

TECHNICAL NOTES

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LANDSCAPING WITH FIRE RESISTANT PLANTS

ABSTRACT

Landscaping with fire resistant plants in Chaparral-Urban Interface areas protects lives and property. This study evaluated low flammability and low water use plants for fire protection, erosion control, drought tolerance and low maintenance. The study determined the minimum water application rates needed to maintain plant vigor and still retain a resistance to fire.

INTRODUCTION

Southern California citizens continue to place greater demands on natural resource areas. Because of expansion of existing cities, and developing new suburban communities, information is needed for proper selection and placement of plant materials for landscaping to minimize the spread of wildfires.

This study was part of a Conservation Field Trail, CFT, developed by the USDA-NRCS Somis Field Office with cooperation with Ventura County Fire Protection District. The USDA-NRCS Lockeford Plant Materials Center assisted in the development of the study plan and plant evaluations. Many USDA-NRCS personnel assisted with obtaining plant and soil samples and doing laboratory work. This CFT and study was developed after the large 1993 Southern California fires in the hope of finding solutions to stopping the spread of wildfires into urban areas. The CFT also included site demonstrations of fire resistant landscape vegetation. The focus of the study was to evaluate selected landscape vegetation that will help create and sustain fire resistant vegetative buffer zones in Chaparral-Urban interface areas.

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METHODS AND MATERIALS

A randomized block design was used with four replications. Ceanothus, Sage and Coyote Bush were planted from one-gallon containers and the other plants were planted from two foot by two-foot flats. Six plants spaced four feet apart were in each sub-block. All plants were watered three times the 1997 rates during the first two weeks of establishment. There were three treatments in 1997 consisting of weekly drip irrigation application rates of 0.5, 1.0 and 1.5 gallons. In 1998 the drip irrigation application rates were reduced to 0.25, 0.5 and 0.75 gallons per week. The irrigation season was April through October. There was a total of 120 sub-blocks. There was a four-foot space between rows. There was an eight-foot space between treatments.

The common name, scientific name, and plant abbreviation of the ten plants used in this study are:

1. Cape Weed, *Arctotheca calendula*, ARCA
2. Trailing Ice Plant, *Lampranthus spectabilis*, LASP
3. Postarata myoporum, *Myoporum parvifloium*, PRMY
4. White Trailing Ice Plant, *Delosperma 'alba'*, DEAL
5. Yankee Point, *Ceanothus griseus horizontalis*, CEAN, CA. native plant
6. Dara Choice Sage, *Salvia sp.*, SALV, CA. native plant
7. Dwarf Coyote Bush, *Baccharis pilularis*, BAPI, CA. native plant
8. Trailing African Daisy, *Osteospermum fruticosum*, OSFR
9. Dwarf Periwinkle, *Vinca minor*, VIMI
10. Trailing Gazania, *Rigeno leucolaena*, FULE

The soil at the study site is similar to ChD2 – Chesterton coarse sandy loam, 5 to 15 percent slopes, eroded except for the sandy loam surface texture and steeper slope.

Typical Profile:

0 to 7 inches. very dark grayish brown sandy loam

7 to 18 inches; brown light clay.

18 to 23 inches; dark yellowish brown loam; many moderately thick clay films on peds and in pores; strongly effervescent with few fine filaments of carbonates

23 to 30 inches; dark yellowish brown strongly cemented pan: strongly effervescent with few fine filaments of carbonates.

All 120 sub-blocks were evaluated and soil and plant samples obtained on 10-8-97 and 8-6-98. Soil and plant samples were weighed immediately and placed in an oven for drying and percent moisture was determined. Plant samples were immediately used in the flammability test, which consisted of exposing a six-inch long sample to a two-inch long butane lighter flame for ten seconds. A rating scale of one to nine was used. For example: one was given for excellent resistance to flammability. (the sample did not burn); three was given for good resistance to flammability, (the sample did produce some smoke but very little burning); six was given for a fair resistance to flammability, (the sample did smoke and burn slow); and a rating of nine was given for poor resistance to flammability, (the sample did burn quickly).

The plants were evaluated for erosion, fuel load, water stress, vigor and flammability using the one to nine scale. The replications were used to develop an average for each plant in each treatment. **Each evaluation element, i.e. erosion control, was sorted to select the best plant and treatment and the # sign was used to identify the element being sorted on the following tables.**

RESULTS AND DISCUSSION

The 1997 study data shows White Trailing Ice Plant and Trailing Gazania as having excellent erosion control attributes. In general the varieties which did not have a high fuel load did not have high flammability. The varieties with excellent flammability resistance at the 0.5 gallons per week irrigation level are Trailing Ice Plant, White Trailing Ice Plant and Dwarf Periwinkle. At the 1.0 gallons per week irrigation level they are Myoporuni Parvifloium, White Trailing Ice Plant, Yankee Point, and Dwarf Periwinkle. At the 1.5 gallons per week irrigation level they are Myoporum Parvifloium, White Trailing Ice Plant, Yankee Point, Sage and Dwarf periwinkle. In general the higher the percent plant moisture the greater the flammability resistance.

