Effects of controlled-burns on native and non-native vegetation in mid-elevation dry meadows of the Umpqua National Forest

2004 Final Report

December 2004

Thomas N. Kaye
Carolyn A. Menke
Jen Cramer

Institute for Applied Ecology
Corvallis, Oregon
www.appliedeco.org

A challenge Cost Share Project funded jointly by

Institute for Applied Ecology
Umpqua National Forest

PREFACE

This report is the result of a cooperative Challenge Cost Share project between the Institute for Applied Ecology (IAE) and a federal agency. IAE is a non-profit organization dedicated to natural resource conservation, research, and education. Our aim is to provide a service to public and private agencies and individuals by developing and communicating information on ecosystems, species, and effective management strategies and by conducting research, monitoring, and experiments. IAE offers educational opportunities through 3-4 month internships. Our current activities are concentrated on rare and endangered plants and invasive species.

Questions regarding this report or IAE should be directed to:

Thomas N. Kaye
Institute for Applied Ecology
563 SW Jefferson
Corvallis, Oregon 97333
phone: 541-753-3099
fax: 541-753-3098
email: kayet@peak.org

ACKNOWLEDGEMENTS

The following individuals contributed their valuable time and expertise toward planning, field work and/or data entry during this project: Jen Cramer, Matt Blakely-Smith, Karin Rohland, Steve Gisler (IAE staff), Lauren Spaderna, Djibo Zanzot, Jon Kart, Jon LeRoy (2001 IAE/NPSO Interns), Melissa Carr, Emerin Hatfield, Beth Lawrence, Scott Probeck (2002 IAE/NPSO Interns), Angela Brandt, Melanie Barnes, Rebecca Kessler (2003 IAE/NPSO Interns), Cara Benfield, Karen Wells, Lauren Fety (2004 IAE Interns), Melissa Kirkland, Cindy Barkhurst, Richard Helliwell, and Bev Reed (Umpqua National Forest).

EXECUTIVE SUMMARY

This study investigated the effects of controlled burns on native and non-native vegetation in mid-elevation dry meadows of the Umpqua National Forest.

1. The goals of the study were to determine if fire could release native seed banks and increase vigor of native bunchgrasses and forbs, while reducing populations of invasive plants (in particular the exotic annual grasses *Taeniatherum caput-medusae* and *Cynosurus echinatus)*.

2. We established plots at two meadows, and half of the plots in each meadow were treated with controlled burns by the Umpqua National Forest. We then collected 2 yrs of pre-fire and 2 yrs of post fire community data. We also collected soil depth data in 3 of the 4 years.

3. Through analyses of dynamics of cover data in control and burned plots, we found that most native plants were relatively unaffected by fire. Fire appeared to temporarily decrease cover of some introduced species, but it did not promote long term change in the composition of plant communities.

4. The fire treatment did not appear to stimulate spread of exotic annual grasses, which can be a risk when using fire as a management tool in grassland plant communities.

TABLE OF CONTENTS **Page**

LIST OF TABLES **Page**

LIST OF FIGURES

INTRODUCTION

Figure 1. Harvey Meadow on the Umpqua National Forest, Cottage Grove Range District (prior to controlled burns).

Several mid-elevation dry meadows on the Cottage Grove District, Umpqua National Forest, have been selected for controlled-burning to enhance their biodiversity, restore natural ecological processes, and reduce resident fuel loads. The specific objectives of these fires are to 1) release native plant seed banks, 2) increase vigor of native bunch grasses and forbs, and 3) reduce existing non-native plant populations, including invasive plants and annual grasses. However, the specific responses to fire of the species in the existing plant communities of these dry meadows are unknown (e.g., some native species may be reduced by fire while some noxious weeds could benefit). The purpose of this report is to document monitoring methods and examine the effects of burning. Burning was originally intended to be implemented in the fall of 2001, but did not occur until September 2002.

A pre-field meeting to review the project monitoring was conducted on 15 February 2001 with staff from IAE and Umpqua National Forest. Review of materials discussed at this meeting and other information (e.g., maps, aerial photographs, site descriptions and field notes, and burn plans) indicated that long-term monitoring to document the effects of controlled-burning on the native and non-native vegetation was feasible and justifiable. A plan for this monitoring was developed and its implementation is presented below.

METHODS

In 2001, IAE coordinated with Forest Service botanists and fire personnel to establish monitoring plots in two dry meadows on the Cottage Grove Ranger District, Harvey Meadow and Layng Meadow (Spaderna 2001). At each site, two sets of monitoring plots were established, one set in the areas to be burned, and another set in unburned areas to serve as controls. Pre-burn, baseline monitoring was conducted in 2001 and 2002, and post-burn monitoring was conducted in 2003 and 2004 to identify plant community responses to fire.

