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Research Project Title: Roadside Development and Management Field Laboratory: Erosion Control Material Testing

16. Abstract

Storm water management issues facing the Texas Department of Transportation (TxDOT) in the late 1980s led to the development of a coordinated research program. The researchers developed methodologies for evaluating the field performance of the department's most pressing needs; the Hydraulics and Erosion Control Laboratory was designed and constructed.

The objectives of the erosion control research are to determine the effectiveness of erosion control products on various application areas typically located in the highway environment, such as slopes and channels. The researchers collected data about the effectiveness or field performance characteristics during one growing season (March-November) and statistically analyzed the data. Product effectiveness data include vegetative density coverage and sediment loss measurements based upon soil type and slope condition. Results for the current year support the TxDOT's Standard Specifications for Soil Retention Blankets (Erosion-Control Blankets and Channel Liners) and Hydraulic Mulches with an *Annual List of Approved Materials.*

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THE 1995 PERFORMANCE RESULTS FOR SLOPE PROTECTION PRODUCTS, HYDRAULIC MULCHES, AND FLEXIBLE CHANNEL LINERS

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Report 1914-5
Project Number 7-1914
Research Project Title: Roadside Development and Management Field Laboratory: Erosion Control Material Testing

Sponsored by the
Texas Department of Transportation

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ACKNOWLEDGMENTS

The authors would like to thank Mr. Paul Northcutt and the Texas Department of Transportation for their help in the preparation of this report and the final field performances.

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INTRODUCTION

Since 1991, an annual evaluation of erosion control products has been conducted at the Hydraulics and Erosion Control Field Laboratory. Data on two specific field performance characteristics of vegetation surface coverage and sediment loss are collected and analyzed. TxDOT uses the data to develop the *Approved Products List* and to develop standard installation detail sheets as construction document inserts. The *Approved Product List* is revised. For further details on the facility and test procedures, see "Procedures and Evaluation Criteria for Erosion-Control Blankets, Flexible Channel Lining Materials", and "Hydraulically-Applied Mulch Products," published by the Texas Transportation Institute, March 1996.

Table 1. 1:2 Clay Product Performance 1998 Evaluation Cycle Only.

No.	Product Name	Year	Slope	Soil	Sediment Loss (cm)	Vegetation Density (%)
1	Futerra	1998	1:2	Clay	0.29	90.83
2	Formula 480 Liquid Clay				0.31	86.38
3	North American Green S150 BN				0.32	95.92
4	Pennzsuppress				0.33	83.96
5	EcoAegis				0.36	82.33
6	K-Mat				0.37	85.66
7	EnviroGuard Plus				0.38	81.41

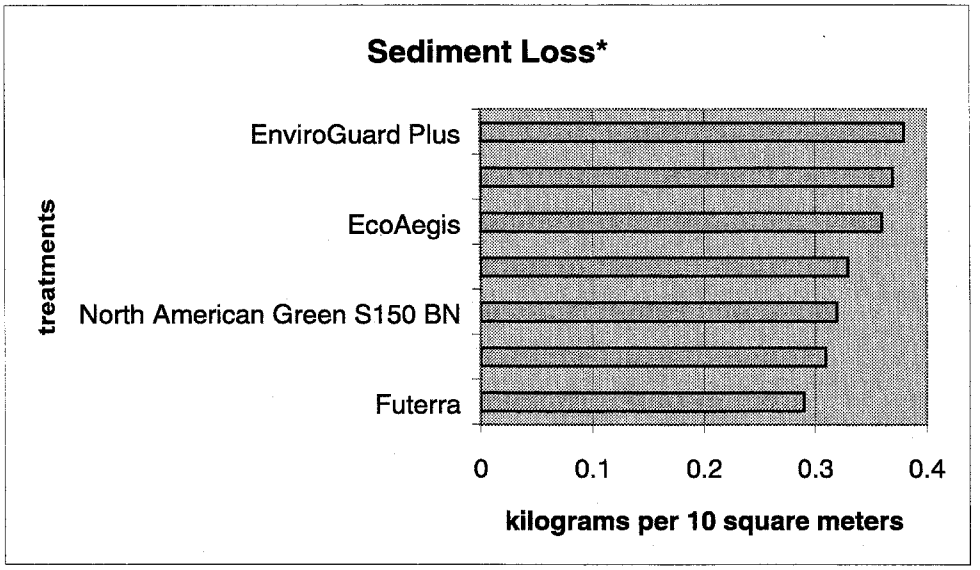

Figure 1. 1:2 Clay Sediment Loss Results.

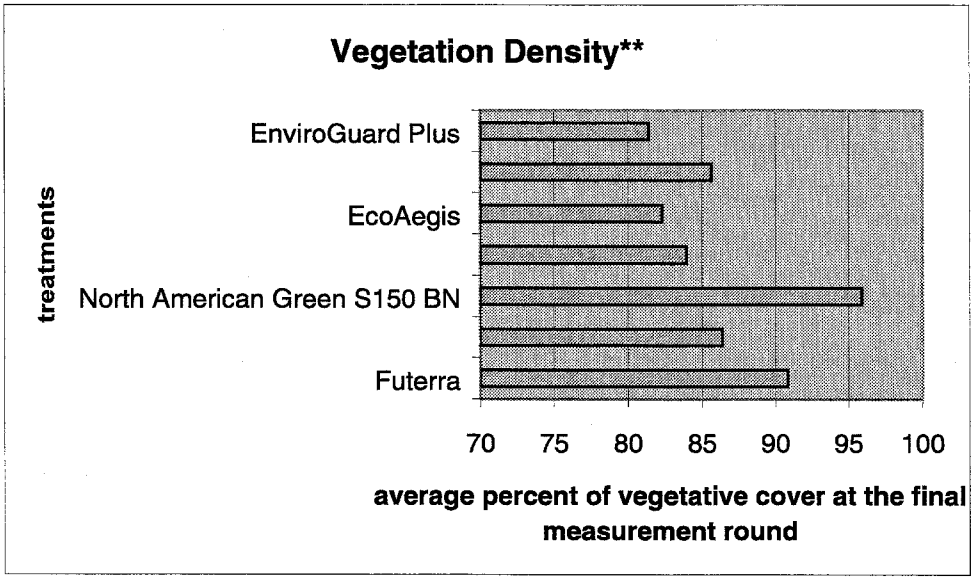

Figure 2. 1:2 Clay Vegetative Density Results.

*maximum allowable sediment loss = 0.34
**minimum vegetative density required = 80%

Table 2. 1:2 Sand Product Performance 1998 Evaluation Cycle Only.