The 1998 study data shows that White Trailing Ice Plant and Trailing Gazania as continuing to have excellent erosion control attributes. As in 1997, the varieties that did not have a high fuel load, did not have high flammability. The varieties with excellent flammability resistance at the 0.25 gallons per week irrigation level are Trailing Ice Plant and White Trailing Ice Plant. At the 0.5 gallons per week irrigation level they are Trailing African Daisy, Trailing Gazania, White Trailing Ice Plant and Myoporum Parvifloium. At the 0.75 gallons per week irrigation level they are White Trailing Ice Plant, Trailing African Daisy, Myoporum Parvifloium and Dwarf Periwinkle.

CONCLUSION

The following varieties are listed in regards to the minimum irrigation level required to maintain excellent flammability resistance. In 1998, the Ice Plant varieties had excellent flammability resistance at the minimal irrigation level of 0.25 gallons per week. At the 0.5 gallons per week irrigation level, Dwarf Periwinkle had excellent flammability resistance in 1997 and good in 1998; Trailing African Daisy, Trailing Gazania and Myoporum Parvifloium had excellent flammability resistance in 1998. At the 0.75 gallons per week irrigation level: Dwarf Periwinkle had excellent flammability resistance. At the 1997, 1.0 gallons per week irrigation level, Yankee Point Ceanothus had an excellent flammability resistance. At the 1997, 1.5 gallons per week irrigation level, Dara Choice Sage had an excellent flammability resistance.

In regards to erosion control: white Trailing Ice Plant and Trailing Gazania were excellent; Cape Weed, Trailing Ice Plant and Dwarf Coyote Bush had good erosion control performance.

In regards to fuel load and low plant maintenance: Trailing Ice Plant, White Trailing Ice Plant and Trailing Gazania had an excellent rating; Prostrate Myoporum and Dwarf Periwinkle had a good rating.

In regards to water stress and drought tolerance: Trailing Ice Plant, White Trailing Ice Plant and Trailing Gazania had an excellent drought tolerance performance; Prostrate Myoporum, Dwarf Coyote Bush, Yankee Point Ceanothus, and trailing African Daisy had good drought tolerance performance.

Overall, the Ice Plants and Trailing Gazania had the best performance. None of the native plants were overall highly rated,

Table 1. Evaluation of Plants by Treatments 6 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	Flammabil	% Soil W	% Plant W
1 ARCA	0.5	6	6	8	8	2	8	87
1 ARCA	1	4	4	5	7	4	7	74
1 ARCA	1.5	3	3	7	8	2	8	69
2 LASP	0.5	4	2	2	3	1	6	75
2 LASP	1	4	2	4	5	2	7	78
2 LASP	1.5	3	3	2	4	2	25	80
3 PRMY	0.5	4	4	4	5	2	5	74
3 PRMY	1	4	3	5	4	1	21	76
3 PRMY	1.5	4	3	2	4	1	7	81
4 DEAL	0.5	1	2	2	2	1	4	88
4 DEAL	1	2	3	3	3	1	8	82
4 DEAL	1.5	2	1	2	2	1	5	88
5 CEAN	0.5	5	6	3	5	2	7	45
5 CEAN	1	5	5	2	6	1	15	46
5 CEAN	1.5	6	6	3	6	1	7	54
6 SALV	0.5	6	7	6	7	2	5	67
6 SALV	1	6	7	7	7	4	11	48
6 SALV	1.5	6	7	5	8	1	7	54
7 BAPI	0.5	4	3	5	6	2	6	66
7 BAPI	1	5	4	5	5	3	6	53
7 BAPI	1.5	4	4	2	4	2	11	49
8 OSFR	0.5	4	6	6	6	2	5	82
8 OSFR	1	5	5	6	6	4	4	69
8 OSFR	1.5	4	5	3	4	2	6	65
9 VIMI	0.5	6	5	7	7	1	6	73
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	1.5	5	2	5	6	1	27	87
10 RILE	0.5	3	5	5	5	3	6	75
10 RILE	1	2	3	3	4	3	6	77
10 RILE	1.5	2	2	1	2	2	5	82

¹ Evaluations were performed on October 8, 1997.

