FHWA/NJ-83/003
83-003-7727

ROADSIDE VEGETATION

IMPLEMENTATION OF FINE FESCUE GRASSES

Final Report

By

Robert F. Baker

July 1982

Prepared By
New Jersey Department of Transportation
Division of Research and Demonstration
In Cooperation With
U.S. Department of Transportation
Federal Highway Administration

NOTICE

This publication is disseminated in the interest of information exchange.

The opinions, findings and conclusions expressed in the publication are those of the author and not necessarily those of the New Jersey Department of Transportation or the Federal Highway Administration.

This report does not constitute a standard, specification or regulation.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/NJ-83/003		

4. Title and Subtitle	5. Report Date
Roadside Vegetation Implementation of Fine Fescue Grasses	July, 1982
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Robert F. Baker	83-003 -7727

9. Performing Organization Name and Address	10. Work Unit No.
New Jersey Department of Transportation 1035 Parkway Avenue Trenton, New Jersey	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Final Report
Federal Highway Administration U.S. Department of Transportation Washington, D.C. 20590	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

(See next page.)

17. Key Words	18. Distribution Statement
Roadside Vegetation, Grass, Landscape	No restrictions.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	64	

Form DOT F 1700.7 (8-69)

ABSTRACT

Attractive, well-maintained roadsides are an integral part of the utility and beauty of the complete highway system. Labor intensive mowing is required to maintain acceptable roadsides.

The objective of a prior roadside vegetation study was the development of a grass mixture which required less mowing, provided a better appearance, and was better adapted to New Jersey roadside environments. The initial research, which was conducted by Rutgers University, developed a grass mixture of Fortress spreading fescue, Banner Chewings fescue, and Kenblue Kentucky bluegrass in equal parts. The mixture was designated New Jersey Type A-2.

The implementation phase of the roadside vegetation study began in July, 1975 with Rutgers University acting as consultant. Effective July, 1977, this effort was taken over and continued by the Department of Transportation. The objective was to evaluate and compare the new standard Type A-2 grass mixture with the old standard Type A grass mixture in large roadside plots. The new Type A-2 grass mixture was evaluated for reduced mowing, better appearance, and better adaptability to New Jersey roadsides.

Nine locations were selected for approximately half-acre plots of Type A and Type A-2 grass mixture. The plots were evaluated and compared periodically by the Division of Research. The data collection program was hampered by the 1979 gasoline crisis, the 1980 drought, and the Department's policy of curtailed mowing. However, height data indicated that the Type A-2 grass mixtures grows less vigorously and approximately half the height of the old Type A grass mixture. It was concluded that the new grass mixture will require less mowing than the old Type A grass mixture and will have a better appearance. The Type A-2 grass mixture is somewhat slower to establish than the Type A. It is recommended that Manhattan ryegrass be added to the Type A-2 grass mixture to improve initial establishment and green-up. It is also recommended that the sowing rate be increased to 100 pounds per acre instead of the initially suggested 60 pounds per acre rate. This should eliminate the need to overseed after initial establishment.

FOREWORD

The Roadside Vegetation study was conceived in the late 1960's when sufficient funds and national programs encouraged highway beautification. Although the primary objective of this study was reduced roadside mowing, the underlying goal was highway beautification and improved roadsides.

Unfortunately, inflation and tight money have changed national programs and goals for highway beautification. In New Jersey, frequent roadside mowing has been almost completely curtailed by policy. Strained roadside maintenance funds have been diverted to high priority highway maintenance needs.

The roadside vegetation study established the concept of using fine fescue grass for New Jersey roadsides. These grasses may not be ideally suited to the present austere, practical approach to roadside landscape design. At this writing, the Bureau of Landscape Architecture is evaluating grasses which they consider to be more appropriate for the present situation. The Bureau of Landscape Architecture will evaluate these grasses and the fine fescue grass in large plots on New Jersey's roadsides.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PICTURES

SUMMARY AND CONCLUSIONS

The implementation phase of the roadside vegetation study began in July, 1975 with Rutgers University Cook College, Department of Soils and Crops acting as consultant to the Department. The implementation was taken over and continued by the New Jersey Department of Transportation in July, 1977 and the contract with Rutgers was terminated. The implementation objective was to evaluate the newly developed Type A-2 grass mixture, compare that mixture with the previous New Jersey standard Type A grass mixture in large roadside plots, and develop any changes in components of the mixture or in recommended application rates that might be needed to permit continued, standardized use of the A-2 grass. The new grass was evaluated for reduced mowing, better appearance, and better establishment characteristics.

The Division of Construction and Maintenance, the Division of Research, and the Bureau of Landscape Architecture established six large roadside plots, and monitored the plots for the study objectives. Grass height measurements, subjective analysis and photographs were made to evaluate the establishment characteristics and mowing requirements.

The 1979 gasoline crisis, the 1980 drought and the 1981 Department restrictions on mowing limited data collection and mowing evaluation. Data collection and evaluation continued despite these restrictions and sufficient data were collected for a subjective evaluation of the plots.

The previously used Type A grass mixture, which is dominated by Kentucky-31 tall fescue, has established adequately on roadsides and medians for several years. However, its turf is clumpy and less dense

than the Type A-2 fine fescues even though it produces a dense, abundant foliage. Tall fescue does not establish well on slopes where fine fescue dominates.

The height measurements of the Type A grasses indicate that the tall fescue grows more vigorously after initial establishment and requires more mowing to maintain an acceptable appearance than the Type A-2 grasses. The tall fescue grows twice the height in the same time as the Type A-2 fine fescues. The Kentucky-31 tall fescue is a tough, wide blade grass that requires excessive mowing energy. Its excessive vigorousness after establishment is not essential for an acceptable roadside.

The Type A-2 grass mixture which is dominated by fine fescues establishes adequately on roadsides and slopes and on loamy and sandy soils. The fine fescues develop a dense, more uniform turf than the tall fescues and establish a significantly better turf for slope protection. The fine fescues provide an improved unmowed appearance over the tall fescues.

The fine fescue grasses appear initially to "green up" (germinate) and establish slower than the Type A grasses. This slow "green up" and slow establishment is attributed to the nature of the fine fescues and the absence of quick germinating ryegrass in the Type A-2 grass mixture.

The height measurements of the Type A-2 grass indicate that the fine fescue grows less vigorously after establishment and requires less mowing to maintain an acceptable appearance than the tall fescue Type A grass mixture. The fine fescue grasses grow approximately half as fast as the tall fescues. However, the fine fescues are not initially

vigorous enough to restrict weed intrusion. An initial mowing or an application of 2-4D chemical herbicide is sufficient to assist the Type A-2 grass for initial establishment. The small investment in the initial mowing and chemicals pays off with reduced future mowing.

The research consultant for the initial roadside vegetation study estimated that the Type A-2 grass mixture would require two to three less mowings per year depending on the environment and soil fertility. In 1970, the Department required six mowings per year by contractors to control the tall fescue grasses. However, in 1982, due to fiscal restraints the Department mows only critical safety areas which are warranted by roadside conditions as determined by appropriate Maintenance personnel. Mowing contractors and Maintenance personnel mow six feet of the shoulder and twelve feet on either side of the median. Cross-overs and jughandle areas are mowed to provide adequate sight distance for safety. A policy of mowing a certain number of times during the growing season is no longer in force.

The fine fescues on sandy soil did not withstand the 1980 drought as the consultant predicted. The drought susceptibility of the fine fescues is attributed to the immaturity of the grasses. If the grasses were more mature, the root system would have been better developed and more able to withstand the drought.

The fine fescue grasses on small maintenance renovation sites are not sufficiently vigorous to exclude the tall fescues from surrounding areas. Tall fescues eventually dominate the fine fescue seeded area.

The fine fescues established an adequate dense turf on a sandy soil which was mulched with Camden composted sludge. The tall fescue turf was sparse and clumpy. The composted sludge provided adequate moisture and nutrients for the grasses on this arid, sandy soil.

Seed sampling was initiated for one landscape seeding to investigate potential seed specification non-compliance. The results indicated a potential for seed mixture violations. Seed certification and seed sampling would guarantee the quality, purity and quantity of seed mixture portions. It would clarify seed germination and establishment problems and serve to enforce the Department's seed specification. It would also clarify future claims against the seed mixture.

The Type A-2 grass mixture represents a roadside landscape philosophy which was initiated by national roadside beautification programs in the 1960s. The Type A-2 grass mixture is composed of specialized turf grasses for the specific purpose of achieving reduced mowing and more attractive roadsides. In contrast, the Type A grass mixture is a generalized, broad purpose grass for varying roadside conditions.

It now appears that the 1960's roadside philosophy has changed to an austere, practical approach to roadside landscape design. The present approach was initiated by the inflationary situation and roadside maintenance policy which eliminates mowing except for high priority urban areas. The present policy may alter the need for the Type A-2 grasses and require additional investigation into Department grass mixture needs.

RECOMMENDATIONS

1. The Type A-2 grass mixture should be modified with a ten percent addition of Manhattan ryegrass to provide quick "green-up" of seeded areas. The modified Type A-2 grass mixture should be specified as follows:

Cultivar	Percent of Total Weight
Kenblue Kentucky bluegrass	30
Fortress spreading fescue	30
Banner Chewings fescue	30
Manhattan ryegrass	10

All seed should be blue tag certified.

The blue tag certification is a guarantee of the quality and variety of seed. At the time of harvest, grass seed is sampled and tested for quality and variety under the Federal Seed Act. A blue tag is then attached to sealed bags of seed to certify its contents. This certification attests to the fact that strict controls have been adhered to through establishment, growth and harvesting to insure against contamination of the seed.

2. The modified Type A-2 grass mixture should be utilized for all roadsides and slopes on major highway landscape projects. The Type A-2 fine fescues require less mowing, provide a superior appearance, and establish well on roadsides and slopes on loamy and sandy soils of the State of New Jersey.

3. The report "Better Grasses for Roadsides" recommends alternate cultivars for the spreading fescue, Chewings fescue and common-type

Kentucky bluegrass. The following are recommended as desirable cultivars:

Spreading Fescue	Chewings or Hard Fescue	Kentucky Bluegrass
Pennlawn	Jamestown	South Dakota
Ruby	C-26	Delta

Preferred cultivars are listed above less desirable cultivars.