No.	Product Name	Year	Slope	Soil	Sediment Loss (cm)	Vegetation Density (%)
1	Landlok TRM 435	1998	1:2	Sand	23.38	72.57
2	Futerra				23.76	75.17
3	BonTerra ENCS2				24.43	82.76
4	ECS High Velocity Straw Mat				25.14	76.85
5	North American Green S150 BN				25.40	76.48
6	Formula 480 Liquid Clay				26.24	68.85
7	North American Green S75				26.42	68.91
8	EnviroGuard Plus				27.42	73.38
9	K-Mat				28.94	64.66
10	EcoAegis				29.98	81.01

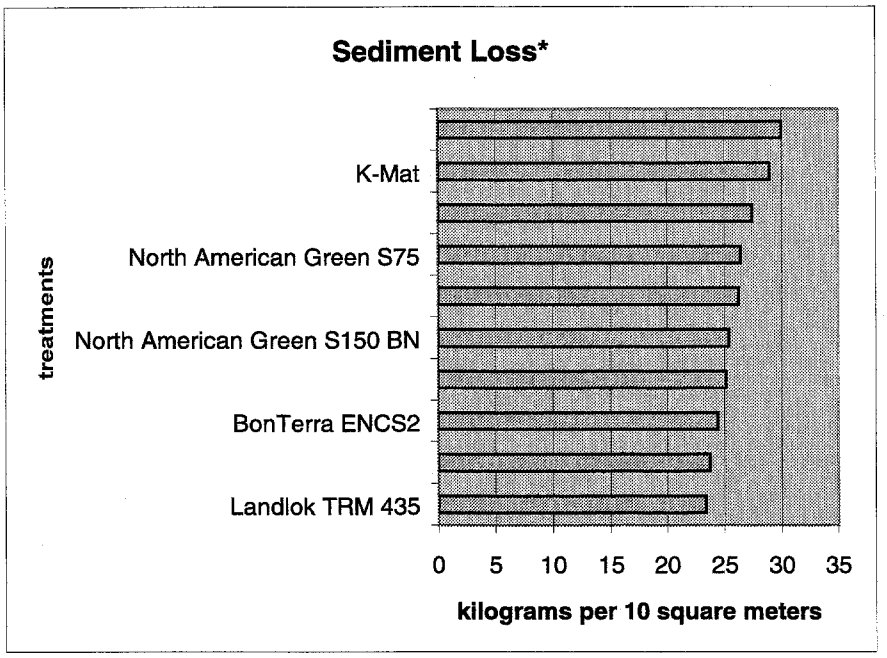

Figure 3. 1:2 Sand Sediment Loss Results.

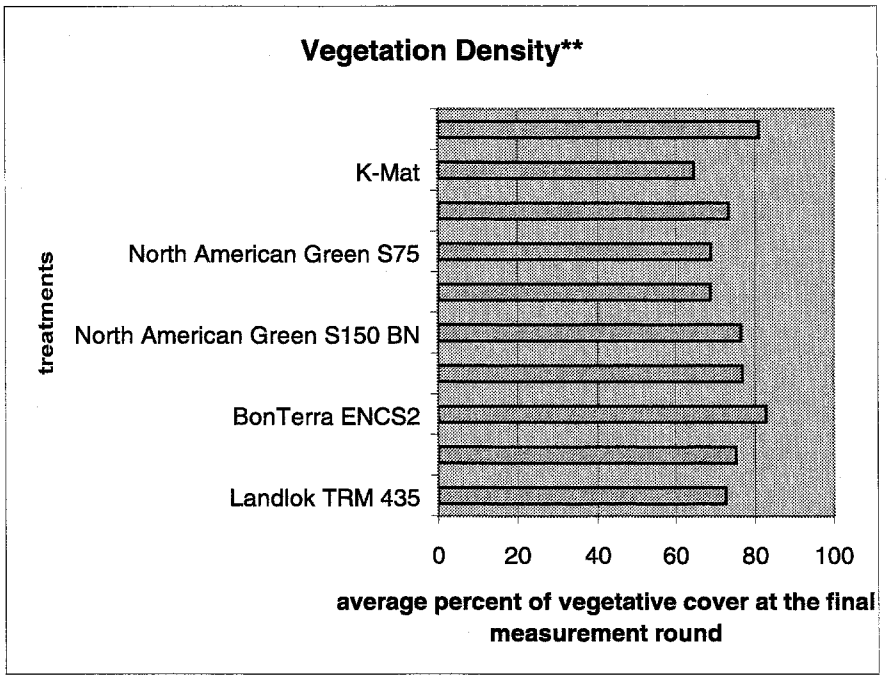

Figure 4. 1:2 Sand Vegetation Density Results.

*maximum allowable sediment loss = 26.84
**minimum vegetative density required = 70%

Table 3. 1:3 Clay Product Performance 1998 Evaluation Cycle Only.

No.	Product Name	Year	Slope	Soil	Sediment Loss (cm)	Vegetation Density (%)
1	Futerra	1998	1:3	Clay	0.27	87.79
2	North American Green S75 BN				0.31	86.81
3	K-Mat				0.32	57.04
4	EnviroGuard Plus				0.32	82.00

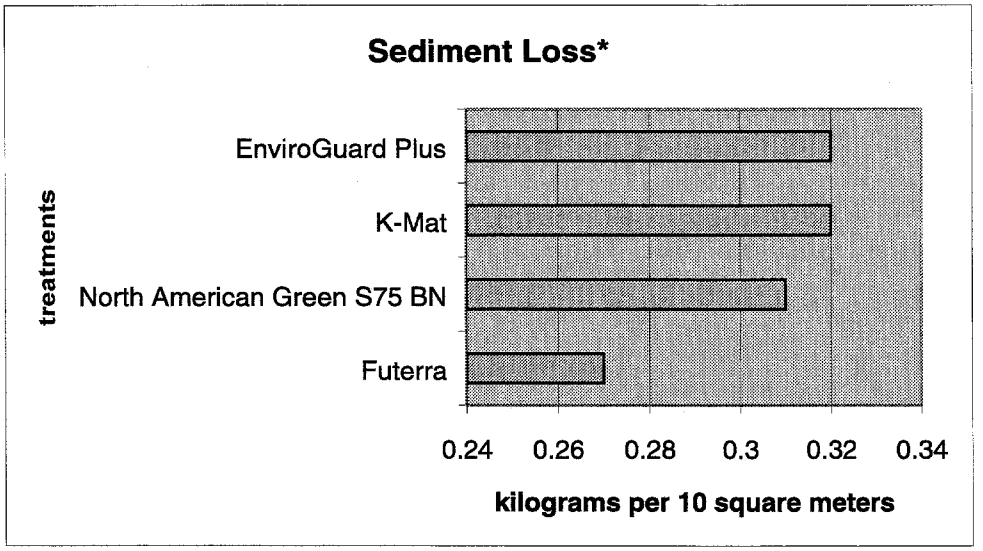

Figure 5. 1:3 Clay Sediment Loss Results.

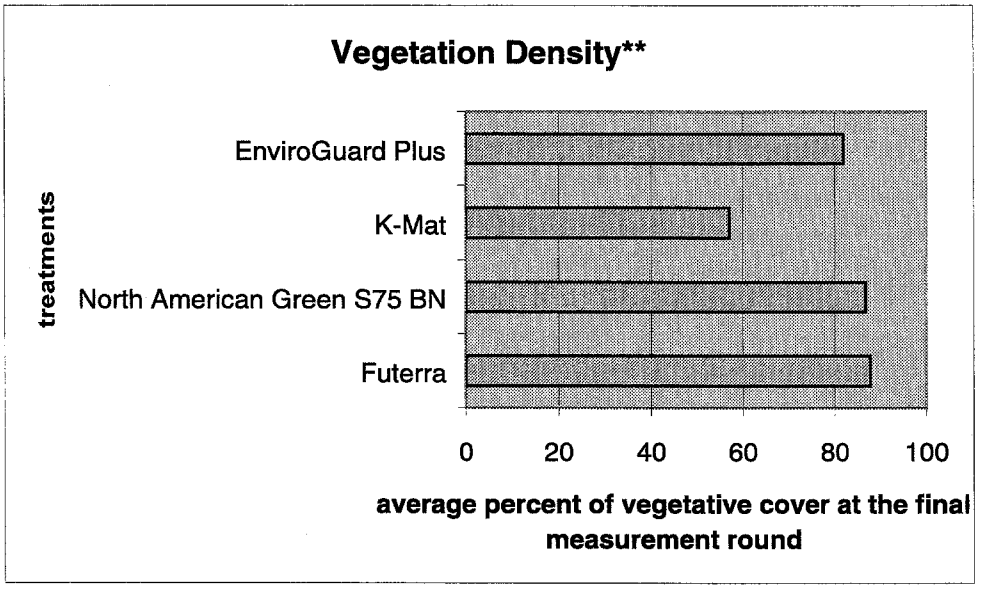

Figure 6. 1:3 Clay Vegetation Density Results.