Table 2. Ranking of Plants for Erosion Control 6 Months after Transplanting ¹

Variety	Treatment	### Erosion	Fuel Load	W Stress	Vigor	Flammabil %	Soil W	% Plant W
4 DEAL	0.5	1	2	2	2	1	4	88
4 DEAL	1	2	3	3	3	1	8	82
4 DEAL	1.5	2	1	2	2	1	5	88
10 RILE	1	2	3	3	4	3	6	77
10 RILE	1.5	2	2	1	2	2	5	82
1 ARCA	1.5	3	3	7	8	2	8	69
2 LASP	1.5	3	3	2	4	2	25	80
10 RILE	0.5	3	5	5	5	3	6	75
1 ARCA	1	4	4	5	7	4	7	74
2 LASP	0.5	4	2	2	3	1	6	75
2 LASP	1	4	2	4	5	2	7	78
3 PRMY	0.5	4	4	4	5	2	5	74
3 PRMY	1	4	3	5	4	1	21	76
3 PRMY	1.5	4	3	2	4	1	7	81
7 BAPI	0.5	4	3	5	6	2	6	66
7 BAPI	1.5	4	4	2	4	2	11	49
8 OSFR	0.5	4	6	6	6	2	5	82
8 OSFR	1.5	4	5	3	4	2	6	65
5 CEAN	0.5	5	6	3	5	2	7	45
5 CEAN	1	5	5	2	6	1	15	46
7 BAPI	1	5	4	5	5	3	6	53
8 OSFR	1	5	5	6	6	4	4	69
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	1.5	5	2	5	6	1	27	87
1 ARCA	0.5	6	6	8	8	2	8	87
5 CEAN	1.5	6	6	3	6	1	7	54
6 SALV	0.5	6	7	6	7	2	5	67
6 SALV	1	6	7	7	7	4	11	48
6 SALV	1.5	6	7	5	8	1	7	54
9 VIMI	0.5	6	5	7	7	1	6	73

¹ Based on evaluations performed on October 8, 1997.

Table 3. Ranking of Plants for Fuel Load 6 Months after Transplanting ¹

Variety	Treatment	Erosion	###			Flammabil %	Soil W	% Plant W
			Fuel Load	W Stress	Vigor			
4 DEAL	1.5	2	1	2	2	1	5	88
4 DEAL	0.5	1	2	2	2	1	4	88
10 RILE	1.5	2	2	1	2	2	5	82
2 LASP	0.5	4	2	2	3	1	6	75
2 LASP	1	4	2	4	5	2	7	78
9 VIMI	1.5	5	2	5	6	1	27	87
4 DEAL	1	2	3	3	3	1	8	82
10 RILE	1	2	3	3	4	3	6	77
1 ARCA	1.5	3	3	7	8	2	8	69
2 LASP	1.5	3	3	2	4	2	25	80
3 PRMY	1	4	3	5	4	1	21	76
3 PRMY	1.5	4	3	2	4	1	7	81
7 BAPI	0.5	4	3	5	6	2	6	66
1 ARCA	1	4	4	5	7	4	7	74
3 PRMY	0.5	4	4	4	5	2	5	74
7 BAPI	1.5	4	4	2	4	2	11	49
7 BAPI	1	5	4	5	5	3	6	53
9 VIMI	1	5	4	7	7	1	6	63
10 RILE	0.5	3	5	5	5	3	6	75
8 OSFR	1.5	4	5	3	4	2	6	65
5 CEAN	1	5	5	2	6	1	15	46
8 OSFR	1	5	5	6	6	4	4	69
9 VIMI	0.5	6	5	7	7	1	6	73
8 OSFR	0.5	4	6	6	6	2	5	82
5 CEAN	0.5	5	6	3	5	2	7	45
1 ARCA	0.5	6	6	8	8	2	8	87
5 CEAN	1.5	6	6	3	6	1	7	54
6 SALV	0.5	6	7	6	7	2	5	67
6 SALV	1	6	7	7	7	4	11	48
6 SALV	1.5	6	7	5	8	1	7	54

¹ Based on evaluations performed on October 8, 1997.

Table 4. Ranking of Plants for Water Stress Tolerance 6 Months after Transplanting ¹

Variety	Treatment	Erosion	###			Flammabil	% Soil W	% Plant W
			Fuel Load	W Stress	Vigor			
10 RILE	1.5	2	2	1	2	2	5	82
4 DEAL	1.5	2	1	2	2	1	5	88
4 DEAL	0.5	1	2	2	2	1	4	88
2 LASP	0.5	4	2	2	3	1	6	75
2 LASP	1.5	3	3	2	4	2	25	80
3 PRMY	1.5	4	3	2	4	1	7	81
7 BAPI	1.5	4	4	2	4	2	11	49
5 CEAN	1	5	5	2	6	1	15	46
4 DEAL	1	2	3	3	3	1	8	82
10 RILE	1	2	3	3	4	3	6	77
8 OSFR	1.5	4	5	3	4	2	6	65
5 CEAN	0.5	5	6	3	5	2	7	45
5 CEAN	1.5	6	6	3	6	1	7	54
2 LASP	1	4	2	4	5	2	7	78
3 PRMY	0.5	4	4	4	5	2	5	74
9 VIMI	1.5	5	2	5	6	1	27	87
3 PRMY	1	4	3	5	4	1	21	76
7 BAPI	0.5	4	3	5	6	2	6	66
1 ARCP.	1	4	4	5	7	4	7	74
7 BAPI	1	5	4	5	5	3	6	53
10 RILE	0.5	3	5	5	5	3	6	75
6 SALV	1.5	6	7	5	8	1	7	54
8 OSFR	1	5	5	6	6	4	4	69
8 OSFR	0.5	4	6	6	6	2	5	82
6 SALV	0.5	6	7	6	7	2	5	67
1 ARCA	1.5	3	3	7	8	2	8	69
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	0.5	6	5	7	7	1	6	73
6 SALV	1	6	7	7	7	4	11	48
1 ARCA	0.5	6	6	8	8	2	8	87

¹ Based on evaluations performed on October 8, 1997.