The monitoring and analysis for the dry meadows targets specific plant taxa, including native perennial grasses such as *Stipa lemmonii*, and non-native grasses such as *Cynosurus echinatus*, *Bromus mollis*, and *Aira caryophyllea*. This sampling procedure allows for quantification of the effects of fire on all vascular plants, as well as species richness and abundance of exposed rock and soil. Also, this technique allows the documentation of additional noxious or invasive weeds as they appear in new locations.

Study sites
After screening various meadows, two study sites were selected. These were Layng and Harvey Meadows, both on the Cottage Grove District of the Umpqua National Forest. Both meadows are steep, south facing meadows with relatively shallow soil and patchy exposure of bedrock and loose rock. Harvey Meadow is located at T21S R1E NE¼ Sec. 27 and Layng Meadow is located at T21S R1E SW¼ Sec 28.

Plot Establishment
In each meadow, a control area and burn area were designated based on natural fire barriers and feasible and safe burn methods as determined by Bev Reed (Umpqua National Forest). A reference line perpendicular to the aspect of each meadow was established as a base line from which to choose and locate plots in both control areas and areas to be burned. These reference lines were marked with metal conduit posts placed at intervals. At Harvey Meadow, three different lines were placed to accommodate the variable aspect. Coordinates were then randomly selected for sample plot locations. The coordinates were based on the distance along the reference line (x-axis), as well as a distance perpendicular to the reference line (y-axis). At each point chosen, a 0.5 m^2 plot (0.5×1 m) was established (See Appendix Figures A-E). Spikes (10 inch steel nails) were pounded into the upper left and lower right corners of each plot to ensure that plots could be re-located. Due to the rocky conditions of Layng and Harvey Meadows, however, the stakes occasionally had to be pounded into a different corner; this was individually noted on the data sheets and maps.

Several plots had stakes out of the ground in 2002. The appropriate coordinates were re-measured for plots 873, 874, 889, and 887 (all located at the Harvey site), and stakes were replaced before re-surveying the plot. However, due to difficult terrain, it is possible that the plot was relocated in a slightly different position than that surveyed in 2001.

Vegetation plot sampling
Within each plot, the percent cover of all vascular plant species was recorded. Additionally, the percentages of moss, lichen, litter, bare ground, loose rock or cobble and bedrock were estimated. Cover values were based on ocular estimation to the nearest percent. Cover values of less than 1% were noted as trace amounts, and recorded as 0.5% for data summaries. We used cards of standardized sizes to assist with ocular estimation. For example, each field recorder had cards cut to 1%, 2%, 4%, and 14% (the size of a clipboard). In addition, all field recorders sampled 3 plots together to calibrate their estimation techniques.

Soil depth
A soil probe (narrow, pointed steel surveyor's spike) was used to determine soil depth in each corner of each plot in 2001. The spike was pushed firmly into the soil until it hit hard, firm rock. The depth of spike penetration was then measured to the nearest 0.5 cm. The four depths were averaged to produce a mean soil depth for each plot.

Data Analysis
Since only two meadows were investigated in this study, the sample size for analysis is small (n=2). However, since multiple plots were placed in each meadow, we used each of

these plots as a replicate (pseudoreplicate) for analysis. Therefore, the resulting p-values from statistical tests should be interpreted as suggestive of differences between vegetation in the burned and control areas, rather than strict statistical evidence of fire effects.

Functional groups

To examine the influence of fire on plant community composition, we first grouped species and cover types into functional groups based on whether species were native or introduced and annual or perennial (native grasses, perennial grasses, introduced grasses, exotic grasses, native forbs, introduced forbs, annual forbs, perennial forbs and shrubs). We also summed lichen and moss soil cover into total cryptogam cover. We calculated the change in each of these functional groups (and bare ground, litter, and rock cover) between the years of the study (2001-2002, 2002-2003, 2003-2004, and 2002-2004), and compared changes between burned and unburned plots in each meadow (Harvey and Layng) using non-parametric Kruskal-Wallis tests, since data did not meet assumptions of normality and equality of variance.