*maximum allowable sediment loss = 0.34
**minimum vegetative density required = 80%

Table 4. 1:3 Sand Product Performance 1998 Evaluation Cycle Only.

No.	Product Name	Year	Slope	Soil	Sediment Loss (cm)	Vegetation Density (%)
1	Futerra	1998	1:3	Sand	11.19	72.17
2	North American Green S75 BN				11.44	75.55
3	EcoAegis				11.93	71.75
4	EnviroGuard Plus				12.04	50.74
5	K-Mat				12.14	65.21

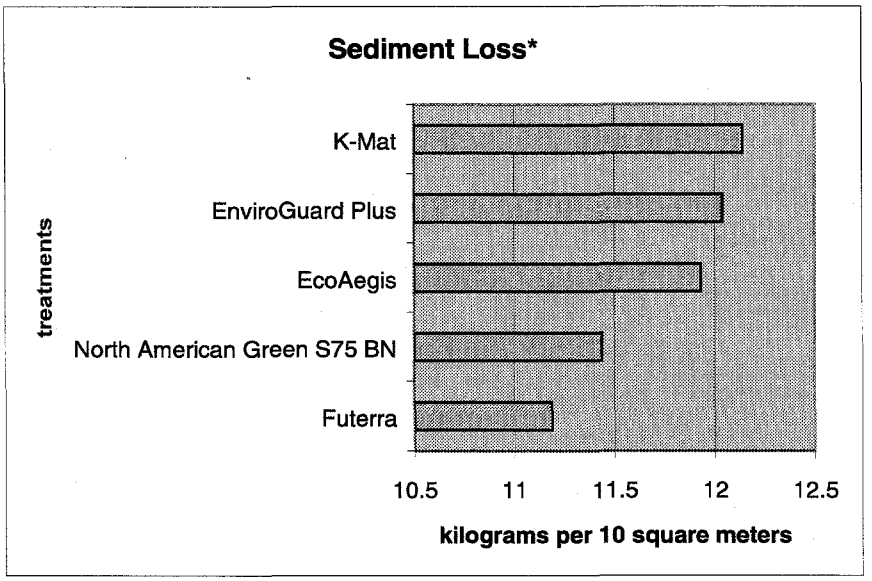

Figure 7. 1:3 Sand Sediment Loss Results.

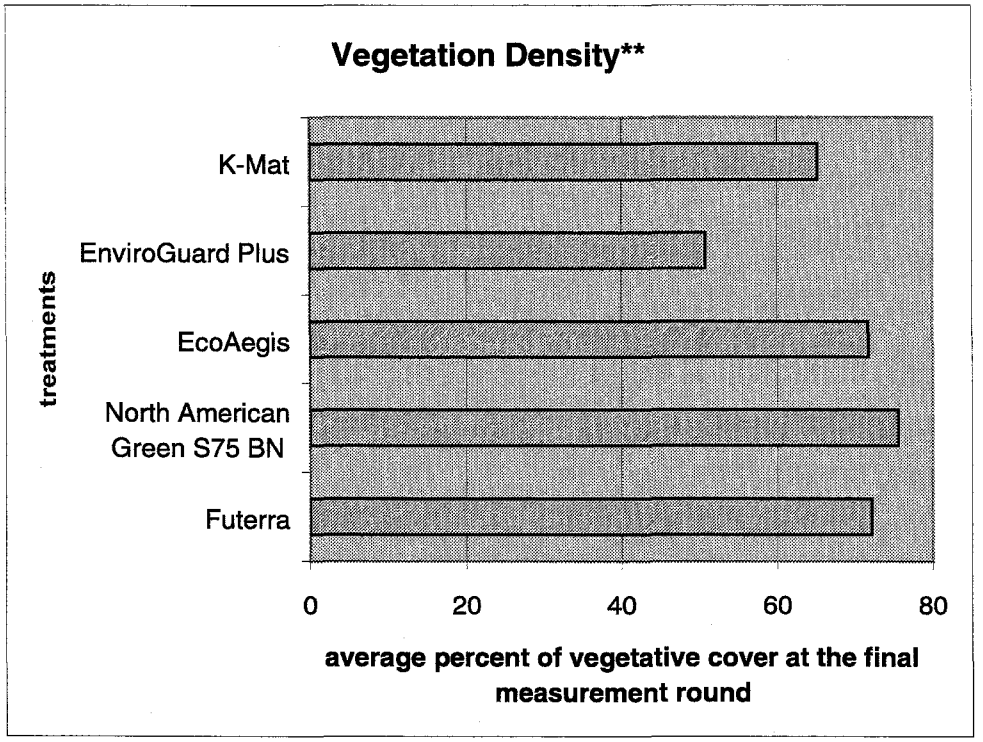

Figure 8. 1:3 Sand Vegetation Density Results.

*maximum allowable sediment loss = 12.20
**minimum vegetative density required = 70%

Table 5. Mulch Results Final Vegetation Density.

No.	Product Name	Year	Slope	Soil	Vegetation Density (%)
1	Evercycle Hydro-Mulch	1998	1:3	Clay	84.33
2	Lay-Low Mulch				81.91
3	Pennzsuppress				81.34

No.	Product Name	Year	Slope	Soil	Vegetation Density
1	Pennzsuppress	1998	1:3	Sand	89.60
2	Lay-Low Mulch				76.47
3	Evercycle Hydro-Mulch				64.66

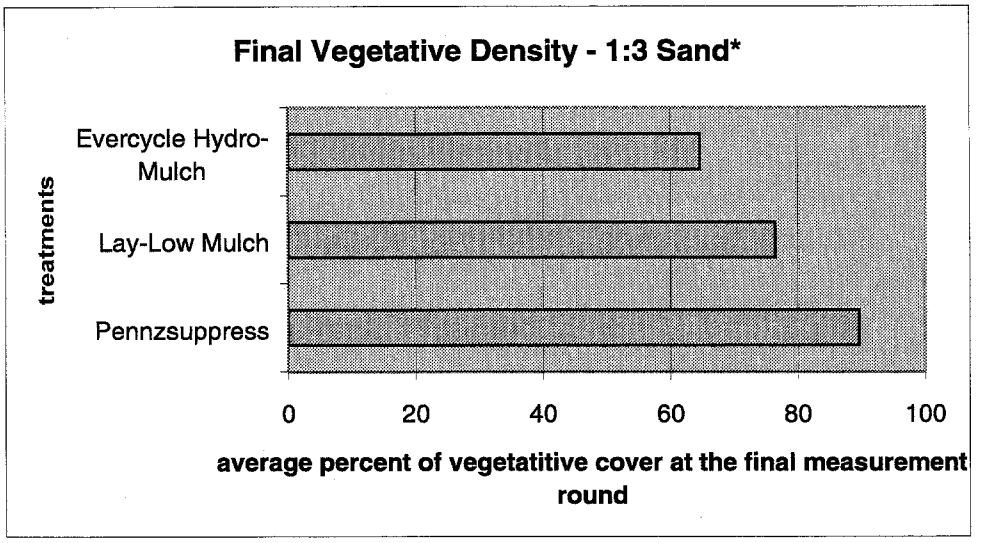

Figure 9. 1:3 Sand Final Vegetative Density.