Table 5. Ranking of Plants for Vigor 6 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	### Vigor	Flammabil %	Soil W	% Plant W
10 RILE,	1.5	2	2	1	2	2	5	82
4 DEAL	1.5	2	1	2	2	1	5	88
4 DEAL	0.5	1	2	2	2	1	4	88
2 LASP	0.5	4	2	2	3	1	6	75
4 DEAL	1	2	3	3	3	1	8	82
2 LASP	1.5	3	3	2	4	2	25	80
3 PRMY	1.5	4	3	2	4	1	7	81
7 BAPI	1.5	4	4	2	4	2	11	49
10 RILE	1	2	3	3	4	3	6	77
8 OSFR	1.5	4	5	3	4	2	6	65
3 PRMY	1	4	3	5	4	1	21	76
5 CEAN	0.5	5	6	3	5	2	7	45
2 LASP	1	4	2	4	5	2	7	78
3 PRMY	0.5	4	4	4	5	2	5	74
7 BAPI	1	5	4	5	5	3	6	53
10 RILE	0.5	3	5	5	5	3	6	75
5 CEAN	1	5	5	2	6	1	15	46
5 CEAN	1.5	6	6	3	6	1	7	54
9 VIMI	1.5	5	2	5	6	1	27	87
7 BAPI	0.5	4	3	5	6	2	6	66
8 OSFR	1	5	5	6	6	4	4	69
8 OSFR	0.5	4	6	6	6	2	5	82
1 ARCA	1	4	4	5	7	4	7	74
6 SALV	0.5	6	7	6	7	2	5	67
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	0.5	6	5	7	7	1	6	73
6 SALV	1	6	7	7	7	4	11	48
6 SALV	1.5	6	7	5	8	1	7	54
1 ARCA	1.5	3	3	7	8	2	8	69
1 ARCA	0.5	6	6	8	8	2	8	87

¹ Based on evaluations performed on October 8, 1997

Table 6. Ranking of Plants for Flammability 6 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	### Flammabil	% Soil W	% Plant W
4 DEAL	1.5	2	1	2	2	1	5	aa
4 DEAL	0.5	1	2	2	2	1	4	aa
2 LASP	0.5	4	2	2	3	1	6	75
4 DEAL	1	2	3	3	3	1	a	a2
3 PRMY	1.5	4	3	2	4	1	7	81
3 PRMY	1	4	3	5	4	1	21	76
5 CEAN	1	5	5	2	6	1	15	46
5 CEAN	1.5	6	6	3	6	1	7	54
9 VIMI	1.5	5	2	5	6	1	27	a7
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	0.5	6	5	7	7	1	6	73
6 SALV	1.5	6	7	5	a	1	7	54
10 RILE	1.5	2	2	1	2	2	5	a2
2 LASP	1.5	3	3	2	4	2	25	80
7 BAPI	1.5	4	4	2	4	2	11	49
a OSFR	1.5	4	5	3	4	2	6	65
5 CEAN	0.5	5	6	3	5	2	7	45
2 LASP	1	4	2	4	5	2	7	78
3 PRMY	0.5	4	4	4	5	2	5	74
7 BAPI	0.5	4	3	5	6	2	6	66
a OSFR	0.5	4	6	6	6	2	5	a2
6 SALV	0.5	6	7	6	7	2	5	67
1 ARCA	1.5	3	3	7	a	2	a	69
1 ARCA	0.5	6	6	a	a	2	a	a7
10 RILE	1	2	3	3	4	3	6	77
7 BAPI	1	5	4	5	5	3	6	53
10 RILE	0.5	3	5	5	5	3	6	75
a OSFR	1	5	5	6	6	4	4	69
1 ARCA	1	4	4	5	7	4	7	74
6 SALV	1	6	7	7	7	4	11	48

¹ Based on evaluations performed on October 8, 1997.

