

**Evaluation and Management of Turfgrass on
Virginia Roadsides
Annual Report**

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ABSTRACT

Turfgrass Cultivar Evaluations

The trial data in this report are reflected in the VDOT Seed Specifications for Grasses and Legumes (Form RD-4) [see appendices]. New cultivar trials of Kentucky bluegrass, tall fescue, perennial ryegrass and fine fescue were planted in November 2002. Older cool-season grass trials were installed in the fall of 1999 at Blacksburg and Orange. The data gathered from 1999 to 2001 will be used to formulate recommendations after fall 2003. Bermudagrass, zoysiagrass, centipedegrass, as well as low growing warm season native grass trials, were installed at Hampton Roads and Culpeper in the summer of 2001.

Management Studies

The 1997 mowing studies on fine and tall fescue continued to be observed to note weed invasion and changing dynamics caused by lodging on the plots that were never mowed. The plots that have never been mowed show signs of density reduction.

Native Grass Studies

Establishment of the shorter native grasses [buffalograss, blue grama, and little bluestem] is very difficult because these grasses are slow to germinate and/or spread and do not produce much top growth during their first year of development. This makes weed and erosion control paramount in the first three years of establishment. The shorter natives [buffalograss, blue grama and little bluestem] have established better on a roadside slope, on an area where there was no previous vegetation, and continue to provide adequate erosion control. These same shorter natives have proved to be harder to establish in areas that had vegetation prior to establishment. The overwhelming reason for the difference was competition from annual grassy weeds on the previously vegetated plots and the lack of competition on the roadside cut slope. The use of companion plants and/or weed control is paramount for effective erosion-free establishment of the warm-season species on slopes. Several experiments investigating the use of companion plants or weed control for successful native grass establishment have shown that most adapted grasses that were planted with the native grasses soon overwhelmed the natives.

Attempts to establish the shorter native grasses in three climatic regions of Virginia reinforce the observations above.

Web site for Virginia Roadside Vegetation Research

The web site has been established to post annual reports, research updates, photographs, and to be a vehicle for communication between the researchers and the VDOT personnel in the field.

The web address is:

<http://filebox.vt.edu/cals/cropsci/roadside.vegetation/>

This site is under continual development and improvement because it is changed based on the user's needs and comments.

1. INTRODUCTION

The current roadside research program continues to fulfill two missions: (1) *to evaluate turfgrass cultivars and other species to ascertain their suitability for use on Virginia roadsides [soil stabilization and persistence]* and (2) *vegetation management studies to determine the optimum methods for successfully establishing and maintaining vegetation for stabilization and aesthetic purposes under variable conditions found on Virginia highway soils.*

Cool season, warm season and native cultivars (varieties) are continually evaluated in trials lasting for three or more years after seeding. This process ensures that new cultivars introduced into the market are evaluated in Virginia environments and the ones selected are best suited to roadside conditions and maintenance protocols. This testing procedure is designed so that the cultivars on the VDOT Seed Specifications for Grasses and Legumes (Form RD-4) document may be periodically updated.

The cultivars that are recommended for inclusion in Form RD-4 have achieved and maintained 70% or greater ground coverage three or more years after being sown. The standard test is for three years but may be extended if the test areas have not been subjected to several stress periods. This determination will be based on weather data collected at the sites and on the overall condition of the test plots. Even though all the recommended cultivars meet the 70% density minimum, some cultivars consistently have a higher percentage of ground cover than others in separate tests, and may be given a “strongly recommended” status. Cultivars that meet a 75% threshold after two years may be designated as “promising”. These cultivars are for emergency use only and are not be included in the recommended list because they have not been tested for the full three years.

Tall Fescue and Hard fescue grasses have been the focus of our management research for many years. A strong role on Virginia roadsides exists for this group of adapted grasses because of many years of successful performance. Virginia has several climatic zones and the fescues are used successfully in most areas; however, there are some areas and conditions where certain species and/or combination of species work best. In western regions, [ridge and valley, northern piedmont] with higher elevations and cooler average temperatures, hard fescues consistently dominate mixed stands. Tall fescues establish and persist better in the middle piedmont region to the coastal plain. In these regions the standard mix is 50% tall fescue and 50% hard fescue. This mixture can be used on over 90+ percent of Virginia for successful erosion control and the maintenance of an aesthetically pleasing ground cover.

Our warm-season native grass research is currently focused on proper establishment methods and variety selection. There are several species of native grasses that could be potentially used successfully on Virginia roadsides. Blue grama establishes rapidly and has shown the ability to compete successfully with annual grassy weeds. Further research regarding blue grama establishment methodology and ecotype adaptability to various climatic regions is underway or planned.

2. DATA RECORDING AND MANIPULATION

Data reported here are visual estimates of percent density (**% of live ground covered**) and overall performance of each experiment and demonstration. The use of the overall performance (OP) rating system reflects the general quality of the stand. Most of the data are shown as percent density. Our observation is that plots with a density of 70% generally provide adequate coverage to exclude weeds and control soil erosion. Therefore, plots with 70% or greater density of live ground cover will be considered acceptable for roadside use. The term “70% threshold” will be used to indicate this concept. Data collected are a combination of visual observations by a trained specialist.

The trial and management studies were evaluated in both the fall (late September to November, after the first frost), in late spring (April to May) and in mid summer (late June to late July). These dates allow for observation during a full range of growing conditions.

When statistical analyses were performed, methods from SAS Institute and means separation with Duncan’s Multiple Range Test were employed.

3. GENERAL ESTABLISHMENT AND MANAGEMENT INFORMATION

All of the sites are prepared in the same general manner unless specified. The original vegetation is killed with glyphosate; the site is disked or rototilled, and then seeded and rolled. The site may be mulched with hydro-mulch or straw to control erosion. The cultivars or treatments are arranged in a randomized block design, replicated at least three times. Plot sizes vary but generally are 1.82 m by 2.4 m (6'x8'). The cool season grasses are sown at a rate of 100 lb/A and the warm season grasses are sown at 50 - 60 lb/A. Lime is applied as dictated by a pre-establishment soil test. The only fertilizer the plots receive is at the time of seeding at a rate of 300 lb/A of 15-30-15 fertilizer and are mowed four to six times a year depending on location. Herbicides are used only when there is a risk of losing the entire site. All cool-season grass studies are planted in the Fall (September - November) or Spring (Feb - March) unless noted differently. Warm-season grasses are established in the spring (March - May).

4. TURFGRASS CULTIVAR EVALUATIONS - Tall Fescue

Tall fescue has been one of the main turfgrasses of VDOT's plantings. Tall fescue has proven to be a low cost, consistent germinator that persists under difficult conditions and has very good drought survival once fully mature. This combination has proven successful for several decades and the new cultivars are providing improved tolerances to insects and diseases. In the western regions, tall fescue persistence has not been as good as fine fescue persistence, as evidenced by the invasion of "greasy grass" *Tridens flavus* into stands of tall fescue throughout Virginia.

4.1. 1999 BLACKSBURG TALL FESCUE TRIALS

Procedure: Thirty-nine cultivars were planted on 17 September 1999 at the Turfgrass Research Center in Blacksburg. The standard planting protocol was followed.

Results and Discussion: The mild winter [1999], the relatively cool and wet summers [2000 -1] provided a nearly stress free period which resulted in all the tall fescue cultivars averaging between 67 - 76% ground cover. The summer drought of 2002 reduced the percentage of live ground cover but an entire replication was shaded from late afternoon sun, which skewed the data upward. Many plots had cover but it could not be determined if the plants were alive. The data for recommendations will be gathered in 2003 to see what recovery has occurred.