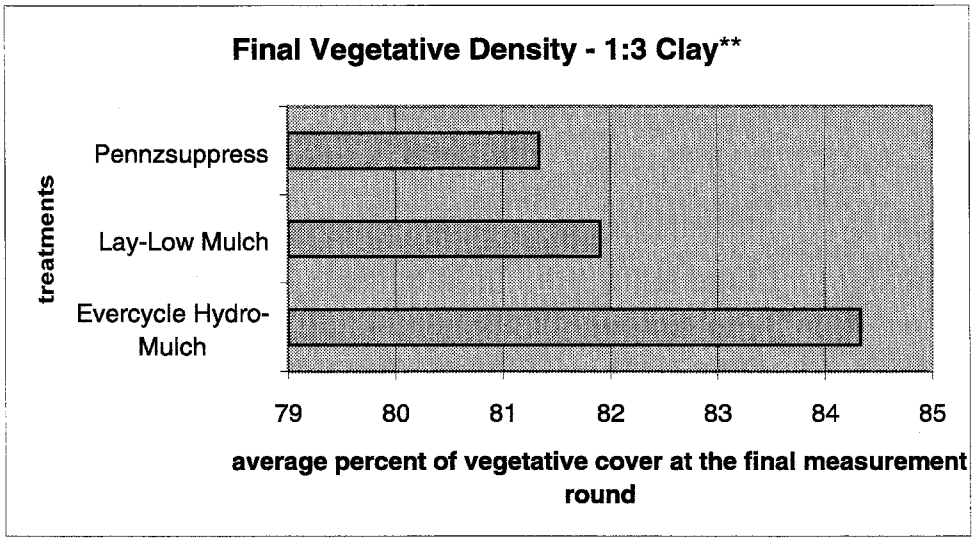

Figure 10. 1:3 Clay Final Vegetative Density.

*minimum vegetative density required = 60%
**minimum vegetative density required = 70%

Table 6. Product Performance 1998 Evaluation Cycle Only.

Cycle	No.	Product Name	Average Sediment Loss (cm)	Final Vegetative Density (%)
1998	1	BonTerra CP2	0.64	78.98
	2	North American Green P350	0.79	80.85
	3	Grass Mat	0.87	66.66
	4	ECS High Velocity Straw Mat	0.90	82.55
	5	Landlok TRM 435	0.92	72.11
	6	Greenstreak PEC-MAT	Passed in 1995	
	7	BonTerra EcoNet ENC2	1.00	89.50
	8	Curlex Channel Enforcer II	1.01	82.65
	9	Permamat 150F	1.04	68.02

Shear Stress Range 0–96 Pascal Flows (0–2 lbs/sq ft)

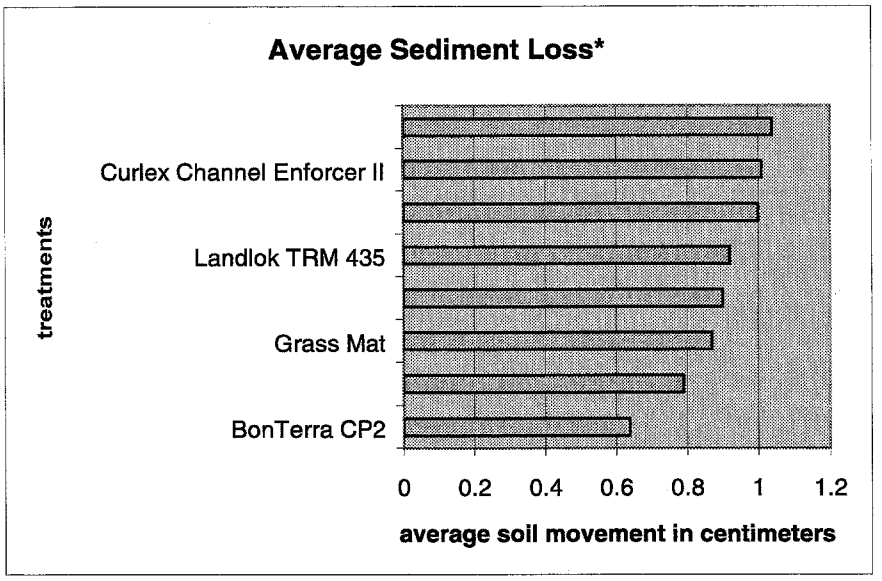

Figure 11. 0–96 Pascal Flows Average Sediment Loss Results.

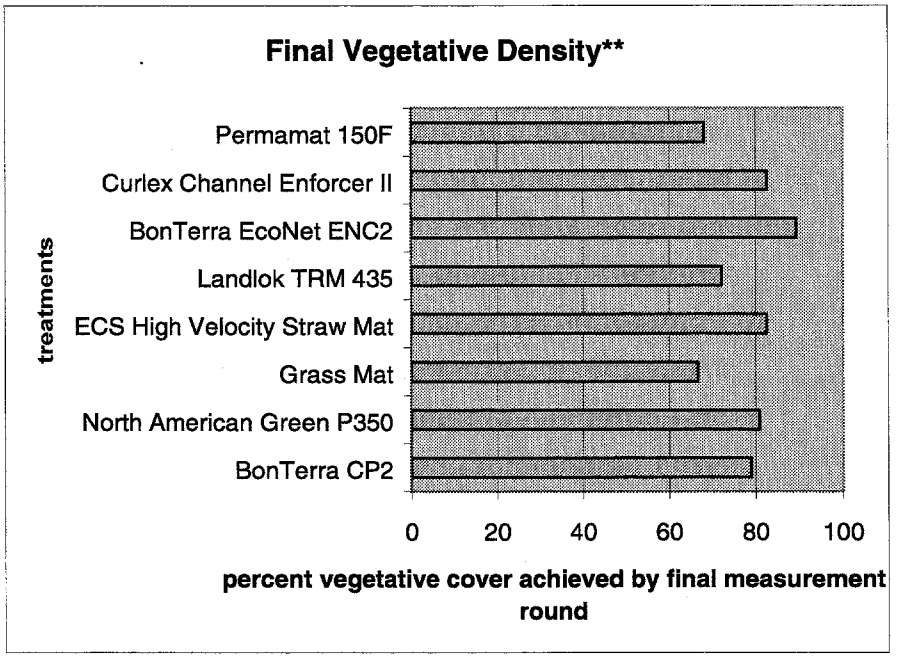

Figure 12. 0–96 Pascal Flows Final Vegetative Density Results.

*maximum allowable sediment loss = 1.15
**minimum vegetative density required = 70%

Table 7. Product Performance 1998 Evaluation Cycle Only.