4. Kentucky-31 tall fescue should not be utilized in grass mixtures for New Jersey roadsides. Sufficient varieties of initially vigorous grasses are available for quick initial "green-up" and establishment. The Kentucky-31 tall fescue is excessively vigorous and requires excessive mowing energy to maintain an acceptable appearance. It grows poorly in sandy soils and does not sufficiently dominate slopes or poor soils.

5. The modified Type A-2 grass mixture should be sown at 100 lbs. per acre. Most test plots and landscape seeding projects were seeded at 60 lbs. per acre. However, overseeding was necessary in most areas of projects. The 100 lbs. per acre rate should eliminate the need to overseed established areas.

6. A seed sampling plan should be initiated to identify and guarantee the seed specification quantities and grass species.

7. Camden composted sludge successfully assisted the establishment of fine fescue grasses on arid sandy soils. However, the serious potential of harmful carcinogens exists in some sludges. The Camden composted sludge was certified free of dangerous carcinogens, but fear of the sludge was expressed from the people who worked with it. The Department should investigate the utilization of safe, carcinogenic-

free composted sludge for roadside landscape maintenance. The sludge assists the establishment of grasses on sandy arid soils and prevents costly erosion.

8. The modified Type A-2 grass mixture should be more appropriate for maintenance renovation sites than the Type A-2 (without Manhattan ryegrass). The modified Type A-2 grass mixture should be used and evaluated at such locations.

I. INTRODUCTION

New Jersey roadsides are an integral part of the utility and beauty of the complete highway system. Roadsides provide a pleasant diversion and break in monotony for motorists. Poorly established and maintained roadsides eventually contribute to highway deterioration. Dying vegetation may hinder highway drainage which creates costly soil erosion, washouts, and may be a fire hazard. Tall grasses create snow accumulation and drifting. Unmowed roadside grasses allow encroachment of deciduous trees which eventually create traffic hazards.(1)

The public awareness of environmental quality and the economical need for roadside maintenance necessitates aesthetically acceptable roadsides and high energy-related mowing. However, roadside maintenance budgets are strained by cost increases in labor and equipment. One solution to this problem is to replace the highly productive coarse grasses which require high energy mowing with finer turf-type grasses which require less mowing energy and grow less vigorously.

In February 1970 the Department of Transportation contracted with Rutgers University Cook College, Department of Soils and Crops, to develop a grass mixture specifically for New Jersey roadsides. The initial research objectives were to crossbreed and develop a low-growing, less vigorous, more attractive roadside grass. The Department desired a grass requiring less mowing and a grass which was better adapted to New Jersey roadsides. The grass mixture was intended primarily for new roadsides of typically loamy soils that are widespread through north and central New Jersey, and secondarily for reseeding programs of older roadsides.

The initial research developed a grass mixture designated as New Jersey Type A-2 which includes Fortress spreading fescue, Banner Chewings fescue, and Kenblue Kentucky bluegrass in equal proportions. The final report for the initial research project, "Better Grasses for Roadsides #7726"[(2)] claims that the new grasses will improve roadside appearance, reduce mowing, and have better establishment characteristics. It was estimated that the lower growing fine fescue grasses will require two to three less mowings per year depending on environment and soil fertility. The new fine grasses eliminate tall seed heads which require excessive mowing and contaminate lawns and field crops. The new lower, slower-growing, fine fescue grasses are also reported to be capable of spreading into damaged areas, thus eliminating the need for labor intensive reseeding. The denser cover of the new grasses provides better support for vehicles which stray from the paved roadway and better lodging characteristics (laid over grass foliage), and will protect steep slopes from costly wind and water erosion. The new fine fescues should

additionally be more tolerant of poor roadside soils and provide better resistance to drought and common grass diseases.

The implementation phase of the Roadside Vegetation study began in July, 1975 with Rutgers University Cook College, Department of Soils and Crops acting as consultant to the Department. The study proposed to evaluate 1/4 to 1/2 acre plots of the newly developed Type A-2 grass and to compare the new mixture with the old Type A grass mixture. Both grass mixtures are shown in Table 1. The new grass mixture would be evaluated for claims made in the final report.

Effective July 1, 1977 the implementation phase of the project was taken over and continued by the New Jersey Department of Transportation and the contract with Rutgers was terminated. In essence, it was established that the need for an additional basic research phase which involved an extension of the previous basic research activities had diminished and that the implementation phase could better be performed by Department staff. The Bureau of Transportation Structures Research, the Bureau of Landscape Architecture, and the Bureau of Maintenance acted together to coordinate the experimental plot seeding and monitoring efforts on new highway construction and maintenance renovations in accordance with an amendment to the implementation research proposal of February 20, 1975.

TABLE 1

Grass Mixtures for New Jersey Roadsides

Type A-2 Mixture

(Present Standard New Jersey Mixture for Roadsides)

Proportion	Variety
33-1/3%	Fortress Spreading Fescue
33-1/3%	Banner Chewing Fescue
33-1/3%	Kenblue Kentucky Bluegrass

Type A Mixture

(Old Standard New Jersey Mixture for Roadsides)

Proportion	Variety
20%	Kentucky Bluegrass
35%	Red Fescue
20%	Kentucky 31, Tall Fescue
10%	Red Top
10%	Perennial Ryegrass
5%	White Clover

II. REVIEW OF PREVIOUS EFFORT

The research consultant for the implementation study completed the report "Roadside Vegetation - Phase I"[3]. The report summarized the consultant's experience with roadside plots on Route I-295, Trenton, Route I-287, Troy Hills and Route N.J. 42, Turnersville.

The implementation plots on Route I-295, Trenton are shown in Figure 1 and consisted of five different grass mixtures of which one is the New Jersey Type A and one is the New Jersey Type A-2 grass mixture, except that South Dakota bluegrass was substituted for Kenblue. The Kenblue Kentucky bluegrass was not available at that time. Kenblue is preferred because it has better green color but other qualities are similar to South Dakota. After seeding the plots were mistakenly masked with rye contaminated straw mulch which resulted in the encroachment of weeds and white clover in all plots. However, growth differences were observed between Type A and Type A-2 grass mixture. Summer and fall plot ratings for 1977 and 1978, Table 2, indicate that the new Type A-2 grass mixture required fewer mowings compared to the old Type A grass mixture. The plots were not monitored after the fall of 1978 because weeds, clover and tall fescue totally engulfed the fine fescue plots by the summer of 1979.

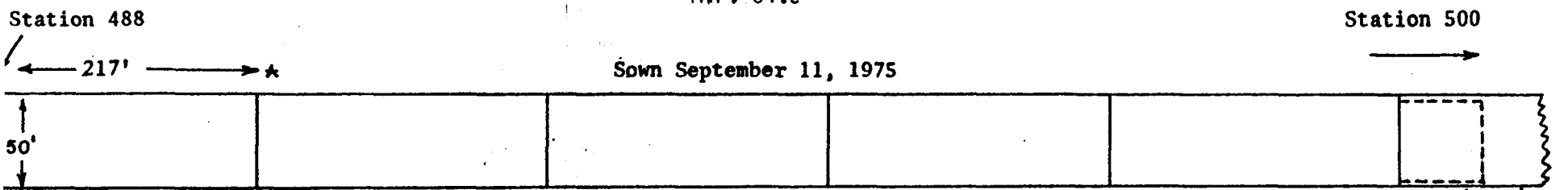
The implementation plots on Route I-287, Troy Hills, are shown in Figure 2 and consisted of one plot of Type A and one plot of Type A-2 grass mixture. The plots were located on a steep slope where mowing was not possible. The plots were contaminated with crownvetch and did not yield mowing data.

The implementation plots on Route N.J. 42, Turnersville are shown in Figure 3 and were located in a narrow median area. Unfortunately, wind and water erosion destroyed the plots before the grass germinated. The plots did not yield mowing data.

Figure 1

Plot Plan Route I-295, Trenton

M.P. 64.5



MIXTURE 1	MIXTURE 2	MIXTURE 3	MIXTURE 4	MIXTURE 5
50% Highlight Chewings Fescue	33% Fortress Spreading Fescue	50% Fortress Spreading Fescue	45% Fortress Spreading Fescue	35% Highlight Chewings Fescue
50% Newport Kentucky Bluegrass	33% Banner Chewings Fescue	50% So. Dakota Kentucky Bluegrass	45% So. Dakota Kentucky Bluegrass	20% Newport Kentucky Bluegrass
	33% So. Dakota Kentucky Bluegrass		10% Linn Perennial Ryegrass	25% K-31 Tall Fescue
				10% Red Top
				10% Linn Perennial Ryegrass

120 plots 6' x 6'

33' buffer

Installation Method

1. Certified seed sown at 40#/A, 1/4A plots.
2. Fertilizer at 400#/A of 10-20-10 raked in with contractor's lime.
3. Seed bed rolled with tandem 2" corrugated rollers.
4. Mulched with contractor's straw.
5. Plot ends are marked by single sown rows of a mixture of spring oats and tall fescue.