Indicator species analysis

To look for individual species with strong responses to fire, we used Indicator Species Analysis (ISA; Dufrene and Legendre 1997) in PC-ORD (McCune and Mefford 1999) to compare patterns in species composition between burn and control plots 2 yrs pre- and post-treatment in Harvey and Layng Meadows. ISA is a multivariate statistical technique which takes both species abundance and frequency into account, and calculates an indicator value as a measure of species "loyalty" (concentration of abundance and frequency) in any group of plots. Statistical significance of indicator values for each species is calculated using Monte Carlo randomization.

Target species and species richness

We used non-parametric Kruskal-Wallis tests to evaluate the specific response of two introduced species (*Taeniatherum caput-medusae* and *Cynosurus echinatus).* We also calculated native, introduced and total species richness in burn and control plots in both meadows over the 4 yrs of the study.

Soil Depth

We examined trends in soil depth over the course of the study in Harvey and Layng Meadows by calculating the difference in soil depth between the years we took soil depth data (2001-2003, 2001-2004, and 2003-2004), and compared changes between burned and unburned plots in each meadow (Harvey and Layng) using two-sample t-tests.

RESULTS AND DISCUSSION

Functional groups

Harvey Meadow

In Harvey Meadow, there was no apparent influence of fire on introduced or annual grasses (most annual grasses were introduced, and vice versa). The cover of these

Table 1. Mean (+/- SE) change in cover of functional groups between years in control and burn plots in Harvey Meadow. Burn plots were treated in fall 2002. Control and burn plots were compared in each time segment using non-parametric Kuskal-Wallis tests. Change values in boldface type were significantly different at the p = 0.05 level.

Harvey Meadow	2002-2001 (both yrs pre-treatment) Control (n=15)		Burn (n=15)			2003-2002 (pre- and post-treatment) Control (n=15)		Burn (n=15)			2004-2003 (both post treatment) Control (n=15)		Burn (n=15)			2004-2002 (pre- and post treatment) Control (n=15)		Burn (n=15)		
	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p
Native grass	3.14	1.41	0.93	0.80	0.34	-2.29	1.49	-0.75	0.56	0.48	-0.03	0.19	-0.86	0.46	0.10	-2.32	1.41	-1.61	0.51	0.85
Perennial grass	3.24	1.41	1.86	1.04	0.93	-2.19	1.51	-1.28	0.61	0.81	**0.17**	**0.31**	**-1.38**	**0.55**	**0.01**	-2.02	1.46	-2.66	0.69	0.14
Introduced grass	**-8.41**	**2.30**	**-15.21**	**2.69**	**0.05**	4.29	1.97	4.50	2.93	0.57	1.92	2.78	6.98	4.91	0.70	6.21	3.03	11.48	4.52	0.37
Annual grass	**-8.41**	**2.30**	**-15.23**	**2.69**	**0.05**	4.29	1.97	4.49	2.93	0.57	1.52	2.84	6.98	4.91	0.63	5.81	3.08	11.47	4.52	0.28
Native forb	**-9.83**	**3.49**	**-2.45**	**1.94**	**0.05**	**16.69**	**2.10**	**6.02**	**1.32**	**0.00**	-12.73	3.12	-6.26	1.62	0.09	**3.97**	**1.84**	**-0.24**	**0.90**	**0.01**
Introduced forb	-0.03	0.38	0.13	0.29	0.58	1.60	0.48	3.28	0.68	0.08	-1.59	0.43	-1.41	0.91	0.80	0.01	0.26	1.87	0.87	0.11
Annual forb	**-7.66**	**1.77**	**-1.26**	**0.84**	**0.01**	**16.27**	**1.63**	**8.88**	**1.53**	**0.00**	**-11.74**	**2.43**	**-4.45**	**1.15**	**0.00**	4.53	2.06	4.43	1.45	0.72
Perennial forb	-2.20	2.14	-1.06	1.45	0.77	1.96	1.15	0.25	1.25	0.24	-2.51	1.93	-3.05	0.94	0.79	-0.55	1.81	-2.80	1.48	0.52
Shrub	0.00	0.00	0.01	0.01	0.53	0.00	0.00	-0.01	0.01	0.53	0.00	0.00	0.00	0.00	1.00	0.00	0.00	-0.01	0.01	0.53
Bare Ground	-1.23	2.31	0.63	0.99	0.91	**-1.90**	**0.79**	**7.83**	**2.49**	**0.00**	**4.20**	**1.65**	**-4.47**	**1.87**	**0.00**	2.30	2.11	3.37	2.14	0.90
Total Cryptogam	12.01	3.29	13.27	4.04	0.68	**-23.34**	**4.71**	**-49.97**	**6.74**	**0.01**	11.67	3.40	5.35	2.13	0.19	**-11.67**	**2.66**	**-44.62**	**6.93**	**0.00**
Plant Litter	0.20	1.87	5.27	2.73	0.28	**2.53**	**2.60**	**16.93**	**5.17**	**0.01**	-6.00	1.92	-0.20	2.35	0.08	**-3.47**	**1.84**	**16.73**	**4.89**	**0.00**
Bedrock	0.20	0.38	-0.17	0.15	0.60	0.27	0.18	-0.07	0.25	0.56	-0.07	0.23	0.37	0.22	0.52	0.20	0.17	0.30	0.19	0.93
Loose rock	1.27	0.59	-0.40	1.30	0.32	**1.67**	**0.90**	**7.80**	**1.91**	**0.01**	0.13	0.79	1.67	1.90	0.31	**1.80**	**1.14**	**9.47**	**2.41**	**0.00**

