniana</u>	3	15 5	30 15			
Q-2	<u>Panicum</u> sp. <u>Rhynchospora</u> sp. <u>Iris virginica</u> <u>Ludwigia repens</u> <u>Hypericum fasciculatum</u> <u>Lachnanthes caroliniana</u> <u>Eleocharis</u> sp.	3 5 3 4 5 40	2 5 2 5 40	50 10 5 			
Q-3	<u>Panicum</u> sp. <u>Eleocharis</u> sp. <u>Rhynchospora</u> sp.	40 30 10	50 20 10	70 10 10			
Q-4	<u>Panicum</u> sp. <u>Eleocharis</u> sp. <u>Rhynchospora</u> sp. <u>Xyris</u> sp. <u>Lachnanthes caroliniana</u> <u>Ludwigia repens</u>	20 60 5 5	10 80 5 2 2	40 35 5 2 			
Q-5	<u>Rhynchospora</u> sp. <u>Iris virginica</u> <u>Ludwigia repens</u>	 2	 	2 1			
Q-6	<u>Panicum</u> sp. <u>Eleocharis</u> sp. <u>Andropogon virginicus</u>		2	8 10 5			
Q-7	<u>Panicum</u> sp. <u>Eleocharis</u> sp. <u>Rhynchospora</u> sp.	5	20 20	25 20 20			
Q-8	<u>Panicum</u> sp. <u>Rhynchospora</u> sp. <u>Eleocharis</u> sp.	20 20 30	5 35 35	30 40			
Q-9	<u>Panicum</u> sp. <u>Eleocharis</u> sp. <u>Rhynchospora</u> sp. <u>Cyperus</u> spp.	10 60 5	5 60 5	10 35 5			
Q-10	<u>Panicum</u> sp. <u>Rhynchospora</u> sp. <u>Eleocharis</u> sp. <u>Iris virginica</u> <u>Juncus effusus</u>	10 10 55 10	20 5 50 15	50 35 3 2			

TABLE 3
Piezometer Data

Piezometer Number	Water Depth
1	-1.3'
2	-1.7'
3	-0.6'
4	-1.1'
5	At Surface
6	-1.0'
7	-1.7'
8	-0.5'
9	At Surface
10	+0.4'
11	-0.5'

(kb\91-297.04\91-297.MR3)

APPENDIX A

PROJECT INFORMATION

Date: March 16, 1994	
Project Name: Trail Ridge Landfill	Project No: 91-297.3
Monitoring Period: Spring 1994	Monitoring Rep: 3 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).	<p>The permittee shall furnish the Department with monitoring reports on the wetland creation areas describing:</p> <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 Condition 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.