Table 2

Rating Data for Implementation

of Fine Fescue Grasses

Route I-295, Trenton

June 6, 1977

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	3" - 6"	Light	35%	3.0
Mixture #2 (Type A-2)	3" - 5"	L-Med.	45%	1.0
Mixture #3	3" - 6"	L-Med.	40%	3.0
Mixture #4	4" - 6"	L-Med.	20%	4.0
Mixture #5 (Type A)	4" - 10"	Light	55%	5.0

Plots Mowed - June 29, 1977

August 23, 1977

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	2" - 5"	Dark	75%	4.5
Mixture #2 (Type A-2)	1" - 5"	Dark	70%	2.0
Mixture #3	1" - 5"	Dark	65%	3.0
Mixture #4	1" - 4"	Dark	30%	1.0
Mixture #5 (Type A)	6	Light	60%	5.0

Plots Mowed - August 30, 1977

October 6, 1977

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	3" - 7"	Dark	80%	4.0
Mixture #2 (Type A-2)	3" - 4"	Dark	95%	0
Mixture #3	3" - 6"	Dark	60%	3.5
Mixture #4	4" - 6"	Dark	35%	3.0
Mixture #5 (Type A)	6" - 8"	Med.	95%	5.0

Plots Mowed - October 13, 1977

Table 2 (Continued)

Rating Data for Implementation

of Fine Fescue Grasses

Route I-295, Trenton, MP. 64.5

May 24, 1978

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	3" - 7"	Light	36%	3.0
Mixture #2 (Type A-2)	3" - 5"	Med.	40%	1.0
Mixture #3	3" - 7"	Med.	35%	3.0
Mixture #4	3" - 6"	Light	25%	3.0
Mixture #5	4" - 8"	Light	60%	5.0

Plots mowed week of June 12

August 21, 1978

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	2" - 5"	Dark	60%	4.0
Mixture #2 (Type A-2)	1" - 5"	Dark	65%	1.0
Mixture #3	1" - 5"	Dark	60%	2.0
Mixture #4	2" - 5"	Dark	60%	3.0
Mixture #5 (Type A)	7"	Med.	75%	5.0

Plots mowed September 11

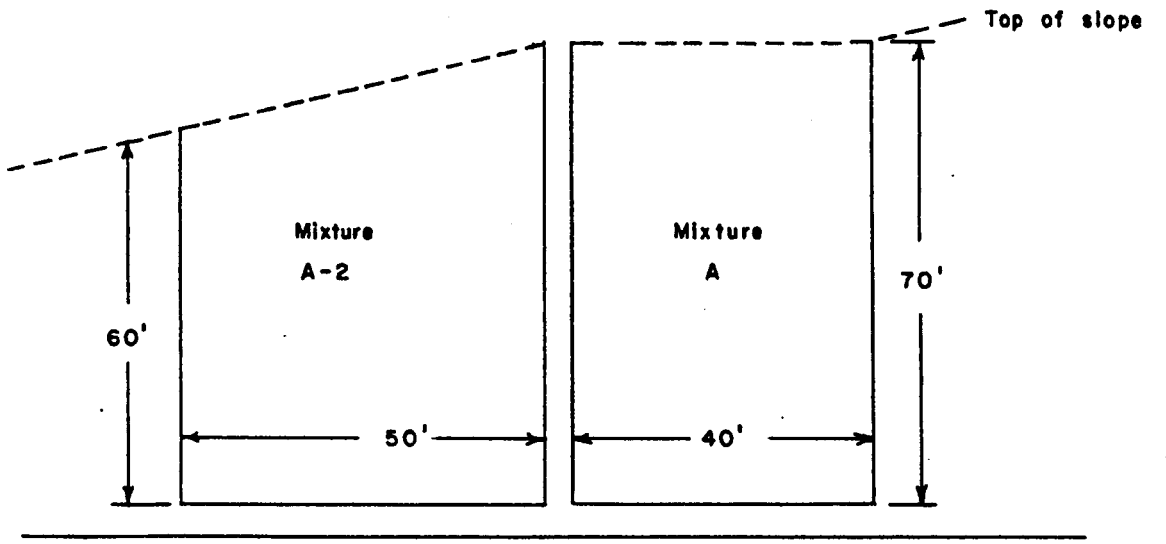
October 3, 1978

Route I-295	Height	Color	Cover	Mowing Rating
Mixture #1	3" - 7"	Dark	40%	4.0
Mixture #2 (Type A-2)	3" - 5"	Dark	55%	1.0
Mixture #3	3" - 5"	Dark	50%	2.0
Mixture #4	3" - 6"	Dark	30%	3.5
Mixture #5 (Type A)	4" - 8"	Med.	90%	5.0

Plots mowed October 24

Figure 2

Plot Plan Route I-287, Troy Hills



Route I-287 Northbound

M.P. 37.5

Sown October 2, 1976

Mixture Type A-2

33% Fortress Spreading Fescue

33% Banner Chewings Fescue

33% So. Dakota Kentucky Bluegrass

Mixture Type A

35% Highlight Chewings Fescue

20% Newport Kentucky Bluegrass

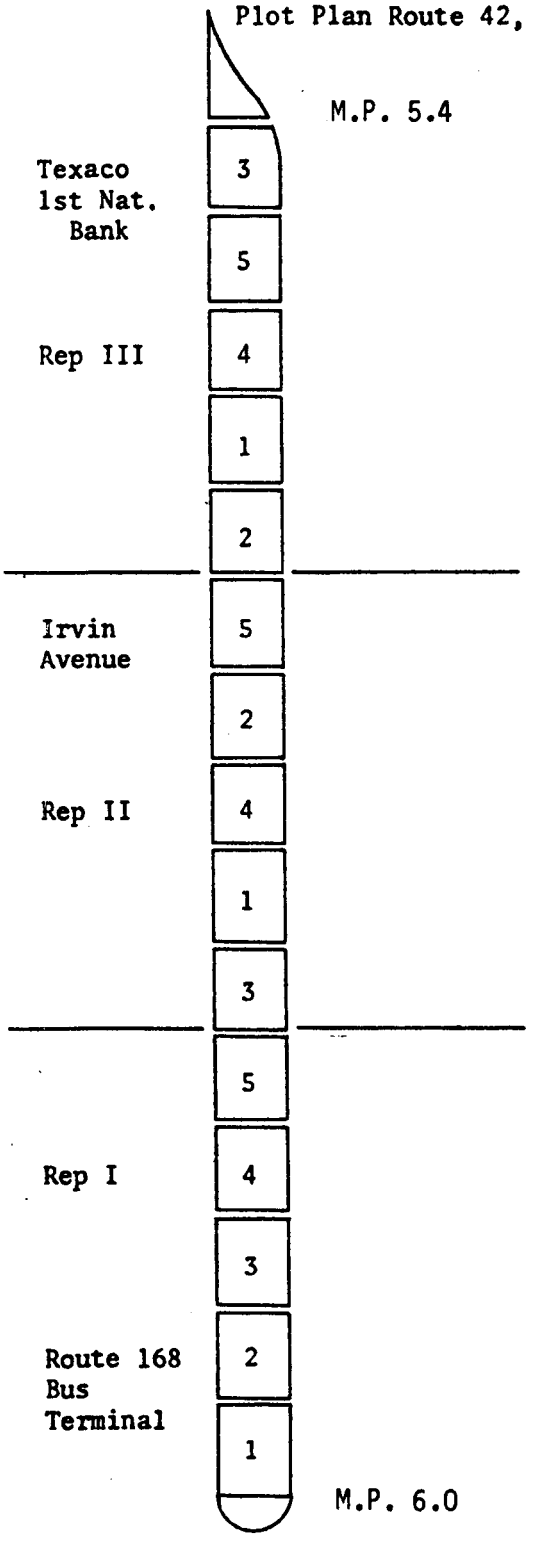
25% K-31 Tall Fescue

10% Redtop

10% Linn Perennial Ryegrass

Figure 3

Plot Plan Route 42, Turnersville



Installation Details

a. Sown Sept. 22, 1976.
b. Plots 200' long in 18' median.
c. Soil was sandy loam, dry and blowing.
d. Cultipacked before and after seeding.
e. Hydroseeder applied paper fiber mulch immediately.
f. Teratac also used to stabilize soil surface.
g. Fertilized @ 800# 10-20-10 and limed @ 1T/A dolomitic limestone/A - Both incorporated 4" deep.
h. Certified seed sown @ 40#/A.
i. Plot ends marked by double rows of K-31 tall fescue

Plot 5 = (Type A)	35% Highlight Chew. Fesc. 20% Newport Kent. Bluegr. 25% K-31 Tall Fescue 10% Redtop 10% Linn Perennial Ryegrass
Plot 4 =	45% Fortress Spred. Fesc. 45% So. Dakota Kent. Bluegr. 10% Linn Perennial Ryegrass
Plot 3 =	50% Fortress Spred. Fesc. 50% So. Dakota Kent. Bluegr.
Plot 2 = (Type A-2)	33% Fortress Spread. Fesc. 33% Banner Chew. Fesc. 33% So. Dakota Kent. Bluegr.
Plot 1 =	50% Highlight Chew. Fesc. 50% Newport Kent. Bluegr.

III. STUDY PROCEDURES

The Division of Construction and Maintenance and the Bureau of Landscape Architecture assisted with the establishment of the large roadside plots. Landscape construction projects were usually hydroseeded after the contractor had prepared the area by standard procedures of grading, topsoiling, liming and fertilizing. Landscape projects are usually mulched with straw. Large roadside maintenance renovation projects were tilled, fertilized and limed as required by the Bureau of Maintenance. Renovation plots were hand-seeded by Maintenance and Research personnel. The Bureau of Maintenance coordinated mowing schedules.

Soil tests were taken on all roadside plots to determine pH, nitrogen, phosphorus and potash contents. A Sudbury Soil Test kit was utilized to analyze two soil samples from each plot. The tests were averaged and are shown in Table 3. The soil tests evaluated the similarity of soil qualities for plot comparisons.

Roadside plots were monitored by the Bureau of Transportation Structures Research on a 4-6 week schedule during late spring, summer, and early fall. Initially, monitoring included site evaluations and use of a rating system to evaluate mowing requirements.