Cycle	No.	Product Name	Average Sediment Loss (cm)	Final Vegetative Density (%)
1998	1	North American Green P350	0.82	80.85
	2	BonTerra CP2	0.85	78.98
	3	ECS High Velocity Straw Mat	0.86	82.55
	4	BonTerra EcoNet ENC2	0.92	89.5
	5	Curlex Channel Enforcer II	0.95	82.65
	6	Landlok TRM 435	0.97	72.11
	7	Permamat 150F	0.98	68.02
	8	Grass Mat	1.09	66.66

Shear Stress Range – 0 – 192 Pascal Flows (0 – 4 lbs / sq ft)

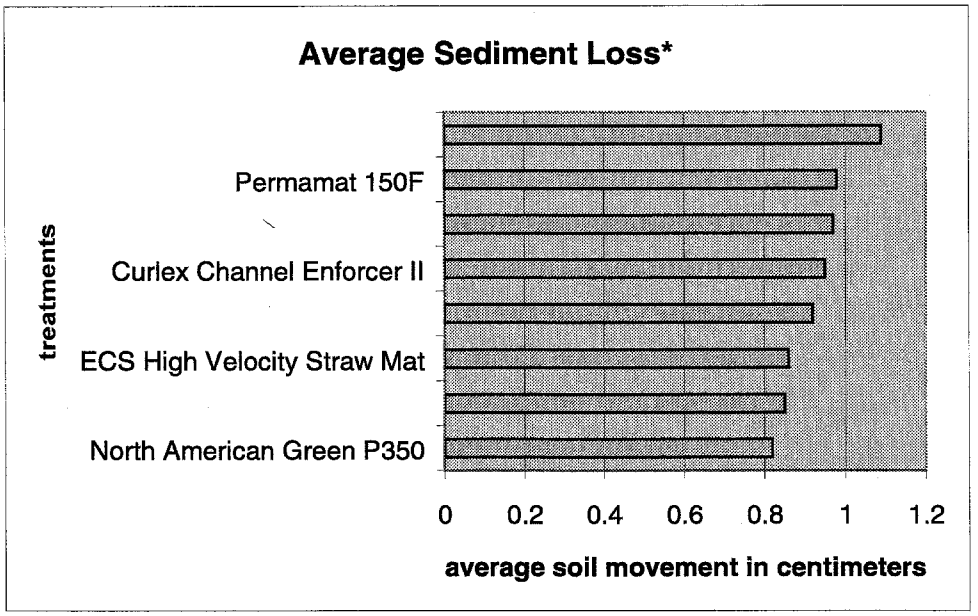

Figure 13. 0–192 Pascal Flows Average Sediment Loss Results.

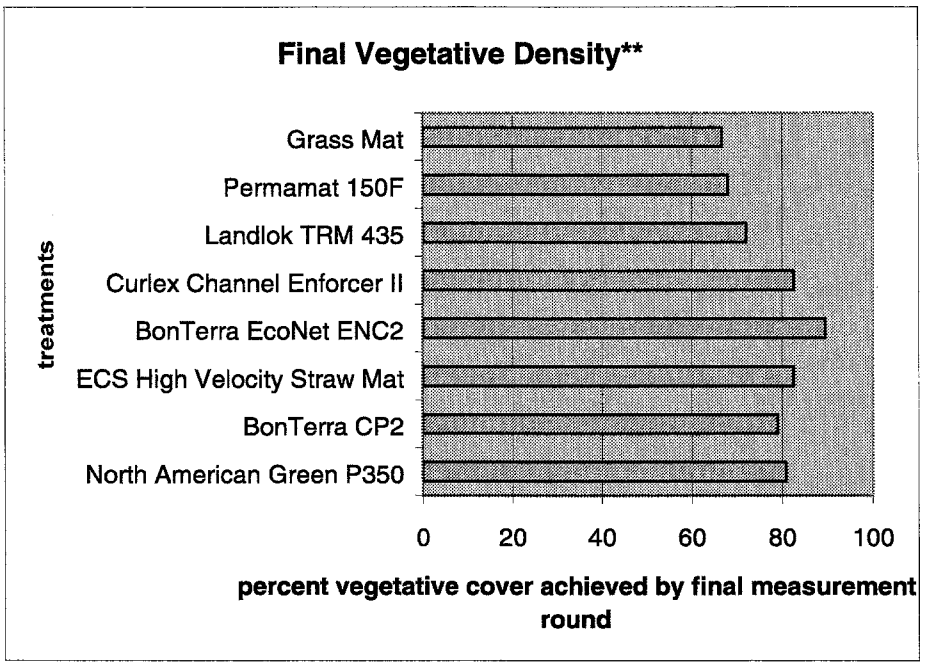

Figure 14. 0–192 Pascal Flows Final Vegetative Density Results.

*maximum allowable sediment loss = 1.00
**minimum vegetative density required = 70%

Table 8. Product Performance 1998 Evaluation Cycle Only.

Cycle	No.	Product Name	Average Sediment Loss (cm)	Final Vegetative Density (%)
1998	1	BonTerra CP2	0.77	78.98
	2	North American Green P350	0.80	80.85
	3	Landlok TRM 435	0.81	72.11
	4	Permamat 150F	0.91	68.02
	5	Curlex Channel Enforcer II	0.97	82.65
	6	Greenstreak PEC-MAT	Passed in 1995	

Shear Stress Range – 0 – 287 Pascal Flows (0 – 6 lbs / sq ft)

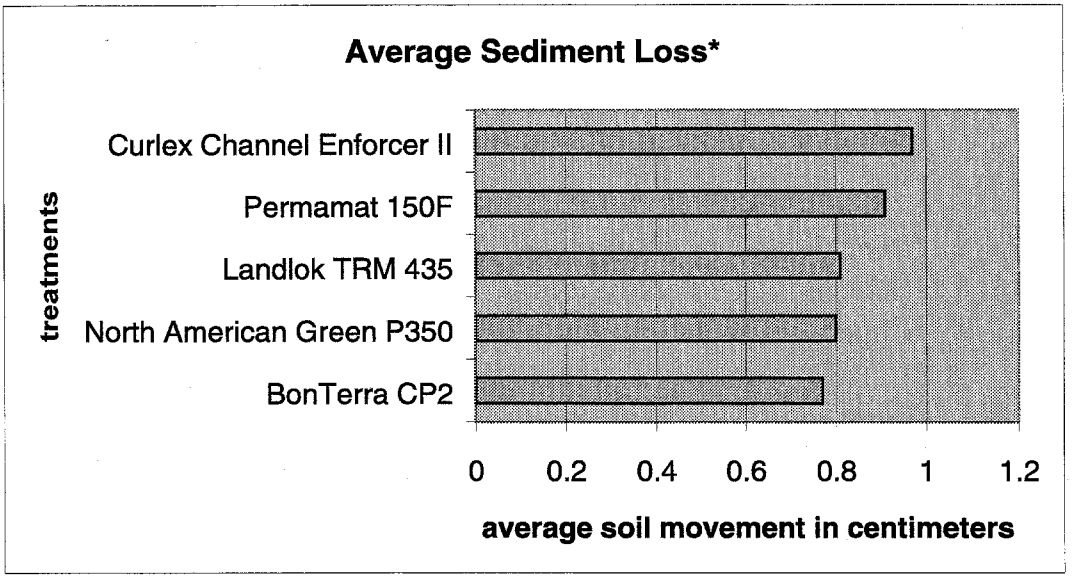

Figure 15. 0–287 Pascal Flows Average Sediment Loss Results.