Table 4.1 Tall Fescue varieties in Blacksburg 1999 Trials

Seed Name	Supplier	Seed Name	Supplier
MC2	TMI	TOMAHAWK	Pure Seed Testing
BRAVO	LESCO	JT-3	Jacklin Seed
LARAMIE	LESCO	HOUNDDOG 5	CEBECO - Int'l Seed
ADVENTURE II	TMI	BRANDY	Jacklin Seed
LANCER	LESCO	PRIDE	CEBECO - Int'l Seed
AVANTI	TMI	KITTYHAWK SST	Smith Seed
COMSTOCK	Smith Seed	WOLFPACK	Pure Seed Testing
DL / SP	ABT - Zajac	ARID 3	Jacklin Seed
STETSON	LESCO	AZTEC II	TMI
JT-1	Jacklin Seed	TSD	TMI
R594E - 97	Pure Seed Testing	APACHE II	Pure Seed Testing
JT -2	Jacklin Seed	ANTHEM 11	TMI
CORONADO GOLD	Pure Seed Testing	MILLENNIUM	TMI
SCORPION	ABT - Zajac	SR 8300	Seed Research
ARID II	Jacklin Seed	GRANDE	Seed Research
CISI - TF23	CEBECO - Int'l Seed	REGIMENT	Seed Research
JT -4	Jacklin Seed	ARABIA	Jacklin Seed
TARHILL	Pure Seed Testing	TULSA	Seed Research
PIXIE	Jacklin Seed	BONANAZA II	Seed Research
		CREWCUT	Seed Research

4.2. 1999 ORANGE TALL FESCUE TRIALS

Procedure: Thirty-nine cultivars were planted on 14 September 1999 at the Orange County Research Center. This experiment is identical to the Blacksburg planting and is designed to determine if the cultivar's performance would differ between two Virginia climatic regions.

Results and Discussion: The mild winter [1999] and relatively cool and wet summers [2000-1] caused all the tall fescue cultivars to increase from between 77 - 90% to 82 - 100% ground coverage. The summer drought of 2002 reduced the percentage of live ground cover with no varieties above the 70% LIVE cover minimum. There were many plots that had over 70% [brown] cover but it could not be determined if the plants were viable.

Orange and Petersburg are parallel trials [both have the same species] planted to determine if there is a difference in performance between the northern piedmont and ridge & valley regions

4.3 2001 PETERSBURG TALL FESCUE TRIALS

Procedure: Thirty-one cultivars were planted on 14 November 2001 at the Petersburg research site located at the intersection of route 460 and interstate 295. This experiment is identical to the Roanoke planting and is designed to determine if the cultivar's performance would differ between two Virginia climatic regions.

Results and Discussion: The mild winter of 2001 allowed high germination and establishment of all species. By June 2002, 27 cultivars had a Rating of over 70% ground cover. The severe drought of summer 2002 decimated this non-irrigated, shallow soil site. There were twelve cultivars with ratings over 35% live cover. **This is a higher percentage than the other species in this trial.** The data helps demonstrate that even with good early establishment the grass has not had enough time to create a fully mature root system. In fairness this was a major drought and fully mature plants would have a very difficult time surviving.

Table 4.3 Tall Fescue varieties in 2001 Petersburg Trials

<u>Seed Name</u>	<u>Supplier</u>	<u>Seed Name</u>	<u>Supplier</u>
Arabia	Simplot - Jacklin	Millennium	TMI, Inc.
Arid 3	Simplot - Jacklin	Mustang 3	Pick Seed
Arid II	Simplot - Jacklin	Olympic Gold	Turf Seed
Aurora Gold	Turf Seed	Pure Gold	Turf Seed
Barlexas	Barenbrug USA	Quest	Simplot - Jacklin
Barrera	Barenbrug USA	Southeast	Landmark Seed
Barrington	Barenbrug USA	SR 8210	Seed Research
Bravo	Lesco, Inc	SR 8250	Seed Research
Coronado Gold	Turf Seed	SR 8500	Seed Research
Coyote	Landmark Seed	SR 8600	Seed Research
Crewcut II	Seed Research	Stetson	Lesco, Inc
Dynasty	Pick Seed	Tar Heel	Turf Seed
Endeavor	Turf Seed	TF 66	Barenbrug USA
Focus	TMI, Inc.	Tracer	Barenbrug USA
Grande	Seed Research	Wolfpack	Turf Seed
Maximize	Turf Seed		

5. TURFGRASS CULTIVAR EVALUATIONS - Fine Fescue

Fine fescues combined with tall fescue have been a standard seeding mixture used by VDOT for many years. The fine fescues tend to work best in the cooler regions of Virginia while the tall fescues perform best in the piedmont and upper coastal plain. The combination of both species provides a wider range of adapted areas [soil, climate and light] than either single component.

Fine fescue is a term, which includes four species or subspecies within the genus *Festuca*: hard fescue (HF) (*Festuca longifolia*), Chewings fescue (CF) (*Festuca rubra* var. *commutata* Gaud.), creeping red fescue (CRF) (*Festuca rubra rubra*, also referred to as strong creeping fescue), sheep fescue (SF) (*Festuca ovina*) and slender creeping red fescue (SCRF) (*Festuca rubra trichophylla*). Authorities consider them genetically different, but it is often difficult to tell them apart. **However, our studies reveal that the hard fescues generally tend to outperform the other fine fescue species in Virginia.**

5.1. 1999 BLACKSBURG FINE FESCUE TRIALS

Procedure: Fifteen fine fescue cultivars were planted at the turfgrass research center in Blacksburg on 17 September 1999. The area received an application of pelletized lime [20 lb per 1000 ft²] and 300 lbs of 15-30-15 fertilizer per VDOT standards.

Results and Discussion: The mild weather resulted in all but one cultivar being above the 70% threshold. This is an improvement over last year when four cultivars were below 70%. The soil at the Blacksburg site is a loam with good depth, which also contributed to the good establishment. The data are preliminary [therefore no data are presented] and cannot be used for recommendations.

Table 5.1 Fine Fescue varieties in 1999 Trials

MX86AE	SHEEP	Jacklin Seed	BRITTANY	CRF	LESCO
QUATRO	SHEEP	CEBECO - Int'l Seed	SHADEMARK	CRF	LESCO
OSPREY	HF	Seed Research	TRAPEZE	CRF	ABT - Zajac
ATTLIA E	HF	TMI	SR 5200 E	CRF	Seed Research
DEFIANT	HF	LESCO	DAWSON	SCRIF	Seed Research
MINOTAUR	HF	TMI	INTRIGUE	CHEW	TMI
RESCUE	HF	Jacklin Seed	SANDPIPER	CHEW	Seed Research
SCALDIS	HF	Seed Research			

5.2. 1999 ORANGE COUNTY FINE FESCUE TRIALS

Procedure: Fifteen fine fescue cultivars were planted on 14 September 1999 at the Orange Agriculture Research Center. The seed was planted according to the protocol outlined in section 3. No lime was applied to this site with a clay loam soil. This experiment uses the same cultivars and seeding methods as the fall 1999 Blacksburg fine fescue trial and the combined data will show if the cultivars perform differently in two climatic regions of Virginia.

Results and Discussion: All cultivars are above the 70% threshold. The weather after seeding was very favorable for germination and the mild winter combined with the cool wet summer provided outstanding growing conditions. The severe drought of summer 2002 decimated this non-irrigated, shallow soil site. There were no cultivars with ratings over 30% live cover. The data are preliminary [therefore none are presented] and cannot be used for recommendations but helps demonstrate that initial growing conditions have a large influence on establishment. This result illustrates why trials are also needed on roadside sites.

5.3. 2001 PETERSBURG FINE FESCUE TRIALS

Procedure: Nineteen cultivars were planted on 14 November 2001 at the Petersburg research site located at the intersection of route 460 and interstate 295. This experiment is identical to the Roanoke planting [Spring 2002] and is designed to determine if cultivar performance would differ between two Virginia climatic regions.

Results and Discussion: The mild winter of 2001 allowed high germination and establishment of all species. By June 2002, 27 cultivars had a Rating of over 70% ground cover. The severe drought of summer 2002 decimated this non-irrigated, shallow soil site. **There were only three cultivars with average ratings over 15% live cover and two were hard fescue varieties.** The data will be collected in 2003 to determine if any recovery will occur.