The rating system for mowing requirements is based on a zero to five rating scale shown in Table 4. The rating system recognized that all grass plants do not grow at the same rate. A plot is rated by the percentage of grass above the 4 inch mowing height at which maintenance sets the mowers. The zero rating indicates that all grass is below the 4 inch mowing height and the plot does not require mowing. The five rating indicates that 80-100% of the grass is 4 inches or greater and

TABLE 3

Soil Tests

Identification	pH	Nitrogen Content	Phosphorus Content	Potash Content	Remarks
Route 55, M.P. 22.5 Area Type A-2 Mixture (before fertilizer & lime)	4.5	190 lbs/ acre	2 lbs/ acre	160 lbs/ acre	No Organic, Sandy Soil
Route 55, M.P. 22.5 Area Type A Mixture (before fertilizer & lime)	5.2	100 lbs/ acre	2 lbs/ acre	160 lbs/ acre	Some Organic, Sandy Soil
Route 22, North Branch (Type A) (after fertilizer & lime) M.P. 29.2	7.5	20 lbs/ acre	20 lbs/ acre	40 lbs/ acre	Some Organic, Fine Sandy-Clay Soil
Route 22, North Branch (Type A-2) (after fertilizer & lime) M.P. 28.4	7.5	20 lbs/ acre	40 lbs/ acre	40 lbs/ acre	Some Organic, Fine Sandy-Clay Soil
Route I-195, M.P. 5.9 Robbinsville, Renovation Area (Type A-2) (before fertilizer & lime)	5.2 Lab.3.5	10 lbs/ acre	20 lbs/ acre	80 lbs/ acre	Loamy-Clay, Some Organic
Route I-195, Robbinsville, Renovation Area (Type A) M.P. 5.8 (before fertilizer & lime)	5.2 Lab.3.5	190 lbs/ acre	4 lbs/ acre	10 lbs/ acre	Loamy-Clay, Some Organic

TABLE 3 (Continued)

Identification	pH	Nitrogen Content	Phosphorus Content	Potash Content	Remarks
Route I-195, Type A-2 Jackson Mills (after fertilizer & lime) M.P. 24.5	7.5	40 lbs/ acre	40 lbs/ acre	40 lbs/ acre	Sandy Soil
Route I-195, Type A Jackson Mills (after fertilizer & lime) M.P. 24.5	7.5	40 lbs/ acre	40 lbs/ acre	80 lbs/ acre	Sandy Soil
Route I-80, Type A-2 Allamuchy-Hope (after fertilizer & lime) M.P. 19.5	6.7	50 lbs/ acre	81 lbs/ acre	80 lbs/ acre	Loamy-Clay
Route I-80, Type A Allamuchy-Hope (after fertilizer & lime) M.P. 11	6.7	50 lbs/ acre	20 lbs/ acre	20 lbs/ acre	Loamy-Clay
Route I-195, Type A-2 Howell Twp. (after fertilizer & lime) M.P. 33.7	6.7	100 lbs/ acre	81 lbs/ acre	5 lbs/ acre	Sandy Soil
Route I-195, Type A Howell Twp. (after fertilizer & lime) M.P. 33.7	6.7	100 lbs/ acre	41 lbs/ acre	10 lbs/ acre	Sandy Soil

Table 4

Rating and Evaluation of Grasses

Height - Lowest and highest of five measurements.

Color - L - Light green
M - Medium green
D - Dark green

Cover - percentage of plots covered by seeded mixture - excluding weeds

Mowing Rating (Excluding Weeds)

0 - No mowing needed - 100% of grasses less than 4" height.

1.0 - Less than 20% higher than 4 inches.

2.0 - Greater than 20% and less than 40% higher than 4 inches.

3.0 - Greater than 40% and less than 60% higher than 4 inches.

4.0 - Greater than 60% and less than 80% higher than 4 inches.

5.0 - Greater than 80% higher than 4 inches. Mowing required.

that the plot requires mowing. Ratings between zero and five are graduated to reflect various percentages of grass above the 4 inch height.

The height measurements in Table 4 show the distance from the base of the grass plant to the highest point of the foliage above the ground. If the plant is lodged (laid over), the measurement is made to the top of the lodged foliage. Color is a subjective analysis of light, medium and dark green. Cover is the vegetation density and the percentage of grass plants in the plot. Cover percentage excludes weeds.

As the study progressed it became evident that the rating system worked well on frequently mowed plots. However, environmental problems and the gasoline shortage limited the effectiveness of the rating system and it was discontinued. The rating system was replaced with grass height measurements, subjective analysis, and photographs to evaluate the establishment characteristics and mowing requirements.

IV. PROBLEMS

Roadside plot data were collected for spring, summer and fall of 1977 and 1978 without difficulties. However, beginning in the spring of 1979, data collection was hampered by a series of uncontrollable events. The gasoline shortage in the spring of 1979 limited mowing to high priority areas until late September and October. The maintenance landscape unit was not able to mow plots when mowing was required. The 1980 spring, summer, and fall drought adversely affected the growth of newly established immature grasses. Although mowing was available, grasses were not growing at normal rates. The abnormal growth rate obviously affected the plot evaluations and the requirement for mowing. The Department policy in 1981 curtailed mowing on all roadsides except high priority areas. Essentially, it was not possible to regulate mowing on the roadside plots.

Although the Bureau of Landscape Architecture and the Bureau of Maintenance were helpful in locating potential sites for roadside plots, it was not feasible to locate sites in the northeastern portion of the state. Essentially, construction and renovation sites were not available at the time that sites were needed. The allotted time ran out for continuation of the plot seeding portion of the implementation phase.

V. RESULTS

The results of the implementation phase are discussed for each roadside plot location. Five roadside plot locations were established by the Bureau of Transportation Structures Research specifically for the implementation study. One additional plot location (Route I-195, Allaire State Park) was established by the Bureau of Landscape Architecture and will be discussed in this section.

Pictures are utilized to clarify the following discussion. These pictures are representative of the grass plots and are a valid means of analyzing the grass plots at a specific time. However, grass growth varies in each plot and the pictures are not always typical of the entire plot.

ROUTE I-195, JACKSON MILLS

Two median plots were installed by the contractor on September 29, 1977. The two plots, each 40 feet x 500 feet, were hydroseeded at 60 lbs./acre of Type A and Type A-2 grass mixture after the contractor applied 50 lbs./acre of lime and 300 lbs./acre of 10-20-10 fertilizer. The plan of the plots is shown in Figure 4. Soil tests are shown in Table 3. The soil at this location is sandy.

The plots were initially mowed in spring and summer 1978 by the construction contractor to control volunteer ryegrass and contaminants from the mulch and topsoil. The Type A and Type A-2 grasses established a good turf until a summer washout forced the contractor to reseed and mulch the center 2-3 feet of the median. Essentially, this did not affect the test plots, but did add volunteer white clover (probably from the

mulch). The white clover, which is a vigorous grower, predominated in the center of the median until the 1980 summer drought.

Picture #1 shows the Type A-2 grass in the spring of 1978. The area of Picture #1 is adjacent to the area of Picture #2, which shows the Type A grass at the same time. The Type A-2 grass is an even, dense cover. Height measurements indicate that the Type A-2 grass is 2-4 inches tall. In Picture #2 the tall seed stalks of the Type A grass show a significant difference from the Type A-2 grass. Height measurements indicate that the Type A grass is 4-6 inches tall and the seed stalks are 12-16 inches tall. The Type A grass requires mowing but the Type A-2 grass does not.

The plots were not mowed during the 1979 spring and early summer gasoline crisis. Measurements in early June indicated that the Type A-2 grass was 2-4 inches tall and the Type A grass was 4-6 inches tall. The plots were mowed in the late summer and fall of 1979. Measurements which were made approximately one week before fall mowing indicated that the Type A-2 grass was 3-4 inches tall and the Type A grass was 6-8 inches tall. Essentially, the Type A-2 grass did not require mowing during 1979. However, mowing was required to control weeds and volunteer grasses.

In 1980, grass mowing frequency was reduced by the drought which slowed grass growth. Picture #3 shows the Type A-2 grass in June 1980, approximately two weeks after mowing. The Type A-2 grass has a dense, dark green turf which is about 4 inches tall. Picture #4 shows the Type A grass at the same time. The Type A grass has a sparse turf 4-5 inches tall. As the summer drought progressed, both the Type A-2 and Type A grasses persisted very poorly. The apparent drought

susceptibility of both grasses is attributed to the inadequate root system of the newly established grasses. It is possible that the grasses would have better sustained the drought if the grass plants were more mature.

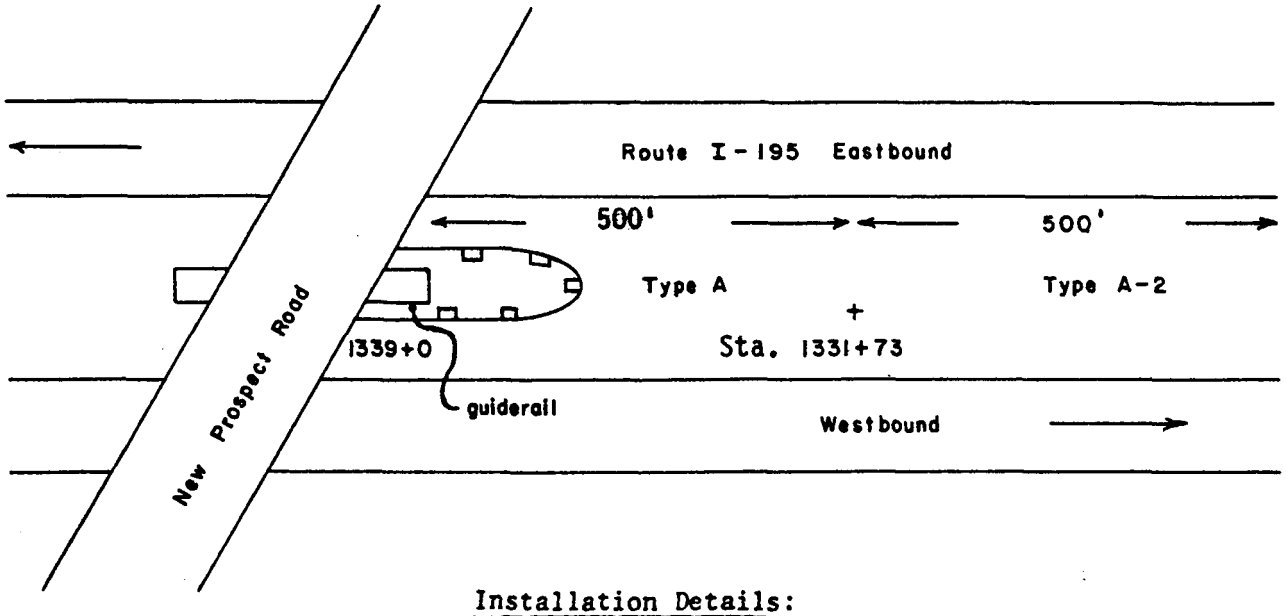
In May 1981, white clover dominates much of both plots. However, the Type A-2 and Type A grasses persist to provide adequate vegetative cover. Height measurements indicate that both grasses are less than 4 inches tall.

The 1980 drought and poor soil on the full length of Route I-195 are probably reason for the poor establishment of the Type A-2 grass and indeed, the Type A grass. The soil and environment of this route may severely inhibit the establishment of vegetation which is not entirely suited to the prevailing conditions.