Table 2. Mean (+/- SE) change in cover of functional groups between years in control and burn plots in Layng Meadow. Burn plots were treated in fall 2002. Control and burn plots were compared in each time segment using non-parametric Kruskal-Wallis tests. Change values in boldface type were significantly different at the p = 0.05 level.

Layng Meadow	2002-2001 (both yrs pre-treatment)					2003-2002 (pre- and post-treatment)					2004-2003 (both post treatment)					2004-2002 (pre- and post treatment)				
	Control (n=11)		Burn (n=12)			Control (n=11)		Burn (n=12)			Control (n=11)		Burn (n=12)			Control (n=11)		Burn (n=12)		
	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p	Mean	SE	Mean	SE	p
Native grass	3.64	0.99	3.93	1.06	0.90	-3.86	1.08	-5.38	1.63	0.73	0.59	0.31	0.46	0.68	0.25	-3.27	1.10	-4.93	1.73	0.68
Perennial grass	2.05	0.72	3.93	1.06	0.21	-2.54	0.76	-5.38	1.63	0.29	0.58	0.31	0.46	0.68	0.25	-1.95	0.80	-4.93	1.73	0.34
Introduced grass	-17.97	3.37	-13.55	5.33	0.13	11.85	3.53	8.48	2.51	0.64	-7.65	3.72	-3.68	2.13	0.28	4.20	2.16	4.79	1.86	0.71
Annual grass	-16.65	3.30	-13.55	5.33	0.21	10.53	3.48	8.48	2.51	0.95	-7.65	3.72	-3.68	2.13	0.28	2.88	2.37	4.79	1.86	0.53
Native forb	-1.41	5.43	10.85	6.49	0.26	14.91	5.61	-0.84	10.84	0.34	-16.76	3.36	-9.96	5.60	0.15	-1.85	6.39	-10.80	8.83	0.62
Introduced forb	-1.07	0.29	-0.60	0.53	0.15	1.00	0.39	3.02	1.07	0.16	**1.95**	**1.15**	**-2.38**	**0.82**	**0.00**	**2.95**	**1.00**	**0.64**	**0.51**	**0.05**
Annual forb	-3.12	1.84	-1.13	1.38	0.42	12.87	2.94	8.91	2.21	0.21	-1.75	2.91	2.43	1.84	0.35	11.12	2.11	11.33	3.18	0.78
Perennial forb	0.64	4.79	11.42	6.54	0.30	3.04	3.95	-6.86	11.21	0.57	-13.05	3.62	-14.63	5.12	0.85	-10.02	5.57	-21.49	8.56	0.32
Shrub	0.00	0.00	-0.17	0.17	0.73	0.00	0.00	-0.25	0.35	1.00	0.00	0.00	-0.08	0.08	0.73	0.00	0.00	-0.33	0.33	0.73
Bare Ground	-4.82	1.86	-4.75	3.80	0.30	5.18	1.62	5.13	1.94	0.68	0.64	1.64	3.08	2.85	0.40	5.82	1.33	8.21	3.01	0.82
Total Cryptogam	-0.40	3.53	-2.12	5.59	0.62	-4.64	3.59	-19.47	6.80	0.07	**0.61**	**1.99**	**13.81**	**3.84**	**0.01**	-4.03	2.89	-5.66	7.89	0.97
Plant Litter	22.91	7.37	7.50	7.24	0.08	**-28.27**	**7.89**	**-1.75**	**6.58**	**0.02**	**14.18**	**3.84**	**-11.75**	**4.78**	**0.00**	-14.09	5.77	-13.50	7.37	0.73
Bedrock	-0.22	0.25	-0.71	0.36	0.25	0.90	0.35	1.38	1.11	0.35	0.68	0.68	0.75	0.72	0.92	1.58	0.88	2.13	1.29	0.75
Loose rock	0.23	0.85	-1.18	1.62	0.56	**0.86**	**0.85**	**7.00**	**1.73**	**0.01**	5.95	2.16	9.58	3.53	0.48	**6.82**	**2.27**	**16.58**	**3.52**	**0.04**