Table 5.3 Fine Fescue varieties in 2001 Trials

Bridgeport	CHF	Barenbrug USA	Shademaster II	CRF	Turf Seed
Brittany	CHF	Lesco, Inc	SR 5210	CRF	Seed Research
Intrigue	CHF	TMI, Inc.	Defiant	HF	Lesco, Inc
Sandpipers	CHF	Seed Research	Discovery	HF	Turf Seed
SR 5100	CHF	Seed Research	Hardtop	HF	Barenbrug USA
Tiffany	CHF	Turf Seed	Minotaur	HF	TMI, Inc.
SR 7100	COB	Seed Research	Osprey	HF	Seed Research
BAR CF 8 FUS1	CRF	Barenbrug USA	Rescue 911	HF	Simplot - Jacklin
Jasper II	CRF	Pick Seed	Scaldis II	HF	Seed Research
Shademark	CRF	Lesco, Inc	SR 3100	HF	Seed Research

6. TURFGRASS CULTIVAR EVALUATIONS - Kentucky Bluegrass

6.1. 1999 BLACKSBURG KENTUCKY BLUEGRASS TRIALS

Procedure: Fifteen Kentucky bluegrass cultivars were planted on 17 September 1999 at the Turfgrass Research Center in Blacksburg.

Results and Discussion: This location yielded second year results that ranged from 70 - 90 % ground cover. The end of the second year found all cultivars over the threshold. The weather for the first two years after seeding was very favorable for germination and the mild winters combined with the cool wet summers provided outstanding growing conditions. The data are preliminary [therefore none are presented] and cannot be used for recommendations but helps demonstrate that favorable initial growing conditions have a large influence on establishment success.

Table 6.1 Kentucky bluegrass varieties in 1999 Trials

DRAGON	ABT - Zajac
LIVINGSTON	Pure Seed Testing
BLUESTAR	Pure Seed Testing
GINGER	Dye Seed
BLUEMOON	Jacklin Seed
VOYAGER	Pure Seed Testing
DELLWOOD	ABT - Zajac
CHICAGO II	Jacklin Seed
FREEDOM II	Jacklin Seed
NOTTINGHAM	ABT
DENIM	Pure Seed Testing
MERIT	Seed Research
SR 2100	Seed Research
CANON	Seed Research
CYNTHIA	Seed Research

6.2. 1999 ORANGE COUNTY KENTUCKY BLUEGRASS TRIALS

Procedure: Fifteen Kentucky bluegrass cultivars were planted on 14 September 1999 at the Orange county AREC using the standard protocol described in section 3 of this report. This experiment is identical to the Blacksburg planting and is designed to determine if the cultivars perform differently between two different Virginia climatic regions.

Results and Discussion: This location yielded second year results that ranged from 55 - 88 % ground cover with 5 cultivars above the 70% threshold. The mild winter of 1999 and the relatively cool and wet summer of 2000 produced nearly stress free conditions. The data are preliminary [therefore no data are presented] and cannot be used for recommendations but helps demonstrate that favorable initial growing conditions have a large influence on establishment success.

6.3. 2001 PETERSBURG KENTUCKY BLUEGRASS TRIALS

Procedure: Eighteen cultivars were planted on 14 November 2001 at the Petersburg research site located at the intersection of route 460 and interstate 295. This trial was established following the standard protocol described in section 3 of this report This experiment has the identical varieties to the Roanoke planting and is designed to determine if cultivar performance would differ between two Virginia climatic regions.

Results and Discussion: The mild winter of 2001 allowed high germination and establishment of all species. By June 2002, 27 cultivars had a Rating of over 70% ground cover. The severe drought of summer 2002 decimated this non irrigated, shallow soil site. **There were only four cultivars with average ratings over 10% live cover..** Kentucky bluegrass has a dormancy mechanism for survival during a drought and data will be collected in 2003 to determine if any recovery will occur.

Table 6.3 Kentucky bluegrass varieties in 2001 Trials

Baritone	Barenbrug USA	PST B4 246	Turf Seed
Baron	Barenbrug USA	PST B9 35	Turf Seed
Baronie	Barenbrug USA	PST B5 89	Turf Seed
Barzan	Barenbrug USA	PST-A6-214	Turf Seed
BlueStar	Turf Seed	PST-B5-43	Turf Seed
Brooklawn	TMI, Inc.	Shamrock	Lesco, Inc
Canon	Seed Research	SR 2100	Seed Research
Denim	Turf Seed	Unique	Pick Seed
Langara	Pick Seed	Voyager	Turf Seed

7. PERENNIAL RYEGRASS TRIALS AND MISCELLANEOUS COOL SEASON VARIETY TRIALS

Perennial ryegrass was added to list of species to trial. National breeding programs have developed some varieties that tolerate drought fairly well. The advantage of perennial ryegrass is that it is one of the fastest germinating turfgrass species [3-4 days under good conditions].

7.1. 2001 PETERSBURG PERENNIAL RYEGRASS TRIALS

Procedure: Thirteen cultivars were planted on 14 November 2001 at the Petersburg research site located at the intersection of route 460 and interstate 295. This trial was established following the standard protocol described in section 3 of this report. This experiment is identical to the Roanoke planting [Spring 2002] and is designed to determine if the cultivar's performance would differ in two Virginia climatic regions.

Results and Discussion: The mild winter of 2001 allowed high germination and establishment of all species. By June 2002, all cultivars had a Rating of over 70% ground cover. The severe drought of summer 2002 decimated this non irrigated, shallow soil site. **There were only four cultivars with average ratings over 20% live cover.** The data will be collected in 2003 to determine if any recovery will occur.

Table 7.1 Perennial ryegrass varieties in 2001 Trials

Allsport	Lesco, Inc	Pinnacle II	Barenbrug USA
ASAP	Simplot -Jacklin	Pirouette	Barenbrug USA
Barlennium	Barenbrug USA	Pizzazz	TMI, Inc.
Goalkeeper	Simplot - Jacklin	Premeir II	Barenbrug USA
Legacy II	Lesco, Inc	Prospect	Lesco, Inc
Linedrive	Lesco, Inc	Prosport	Lesco, Inc
Peak	Barenbrug USA		

7.2. 2001 MISC COOL SEASON TRIALS

Procedure: Eleven cultivars were planted on 14 November 2001 at the Petersburg research site located at the intersection of route 460 and interstate 295. This trial was established following the standard protocol established by VDOT and designed to evaluate non-standard grasses. This experiment is identical to the Roanoke planting [Spring 2002] and is designed to determine if the cultivar performance would differ between two Virginia climatic regions.

Results and Discussion: The severe drought of summer 2002 decimated this non irrigated, shallow soil site.. **There was only one cultivar with a rating of 45% live cover and this was an orchardgrass.** The data will be collected in 2003 to determine if any recovery will occur.

Table 7.2 Misc. Cool Season varieties in 2001 Trials

Barloel	Barenbrug USA	Praire Junegrass [Koleria macrantha]
Barleria	Barenbrug USA	Praire Junegrass [Koleria macrantha]
Elsie	Turf Seed	Orchardgrass [Dactylis glomerata]
Megabite	Turf Seed	Orchardgrass [Dactylis glomerata]
Pro Am	Lesco, Inc	Rough bluegrass [Poa trivialis]
Barpressa	Barenbrug USA	Canadian Bluegrass [Poa compressa]
SR 7100	Seed Research	Colonial Bentgrass [Agrostis capillaris]
Golfstar	Simplot -Jacklin	Idaho Bentgrass [Agrostis idahoensis]
Barcampsia	Barenbrug USA	Tufted Hairgrass [Deschampsia caespitosa]
SR 7200	Seed Research	Velvet Bentgrass [Agrostis canina]
Bar WB01	Barenbrug USA	Velvet grass [Holcus lanatus]

8. WARM SEASON VARIETY TRIALS

8.1. 2001 Warm season grass trials in Hampton Roads

Warm season grass trials [2000] in Hampton Roads and Culpeper were initiated and some preliminary germination data were gathered. The Hampton Roads experiment was terminated because of existing bermudagrass infestation and the area was sprayed with glyphosate several times during August and September to kill the existing bermudagrass. New trials were planted on May 1, 2001 with 15 bermudagrass, 5 zoysiagrass, 7 buffalograss, 1 centipedegrass and 2 bahiagrass cultivars. The buffalograss was planted at 40 lb PLS (pure live seed) per acre and all others were planted at 50 lb (bulk) per acre. The grasses established well in the wet mild summer. All but one bermudagrass were above the 70% level with most in the 90% range. Two of the zoysia grasses reached the 70% range with the others less than 63%. None of the buffalograss was above 60% with most below the 40% level; this result was not unexpected because buffalograss is known for its slow germination and spread. A surprise is the outstanding performance of the centipedegrass with a cover of 90%, while both of the bahiagrasses were below 22% cover.