Table 7. Ranking of Plants Based on % Soil Moisture 6 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	###		
						Flammabil	% Soil W	% Plant W
9 VIMI	1.5	5	2	5	6	1	27	87
2 LASP	1.5	3	3	2	4	2	25	80
3 PRMY	1	4	3	5	4	1	21	76
5 CEAN	1	5	5	2	6	1	15	46
7 BAPI	1.5	4	4	2	4	2	11	49
6 SALV	1	6	7	7	7	4	11	48
4 DEAL	1	2	3	3	3	1	8	82
1 ARCA	1.5	3	3	7	8	2	8	69
1 ARCA	0.5	6	6	8	8	2	8	87
3 PRMY	1.5	4	3	2	4	1	7	81
5 CEAN	1.5	6	6	3	6	1	7	54
6 SALV	1.5	6	7	5	8	1	7	54
5 CEAN	0.5	5	6	3	5	2	7	45
2 LASP	1	4	2	4	5	2	7	78
1 ARCA	1	4	4	5	7	4	7	74
2 LASP	0.5	4	2	2	3	1	6	75
9 VIMI	1	5	4	7	7	1	6	63
9 VIMI	0.5	6	5	7	7	1	6	73
8 OSFR	1.5	4	5	3	4	2	6	65
7 BAPI	0.5	4	3	5	6	2	6	66
10 RILE	1	2	3	3	4	3	6	77
7 BAPI	1	5	4	5	5	3	6	53
10 RILE	0.5	3	5	5	5	3	6	75
4 DEAL	1.5	2	1	2	2	1	5	88
10 RILE	1.5	2	2	1	2	2	5	82
3 PRMY	0.5	4	4	4	5	2	5	74
8 OSFR	0.5	4	6	6	6	2	5	82
6 SALV	0.5	6	7	6	7	2	5	67
4 DEAL	0.5	1	2	2	2	1	4	88
8 OSFR	1	5	5	6	6	4	4	69

¹ Based on evaluations performed on October 8, 1997.

Table 8. Ranking of Plants by % Plant Water 6 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	Flammabil %	Soil W	### % Plant W
4 DEAL	1.5	2	1	2	2	1	5	88
4 DEAL	0.5	1	2	2	2	1	4	88
9 VIMI	1.5	5	2	5	6	1	27	87
1 ARCA	0.5	6	6	8	8	2	8	87
4 DEAL	1	2	3	3	3	1	8	82
10 RILE	1.5	2	2	1	2	2	5	82
8 OSFR	0.5	4	6	6	6	2	5	82
3 PRMY	1.5	4	3	2	4	1	7	81
2 LASP	1.5	3	3	2	4	2	25	80
2 LASP	1	4	2	4	5	2	7	78
10 RILE	1	2	3	3	4	3	6	77
3 PRMY	1	4	3	5	4	1	21	76
2 LASP	0.5	4	2	2	3	1	6	75
10 RILE	0.5	3	5	5	5	3	6	75
1 ARCA	1	4	4	5	7	4	7	74
3 PRMY	0.5	4	4	4	5	2	5	74
9 VIMI	0.5	6	5	7	7	1	6	73
1 ARCA	1.5	3	3	7	8	2	8	69
8 OSFR	1	5	5	6	6	4	4	69
6 SALV	0.5	6	7	6	7	2	5	67
7 BAPI	0.5	4	3	5	6	2	6	66
8 OSFR	1.5	4	5	3	4	2	6	65
9 VIMI	1	5	4	7	7	1	6	63
5 CEAN	1.5	6	6	3	6	1	7	54
6 SALV	1.5	6	7	5	8	1	7	54
7 BAPI	1	5	4	5	5	3	6	53
7 BAPI	1.5	4	4	2	4	2	11	49
6 SALV	1	6	7	7	7	4	11	48
5 CEAN	1	5	5	2	6	1	15	46
5 CEAN	0.5	5	6	3	5	2	7	45

¹ Based on evaluations performed on October 8, 1997.

Table 9. Evaluation of Plants by Treatments 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	Flammabil%	Soil W	% Plant W
1 ARCA	0.25	5	6	6	7	4	6	79
1 ARCA	0.5	5	6	5	7	4	4	68
1 ARCA	0.75	5	7	6	8	4	6	68
2 LASP	0.25	5	6	6	6	2	6	72
2 LASP	0.5	5	5	4	5	4	3	62
2 LASP	0.75	3	3	2	3	3	4	58
3 PRMY	0.25	6	5	6	6	4	9	70
3 PRMY	0.5	4	4	5	5	3	4	72
3 PRMY	0.75	4	3	2	4	2	5	71
4 DEAL	0.25	2	2	3	3	3	18	85
4 DEAL	0.5	3	3	4	4	3	4	77
4 DEAL	0.75	2	2	2	2	2	6	85
5 CEAN	0.25	6	5	6	5	7	5	46
5 CEAN	0.5	6	6	3	7	6	3	41
5 CEAN	0.75	7	5	2	7	4	5	35
6 SALV	0.25	6	6	6	6	5	6	54
6 SALV	0.5	8	7	4	8	5	5	43
6 SALV	0.75	9	8	9	9	6	6	44
7 BAPI	0.25	3	4	3	4	6	6	53
7 BAPI	0.5	4	4	4	4	6	3	49
7 BAPI	0.75	3	3	2	2	5	4	51
8 OSFR	0.25	5	7	7	6	5	32	71
8 OSFR	0.5	6	6	7	7	3	15	77
8 OSFR	0.75	4	5	3	3	2	5	80
9 VIMI	0.25	7	4	8	8	5	4	43
9 VIMI	0.5	8	3	8	8	4	4	63
9 VIMI	0.75	7	2	5	7	3	11	54
10 RILE	0.25	3	4	4	4	4	5	55
10 RILE	0.5	2	2	3	3	3	6	67
10 RILE	0.75	2	2	2	2	4	5	74

¹ Evaluations were performed on August 6, 1998.