functional groups in the burn and control plots appears to have responded similarly to year to year climatic differences regardless of the burn treatment in 2002 (Table 1). Cover of perennial grasses (primarily native) appears to have remained constant in the burn plots the first year post-treatment (2003), then it decreased between 2003 and 2004 (1 and 2 yr post-treatment). Perennial grass cover remained constant in the control plots.

Between 2002 (pre-treatment) and 2004 (2 yr post treatment) native forb cover decreased slightly in the burn plots, while it increased slightly in the control plots (Kruskal Wallis; $p = 0.01$; Table 1). Direct (mortality of some perennial individuals) or indirect fire effects (on water availability and competitive dynamics) may have reduced native forb abundance or size, resulting in a decrease in cover.

Annual forb cover (including native and non natives) was low in the burn plots the first year after the fire treatment; cover of annual forbs increased far more in the control plots than the burn plots between 2002 and 2003 (pre- and post-treatment; $p < 0.01$). This observed increase in forb cover appears to have been an ephemeral response (perhaps to good growing conditions) in 2003, as cover of this functional group then decreased between 2003 and 2004 in both burn and control plots.

Cover of bare ground, plant litter and loose rock all increased more in burn plots than control plots between 2002 and 2003, while total cryptogam cover decreased more in burn plots than control plots between 2002 and 2003 (pre and post treatment ; all $p < 0.01$; Table 1). Post-fire increases in bare ground and loose rock cover are expected, since burning generally removes accumulations of material covering the soil. The increase in plant litter is somewhat unusual. A possible explanation is that charred litter from plants and cryptogams was included as plant litter when plots were sampled post-fire. Decreases in total cryptogam cover and increases in plant litter and loose rock cover were still evident in the burn plots 2004 (all $p < 0.01$).

Layng Meadow

In Layng meadow we saw no significant difference in dynamics of any grass functional group in burn or control plots during the study (Table 2). Cover of introduced forbs remained constant in the burn plots between 2002 and 2003 (pre- and post-treatment), then decreased between 2003 and 2004 (one and two yrs post-treatment). Introduced forb cover increased slightly (~ 2 %) in control plots between 2003 and 2004 (Table 2). This difference in dynamics of introduced forb cover was also evident when the 2002-2004 time span was examined. The overall trend in both the burned and unburned plots appears to be a decrease in cover of perennial and native forbs and an increase in cover of annual and introduced forbs.

At Layng we also saw a greater increase in bare rock cover in burn plots between 2002-2003 and 2002-2004 (Table 2). Interestingly, we observed a pattern in litter dynamics at Layng that is very similar to that at Harvey; in this case, plant litter decreased in both burned and control plots, but decreased significantly less (26%; $p = 0.02$) in the burned than the control plots between 2002 and 2003. Cryptogam cover also decreased in both burned and control plots, but on average it decreased ~15% more in the burned

Table 3. Indicator species, indicator values and p-values for pair-wise comparisons of plant communities between control and burn plots in 2001-2004 within Harvey and Layng Meadows. Introduced species are shown in underlined text.