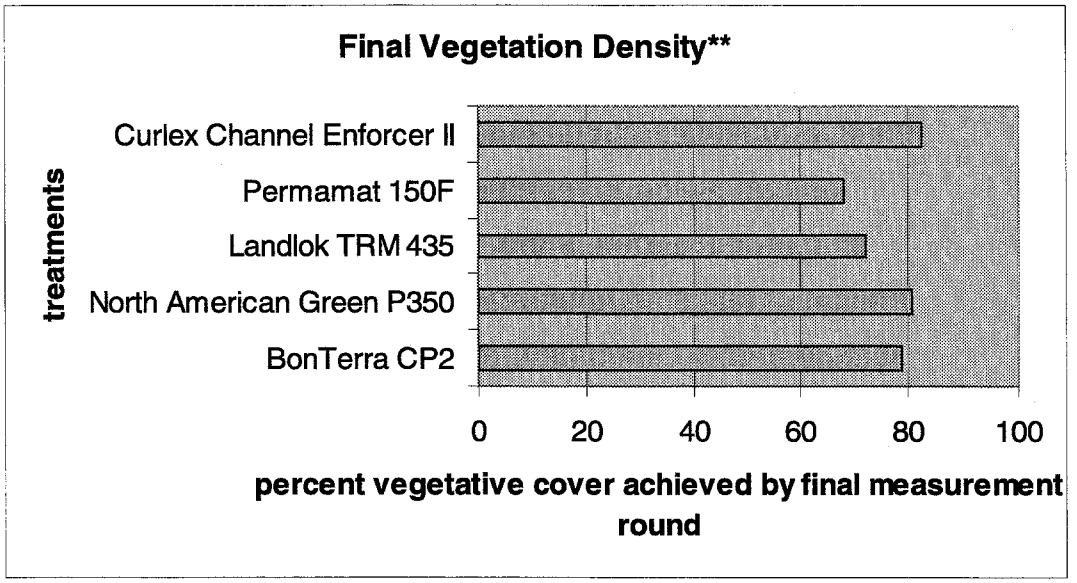

Figure 16. 0–287 Pascal Flows Final Vegetation Density Results.

*maximum allowable sediment loss = 1.00
**minimum vegetative density required = 70%

Table 9. Product Performance 1998 Evaluation Cycle Only.

Cycle	No.	Product Name	Average Sediment Loss (cm)	Final Vegetative Density (%)
1998	1	Landlok TRM 435	0.71	72.11
	2	North American Green P350	0.77	80.85
	3	Permamat 150F	0.84	68.02
	4	BonTerra CP2	0.84	78.98
	5	Greenstreak PEC-MAT	0.88	70.85
	6	Curlex Channel Enforcer II	0.90	82.65

Shear Stress Range – 0 – 383 Pascal Flows (0 – 8 lbs / sq ft)

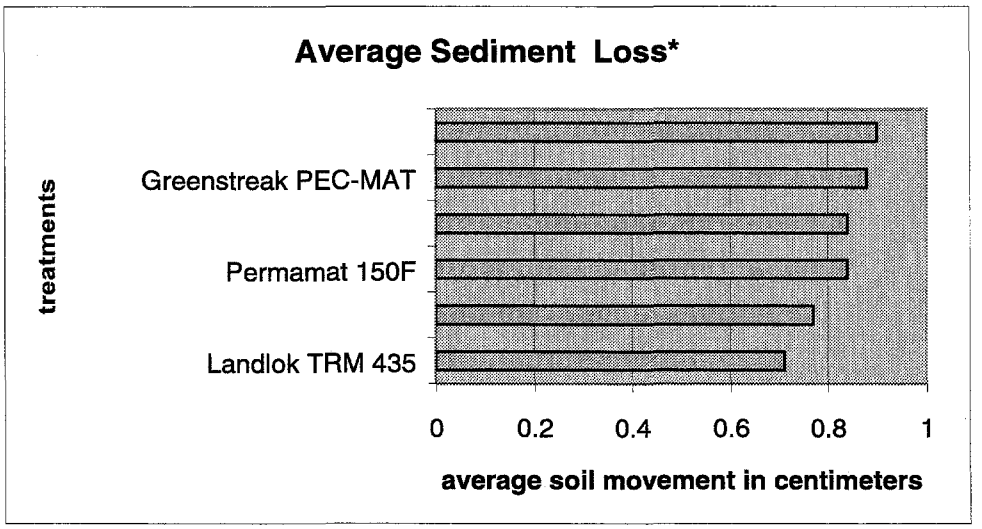

Figure 17. 0–383 Pascal Flows Average Sediment Loss Results.

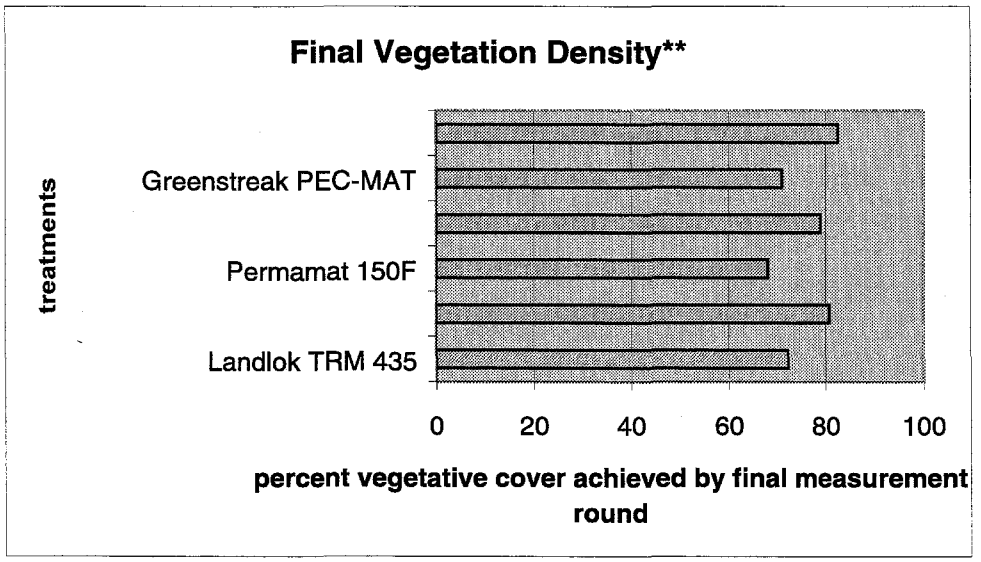

Figure 18. 0–383 Pascal Flows Final Vegetation Density Results.

*maximum allowable sediment loss = 0.80
**minimum vegetative density required = 70%

Table 10. Minimum Performance Standards.