Table 10. Ranking of Plants for Erosion Control 16 Months after Transplanting ¹

Variety	Treatment	### Erosion	Fuel Load	W Stress	Vigor	Flammabil %	Soil W	% Plant W
4 DEAL	0.25	2	2	3	3	3	18	85
4 DEAL	0.75	2	2	2	2	2	6	85
10 RILE	0.5	2	2	3	3	3	6	67
10 RILE	0.75	2	2	2	2	4	5	74
2 LASP	0.75	3	3	2	3	3	4	58
4 DEAL	0.5	3	3	4	4	3	4	77
7 BAPI	0.25	3	4	3	4	6	6	53
7 BAPI	0.75	3	3	2	2	5	4	51
10 RILE	0.25	3	4	4	4	4	5	55
3 PRMY	0.5	4	4	5	5	3	4	72
3 PRMY	0.75	4	3	2	4	2	5	71
7 BAPI	0.5	4	4	4	4	6	3	49
8 OSFR	0.75	4	5	3	3	2	5	80
1 ARCA	0.25	5	6	6	7	4	6	79
1 ARCA	0.5	5	6	5	7	4	4	68
1 ARCA	0.75	5	7	6	8	4	6	68
2 LASP	0.25	5	6	6	6	2	6	72
2 LASP	0.5	5	5	4	5	4	3	62
2 OSFR	0.25	5	7	7	6	5	32	71
3 PRMY	0.25	6	5	6	6	4	9	70
5 CEAN	0.25	6	5	6	5	7	5	46
5 CEAN	0.5	6	6	3	7	6	3	41
6 SALV	0.25	6	6	6	6	5	6	54
8 OSFR	0.5	6	6	7	7	3	15	77
5 CEAN	0.75	7	5	2	7	4	5	35
9 VIMI	0.25	7	4	8	8	5	4	43
9 VIMI	0.75	7	2	5	7	3	11	54
6 SALV	0.5	8	7	4	8	5	5	43
9 VIMI	0.5	8	3	8	8	4	4	63
6 SALV	0.75	9	8	9	9	6	6	44

¹ Based on evaluations performed on August 6, 1998.

Table 11. Ranking of Plants for Fuel Load 16 Months after Transplanting ¹

Variety	Treatment	Erosion	### Fuel Load	W Stress	Vigor	Flammabil %	Soil W	% Plant W
4 DEAL	0.25	2	2	3	3	3	18	85
4 DEAL	0.75	2	2	2	2	2	6	85
10 RILE	0.5	2	2	3	3	3	6	67
10 RILE	0.75	2	2	2	2	4	5	74
9 VIMI	0.75	7	2	5	7	3	11	54
2 LASP	0.75	3	3	2	3	3	4	58
4 DEAL	0.5	3	3	4	4	3	4	77
7 BAPI	0.75	3	3	2	2	5	4	51
3 PRMY	0.75	4	3	2	4	2	5	71
9 VIMI	0.5	8	3	8	8	4	4	63
7 BAPI	0.25	3	4	3	4	6	6	53
10 RILE	0.25	3	4	4	4	4	5	55
3 PRMY	0.5	4	4	5	5	3	4	72
7 BAPI	0.5	4	4	4	4	6	3	49
9 VIMI	0.25	7	4	8	8	5	4	43
8 OSFR	0.75	4	5	3	3	2	5	80
2 LASP	0.5	5	5	4	5	4	3	62
3 PRMY	0.25	6	5	6	6	4	9	70
5 CEAN	0.25	6	5	6	5	7	5	46
5 CEAN	0.75	7	5	2	7	4	5	35
1 ARCA	0.25	5	6	6	7	4	6	79
1 ARCA	0.5	5	6	5	7	4	4	68
2 LASP	0.25	5	6	6	6	2	6	72
5 CEAN	0.5	6	6	3	7	6	3	41
6 SALV	0.25	6	6	6	6	5	6	54
8 OSFR	0.5	6	6	7	7	3	15	77
1 ARCA	0.75	5	7	6	8	4	6	68
8 OSFR	0.25	5	7	7	6	5	32	71
6 SALV	0.5	8	7	4	8	5	5	43
6 SALV	0.75	9	8	9	9	6	6	44

¹ Based on evaluations performed on August 6, 1998.