Figure 4

Plot Plan Route I-195, Jackson Mills

Milepost 24.5



Installation Details:

Date: September 29, 1977

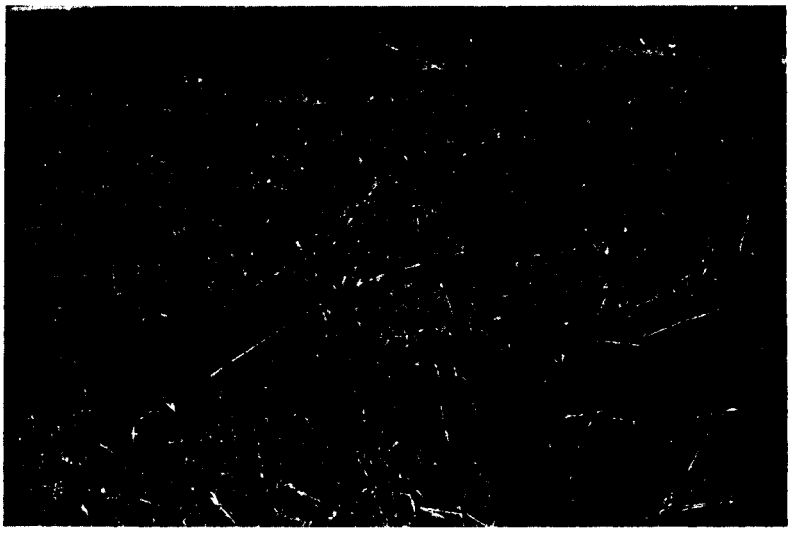
Contractor seeded @ 60 lbs/acre

Type A

20% Kentucky Bluegrass
35% Red Fescue
20% Kentucky 31
10% Redtop
10% Perennial Ryegrass
5% White Clover

Type A-2

33 1/3% Fortress
33 1/3% Banner
33 1/3% Kenblue



PICTURE #1: TYPE A-2 GRASS PLOT

Route I-195, Jackson Mills
Spring, 1978

PICTURE #2: TYPE A GRASS PLOT

Route I-195, Jackson Mills
Spring, 1978

PICTURE #3: TYPE A-2 GRASS PLOT

Route I-195, Jackson Mills
June, 1980

PICTURE #4: TYPE A GRASS PLOT

Route I-195, Jackson Mills
June, 1980

ROUTE I-195, ROBBINSVILLE

Two median plots, which are shown in Figure 5, were installed by the Bureau of Maintenance on November 2, 1977. The median renovation plots were each 60 x 300 feet and were rototilled, limed, fertilized and mulched in accordance with standard maintenance practices. The plots were hand-seeded with 60 lbs./acre of Type A and Type A-2 grass mixture.

Soil tests are shown in Table 3. The Department's soil laboratory indicated that soil pH was 3.5 for each plot, a highly acidic condition which provides a very poor environment for the growth of most plant species. Tests made with the soil test kit indicated a pH of 5.2. In any case, the soil for both plots was very poor at this location.

This renovation site was located in a low area where the original vegetation had died out from arid soil and poor drainage. Soil erosion and washouts had also occurred in the area prior to the establishment of the plots. In an effort to correct soil deficiencies, a stockpiled topsoil was spread over the area to about 2" thick.

Unfortunately, heavy rains washed out both test plots in the summer of 1978. The plots were reseeded in October 1978 by the Division of Research.

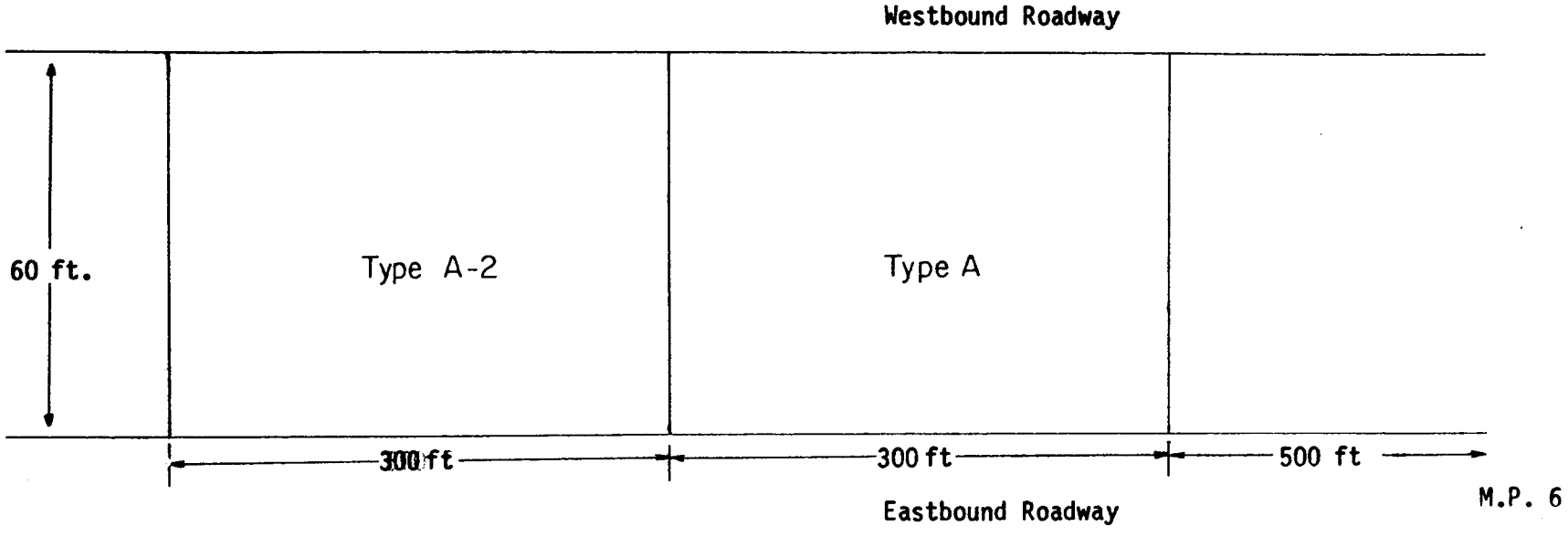
In the spring of 1979 the plots were again washed out. No further attempt was made to reestablish the plots. No mowing data were obtained. The Type A and Type A-2 grass plot failure was attributed to poor arid soil and washout of the renovation site.

Figure 5

PLOT PLAN

ROUTE I-195, ROBBINSVILLE

Renovation Plots



NOTE: Area of both plots was washed out and eroded before seeding.

ROUTE U.S. 22, NORTH BRANCH

Two median plots in the renovated crossovers of Route U.S. 22 are shown in Figure 6 and were installed by the Bureau of Maintenance on May 10, 1978. The two plots were each 60 ft. x 80 ft. and were hand-seeded with 20 lbs. (180 lbs./acre) of Type A and 20 lbs. of Type A-2 grass mixture, after maintenance rototilled the soil and applied 20 lbs. of lime and 20 lbs. of 5-10-5 fertilizer. Each plot was mulched with seed-free oat straw.

The soil in these plots was infertile which was evidenced by the soil tests shown in Table 3. Soil tests were taken after liming and fertilizing.

The turf surrounding the plots is dominated by tall fescue, red top, clover and weeds.

The Type A and Type A-2 grass mixtures produced an initially acceptable turf in a reasonable time. The plots were mowed in the late summer and fall of 1978 to control weeds. Type A and Type A-2 grasses were not sufficiently mature to require mowing. Automobiles traversed the plots and the wheel tracks had to be reseeded.

The gasoline shortage in the spring of 1979 reduced the availability of mowing when the grasses matured. Weeds which grew to 4 feet volunteered from the surrounding areas into both plots. The Type A-2 grass was not sufficiently vigorous to compete with the weeds and tall fescue from the surrounding area. Approximately 25% of the area of the Type A-2 plots was contaminated by the volunteer vegetation.

However, the volunteer vegetation did not prevent measurement of the grass height in both plots in the fall of 1979. Before mowing, the Type A-2 foliage was 4-8 inches tall and the Type A foliage was 8-16 inches tall. Both plots were mowed at a 4-inch height. The Type A-2 grass measured 4-5 inches approximately three weeks after a late fall mowing. The Type A grass measured 7-10 inches at the same time.

In the spring, summer, and fall of 1980, the Type A and Type A-2 grasses showed less growth due to the severe drought. However, spring measurements of grasses before mowing indicated that the Type A-2 grass was 4-6 inches and the Type A was 10-12 inches tall. The Type A grass, which is more vigorous, crowded out weeds and maintained a good stand of grass. The Type A-2 grass, which is reported to be drought tolerant, was not sufficiently persistent to crowd out weeds. Surrounding tall fescue and red top volunteered into the Type A-2 grass which was weakened by weeds during the previous year.

Picture #5 shows Type A-2 grass in April, 1981. The pencil in the center of the picture is 5-3/4 inches tall. All Type A-2 grass is below the top of the pencil. Picture #6 shows Type A grass at the same time as above. The same pencil is shown in the center of the picture. All of the vigorous Type A grass is above the top of the pencil.

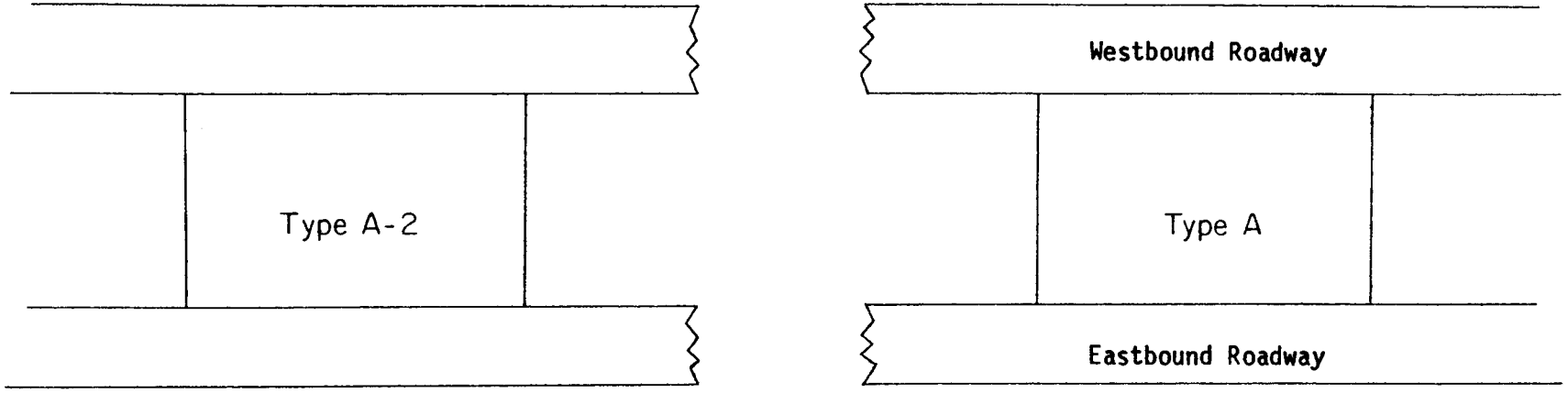
The above-mentioned pictures emphasize the dramatic difference between the vigorous tall fescue grasses and the fine fescue grasses. Both pictures were taken at the same time before mowing. Soil conditions are similar and neither plot was fertilized recently. The fine fescue grasses provide an adequate turf with less mowing.