	HARVEY MEADOW							LAYNG MEADOW					
	CONTROL			BURN (treated Fall 02)				CONTROL			BURN (treated Fall 02)		
	Indicator Species	IV	p	Indicator Species	IV	p		Indicator Species	IV	p	Indicator Species	IV	p
2001	*Vulpia sp.*	47	0.006	*Cynosurus echinatus*	77	0.008	2001	*Madia gracilis*	63	0.004	*No significant indicator species*		
	Trifolium microcephalum	61	0.006	*Cerastium glomeratum*	40	0.027		*Mimulus guttatus*	71	0.016			
	Agoseris heterophylla	59	0.008					*Trifolium microcephalum*	64	0.035			
	Daucus pusillus	66	0.01										
	Trifolium variegatum	57	0.03										
2002	*Danthonia californica*	60	0.001	*Poa sp.*	67	0.002	2002	*Cynosurus echinatus*	81	0.002	*Aira caryophyllea*	67	0.02
	Orthocarpus hispidus	47	0.006	*Veronica arvensis*	65	0.019		*Madia gracilis*	62	0.025	*Plectritis congesta*	47	0.032
	Daucus pusillus	70	0.006	*Clarkia*	70	0.037		Plant Litter	67	0.056			
	Trifolium variegatum	62	0.009										
	Trifolium microcephalum	65	0.011										
	Brodiaea sp.	76	0.018										
	Mimulus guttatus	33	0.046										
	Madia gracilis	59	0.057										
2003	*Trifolium microcephalum*	78	0.003	Plant litter	69	0.002	2003	Moss	70	0.026	Loose Rock	78	0.001
	Moss	78	0.003	*Cerastium glomeratum*	69	0.008		*Agoseris heterophylla*	71	0.042	*Sherardia arvensis*	71	0.039
	Mimulus guttatus	51	0.006	Loose Rock	71	0.008		*Bromus mollis*	70	0.054			
	Brodiaea sp.	77	0.011	Bare ground	74	0.008							
	Orthocarpus hispidus	40	0.019	*Cynosurus echinatus*	71	0.021							
	Agoseris heterophylla	54	0.046	*Veronica arvensis*	48	0.025							
2004	*Brodiaea sp.*	73	0.001	Plant litter	81	0.001	2004	Plant Litter	79	0.001	Loose Rock	70	0.025
	Agoseris heterophylla	66	0.003	*Sherardia arvensis*	77	0.01		*Cynosurus echinatus*	65	0.038			
	Orthocarpus hispidus	53	0.005	Loose Rock	63	0.032							
	Moss	70	0.008										
	Trifolium microcephalum	57	0.015										
	Mimulus guttatus	40	0.022										

plots, although the significance of this difference was equivocal (p = 0.07). Cryptogam cover then increased by ~ 13% more in the burn plots than the control plots between 1 and 2 yrs post-treatment (2003 and 2004; p = 0.01). It does not appear that the single fire event permanently damaged the cryptobiotic soil layer.

Indicator Species Analysis

Harvey Meadow

It appears that there were more differences in plant species composition between the burn and control plots in Harvey Meadow than Layng Meadow. In all four years, the control plots in Harvey Meadow were indicated by multiple species of native forbs and grasses, (with the exception of *Vulpia)* in 2001. In contrast, the pre- (2001 and 2002) and post-treatment (2003 and 2004) burn plots had indicator species that were primarily introduced annuals. Prior to treatment these indicators were *C. echinatus, Veronica arvensis* and *Cerastium glomeratum,* and post-treatment indicators for the burn plots included these same three species and *Sherardia arvensis.* This suggests that there were compositional differences between the burn and control plots prior to treatment. The data indicates that there was not a sudden surge in abundance or frequency of multiple species of introduced forbs or grasses following the fire treatment in the burn plots. It also suggests that the fire did not cause a shift in plant community composition towards greater dominance by native species.

Layng Meadow

The control and burn plots in Layng Meadow were more similar in species composition than those at Harvey. We found few indicator species to differentiate the community composition between the burn and control plots in each year between 2001 and 2004. *Cynosurus echinatus* was more frequent and abundant in the control plots (particularly in 2002 and 2004). In the burn plots loose rock was more frequent and abundant post-treatment in 2003 and 2004. The exotic annual forb *Sherardia arvensis* was an indicator for the post-treatment burn plots in 2003. As was the case with plots in Harvey Meadow, there was no sudden surge in abundance or frequency of multiple species of introduced forbs or grasses following the fire treatment in the burn plots.

Species Richness and Target Species

We found that total richness and native and introduced species richness did not change significantly with fire in Harvey Meadow (Kruskal-Wallis, all $p > 0.15$) or Layng Meadow (Kruskal-Wallis, all $p > 0.25$). Year to year species richness dynamics in control and burn plots were similar pre- and post-treatment (Figure 2).

We also investigated the dynamics of two introduced annual grasses, *Cynosurus echinatus* and *Taeniatherum caput- medusae.* Dynamics in *C. echinatus* cover were similar between control and burn plots; fire did not appear to influence this species in our plots in Harvey or Layng meadows. *Taeniatherum caput-medusae* was not present in Layng meadow during the course of the study. In Harvey meadow in 2001 (1 yr pre treatment), *T. caput medusae* had greater cover in control plots and minimal coverage in the burn plots. In 2002, still pre-treatment, cover of *T. caput-medusae* dropped to zero in