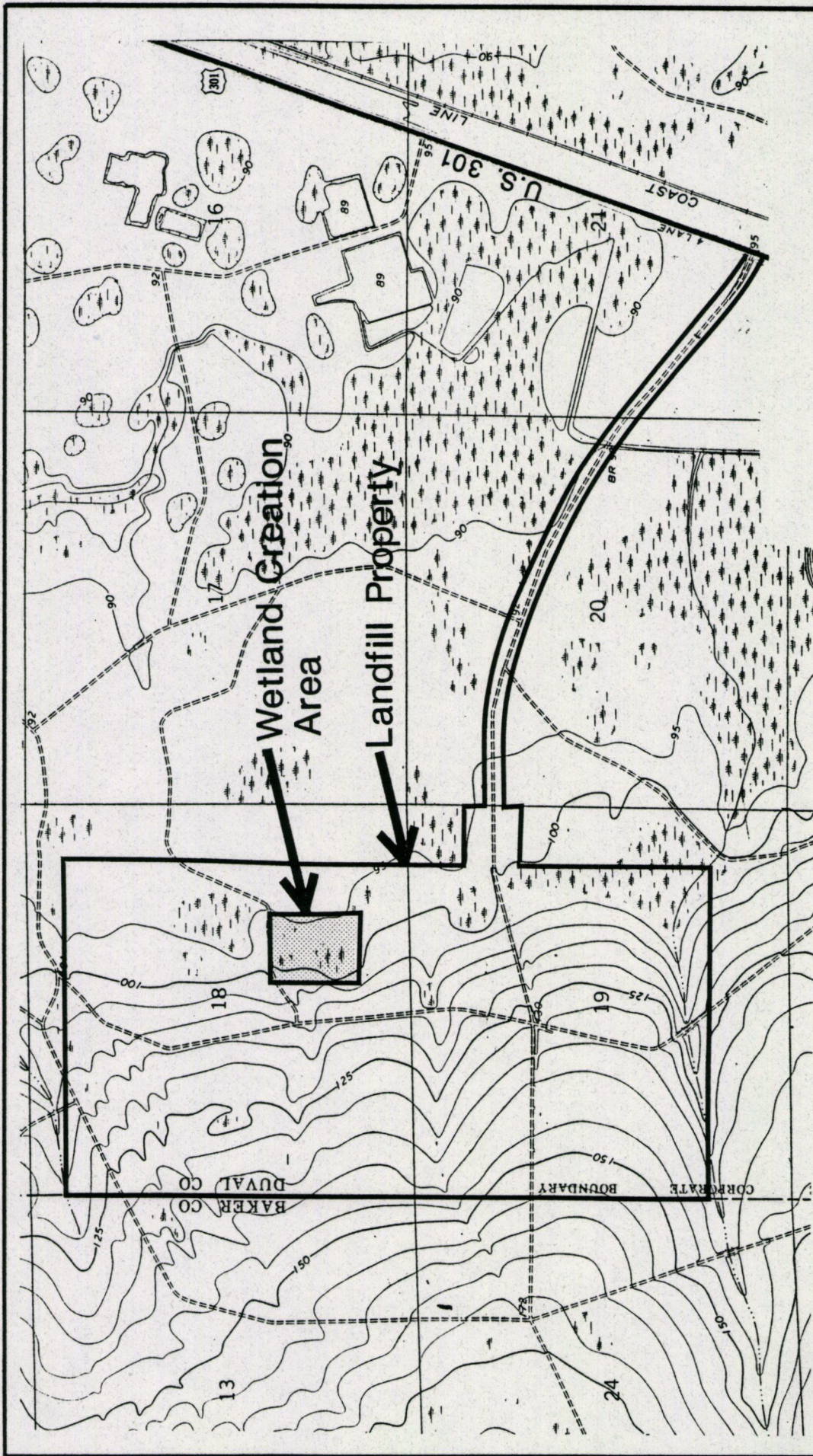


Figure 1
Location Map

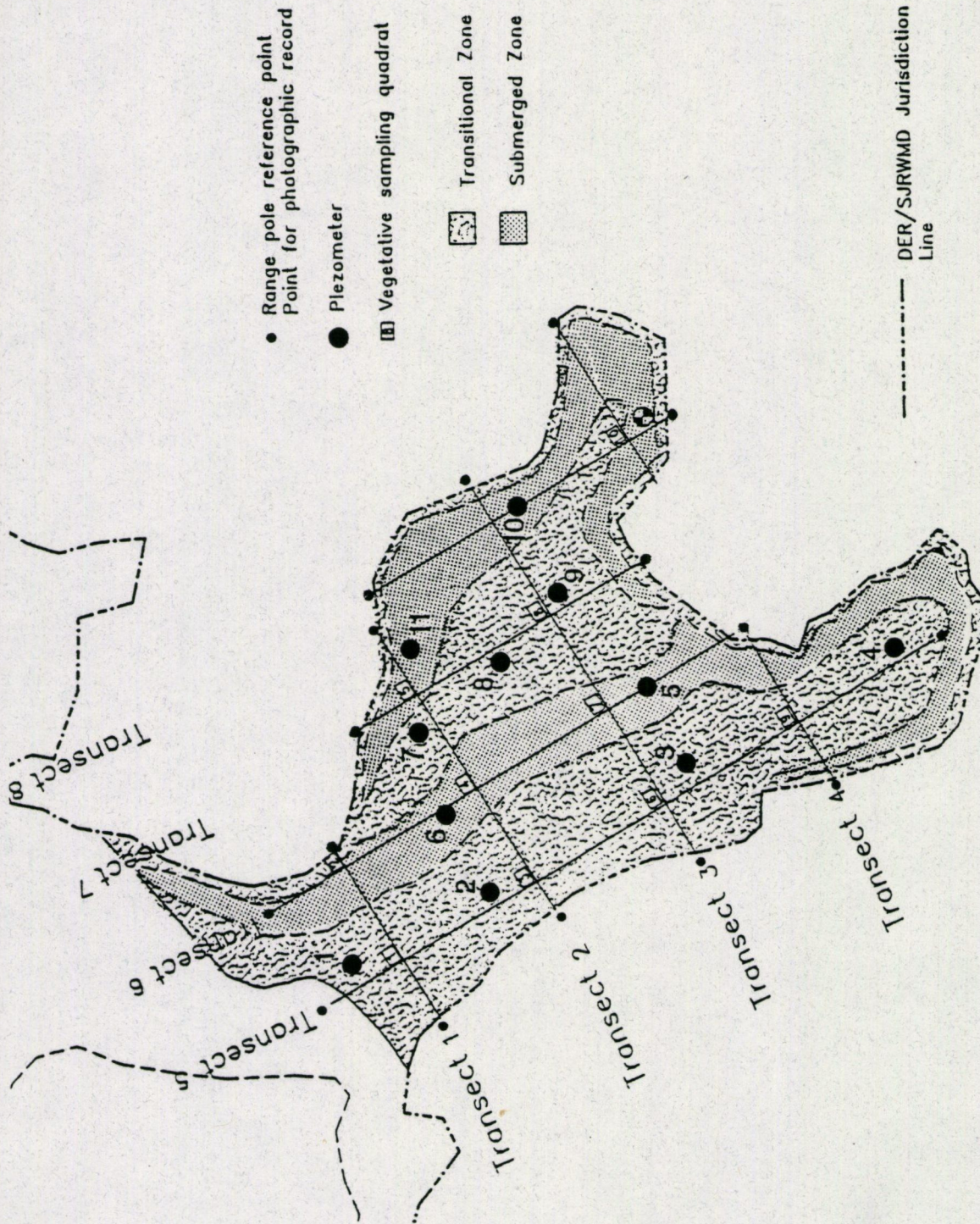
Source: U.S.G.S. Topographical Survey,
Maxville, FL., Quadrangle. (1970)



ENVIRONMENTAL
SERVICES, INC.

Trail Ridge Landfill Mitigation Monitoring

Project No.	91-297.3
Date	5/26/93
Scale	1"=2000'
Drawing No.	1 of 2



ENVIRONMENTAL
SERVICES, INC.

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

Trail Ridge Landfill
Spring 1994



Photo 1 - Transect #1

Trail Ridge Landfill
Spring 1994



Photo 2 - Transect #1

Trail Ridge Landfill
Spring 1994



Photo 3 - Transect #2

Trail Ridge Landfill
Spring 1994



Photo 4 - Transect #2

Trail Ridge Landfill
Spring 1994



Photo 5 - Transect #3

Trail Ridge Landfill
Spring 1994



Photo 6 - Transect #3

Trail Ridge Landfill
Spring 1994



Photo 7 - Transect #4

Trail Ridge Landfill
Spring 1994



Photo 8 - Transect #5

Trail Ridge Landfill
Spring 1994



Photo 9 - Transect #5 (Note standing water)

Trail Ridge Landfill
Spring 1994



Photo 10 - Transect #6

Trail Ridge Landfill
Spring 1994



Photo 11 - Transect #6

Trail Ridge Landfill
Spring 1994



Photo 12 - Transect #7 (Note standing water)

Trail Ridge Landfill
Spring 1994



Photo 13 - Transect #8

Trail Ridge Landfill
Spring 1994



Photo 14 - Sample Quadrant



Photo 15 - Sample Quadrat

Trail Ridge Landfill
Spring 1994



Photo 16 - Sample Quadrant



Photo 17 - Sample Quadrat

Trail Ridge Landfill
Spring 1994



Photo 18 - Sample Quadrant (Note saturated soil)



Photo 19 - Sample Quadrant

Trail Ridge Landfill
Spring 1994



Photo 20 - Sample Quadrant



Photo 21 - Sample Quadrat

Trail Ridge Landfill
Spring 1994



Photo 22 - Sample Quadrant



Photo 23 - Sample Quadrat