Table 8.1 Warm Season varieties in 2001 Trials

AU Sand Mtn	SRO	Bahia	Cody-pb-c	Pawnee-Buttes	Buffalo
Riba	SRO	Bahia	Sharp Shooter	Sharp Bros	Buffalo
Barmuda	Barenbrug	Berm.	Sharp's Imp2	Sharp Bros	Buffalo
Sahara	Barenbrug	Berm.	PennBuf	SRO	Buffalo
Majestic-c	Bermuda Ind.	Berm.	Bison	Stock Seed	Buffalo
U-3	Bermuda Ind.	Berm.	Cody-st-c	Stock Seed	Buffalo
Jackpot	Jacklin	Berm.	Texoka	Stock Seed	Buffalo
Southern Star	Jacklin	Berm.	Centipede	Patten Seed	Centipede
Sun Devil 2	Jacklin	Berm.	Cathay	Jacklin	Zoysia
Sunstar	Lesco	Berm.	Zenith	Patten Seed	Zoysia
Mohawk	Seeds West	Berm.	Campanion	SRO	Zoysia
Sydney	Seeds West	Berm.	Del Sol	TMI	Zoysia
990210H	SRO	Berm.	Zen 300	TMI	Zoysia
SR9554	SRO	Berm.	Hachita	Sharp Brothers	Blue grama
Yukon	SRO	Berm.			
Savannah-c	Turf-Seed	Berm.			
Sungrazer		Berm.			

8.2. 2001 Warm season grass trials in Culpeper

The 2000 warm season grass trials in Hampton Roads and Culpeper were initiated and some preliminary

germination data were gathered. Inconsistent establishment was caused by poor germination conditions immediately following seeding and the 2000 trial was terminated. New trials were planted on April 18, 2001 with 14 bermudagrass, 5 zoysiagrass, 7 buffalograss, 1 centipedegrass, 2 bahiagrasses and 1 blue grama cultivar. The preliminary results are similar to the Hampton Roads experiment. The bermudagrasses were generally in the 80% range except one at the 37% level. Overall the coverage was less than HR, which is expected in the cooler Culpeper [upper piedmont] region. One zoysiagrass did very well [95%] while the others were less than 15%. The centipede managed a respectable 66% while the blue grama averaged 94% coverage.

9. MANAGEMENT STUDIES

9.1 The Effect of Mowing Regimes on the Establishment and Persistence of Fine Fescue - Fall 1997

Objective: To determine the effect of mowing frequency on the persistence of hard, Chewings and tall fescue.

Procedure: A relatively flat site in Blacksburg at the Turfgrass Research Center was selected in the fall of 1997. The previously established vegetation was destroyed with glyphosate. The site was disked, rototilled and fertilized in the fall of 1997¹. Lime was not required (pH 7.2). Monostands of hard, Chewings' and Tall fescue were sown at 100 lb/A on 8 September 1997. The treatments were arranged in a randomized split block design and replicated four times using 10' X 8' plots. Garlon 3A™ (2.7 qt/A) was applied in the spring of 1998 to control broadleaf weeds. Beginning in the spring of 1998, the designated plots were mowed either once, twice, or thrice a year with the residue left on the plots. Some plots were not mowed until after the first, second or third year. Data were recorded prior to the initial mowing and recorded in the fall and spring each year.

Results and Discussion: All the grasses were well established by the first mowing in the spring of 1998. The data are presented in Table 9.1. The density of all the species increased over the summer. By the winter of 1998 all of the fine fescue plots attained a density greater than 90% and all of the tall fescue plots had a density greater than 86%. **One observation is of interest: the turfgrasses that were mowed on May 15 and again on July 15 were relatively free of seedheads in September 1998 (reconfirming Dr. Blaser's past recommendations to let the tall fescue go to seed in the spring before mowing which results in removal of the apical meristem from the reproductive tiller; the result being a stand of vegetative (clean-looking) tillers for the remainder of the season.** The turf that was never mowed, especially the tall and chewings fescues, showed increased weed infestations. This demonstrates that some mowing will help maintain the stand of grass. This may be due to a reduction of grass leaves that lodge and/or a reduction in the amount and height of the individual weed plants. Both of these items would give the grass plants a competitive edge. The hard fescue performed better than the chewings or the tall fescue in this test located in the ridge and valley climatic region. These data show that, for the ridge and valley region, hard fescue should be planted and that it should be mowed at least twice (May and September) each year.

TABLE 9.1 Mowing Study - Blacksburg, planted 8 September 1997 at a rate of 100 lb per acre and mowing treatments started the following spring. The data represents the percentage of ground cover [density] and average of four replications The mowing regime shows when the plots were mowed or not mowed.

	Treat #	Mowing Regime	% Ground Cover						Weed
			April '98	Dec '98	Dec '99	Jun '00	Jun-01	Jun-02	%
Chewings Fescue	1	May	70	95	88	88	85	79	15
	2	May + Sept	74	95	89	89	87	77	5
	3	May, July + Sept	73	95	95	87	88	85	5
	4	May	69	95	91	78	81	78	6.25
	5	Never Mowed	70	95	95	81	88	80	10
Hard Fescue	1	May	68	95	100	89	91	94	2.5
	2	May + Sept	79	94	95	90	91	90	3.75
	3	May, July + Sept	71	95	98	95	90	85	1.25
	4	May	74	95	98	90	90	95	2.5
	5	Never Mowed	74	95	94	79	90	95	1.25
Tall Fescue	1	May	61	89	84	82	90	81	2.5
	2	May + Sept	63	89	80	86	89	80	1.25
	3	May, July + Sept	60	90	83	91	87	86	1.25
	4	May	56	86	85	83	87	75	6.25
	5	Never Mowed	64	88	79	79	85	78	10.25

10. NATIVE GRASS RESEARCH

10.1 Demonstration - Preliminary Evaluation of Native Grasses for Roadside Use - Spring 1997

Procedure: Twenty types of native grasses were sown in 10' X 10' blocks as a demonstration. These grasses were established in the Valley & Ridge (Blacksburg) region (Turfgrass Research Center) in the late spring of 1997. All varieties examined were seeded and established according to information gathered from the literature and seed sources.

Results and Discussion:

The Blacksburg demonstration continues to perform well for several species while several species were hard hit by a combination of drought and disease. The switch grass, and Indian grass maintained their density and even had some plants invade an adjacent plowed area. Gamagrass showed acceptable density for the first time since replanting [2 years ago]. The density of buffalograss and sideoats grama declined to just below acceptable standards [70% ground cover] due to unfavorable conditions and disease. The stand of Virginia wildrye had over 35% weed coverage [downy brome] while the Canadian wildrye had acceptable coverage the seed heads were noticeably shorter in height. The plots were mowed to 5" in November. The whole site was fertilized with 2 lb of phosphorus and 1/2 lb nitrogen in early April. The native cool-season grass, *Koeleria*, responded to the fertilizer with a lush growth in the spring but suffered under the drought in the summer. Western wheatgrass did attain sufficient growth early but only produced sparse seedheads. The pubescent western wheatgrass 'Manska' was overrun by broadleaf weeds and was sprayed with 2-4,D as a control. These results indicate that the natives are susceptible to declines in percentage of cover. It remains to be seen if they can rebound. **The observations show the robust and low maintenance nature of the taller species, once they are established. The wheatgrasses did not hold their ground cover percentages and would not be recommended for use on roadside projects.**

The demonstration plots have been used by classes at Virginia Tech, local gardener groups and some academic groups as examples of type and size of these native species.