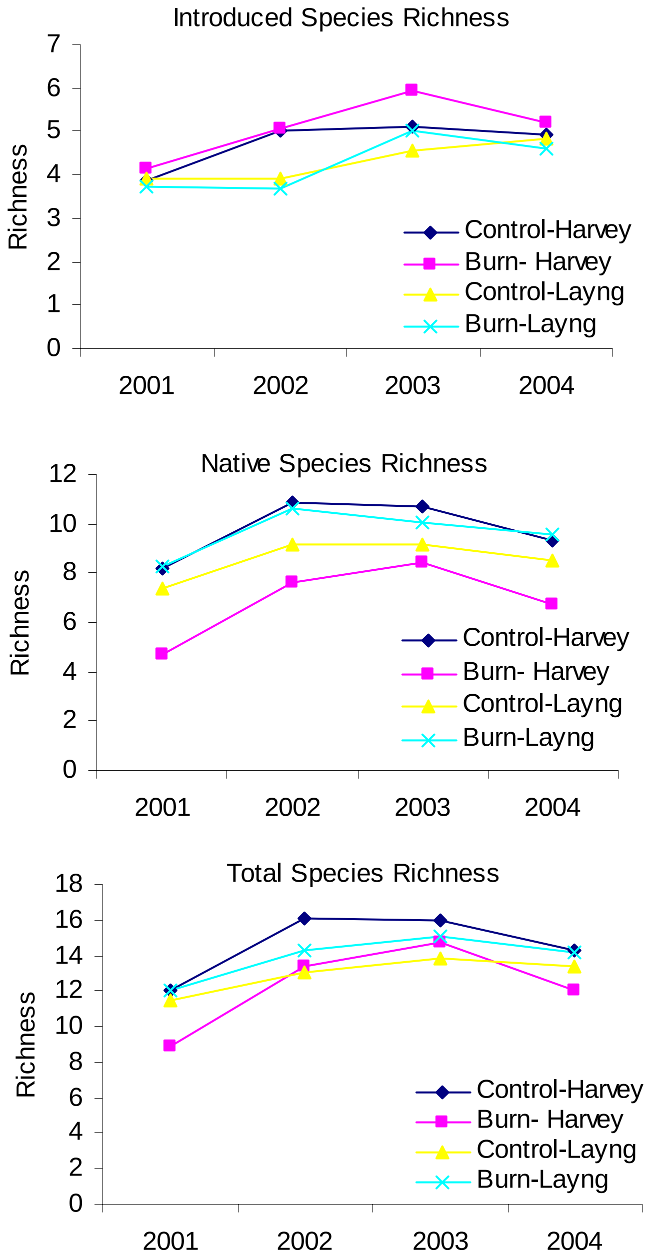
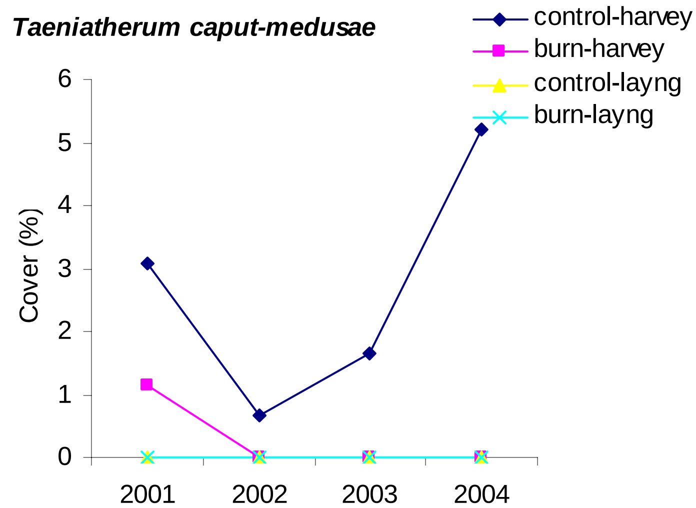


Figure 2. Mean species richness (total, native and introduced) in Harvey and Layng Meadows 2001-2004. Burn plots were treated in fall 2002. Changes between years were compared between control and burn plots in each meadow using non-parametric Kruskal-Wallis tests. There were no significant differences in changes between control and burn plots, before or after treatment.