Specification Pay Item	Class	Type	Site Conditions	Maximum Sediment Loss (cm)	Minimum Vegetation Density
169 "Soil Retention Blanket"	1 "Slope Protection"	A	Slopes 1:3 or Flatter - Clay Soil	0.34	80%
		B	Slopes 1:3 or Flatter - Sand Soil	12.20	70%
		C	Slopes Steeper than 1:3 - Clay Soil	0.34	80%
		D	Slopes Steeper than 1:3 - Sand Soil	26.84	70%
169 "Soil Retention Blanket"	2 "Flexible Channel Liner"	E	Shear Stress Range 0 - 96 Pa	1.15	70%
		F	Shear Stress Range 0 - 192 Pa	1.00	70%
		G	Shear Stress Range 0 - 287 Pa	1.00	70%
		H	Shear Stress Range 0 - 383 Pa	0.80	70%
164 Seeding for Erosion Control"	3 "Cellulose Fiber Mulch"	N/A	Clay or Tight Soil	N/A	70%
		N/A	Sand or Loose Soil	N/A	60%

In order for a soil retention blanket or cellulose fiber mulch to be placed upon TxDOT's official Approved Product List (APL) and be eligible for use within TxDOT's construction and/or maintenance activities, the product must meet or exceed the above performance standards through formal testing at the TxDOT/TTI Hydraulics and Erosion Control Laboratory located on the Riverside Campus of Texas A&M University, College Station, Texas.

TxDOT reserves the right to revise any of the above performance standards based upon a statistical review of the performance data, as received from a completed evaluation cycle at the TxDOT/TTI Hydraulics and Erosion Control Laboratory.

Complete product performance data and TxDOT's current *Approved Product List* (APL) may be viewed on TxDOT's Internet home page by pointing your browser to http://www.dot.state.tx.us, clicking on the "Business" button, then clicking on "Material Information," then clicking on "Field Performance of Erosion Control Products."

Printed copies of the latest final performance report and the APL are also available through Mr. Paul Northcutt, Texas Department of Transportation, Maintenance Division, 125 E. 11th Street, Austin, TX 78701-2483; telephone (512) 416-3091, fax (512) 416-3944, e-mail: pnorth@dot.state.tx.us.

Table 11. Riverside Campus Weather Data March 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
3/1/98	60	60	31	99	13	13			
3/2/98	61	61	38	100	29	13			
3/3/98	62	60	41	82	31	9			
3/4/98	63	73	53	100	74	20			
3/5/98	64	82	57	100	56	14			
3/6/98	65	56	52	100	78	11			
3/7/98	66	60	53	100	96	16	0.04		
3/8/98	67	57	40	100	56	28	0.04		
3/9/98	68	52	34	88	37	18			
3/10/98	69	52	31	94	20	12			
3/11/98	70	61	34	63	22	12			
3/12/98	71	46	36	100	39	10	0.06		
3/13/98	72	57	43	100	81	11	0.09		
3/14/98	73	63	52	100	100	14	0.14		
3/15/98	74	67	61	100	92	19	0.01		
3/16/98	75	73	55	100	55	22	1		
3/17/98	76	71	53	100	44	15			
3/18/98	77	82	55	100	33	11			
3/19/98	78	66	45	100	43	29	0.02		
3/20/98	79	59	40	95	46	20			
3/21/98	80	64	39	100	30	10			
3/22/98	81	72	40	100	27	6			
3/23/98	82	80	48	94	34	14			
3/24/98	83	80	53	100	54	17			
3/25/98	84	79	62	100	52	17			
3/26/98	85	79	66	100	53	22			
3/27/98	86	79	65	100	64	17	0.18		
3/28/98	87	82	68	100	55	18			
3/29/98	88	84	69	100	43	18			
3/30/98	89	84	59	100	59	19	0.5		
3/31/98	90	72	52	100	27	14			
Mar-98.	**TOTAL**						2.08	**inches**	

Table 12. Riverside Campus Weather Data April 1998.

date	day	hi temp	Low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
4/1/98	91	81	48	85	22	7			
4/2/98	92	73	50	100	62	7			
4/3/98	93	78	57	100	26	16			
4/4/98	94	72	48	95	37	11			
4/5/98	95	76	50	100	47	13			
4/6/98	96	75	54	100	65	15			
4/7/98	97	88	68	100	27	10			
4/8/98	98	81	61	100	18	17	0.02		
4/9/98	99	74	51	95	31	14			
4/10/98	100	78	49	100	29	10			
4/11/98	101	82	51	100	30	16			
4/12/98	102	79	61	93	51	21			
4/13/98	103	83	67	100	68	15			
4/14/98	104	84	69	100	56	13			
4/15/98	105	80	71	100	81	10			
4/16/98	106	79	66	100	40	17			
4/17/98	107	69	58	67	44	15			
4/18/98	108	70	57	97	52	12			
4/19/98	109	77	48	100	33	8			
4/20/98	110	80	52	100	37	11			
4/21/98	111	72	56	100	34	16	0.47		
4/22/98	112	77	47	100	26	12			
4/23/98	113	81	49	100	24	7			
4/24/98	114	84	59	100	40	20			
4/25/98	115	81	61	100	54	18			
4/26/98	116	73	66	100	86	10	0.36		
4/27/98	117	70	60	100	83	14	1.22		
4/28/98	118	67	54	100	59	13			
4/29/98	119	73	53	97	41	13			
4/30/98	120	83	52	100	36	10	0.5		
Apr-98. TOTAL							2.57	**inches**	

Table 13. Riverside Campus Weather Data May 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
5/1/98	121	87	57	82	40	22			
5/2/98	122	87	58	100	49	14	0.02		
5/3/98	123	82	68	100	60	10			
5/4/98	124	87	60	91	51	10			
5/5/98	125	81	69	100	81	14			
5/6/98	126	91	72	100	54	13			
5/7/98	127	97	70	100	33	12			
5/8/98	128	92	72	100	41	19			
5/9/98	129	92	70	100	17	17			
5/10/98	130	86	62	92	36	10			
5/11/98	131	91	62	98	42	14			
5/12/98	132	89	69	100	49	13			
5/13/98	133	83	70	100	75	13			
5/14/98	134	87	76	100	72	13			
5/15/98	135	87	75	99	59	12			
5/16/98	136	85	73	100	80	7			
5/17/98	137	92	66	100	40	10			
5/18/98	138	92	66	100	38	13			
5/19/98	139	92	63	100	36	13			
5/20/98	140	91	70	100	46	11			
5/21/98	141	92	72	95	46	11			
5/22/98	142	93	72	99	45	13			
5/23/98	143	89	73	98	55	13			
5/24/98	144	92	74	100	51	15			
5/25/98	145	92	75	100	54	12			
5/26/98	146	92	76	100	54	12			
5/27/98	147	94	69	100	39	7	0.06		
5/28/98	148	97	72	100	35	8			
5/29/98	149	98	73	100	37	8			
5/30/98	150	97	73	100	39	7			
5/31/98	151	100	73	100	35	11			
May-98. TOTAL							0.08	**inches**	

Table 14. Riverside Campus Weather Data June 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
6/1/98	152	99	73	100	29	10			
6/2/98	153	99	74	100	35	15			
6/3/98	154	98	80	98	42	16			
6/4/98	155	97	80	100	52	15			
6/5/98	156	91	70	100	65	12			
6/6/98	157	78	64	100	48	13			
6/7/98	158	89	64	100	48	13			
6/8/98	159	94	77	99	54	19			
6/9/98	160	96	77	100	42	13			
6/10/98	161	96	79	99	51	19			
6/11/98	162	94	79	100	36	15			
6/12/98	163	97	80	100	46	16			
6/13/98	164	100	79	100	36	15			
6/14/98	165	105	78	99	21	15			
6/15/98	166	101	76	100	48	13	0.02		
6/16/98	167	100	73	84	37	13			
6/17/98	168	98	80	100	43	18			
6/18/98	169	99	82	96	42	14			
6/19/98	170	99	81	100	45	17			
6/20/98	171	100	80	99	39	17			
6/21/98	172	101	79	100	36	16			
6/22/98	173	99	77	100	36	14			
6/23/98	174	99	77	100	32	13			
6/24/98	175	99	77	100	36	14			
6/25/98	176	100	76	100	34	11			
6/26/98	177	98	77	96	46	14			
6/27/98	178	98	81	97	46	19			
6/28/98	179	94	80	100	57	12	0.37		
6/29/98	180	95	75	100	54	16	0.05		
6/30/98	181	98	79	100	40	12	0.09		
Jun-98.	**TOTAL**						0.53	**inches**	