Plot layout for the Blacksburg native grass demonstration

Big Bluestem "Roundtree"	Eastern Gamagrass		Buffalograss "Sharps Improved"
Switchgrass "Cave in Rock"	Switchgrass "Blackewell"	Velvet grass	Blue Grama "Vns"
Virginia Wild Rye	Big Bluestem "Niagara"	Pubescent Wheatgrass "Manska"	Sideoats Grama "Trailway"
Canada Wild Rye	Indiangrass "Rumsey"	Western Wheatgrass	Koeleria M. "Barkoal"
Big Bluestem "Kaw"		Little Bluestem	Little Bluestem "Blaze"

10.2 Screening of Pure and Mixed Stands of Short and Tall Native Grasses

Objective: The goal of this study was to determine the adaptation and persistence of selected native grasses to the Valley and Ridge region of Virginia when seeded on a newly constructed slope in Montgomery County, Virginia.

Methods and materials: Pure and mixed stands of short [Table 10.2A] and tall [Table.10.2C] warm-season native grasses were sown on April 28, 1998 on a newly cut roadside slope of the Smart Road Project. Located in Montgomery County, just east of Blacksburg, Virginia the rocky north-eastern facing 2:1 slope with an elevation of 638 meters and a soil pH of 8.0 was divided into 10' by 10' plots. The experiment used a randomized block design with 3 replications. The seed was sown by hand. A companion plant, *Coreopsis tinctoria*, was seeded into designated plots at 2.25 lbs/A. Fertilizer, 44 lb nitrogen/A from a sulfur-coated urea, 600 lb phosphorus/A from 0-46-0, and 87 lb potash/A from 0-0-60 were applied. The site was then covered with hydromulch (1500 lb/A). By late spring the site had developed several deep rills due to the steep slope, inadequate vegetative cover and the frequent severe storms that plagued the area soon after the seed was sown. **Thus, extra measures were taken to retard soil erosion.** In July 1998, 2,000 lbs/A of straw was blown onto the plots and 20 lbs/A of German millet (*Setaria italica*), 300 lbs/A of 15-30-15 and 1000 lbs/A of paper mulch were applied with a hydraulic seeder. In the spring of 1999 and 2000 glyphosate was applied to selectively control the few large broadleaf weeds. In July 1999 sulfur coated urea (45 N lb/A) was applied. The data collected were the percentage of ground covered by the different species.

Table 10.2A Native Warm Season Grass Screening Trial in Blacksburg, VA. The SHORT native grasses seeding rates. PLS means the seeding rate is based on pure live seed and BULK means seeding rate is based on bulk rate.

	Bulk Lbs Per Acre	Lbs PLS Per Acre
Buffalograss 'Cody'		44.00
Blue grama		11.00
Sideoats grama		23.00
Little bluestem 'Little Camper'		17.00
Hard and Tall Fescue (1:1)	100.00	
Buffalograss 'Cody'		44.00
+ little bluestem 'Little Camper'		8.00
Buffalograss 'Cody'		44.00
+ blue grama		5.00
Buffalograss 'Cody'		44.00
+sideoats grama		11.00
Little bluestem 'Little Camper'		17.00
+ blue grama		5.00
Little bluestem 'Little Camper'		17.00
+sideoats grama		11.00
Buffalograss 'Cody'		44.00
+ little bluestem 'Little Camper'		8.00
+ blue grama		3.00
Buffalograss 'Cody'		44.00
+ little bluestem 'Little Camper'		8.00
+sideoats grama		11.00

Results of the short native grass: The northeast-facing site that was used for this study was a very rocky 2:1 slope. Additional factors contributed to the difficulty of establishing vegetation on this site. Montgomery County experienced a drought from August to October in 1998 and a severe drought in the summer of 1999. The short native grass percentage ground cover [density] on the slopes was slower to develop than the standard tall/hard fescue plots. [Table 10.2B]. A year after sowing [May 99], all of the short-grass entries exceeded 50% cover with 7 of 12 exceeding 70%; however, density declined after the severe drought in the summer of 1999 [Dec 99]. All of the entries, except sideoats grama, rebounded by the next year to be close to or exceed previous high densities [Jun 00]. The little bluestem and sideoats grama plots only had coverage in the 40% range, significantly less than the other species. The standard mix [hard and tall fescue] was superior to the native species until the second year. Two years after seeding the buffalograss/blue grama mix had the most cover of any short grass species; in fact, any mix that included either buffalo and/or blue grama was statistically and numerically similar to the fescue mix plots with 73.3% ground cover. The third year showed increases in percentage cover in all plantings except the little bluestem/sideoats grama plots. Also, after three years the buffalograss plots average cover [86.7%] was numerically superior to the fescue mix [85.0%]. The sideoats grama, little bluestem and side oats/little bluestem average ground cover were less than 70% and statistically less than the other short grass species tested. The fourth year produced a general decline in coverage, much was due to an invasion of common vetch over a wide area of the test site. A 2-4,D product was applied to control the vetch. **The native plants that have shown promise continue to provide adequate control of erosion on this rocky slope. The take home message is that the Blue grama and Buffalo grasses will control erosion once established. The establishment of the short native species on this site was helped by the lack of competition from annual grassy weeds. This situation would be expected in newly created “cut” slopes, but would not hold true for “fill” or sites with existing vegetation. The blue grama and buffalograss plots were statistically equal to the fescues by the end of the second year. The adapted grasses [fescues] established much faster than the natives.**

Table 10.2B Screening of warm season SHORT native grasses in Blacksburg, Va. Seeded 28 April 1998 on a NW facing cut slope. The data presented are the percentage of ground cover, the average of three replications.

<u>Plants</u>	<u>Percent of Ground Cover</u>				
	<u>Nov-98</u>	<u>Dec-99</u>	<u>Jun-00</u>	<u>Jul-01</u>	<u>Jul-02</u>
Buffalograss 'Cody'	48.3BD	66.7A	73.3A	86.7A	80.3AB
Blue grama	56.7AB	66.7A	73.3A	76.7AB	72.6B
Sideoats grama	35.0D	50.0AC	41.7C	53.3B	40.4C
Little bluestem 'Little Camper'	38.3CD	33.3C	46.7BC	66.7AB	60.4B
Hard and Tall Fescue (1:1)	68.3A	70.0A	73.3A	85.0AB	87.0A*
Buffalograss /L bluestem	51.7BC	60.0AB	66.7A	70.0AB	60.1AB
Buffalograss /blue grama	55.0AB	60.0AB	73.3A	80.0AB	76.2B
Buffalograss/sideoats	53.3AC	53.3AB	73.3A	71.7AB	72.7B
Little bluestem/blue grama	58.3AB	63.3AB	73.3A	75.0AB	70.0B
Little bluestem /sideoats	35.0D	43.3BC	53.3AC	53.3B	45.0B
Buffalograss/L bluestem/blue grama	58.3AB	63.3AB	63.3A	73.3AB	70.8B
Buffalograss/L Bluestem/sideoats	48.3BD	63.3AB	56.7AC	70.0AB	66.7B

Within each column the values followed by the same letter do not significantly differ at the 5% level of probability using the Duncan's Multiple Range Test. Means are the average of 3 replications in a randomized block design.

*** The plots are now dominated by hard fescue - over 80 %. This shows that hard fescue will dominate grass areas in the western part of Virginia. [higher elevation and cool temperatures than coastal area of Virginia]**

Table 10.2C Native Warm Season Grass Screening Trial in Blacksburg, VA. The TALL native grasses seeding rates. PLS means the seeding rate is based on pure live seed and BULK means seeding rate is based on a bulk rate.