Figure 6

PLOT PLAN

ROUTE U.S. 22, NORTH BRANCH

Renovated Crossovers



M.P. 28.4

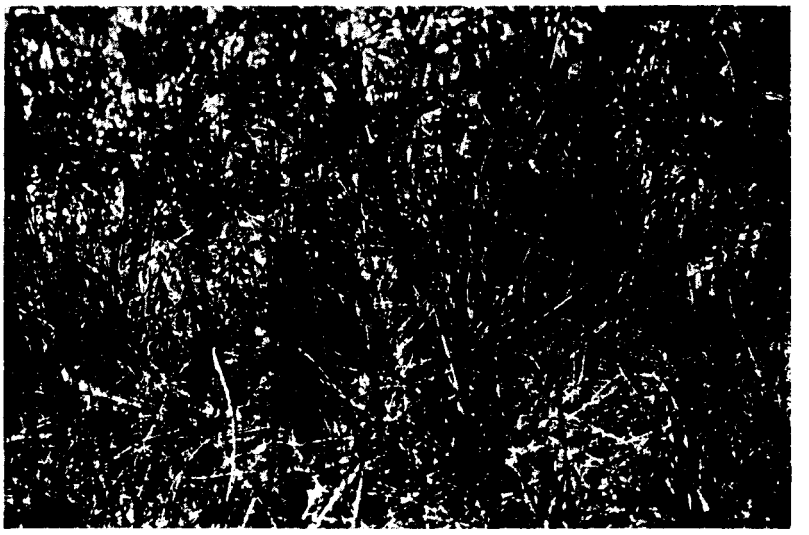
M.P. 29.2

TYPE A-2

33-1/3% Fortress
33-1/3% Banner
33-1/3% Kenblue

TYPE A

20% Kentucky Bluegrass
35% Red Fescue
20% Kentucky 31
10% Red Top
10% Perennial Ryegrass
5% White Clover



PICTURE #5: TYPE A-2 GRASS PLOT

Route U.S. 22, North Branch
April 22, 1981

PICTURE #6: TYPE A GRASS PLOT

Route U.S. 22, North Branch
April 22, 1981

ROUTE N.J. 55, MILLVILLE

Two roadside renovation plots, which are shown in Figure 7, were installed on the southwest side of Route 55, Millville, by the Bureau of Transportation Structures Research on May 12, 1978. The two plots are each 60 x 200 feet and were hand-seeded with 25 lbs. (90 lbs./acre) of Type A and Type A-2 grass mixture. The Bureau of Maintenance rototilled the plots and applied 150 lbs. of 10-6-4 fertilizer and 500 lbs./acre of lime. It was found that the hand-seeding by inexperienced Research personnel required more seed than mechanical hydroseeding. Essentially, it was not possible to maintain the recommended 60 lbs./acre of seed. The plots were mulched with weed-free straw.

The objective of plots on Route 55 was to evaluate the new grass on the sandy, arid soil of southern New Jersey. The Research consultant had used this specific area in the previous study for small roadside plots. With the exception of a few fine fescue grasses, all other grass had died. Some native grasses had established in the southern portion of the Type A plot when experimental grasses died out. The remainder of the plot was devoid of vegetation.

The initial establishment of turf on both the Type A and Type A-2 grass plots was sparse. However, the Type A-2 grass mixture produced slightly more grass plants than the Type A.

Soil tests are shown in Table 3. The tests indicate that the Route 55 plots were the most fertile of all roadside plots. However, the area appeared very infertile because it supported very little natural vegetation.

The plots were initially mowed in September, 1978 and July, 1979 to control volunteer weed and seed stalks. Grasses in the sandy soil grow less vigorously than in a loamy soil and do not require as many mowings. No other mowings were made on these plots, primarily because the sandy soil would not support mowers.

On October 31, 1979, Camden composted sludge was top-dressed on the center sections of both plots as shown in Figure 7. The objective was to evaluate the effect of the composted sludge on vegetation in sandy soil and to improve the sparse turf on the plots. The wood chip composted sludge was applied at 25 tons/acre. The sludge improved the vegetation in both plots. However, the Type A-2 showed the greatest improvement by producing rhyzomes and new grass plants.

The 1980 drought adversely affected the non-composted grasses. However, the Type A and Type A-2 composted grasses persisted during the drought. Measurements of the composted Type A grass in the summer and fall of 1980 indicated a 4-6 inch height. Measurements of the composted Type A-2 grass in the same period indicated a height of less than 4 inches.

In the spring of 1981 measurements indicated that the Type A grass foliage was 8-12 inches tall and the Type A-2 grass foliage was less than 6 inches.

Picture #7 shows an overall view of the plots in April of 1981. The Type A grass, which is shown in the foreground, is a sparse, clumpy turf. Although it grows vigorously, the Type A grass does not form a dense turf to protect from erosion and washout. In the background of Picture #7 the Type A-2 grass shows a denser, more even turf.

Picture #8 shows a close-up of the Type A-2 grass in April of 1981. The black pencil is 5-3/4 inches tall. The grass is all below the top of the pencil. Compared to Picture #9 of the Type A grass, the Type A-2 grass is a denser, more even turf.

Picture #9 shows the Type A grass in the composted sludge area. The Type A grass is clumpy and sparse.

The Route 55 grass plots did not provide mowing data. However, they do emphasize that the Type A-2 grass mixture provides an adequate, dense turf in a sandy soil. The Type A-2 grass survived the drought in the composted and non-composted area. The composted area of the Type A-2 provided a denser turf than the non-composted Type A-2. The Type A grass mixture provides a sparse, clumpy turf of vigorous, tall fescue grass plants.

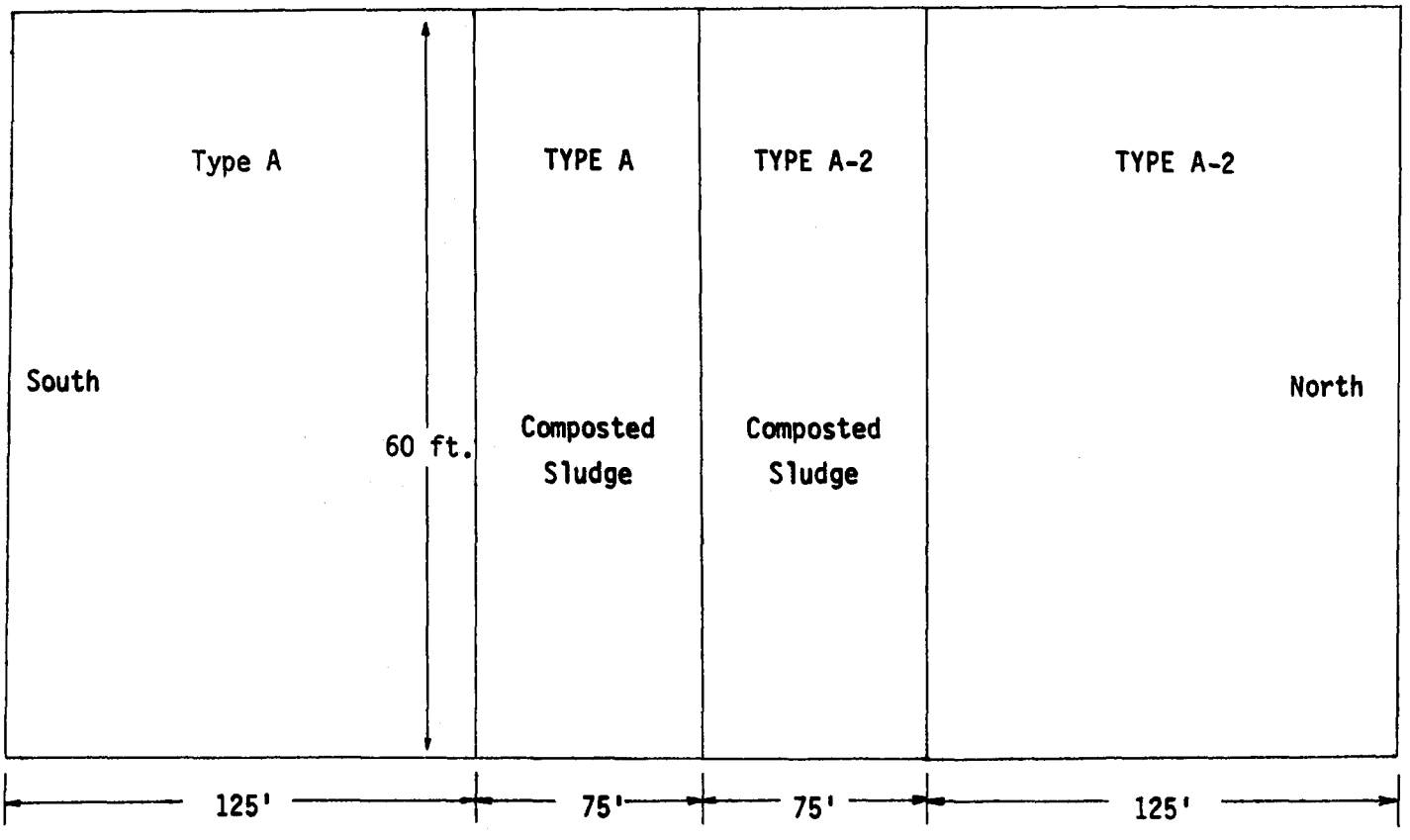
Figure 7

PLOT PLAN

ROUTE N.J. 55, MILLVILLE

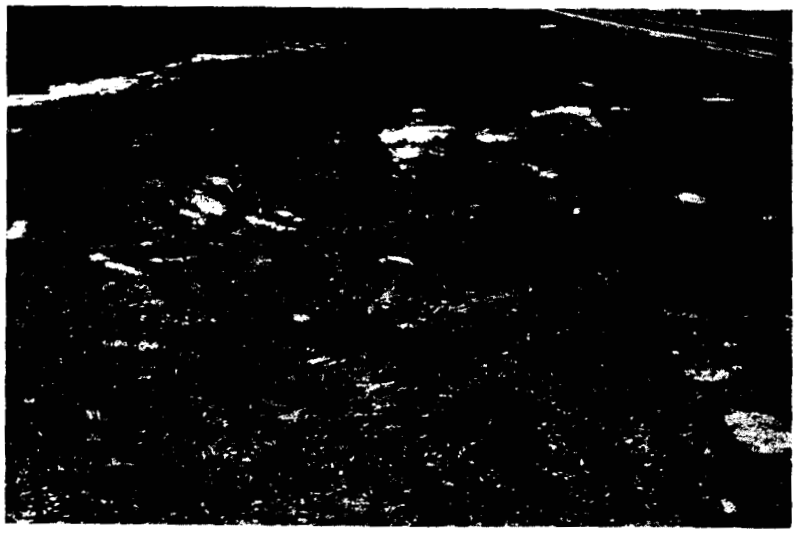
M.P. 22.5

Implementation Renovation Plots



Plots sown May, 1978.