Table 12. Ranking of Plants for Water Stress Tolerance 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	Flammabil	% Soil W	% Plant W
4 DEAL	0.75	2	2	2	2	2	6	85
10 RILE	0.75	2	2	2	2	4	5	74
2 LASP	0.75	3	3	2	3	3	4	58
7 BAPI	0.75	3	3	2	2	5	4	51
3 PRMY	0.75	4	3	2	4	2	5	71
5 CEAN	0.75	7	5	2	7	4	5	35
4 DEAL	0.25	2	2	3	3	3	18	85
10 RILE	0.5	2	2	3	3	3	6	67
7 BAPI	0.25	3	4	3	4	6	6	53
8 OSFR	0.75	4	5	3	3	2	5	80
5 CEAN	0.5	6	6	3	7	6	3	41
4 DEAL	0.5	3	3	4	4	3	4	77
10 RILE	0.25	3	4	4	4	4	5	55
7 BAPI	0.5	4	4	4	4	6	3	49
2 LASP	0.5	5	5	4	5	4	3	62
6 SALV	0.5	8	7	4	8	5	5	43
9 VIMI	0.75	7	2	5	7	3	11	54
3 PRMY	0.5	4	4	5	5	3	4	72
1 ARCA	0.5	5	6	5	7	4	4	68
3 PRMY	0.25	6	5	6	6	4	9	70
5 CEAN	0.25	6	5	6	5	7	5	46
1 ARCA	0.25	5	6	6	7	4	6	79
2 LASP	0.25	5	6	6	6	2	6	72
6 SALV	0.25	6	6	6	6	5	6	54
1 ARCA	0.75	5	7	6	8	4	6	68
8 OSFR	0.5	6	6	7	7	3	15	77
8 OSFR	0.25	5	7	7	6	5	32	71
9 VIMI	0.5	8	3	8	8	4	4	63
9 VIMI	0.25	7	4	8	8	5	4	43
6 SALV	0.75	9	8	9	9	6	6	44

¹ Based on evaluations performed on August 6, 1998.

Table 13. Ranking of Plants for Vigor 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	### Vigor	Flammabil %	Soil W	% Plant W
4 DEAL	0.75	2	2	2	2	2	6	85
10 RILE	0.75	2	2	2	2	4	5	74
7 BAPI	0.75	3	3	2	2	5	4	51
2 LASP	0.75	3	3	2	3	3	4	58
4 DEAL	0.25	2	2	3	3	3	18	85
10 RILE	0.5	2	2	3	3	3	6	67
8 OSFR	0.75	4	5	3	3	2	5	80
3 PRMY	0.75	4	3	2	4	2	5	71
7 BAPI	0.25	3	4	3	4	6	6	53
4 DEAL	0.5	3	3	4	4	3	4	77
10 RILE	0.25	3	4	4	4	4	5	55
7 BAPI	0.5	4	4	4	4	6	3	49
2 LASP	0.5	5	5	4	5	4	3	62
3 PRMY	0.5	4	4	5	5	3	4	72
5 CEAN	0.25	6	5	6	5	7	5	46
3 PRMY	0.25	6	5	6	6	4	9	70
2 LASP	0.25	5	6	6	6	2	6	72
6 SALV	0.25	6	6	6	6	5	6	54
8 OSFR	0.25	5	7	7	6	5	32	71
5 CEAN	0.75	7	5	2	7	4	5	35
5 CEAN	0.5	6	6	3	7	6	3	41
9 VIMI	0.75	7	2	5	7	3	11	54
1 ARCA	0.5	5	6	5	7	4	4	68
1 ARCA	0.25	5	6	6	7	4	6	79
8 OSFR	0.5	6	6	7	7	3	15	77
6 SALV	0.5	8	7	4	8	5	5	43
1 ARCA	0.75	5	7	6	8	4	6	68
9 VIMI	0.5	8	3	8	8	4	4	63
9 VIMI	0.25	7	4	8	8	5	4	43
6 SALV	0.75	9	8	9	9	6	6	44

¹ Based on evaluations performed on August 6, 1998.

Table 14. Ranking of Plants for Flammability 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	### Flammabil	% Soil W	% Plant W
4 DEAL	0.75	2	2	2	2	2	6	85
2 LASP	0.25	5	6	6	6	2	6	72
8 OSFR	0.75	4	5	3	3	2	5	80
3 PRMY	0.75	4	3	2	4	2	5	71
4 DEAL	0.25	2	2	3	3	3	18	85
8 OSFR	0.5	6	6	7	7	3	15	77
9 VIMI	0.75	7	2	5	7	3	11	54
10 RILE	0.5	2	2	3	3	3	6	67
2 LASP	0.75	3	3	2	3	3	4	58
4 DEAL	0.5	3	3	4	4	3	4	77
3 PRMY	0.5	4	4	5	5	3	4	72
3 PRMY	0.25	6	5	6	6	4	9	70
1 ARCA	0.25	5	6	6	7	4	6	79
1 ARCA	0.75	5	7	6	8	4	6	68
10 RILE	0.75	2	2	2	2	4	5	74
10 RILE	0.25	3	4	4	4	4	5	55
5 CEAN	0.75	7	5	2	7	4	5	35
1 ARCA	0.5	5	6	5	7	4	4	68
9 VIMI	0.5	8	3	8	8	4	4	63
2 LASP	0.5	5	5	4	5	4	3	62
8 OSFR	0.25	5	7	7	6	5	32	71
6 SALV	0.25	6	6	6	6	5	6	54
6 SALV	0.5	8	7	4	8	5	5	43
7 BAPI	0.75	3	3	2	2	5	4	51
9 VIMI	0.25	7	4	8	8	5	4	43
7 BAPI	0.25	3	4	3	4	6	6	53
6 SALV	0.75	9	8	9	9	6	6	44
7 BAPI	0.5	4	4	4	4	6	3	49
5 CEAN	0.5	6	6	3	7	6	3	41
5 CEAN	0.25	6	5	6	5	7	5	46