<u>Plants</u>	<u>Bulk Lbs per Acre</u>	<u>Lbs PLS seeds per Acre</u>
Big bluestem 'Niagara'		13.20
Indiangrass		12.40
Switchgrass 'Blackwell'		5.60
Deertongue 'Tioga'		5.60
Big bluestem 'Niagara'		6.60
+ Indiangrass		6.20
Switchgrass 'Blackwell'		2.80
+ deertongue 'Tioga'		2.80
Hard fescue 'Nordic'	100.00	
Tall fescue 'Eldorado'	100.00	

Results of the tall native grass species: The first year ended with only the two standards, hard fescue and tall fescue, achieving a ground cover of greater than 70% [TABLE 10.2D]. The best tall native species was big bluestem/indiangrass [50%]. The density of the tall native grass improved the second year. As expected, the switchgrass and big bluestem were the best native species at the end of the second year with averages of 33% and 50%. However, all species did not rival the density of the tall or hard fescue at 60% and 83%. The third year ended with only one native, big bluestem, having a ground cover over 60%. **Hard fescue density increased to 90% while the tall fescue decreased to 52%. The fourth year found the hard fescue plots holding at 83% while the tall fescue fell to 43%.** Indian grass plots increased slightly while most other species showed decreases. It should be noted that the tall natives are still stunted [on this rocky, sandy slope] compared to the same cultivars grown at the Turfgrass Research Center.. The tall native species used in this trial has not reached minimum erosion standard of 70% cover after four years. Several reasons may account for this: the sandy nature of the slope limits water retention, the early erosion control measures may have thinned the stand. It should be noted that these species performed well in a trial at the Turfgrass Center on a flat site with many annual grassy weeds present.

Table 10.2D Screening of warm season TALL native grasses in Blacksburg, Va. Seeded 28 April 1998 on a NW facing road cut slope. The data presented are the percentage of ground cover, average of three replications.

<u>Plants</u>	Percent of Ground Cover					
	<u>Aug-98</u>	<u>May-99</u>	<u>Dec-99</u>	<u>Jun-00</u>	<u>July-01</u>	<u>July-02</u>
Big bluestem 'Niagara'	36.7BC	55.0B	36.7B	50.0BC	61.7AB	58.8AB
Indiangrass	35.0BC	45.0B	23.3B	16.7E	25.0B	30.6B
Switchgrass 'Blackwell'	43.3BC	48.3B	36.7B	33.3CE	46.7B	47.2B
Deertongue 'Tioga'	30.0C	50.0B	23.3B	16.7E	28.4B	10.5C
Big bluestem/indiangrass	51.7B	45.0B	36.7B	43.3BD	56.7AB	57.7AB
Switchgrass 'Blackwell'/deertongue	26.7C	56.7B	30.0B	26.7DE	43.3B	40.5B
Hard fescue 'Nordic'	71.7A	78.3A	80.0A	83.3A	90.0A	83.2A
Tall fescue 'Eldorado'	75.0A	83.3A	63.3A	60.0B	51.7B	42.4B

Within each column the values followed by the same letter do not significantly differ at the 5% level of probability using the Duncan's Multiple Range Test.
Means are the average of 3 replications in a randomized block design.

10.3 Short Native Grasses Planted with Selected Companion Species using Seasonal Planting Times

Objective: The goal of this study was to help determine the "best planting practices" for short native plants by using companion species and by using three different establishment times

Methods and materials: Pure and mixed stands of short warm-season native grasses were sown on 5 July 2001 [summer], 5 December 2001 [winter] and 30 May 2002 [spring] at the Turfgrass Research Center. The experiment used a randomized block design with 3 replications. The seed was mixed and sown by hand. The seeding consisted of a "basic mix" of native grasses and selected companion grasses planted as mixes and planted alone. Table 10.3A lists the mixes.

Data collection: The percent ground cover of the natives, the companions in the mixed plots and the percent of ground cover of the single variety plots were recorded.

Results: The **very preliminary data** indicates that the most successful time to plant native grasses are the summer and the least productive time is winter. **The best companions [so far] are Buckwheat and *C. tinctoria*. The native mix that produced cover was dominated by blue grama, probably due to its shorter germination time. The companions that tended to dominate the natives and reduce the amount of native grasses, was any of the adapted grasses [all the Fescues]. This early data would indicate that short native grasses should not be seeded with fescues in western Virginia.**

Table 10.3A Short Natives planted with Companion species using seasonal planting times - SEEDING RATES

	Bulk Lbs Per Acre	Lbs PLS Per Acre
BASIC MIX:		
Buffalograss 'Cody'		25.0
Blue grama 'Hatchita'		15.0
Little bluestem 'Little Camper'		10.0
COMPANIONS:		
German Millet	15.0	
Creeping Red Fescue 'ShademasterII'	15.0	
Coreopsis Tinctoria	2.25	
Buckwheat	20.0	
Birdsfoot trefoil	5.0	
Crimson Clover		8.0
Praire Clover		8.0
Hard Fescue 'Discovery'	15.0	
Tall Fescue 'Coyote'	15.0	
Intermediate. P. Rye "Transist"	15.0	
ABRUZZI RYE	15.0	
OTHER BLENDS & SINGLE PLANTINGS		
Basic mix alone		
Blue Grama and Buffalograss		25.0 & 10.0
Blue grama		15.0
Buffalograss		30.0.0
Hard Fescue	15.0	
Tall Fescue	15.0	
Creeping Red Fescue "Shademaster II"	15.0	
Little Bluestem "Camper"	10.0	

Table 10.3B Short Natives planted with Companion species using seasonal planting times - PLOT PLANS

2001 Native Mix and Companion

SUMMER PLANTING

PLANTED ON 5 JULY 01

<- Huckleberry Trail -->

plot # - treatment

AFTERNOON SHADE >

<-- TRC

308 - 7	309 - 6	310 - 9	311 - 2	312 - 12	313 - 13	314 - 8	315 - 1	316 - 14	317 - 16	218 - 18	318 - 18	BL AN K	BLANK
118 - 18	212 - 5	213 - 14	214 - 6	215 - 4	216 - 2	217 - 1	301 - 17	302 - 5	303 - 15	304 - 3	305 - 4	306 - 11	307 - 10
115 - 8	116 - 6	117 - 7	201 - 11	202 - 12	203 - 3	204 - 15	205 - 17	206 - 9	207 - 7	208 - 10	209 - 8	210 - 16	211 - 13
101 - 17	102 - 9	103 - 12	104 - 10	105 - 2	106 - 13	107 - 11	108 - 1	109 - 14	110 - 3	111 - 15	112 - 16	113 - 5	114 - 4

#	Companions:
1	G. Millet @ 15 Lb / A
2	Creeping Red Fescue @ 15 Lb / A "Shademaster II
3	C. Tinctoria @ 2.25 lb / A
4	Buckwheat @ 20 PLS / A
5	Birdsfoot trefoil @ 5 lb / A
6	Crimson Clover @ 8 PLS/ A
7	Praire Clover @ 8 PLS / A
8	Hard Fescue @ 15 lb / A "Discovery"
9	Tall Fescue @ 15 lb / A "Coyote"

#	Companions:
10	Basic mix alone
11	Blue Grama and Buffalograss
12	Blue grama @ 15 PLS lb /A "Hachita"
13	Buffalograss @ 30 PLS lb / A "Cody" cert.
14	Hard Fescue @ 15 lb / A "Discovery"
15	Tall Fescue @ 15 lb / A "Coyote"
16	Creeping Red Fescue @ 15 Lb / A "Shademaster II
17	Little Bluestem @ 10 PLS lb / A "Camper"
18	Basic mix with -Intermed. P. Rye @ 15 lb /A "Transist"

planted 6 July

2001 Native Mix and Companion

WINTER PLANTING

plot # - treatment

planted 5 Dec 01

<< Southgate Drive >>

TRC

310 - 9	311 - 2	312 - 12	313 - 13	314 - 8	315 - 1	316 - 14	317 - 16	218 - 18	318 - 18	
216 - 2	217 - 1	301 - 17	302 - 5	303 - 15	304 - 3	305 - 4	306 - 11	307 - 10	308 - 7	309 - 6
206 - 9	207 - 7	208 - 10	209 - 8	210 - 16	211 - 13	118 - 18	212 - 5	213 - 14	214 - 6	215 - 4
112 - 16	113 - 5	114 - 4	115 - 8	116 - 6	117 - 7	201 - 11	202 - 12	203 - 3	204 - 15	205 - 17
101 - 17	102 - 9	103 - 12	104 - 10	105 - 2	106 - 13	107 - 11	108 - 1	109 - 14	110 - 3	111 - 15