Compost was applied October, 1979.



PICTURE #7: OVERVIEW

Route N.J. 55, Millville
April, 1981

PICTURE #8: TYPE A-2 GRASS PLOT
Route N.J. 55, Millville
April, 1981

PICTURE #9: TYPE A GRASS PLOT
Route N.J. 55, Millville
April, 1981

ROUTE I-80, ALLAMUCHY-HOPE

Two median plots were designated to be installed by the construction contractor in the median of Route I-80 at M.P. 11. Each plot was 60 x 200 feet for both Type A and Type A-2 grass mixtures. However, on November 16, 1978, the contractor hydroseeded the entire area with the Type A grass mixture at 60 lbs./acre. An area of about two acres, which is at M.P. 19.5, was seeded by the contractor with the Type A-2 grass mixture. This area was seeded at 60 lbs. per acre within a few days of the Type A plot and was selected for comparison with the Type A grass plot. The contractor fertilized and limed both plots before seeding. The plots are shown in Figure 8.

Mowing problems were realized when the Bureau of Maintenance mowed the Type A plot and a mowing contractor mowed the Type A-2 plot. Essentially, plots were mowed at different times and it was impossible to regulate mowing at the required times.

Another problem was encountered with grass establishment in the Type A-2 plot. The initial turf in the spring of 1979 was sparse and dominated by weeds. The poor initial establishment was attributed to the late fall seeding and the possibility of inferior quality seed. Unfortunately, no Type A-2 grass seed was available for verification of the seed mixture composition.

In April and May of 1980, an adequate turf of the Type A-2 grass had developed for evaluation. New grass plants were beginning to produce a dense, fine fescue turf. Portions of the A-2 plot were mowed in May, 1980. Before mowing, measurements of grass foliage showed that the Type A-2 grasses were less than four inches but weeds necessitated mowing.

The Type A grass in May, 1980 had produced a sparse turf of clumpy grass plants with thick foliage. Measurements, which were taken at the same time as the Type A-2 grass, indicated that the Type A grass was more than 8 inches tall. Although the Type A grass was affected by the drought, its vigorous nature enabled it to develop a denser foliage.

Measurements in the fall of 1980 (after the drought) indicated that Type A and Type A-2 grass did not grow at normal rates. The Type A-2 grass measurements averaged less than 4 inches. The Type A grass measurements indicated a 4-6 inch height.

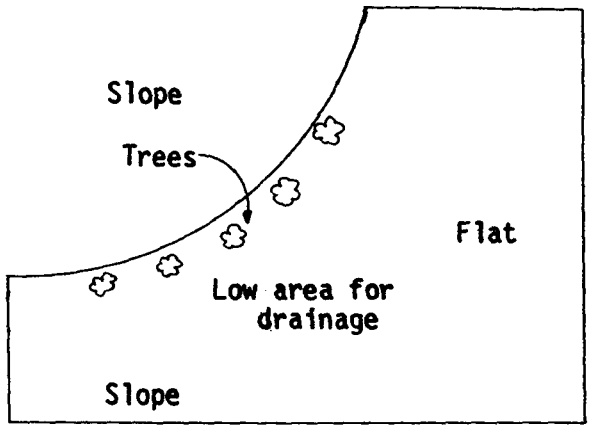
In the spring of 1981, fine fescue grasses (probably Pennlawn) persisted on the north-facing slope of the Type A plot. This was attributed to some tall fescue failure during the 1980 summer. The fine fescue grass of the Type A-2 grass mixture persisted in the spring of 1981, as shown in Picture #10. The pencil in the center of the picture is 5-3/4 inches tall. All Type A-2 grass is below the top of the pencil.

The Type A, tall fescue grasses are shown in Picture #11 at the same time as the above picture. The tall fescue grasses in this picture are 18 inches tall. Neither test plot was mowed prior to the pictures. The dense, tall foliage of the Type A grass will require excessive mowing energy. The Type A, tall fescue grasses are vigorous producers of thick, clumpy foliage which requires extensive mowing for uniformity of appearance. The Type A-2 fine fescue grasses provide dense, uniform turf.

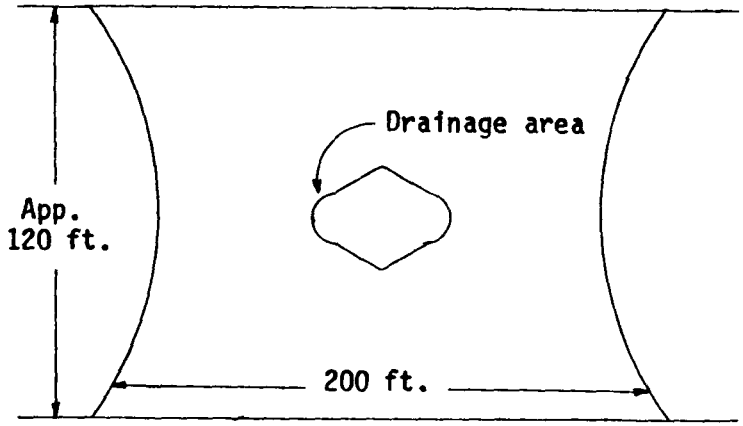
Figure 8

PLOT PLAN

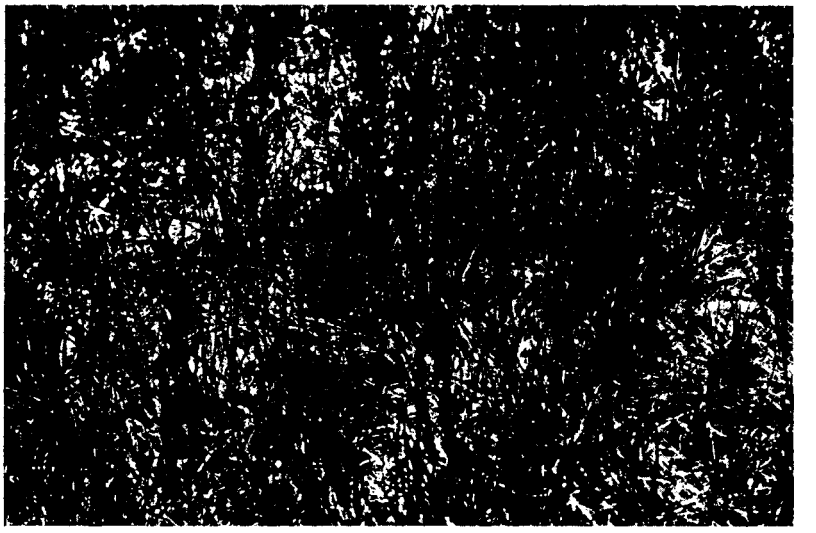
ROUTE I-80, ALLAMUCHY-HOPE



Westbound Roadway
Area is app. 2 acres
M.P. 19.5



Type A grass mixture
M.P. 11



PICTURE #10: TYPE A-2 GRASS PLOT

Route I-80, Allamuchy-Hope
Spring, 1981

PICTURE #11: TYPE A GRASS PLOT

Route I-80, Allamuchy-Hope
Spring, 1981

ROUTE I-195, ALLAIRE STATE PARK

The Route I-195, Allaire State Park plots were installed by the Bureau of Landscape Architecture and not under the Roadside Vegetation Study. However, these plots will be discussed in this section.

Two plots were installed on a north-facing slope by the construction contractor on April 20, 1980. Both plots were fertilized and limed. The Type A-2 grass plot was hydroseeded at 60 lbs./acre. The Type A grass plot was hydroseeded at 100 lbs./acre. These plots are located at M.P. 33.7.

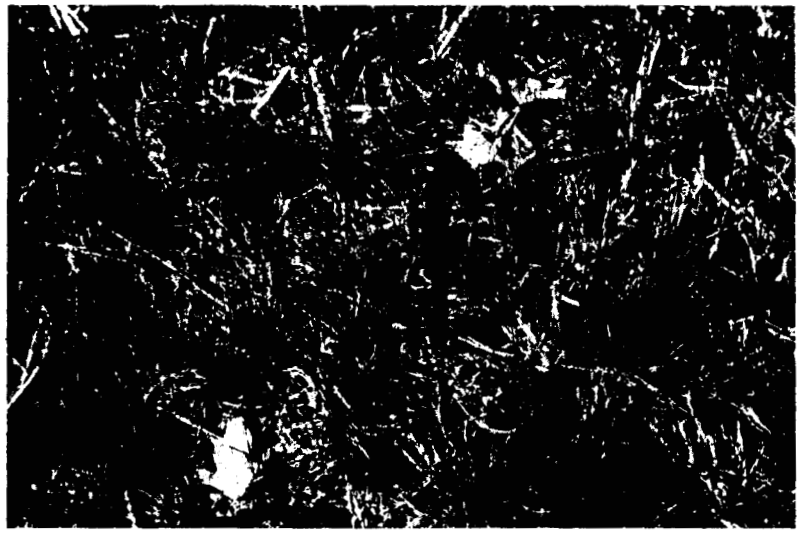
The objective of these plots was to evaluate the rate of establishment of the Type A-2 grasses. It appeared that in previous plots, the Type A-2 grass established at a somewhat slower rate than the Type A. The slower establishment is probably attributed to the absence of ryegrass in the Type A-2 grass mixture. Ryegrass appeared in the Type A plot about 8 to 10 days after seeding. Unidentified grasses appeared in the Type A-2 plot at the same time and fine fescue grasses appeared about two weeks after seeding. It was not conclusive that the Type A-2 grasses were sufficiently slower establishing than the Type A grasses.