Table 15. Riverside Campus Weather Data July 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
7/1/98	182	100	79	100	40	12	0.09		
7/2/98	183	99	77	100	36	11			
7/3/98	184	88	77	100	70	10	0.66		
7/4/98	185	96	78	100	42	13			
7/5/98	186	98	78	100	39	12			
7/6/98	187	101	77	100	35	10			
7/7/98	188	100	77	100	35	10			
7/8/98	189	100	77	100	38	10			
7/9/98	190	100	78	100	34	12			
7/10/98	191	101	78	100	34	13			
7/11/98	192	101	78	100	34	11			
7/12/98	193	103	79	100	33	12			
7/13/98	194	99	82	90	42	12			
7/14/98	195	100	76	98	40	11			
7/15/98	196	99	75	100	36	8			
7/16/98	197	102	78	100	30	8			
7/17/98	198	103	78	95	28	12			
7/18/98	199	99	77	97	33	6			
7/19/98	200	100	78	100	36	12			
7/20/98	201	99	77	100	34	14			
7/21/98	202	99	79	100	34	15			
7/22/98	203	98	78	100	37	13			
7/23/98	204	100	78	100	34	11			
7/24/98	205	101	78	100	33	14			
7/25/98	206	101	78	100	34	12			
7/26/98	207	101	77	100	32	13			
7/27/98	208	100	78	100	30	13			
7/28/98	209	100	79	100	32	13			
7/29/98	210	100	77	100	34	13			
7/30/98	211	102	77	100	26	14			
7/31/98	212	103	76	100	23	12			
Jul-98.	**TOTAL**						0.75	**inches**	

Table 16. Riverside Campus Weather Data August 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
8/1/98	213	104	75	99	22	11			
8/2/98	214	104	79	88	28	10			
8/3/98	215	105	80	76	26	15			
8/4/98	216	102	79	94	31	25			
8/5/98	217	98	77	94	39	20			
8/6/98	218	86	76	100	63	7	0.08		
8/7/98	219	90	77	100	59	13			
8/8/98	220	98	76	100	36	10			
8/9/98	221	99	76	100	33	11			
8/10/98	222	101	77	100	28	9			
8/11/98	223	101	77	100	32	9			
8/12/98	224	101	78	100	34	19	0.42		
8/13/98	225	90	79	100	54	15			
8/14/98	226	81	72	100	79	19	1.07		
8/15/98	227	95	73	100	39	6			
8/16/98	228	94	75	100	55	14			
8/17/98	229	90	77	100	74	14			
8/18/98	230	92	76	100	54	12			
8/19/98	231	96	77	100	46	10			
8/20/98	232	97	77	100	41	20	0.25		
8/21/98	233	92	76	100	54	16			
8/22/98	234	85	76	100	83	16	0.05		
8/23/98	235	91	75	100	68	13	0.56		
8/24/98	236	95	76	100	50	7	0.02		
8/25/98	237	97	78	100	50	9			
8/26/98	238	96	77	100	49	9			
8/27/98	239	97	76	100	41	6			
8/28/98	240	100	78	99	36	8			
8/29/98	241	102	77	99	34	8			
8/30/98	242	96	75	100	47	9			
8/31/98	243	93	75	100	47	9			
Aug-98.	**TOTAL**						2.45	**inches**	

Table 17. Riverside Campus Weather Data September 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
9/1/98	244	104	75	99	22	11			
9/2/98	245	104	79	88	28	10			
9/3/98	246	105	80	76	26	15			
9/4/98	247	102	79	94	31	25			
9/5/98	248	98	77	94	39	20			
9/6/98	249	86	76	100	63	7	0.08		
9/7/98	250	90	77	100	59	13			
9/8/98	251	98	76	100	36	10			
9/9/98	252	99	76	100	33	11			
9/10/98	253	101	77	100	28	9			
9/11/98	254	101	77	100	32	9			
9/12/98	255	101	78	100	34	19	0.42		
9/13/98	256	90	79	100	54	15			
9/14/98	257	81	72	100	79	19	1.07		
9/15/98	258	95	73	100	39	6			
9/16/98	259	94	75	100	55	14			
9/17/98	260	90	77	100	74	14			
9/18/98	261	92	76	100	54	12			
9/19/98	262	96	77	100	46	10			
9/20/98	263	97	77	100	41	20	0.25		
9/21/98	264	92	76	100	54	16			
9/22/98	265	85	76	100	83	16	0.05		
9/23/98	266	91	75	100	68	13	0.56		
9/24/98	267	95	76	100	50	7	0.02		
9/25/98	268	97	78	100	50	9			
9/26/98	269	96	77	100	49	9			
9/27/98	270	97	76	100	41	6			
9/28/98	271	100	78	99	36	8			
9/29/98	272	102	77	99	34	8			
9/30/98	273	96	75	100	47	9			
Sep-98.	**TOTAL**						2.45	**inches**	

Table 18. Riverside Campus Weather Data October 1998.

date	day	hi temp	low temp	hi humid	low humid	hi wind	rain	rad rate	rad flux
10/1/98	274	92	73	100	47	8			
10/2/98	275	86	74	100	80	11			
10/3/98	276	92	77	100	55	10			
10/4/98	277	91	77	100	64	15			
10/5/98	278	91	78	100	64	20			
10/6/98	279	82	61	100	77	22	1.32		
10/7/98	280	79	55	100	34	15			
10/8/98	281	79	56	100	34	9			
10/9/98	282	79	56	96	44	6			
10/10/98	283	79	58	100	44	9			
10/11/98	284	82	58	100	65	6			
10/12/98	285	85	68	100	57	8			
10/13/98	286	83	65	100	51	8			
10/14/98	287	82	63	100	54	7			
10/15/98	288	85	64	100	58	11			
10/16/98	289	89	71	100	62	18			
10/17/98	290	79	71	100	100	16	2.98		
10/18/98	291	74	65	100	98	9	1.29		
10/19/98	292	66	62	100	95	11	0.76		
10/20/98	293	68	65	100	100	8	0.51		
10/21/98	294	65	59	100	97	14	0.21		
10/22/98	295	71	58	100	59	12			
10/23/98	296	68	50	93	44	9			
10/24/98	297	76	51	100	55	10			
10/25/98	298	82	57	100	48	8			
10/26/98	299	82	62	100	61	9			
10/27/98	300	80	64	100	73	9			
10/28/98	301	80	67	100	83	8			
10/29/98	302	81	70	100	75	7			
10/30/98	303	83	71	100	68	9			
10/31/98	304	83	67	100	71	14			
Oct-98.	**RAINFALL TOTAL**						7.07	**inches**	