#	Companions:
1	Abruzzi rye @ 15 lb / A
2	Creeping Red Fescue @ 15 Lb / A "Shademaster II
3	C. Tinctoria @ 2.25 lb / A
4	Buckwheat @ 20 PLS / A
5	Birdsfoot trefoil @ 5 lb / A
6	Crimson Clover @ 8 PLS / A
7	Praire Clover @ 8 PLS / A
8	Hard Fescue @ 15 lb / A "Discovery"
9	Tall Fescue @ 15 lb / A "Coyote"

#	Companions:	
10	Basic mix alone	
11	Blue Grama and Buffalograss	25 & 10 PLS / A
12	Blue grama @ 15 PLS lb / A	"Hachita"
13	Buffalograss @ 30 PLS lb / A	"Cody" cert.
14	Hard Fescue @ 15 lb / A "Discovery"	
15	Tall Fescue @ 15 lb / A "Coyote"	
16	Creeping Red Fescue @ 15 Lb / A "Shademaster II	
17	Little Bluestem @ 10 PLS lb / A "Camper"	
18	Basic mix with -Intermed. P. Rye @ 15 lb / A "Transist"	

2001 Native Mix and Companion

SPRING PLANTING

Plot # - treatment

Planted 30 MAY 2002

<< Southgate Drive >>

TRC

309 - 6	310 - 9	311 - 2	312 - 12	313 - 13	314 - 8	315 - 1	316 - 14	317 - 16	318 - 18	101 - 17	103 - 12
308 - 7	307 - 10	306 - 11	305 - 4	304 - 3	303 - 15	302 - 5	301 - 17	218 - 18	217 - 1	216 - 2	215 - 4
203 - 3	204 - 15	205 - 17	206 - 9	207 - 7	208 - 10	209 - 8	210 - 16	211 - 13	212 - 5	213 - 14	214 - 6
202 - 12	201 - 11	118 - 18	117 - 7	116 - 6	115 - 8	114 - 4	113 - 5	112 - 16	111 - 15	110 - 3	109 - 14
TREAT #1	102	TREAT # 3	104 - 10	105 - 2	106 - 13	107 - 11	108 - 1				

#	Companions:
1	G. Millet @ 15 Lb / A
2	Creeping Red Fescue @ 15 Lb / A "Shademaster II
3	C. Tinctoria @ 2.25 lb / A
4	Buckwheat @ 20 PLS / A
5	Birdsfoot trefoil @ 5 lb / A
6	Crimson Clover @ 8 PLS/ A
7	Praire Clover @ 8 PLS / A
8	Hard Fescue @ 15 lb / A "SR 3100"
9	Tall Fescue @ 15 lb / A "SOUTHEAST"

#	Companions:
10	Basic mix alone
11	Blue Grama and Buffalograss
12	Blue grama @ 15 PLS lb /A
13	Buffalograss @ 30 PLS lb / A
14	Hard Fescue @ 15 lb / A "SR 3100"
15	Tall Fescue @ 15 lb / A "SOUTHEAST"
16	Creeping Red Fescue @ 15 Lb / A "Shademaster II
17	Little Bluestem @ 10 PLS lb / A "Camper"
18	Basic mix with -Intermed. P. Rye @ 15 lb /A "Transist"

25 & 10 PLS / A

"Hachita"

"Cody" cert.

11. CONCLUSION

11.1 Turfgrass Cultivar Evaluations

The trial data in this report are reflected in the updated VDOT Seed Specifications for Grasses and Legumes (Form RD-4). The next update will occur in 2003 when new data are collected from tall fescue, fine fescue, perennial ryegrass and Kentucky bluegrass variety trials. As mentioned in other reports, it is noted that in the Coastal Plain Region of Virginia, fine fescue will establish best if sown in the fall. Fine fescue tends to establish and persist better in the higher and colder regions of the Commonwealth. A blend of tall fescue and fine fescue produces a mix that is adaptable to a wider range of conditions than either component alone. It should be noted that orientation of slopes on a highway corridor often exhibit significantly different environments. The fine fescues and tall fescues have performed consistently and reliably for many years and the improved varieties should allow them to be successful under a broader range of conditions with less chemical input needed.

11.2 Native Grass Management Studies

Shorter native grasses like buffalograss, side oats grama, and little bluestem have not established as well as the "adapted" or "introduced" species like tall and fine fescue on difficult sites during the first years of establishment. Blue grama has established, in some summer trials, as well as other warm season grasses used by VDOT as companion species. Further trials of different cultivars of Blue grama should be planted to find if they are adapted for use in the Commonwealth. The use of companion plants is important to establish erosion control on the disturbed sites while the native plants establish themselves. The data [preliminary] shows that the adapted grasses will tend to out compete the natives for space and should be planted at the lowest rate needed to provide erosion control. Current research indicates that these shorter growing native grasses may be suitable for use along roadsides but the consistency and density of establishment must be greatly improved for them to even be considered as an option. **The overall goal is to use the optimum vegetation in a specific location [situation] to achieve the goals of soil stabilization, persistence and aesthetic quality.**

12. ACKNOWLEDGMENTS

This report is prepared in cooperation with the U.S. Department of Transportation, Federal Highway Authority and the Virginia Department of Transportation.

13. DISCLAIMER

“The contents of this report reflect the view of the Consultant who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the Virginia Department of Transportation. This report does not constitute a standard, specification or regulation.”

15. Addendum

RD 4 LIST VIRGINIA DEPARTMENT OF TRANSPORTATION -

SPECIFICATIONS FOR STANDARD AND NON-STANDARD SEED ITEMS

- I. Specifications for Standard Seed Items
- II. Specifications for Non-Standard Seed Items
- III. Sampling and Testing Procedures for In State and
Out of State Vendors

BOTANICAL NAME

RD 4 LIST *Coronilla varia*
Cynodon dactylon
Dactylis glomerata
Eragrostis curruia
**Festuca arundinacea*
**Festuca longifolia*
**Festuca ovina*
**Festuca rubra ssp. commutata*
**Festuca rubra ssp. rubra*
Hordeum vulgare
Lathyrus sylvestris
Lepedeza cuneata
Lolium multiflorum
Lotus corniculatus
**Poa pratensis*
Secale cereale
Setaria italica
Triticum aestivum
Trifolium repens

COMMON NAME

Crownvetch
Bermudagrass
Orchardgrass
Weeping Lovegrass
Tall Fescue
Fine Hard Fescue
Fine Sheep Fescue
Fine Chewings Fescue
Fine Creeping Red Fescue
Barley
Flat Pea
Serecia Lespedeza
Annual Ryegrass
Birdsfoot Trefoil
Kentucky Bluegrass
Rye (Winter Rye)
Foxtail Millet (German)
Wheat
White Dutch clover