¹ Based on evaluations performed on August 6, 1998.

Table 15. Ranking of Plants Based on % Soil Moisture 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	###		
						Flammabil	% Soil W	% Plant W
8 OSFR	0.25	5	7	7	6	5	32	71
4 DEAL	0.25	2	2	3	3	3	18	85
8 OSFR	0.5	6	6	7	7	3	15	77
9 VIMI	0.75	7	2	5	7	3	11	54
3 PRMY	0.25	6	5	6	6	4	9	70
4 DEAL	0.75	2	2	2	2	2	6	85
2 LASP	0.25	5	6	6	6	2	6	72
10 RILE	0.5	2	2	3	3	3	6	67
1 ARCA	0.25	5	6	6	7	4	6	79
1 ARCA	0.75	5	7	6	8	4	6	68
6 SALV	0.25	6	6	6	6	5	6	54
7 BAPI	0.25	3	4	3	4	6	6	53
6 SALV	0.75	9	8	9	9	6	6	44
8 OSFR	0.75	4	5	3	3	2	5	80
3 PRMY	0.75	4	3	2	4	2	5	71
10 RILE	0.75	2	2	2	2	4	5	74
10 RILE	0.25	3	4	4	4	4	5	55
5 CEAN	0.75	7	5	2	7	4	5	35
6 SALV	0.5	8	7	4	8	5	5	43
5 CEAN	0.25	6	5	6	5	7	5	46
2 LASP	0.75	3	3	2	3	3	4	58
4 DEAL	0.5	3	3	4	4	3	4	77
3 PRMY	0.5	4	4	5	5	3	4	72
1 ARCA	0.5	5	6	5	7	4	4	68
9 VIMI	0.5	8	3	8	8	4	4	63
7 BAPI	0.75	3	3	2	2	5	4	51
9 VIMI	0.25	7	4	8	8	5	4	43
2 LASP	0.5	5	5	4	5	4	3	62
7 BAPI	0.5	4	4	4	4	6	3	49
5 CEAN	0.5	6	6	3	7	6	3	41

¹ Based on evaluations performed on August 6, 1998.

Table 16. Ranking of Plants by % Plant Water 16 Months after Transplanting ¹

Variety	Treatment	Erosion	Fuel Load	W Stress	Vigor	Flammabil	% Soil W	### % Plant W
4 DEAL	0.75	2	2	2	2	2	6	85
4 DEAL	0.25	2	2	3	3	3	18	85
8 OSFR	0.75	4	5	3	3	2	5	80
1 ARCA	0.25	5	6	6	7	4	6	79
8 OSFR	0.5	6	6	7	7	3	15	77
4 DEAL	0.5	3	3	4	4	3	4	77
10 RILE	0.75	2	2	2	2	4	5	74
2 LASP	0.25	5	6	6	6	2	6	72
3 PRMY	0.5	4	4	5	5	3	4	72
3 PRMY	0.75	4	3	2	4	2	5	71
8 OSFR	0.25	5	7	7	6	5	32	71
3 PRMY	0.25	6	5	6	6	4	9	70
1 ARCA	0.75	5	7	6	8	4	6	68
1 ARCA	0.5	5	6	5	7	4	4	68
10 RILE	0.5	2	2	3	3	3	6	67
9 VIMI	0.5	8	3	8	8	4	4	63
2 LASP	0.5	5	5	4	5	4	3	62
2 LASP	0.75	3	3	2	3	3	4	58
10 RILE	0.25	3	4	4	4	4	5	55
9 VIMI	0.75	7	2	5	7	3	11	54
6 SALV	0.25	6	6	6	6	5	6	54
7 BAPI	0.25	3	4	3	4	6	6	53
7 BAPI	0.75	3	3	2	2	5	4	51
7 BAPI	0.5	4	4	4	4	6	3	49
5 CEAN	0.25	6	5	6	5	7	5	46
6 SALV	0.75	9	8	9	9	6	6	44
6 SALV	0.5	8	7	4	8	5	5	43
9 VIMI	0.25	7	4	8	8	5	4	43
5 CEAN	0.5	6	6	3	7	6	3	41
5 CEAN	0.75	7	5	2	7	4	5	35

¹ Based on evaluations performed on August 6, 1998.