The 1980 summer drought adversely affected the maturity of both the grasses. However, by May, 1981 the Type A-2 grass mixture had established the turf shown in Picture #12 and the Type A shown in Picture #13 at the same time. The Type A-2 grass shows a dense, low-growing turf. The Type A grass shows a sparse and weedy-appearing turf.

Picture #14 is an overview of both plots in May, 1981. The Type A grass is shown in the foreground and the Type A-2 grass is shown

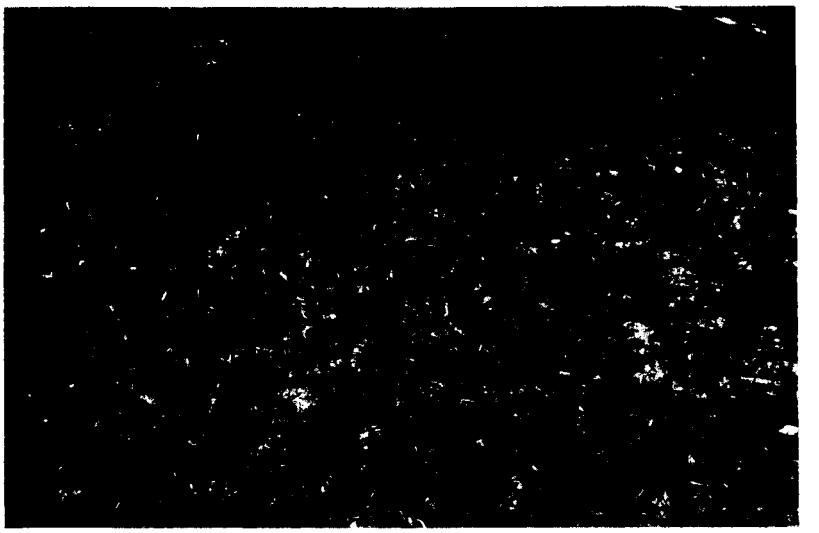
in the background. This picture emphasizes the denser, Type A-2 grass. Both plots were overseeded with Type A-2 in August, 1981.

No mowing data were obtained from these plots. However, the plots showed that the Type A-2 grass provides an adequately dense initial turf in a reasonable time.



PICTURE #12: TYPE A-2 GRASS PLOT
Route I-195, Allaire State Park
May, 1981

PICTURE #13: TYPE A GRASS PLOT
Route I-195, Allaire State Park
May, 1981



PICTURE #14: OVERVIEW

Route I-195, Allaire State Park

May, 1981

VI. DISCUSSION

A. Seed Sampling: The slow germination and establishment of the Type A-2 grass mixture on Route I-80 prompted the investigation of the quality and purity of the grass seed. At the time of the Route I-80 seeding, an attempt was made to obtain seed certification tags and seed samples to verify the Type A-2 grass seed. The attempt was not successful when the remaining areas were seeded before a seed sample could be obtained. The seed certification and seed samples could have shown whether or not the specified seed was sown and this could have assisted the investigation of slow germination.

However, seed sampling was initiated for a landscape seeding on Route I-676, Camden to investigate potential seed specification violations. The seed sampling was obtained by the Department of Agriculture, State Seed Analyst, from one 100 lb. bag of seed which was stored by the contractor in the field office. The results of the seed sampling are reported in Figure 9. The report affirms the presence of fine fescue seed and Kentucky bluegrass seed. The analysis shows that the "found" percent purity of the fine fescue and Kentucky bluegrass is beyond the ± 4.19% tolerance statistically established by the Department of Agriculture. The "found" percent of foreign seed (other crop seed) is more than 10 times the "given" percent of foreign seed.

The seed sample from Route I-676 suggests a potential for seed mixture violation. Seed certification and seed sampling would guarantee the quality, purity and quantity of seed mixture portions. It would clarify seed germination and establishment problems and enforce the

FIGURE 9

SEED SAMPLING REPORT

Found

(Statement required only of kinds present to extent of 5 per cent or more.)

Per cent Purity		KINDS	Per cent Germination	
Given	Found		Given	Found
		FINE TEXTURED GRASSES:		
32.67		Fortress Fescue	90	
32.67		Banner Fescue	90	
65.34	52.55	Total Red Fescue - Purity: Tolerance 4.19% Difference 12.79%		83
33.32	43.79	Kenblue Ky Bluegrass Ky Bluegrass Tolerance 4.19% Difference 10.47%	85	88
		* See attached sheet - Other Crop Seeds: Tolerance .82% Difference 2.35%		

* Other Crop Seed: Ryegrass 49
Orchardgrass 1
Red top 1

Weed Seeds: Festuca myuros 1
Puccinellia sp. 5

Department's seed specification. It would also clarify future claims against the seed mixture.

B. Smothering of Fine Fescue Grasses: The smothering of fine fescue grasses in several small areas on slopes has been noted on recently seeded roadside of the Type A-2 grass mixture. However, smothering has not occurred in the experimental plots, and has not occurred on old roadsides where fine fescues have dominated from the Type A grass mixture. Smothering is the laying over of grass foliage (lodging) that kills the grass plants. Not all lodging causes smothering and death to the grass plants. Lodging of grass plants provides soil and erosion protection, assists in reducing evaporation of moisture from the soil, and provides an acceptable unmowed appearance.

The evaluation of smothering must consider numerous variables such as soil fertility, moisture, soil pH, quantity and variety of seed and slope contours. When the nature of the variables is not known, it is difficult to determine the cause of smothering.

The isolated smothering on Type A-2 grass slopes is most likely due to excessive seed and highly productive sites. The smothering would appear not to be directly attributed to the Type A-2 grass mixture. When the Type A-2 grass mixture is sown at 60 lbs./acre, 20 lbs. are Banner Chewings fescue, 20 lbs. are Fortress spreading fescue and 20 lbs. are Kenblue Kentucky bluegrass. The application of Type A-2 grass mixture provides 40 lbs. of fine fescue seed. The application of the old Type A grass mixtures provides 35 lbs. of fine fescue, i.e., Pennlawn red fescue.

The additional 5 lbs. of the Type A-2 grass mixture which is spread over 43,500 sq. ft. would not create excessive grass plants and smothering conditions.

C. Availability of New Grasses: Banner Chewings fescue was developed independently of the original research study (7726) and is available from O. M. Scott Company, Marysville, Ohio. Fortress spreading fescue was developed in the original research study, and is available from Turf-Seed, Inc., Hubbard, Oregon. Kenblue Kentucky bluegrass is a commercially available seed from local seed distributors. If either Banner or Fortress becomes difficult to obtain from local distributors, acceptable substitutes should be utilized as discussed in section D.

D. Substitute Grasses: The report "Better Grasses for Roadsides" concluded that fine grasses which include spreading fescues, Chewings fescue and common-type Kentucky bluegrass, provide a more acceptable cover with less mowing than coarse hay-type grasses. The report specifically recommended Fortress, Banner and Kenblue cultivars, and suggested the alternatives in Table 5 for any one of the above three if the primary cultivars are not available.

TABLE 5

Alternate Cultivars

Spreading Fescue	Chewing or Hard Fescue	Kentucky Bluegrass
Pennlawn	Jamestown	South Dakota
Ruby	C-26	Delta

It is recommended that substitutes should be seeded at the same rate as the Banner, Fortress or Kenblue. The preferred cultivar is listed above the less desirable cultivars.

E. Seeding Rate: The Bureau of Landscape Architecture has seeded the Type A grass mixture at 100 lbs./acre for several years prior to the implementation of the Type A-2 grass mixture. The 100 lbs. rate provides better coverage on poor soils where overseeding is necessary for an adequate turf.

F. Evaluation of Type A-3 Grass Mixture: The Bureau of Landscape Architecture has been concerned that the new Type A-2 grass mixture has a somewhat slower establishment rate relative to the old Type A grass mixture. Although grass plots on Route I-195, Allaire State Park did not demonstrate poor establishment or a substantially slower rate, several areas of inadequate establishment were observed along Route I-195, which has essentially a sandy soil.

The Bureau of Landscape Architecture recommended the Type A-3 grass mixture which is shown in Figure 10 to provide quick establishment and a vigorous turf. The recommendation is provided by the Rutgers University Experimental Station. The Type A-3 grass has a vigorous, tall fescue which is called "Rebel". The Rebel tall fescue is a turf type grass which is reportedly less vigorous than K-31 tall fescue. It is the opinion of Landscape that the new Type A-3 grass mixture will be more adaptable to the new reduced mowing policies.

The Bureau of Transportation Structures Research recommends modifying the present slow-growing Type A-2 grass mixture with Manhattan ryegrass. The Manhattan ryegrass in the Type A-2 mixture will provide quick establishment, and the fine fescues and bluegrass in the Type A-2 grass will provide better appearance and a less vigorous turf which requires less mowing than the proposed Rebel tall fescue Type A-3 grass.

Since neither the Type A-3 grass mixture nor the Type A-2 modified with ryegrass has been field-tested on the highway system, the Bureau of Landscape Architecture will establish and monitor large roadside plots of the modified Type A-2 grass mixture at 100 lbs./acre and the Type A-3 grass mixture at 100 lbs./acre for a comparison and evaluation of the establishment criteria.

FIGURE 10

Type A-3 Grass Mixture

Rebel or Falcon Tall Fescue	60%
Kenblue, South Dakota or Park Kentucky Bluegrass	10%
Banner or Jamestown Chewings Fescue	20%
Linn Varieties Perennial Ryegrass	10%

REFERENCES

1. Snow, W. Brewster, "The Highway and the Landscape" New Brunswick: Rutgers University Press, 1959.

2. Duell, Robert W., "Better Grasses for Roadsides", Rutgers University.

3. Duell, Robert W., and Cosky, Steven W., "Roadside Vegetation, Phase I, HPR 7727, Rutgers University, Cook College, July 1977.