***Certified Seed Required For These**

VIRGINIA DEPARTMENT OF TRANSPORTATION

1. SPECIFICATIONS FOR STANDARD SEED ITEMS

Kind and Cultivars	Min. Pure Seed %	Min. Germ. %	Min. Germ. Plus Hard Seed %	Weed Seed Not to Exceed %	<u>LIMITATIONS</u>
<u>Tall Fescue Cultivars:</u> Afa Eldorado Mustang Apache Empress Mustang II Arid Era Orygun Austin Falcon II Pacer Avanti FDM-91 Phonex AZTEC Finelawn Rebel II B4ENTF Finelawn 1 Rebel IIB4WSTF Finelawn 2 Rebel 3D Barcel Finelawn Petite Rebel Jr. Benton Georgia Safari Bonanza Georgia 5 Shenandoah Bonzai Guardian Shortstop Bonzai II Houndog5 Shortstop II Carefree Jaguar Silverado Chesapeake Jaguar3 Tradition Chieftain Kitty Hawk Vegas Cimarron Lexus Willamette Coyote Micro Winchester CRC Mini-Mustang Wrangler Crossfire Mojave Earthsave Monarch	98	90	--	0.25	<u>RES. NOX. WEEDSEEDS</u> Same As VA Seed Law <u>PROH. NOX. WEEDSEEDS</u> Same As VA Seed Law <u>LAWN & TURF REST. NOX</u> 10 Per ounce or 160 Per Pound
<u>Kentucky Bluegrass Cultivars:</u> Adelphi Glade Nustar Caliber J1555 South Dakota Columbia Kenblue Touchdown Eclipse Monopoly Victa Georgetown NJ-54	98	85	--	0.25	
<u>Fine Hard Fescue Cultivars:</u> Aurora Ecostar Pamela Spartan Biljart MB 82-93 Reliant SR3100 Brigade MED 32 Reliant II Valda Defiance Nordic Saxon Vernon Discovery Osprey Scaldis Waldina	98	85	--	0.25	

Kind and Cultivars	Min. Pure Seed %`	Min. Germ. %	Min. Germ. Plus Hard Seed %	Weed Seed Not to Exceed %	<u>LIMITATIONS</u>
<u>Fine Creeping Red Fescue Cultivars:</u> BAR UR 204 Ensylva PST-4DT Cindy Jasper PST-4ST Dover Pennlawn WX3-FFG6	98	85	--	0.25	
<u>Fine Chewings Fescue Cultivars:</u> Banner Jamestown II Tiffany BannerII Koket Treazure Banner III K-2 (MB65-93) TMI-3CE Bridgeport MB61-93 Victory Brittany Molinda Victory II Cascade NJF-93 WX3-FF54 Culumbra Sandpiper ECO (MB 63-93) Shadow ISI-FC-62 Shadow II Jamestown SR 5100	98	85	--	0.25	
<u>Fine Sheep Fescue Cultivars:</u> Azay, Azure Blue, Bighorn, Quatro	98	85	--	0.25	
Bermudagrass (2)	98	85	--	0.25	
Foxtail Millet (German)	98	85	--	0.25	
Annual Ryegrass	98	90	--	0.25	
<u>Rye (Winter Rye) Cultivars:</u> Abruzzi, Balboa	98	85	--	0.25	
Triticum aestivum Wheat	98	85	--	0.25	
Hordeum vulgare (Barley)	98	85	--	0.25	
Weeping Love Grass	98	85	--	0.25	
<u>Orchardgrass Cultivars:</u> (1), OG1A OG, Potomac, Shilo, Taos	90	85	--	0.50	
Sericea Lespedeza (2), (3)	98	40	75	0.50	↓

Kind and Cultivars	Min. Pure Seed %`	Min. Germ. %	Min. Germ. Plus Hard Seed %	Weed Seed Not to Exceed %	<u>LIMITATIONS</u>
<u>Crownvetch Cultivars: (3)</u> Chemung, Emerald, Penngift	98	36	71	0.25	↓
Flat Pea (3)	99	38	75	0.25	
White Dutch Clover (3)	99	80	90	0.25	
<u>Birdfoots Trefoil Cultivars: (3)</u> AuDewey, Empire, Norcen	98	60	80	0.50	

- (1) Virginia origin or approved cultivars.
- (2) **Spring**-Hulled, Fall-Unhulled
- (3) Seed must be inoculated with the appropriate strain and rate of bacteria. For hydroseeding, use a minimum of five times the dry seeding rate of inoculant.

III. SAMPLING PROCEDURE

A. Virginia Supplier

1. The supplier, prior to shipment, shall have the Virginia Department of Agricultural and Consumer Services seed inspector for the area draw samples for testing on all seed lots intended for purchase order deliveries to the Virginia Department of Transportation.
2. All seed lots shall be properly labeled and clearly identified by a lot number prior to sampling by the Virginia Department of Agriculture and Consumer Services seed inspector. The purchase order number, if known, shall be given to the inspector and shown on the test reports.
3. Test results on such samples will be reported to the Virginia Department of Transportation and to the supplier by the Virginia Department of Agriculture and Consumer Services.
4. Seed will not be accepted at any VDOT facility for delivery until the test results have been received and the seed is found to conform to the Virginia Seed Law, and the Virginia Department of Transportation's RD-4 seed specifications and bear a valid green tag. Seed in open bags, seed bags that do not have an attached and valid Green Tag, or bags with expired green tags will not be accepted.

B. Out-Of-State Suppliers

1. Seed will not be accepted for delivery until seed lots have been found to meet the Virginia Department of Transportation's seed specifications and bear the green tag.

2. At the time of shipment, the Virginia Department of Agriculture and Consumer Services, Seed Laboratory, One North 14th Street, Room 238, Telephone – (804) -786-8795, Richmond, Virginia, 23219, shall be notified.

At the point of delivery to a non-VDOT facility, all lots will be subject to sampling and testing by the Virginia Department of Agriculture and Consumer Services. Seed will not be accepted at any VDOT facility for delivery until the test results have been received and the seed is found to conform to the Virginia Seed Law, and the Virginia Department of Transportation's RD-4 seed specifications and bear a valid green tag. Seed in open bags or bags with expired green tags will not be accepted.

3. The results of tests by the Virginia Department of Agriculture and Consumer Services will take precedence over tests performed by others. All seeds are subject to sampling and testing by the Virginia Department of Agriculture and Consumer Services and/or certified VDOT personnel whose decision shall be final. Seed tests shall have been completed within a 9-month period, exclusive of the calendar month in which the test was completed, prior to the delivery date.

4. The labels and seed(s) must conform to these specifications and all Federal and State laws, rules and regulations.

No prohibited noxious-weed seeds, as defined by the rules and regulations adopted for enforcement of the Virginia Seed Laws, will be permitted; i.e., Canada Thistle, Field Bindweed, Quackgrass, Johnsongrass, Plumeless Thistle, etc. Restricted noxious-weed seeds shall not exceed the number per ounce or per pound of such noxious-weed seeds specified in such rules and regulations.

SEED SAMPLE REPORT
FOR SEED SAMPLED OUT OF VIRGINIA FOR USE BY
THE VIRGINIA DEPARTMENT OF TRANSPORTATION

Kind and Variety of Seed: _____

Lot Number: _____

Control Number (supplied by compliance official) _____

Number of Bags Represented by the Sample: _____ Weight per Bag: _____

Number of Bags Sampled: _____ Pounds Represented by the Sample: _____

Shipper=s Name: _____

Complete Mailing Address: _____

Shipper=s Telephone Number: _____

Virginia Receiver=s Name: _____

Complete Mailing Address: _____

I _____, as an employee of the _____,
Compliance Official's Name State Seed Enforcement Agency

certify that I have sampled the above represented seed lot using sampling procedures approved by the Association of Official Seed Analysts or the Seed Control Official of my state and have personally sealed the sample for shipment to the Virginia Department of Agriculture & Consumer Services= Seed Laboratory.

Attach Seed Label Here:

Signature of Compliance Official

Title

IT IS THE POLICY OF THE VDACS SEED LABORATORY TO USE AOSA TESTING PROCEDURES AND NOT TO PROVIDE TEST RESULTS THAT MIGHT VIOLATE THE RIGHTS OF ANY UTILITY PATENT HOLDER OR THE RIGHTS OF ANY CERTIFICATE OWNER PROTECTED UNDER THE U. S. PLANT VARIETY PROTECTION ACT.

I HAVE READ AND UNDERSTAND THE INFORMATION PRESENTED ON THIS SAMPLE REQUEST FORM. I UNDERSTAND THAT I WILL BE RESPONSIBLE FOR ALL CHARGES FOR THE REQUESTED TEST.

SHIPPER'S SIGNATURE

DATE