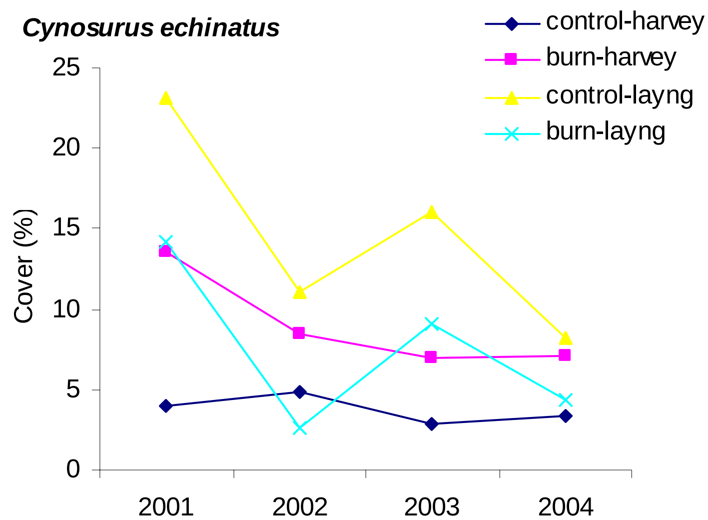


Figure 3. Mean cover of *Cynosurus echinatus* and *Taeniatherum caput medusae* in burn and control plots in Harvey and Layng meadows between 2001 and 2004. Burn plots were treated in fall of 2002.

the burn plots (while remaining at low levels in the control plots). Cover of *T. caput-medusae* did not reappear in the burn plots post-treatment (2003 or 2004), but increased in cover in the control plots. It is impossible to determine whether the fire limited recovery of *T. caput-medusae* in the burn sites, but it does not appear that fire stimulated an increase in this invasive species.

Soil Depth

At Harvey Meadow, the control plots had deeper soil than the burn plots. There was little change in soil depths over the course of the study either set of plots at this meadow. At Layng Meadow, soil depth in burn and control plots remained similar to each other both before and after the fire treatment. Interestingly however, over the four years of the study, soil depths decreased in both sets of plots at this meadow.

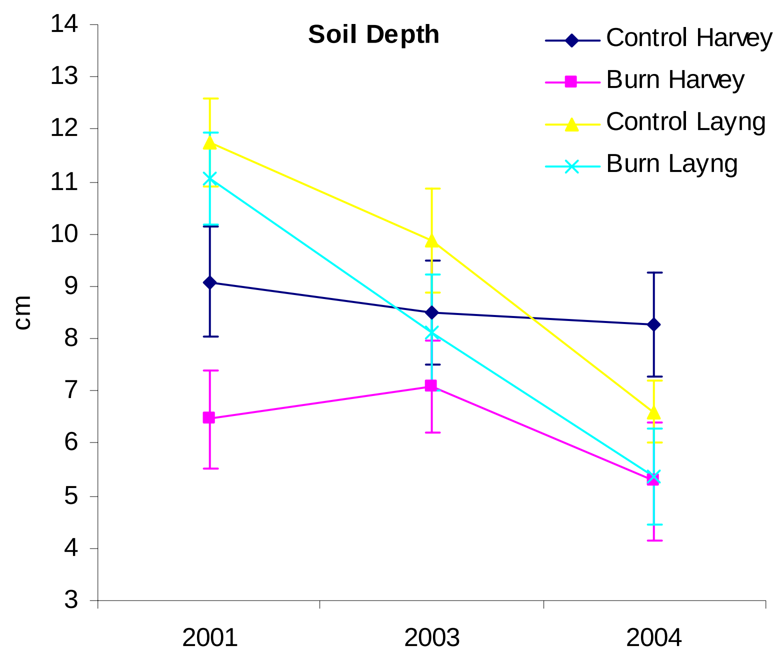


Figure 4. Mean soil depth (cm) with standard error bars in control and burn plots in Harvey and Layng Meadows between 2001 and 2004. Soil depth data were not collected in 2002. Burn plots were treated in 2002. Changes in soil depth were similar between burn and control plots, both before and after treatment.

CONCLUSIONS

Our objective in this report was to determine if the prescribed fire in these dry meadows accomplished the goals of the Forest Service. Unfortunately, the study was limited by low replication and randomization, so the power of the study to determine the true influence of burning in these meadows was reduced.

The first two objectives of the burn were to release native seed banks and increase the vigor of native bunchgrasses and forbs. Based on our assessment of the plant communities in the burn and control plots, it appears that the fires did not promote this seed bank release or increase in vigor, but it did not substantially hinder the native populations either. In general, the plant communities were not substantially impacted by the prescribed burns.

The third objective of the burns was to reduce existing non-native plant populations. Our analyses of functional group cover, indicator species, and cover of *Cynosurus echinatus* and *Taeniatherum caput-medusae* suggest that the fires may have temporarily decreased cover of some introduced species, but did not promote long term change in the plant communities. It is of interest to note, however, that cover of *Taeniatherum caput-medusae* in control plots at Harvey Meadow increased over the course of the study, but it did not spread to the adjacent burn plots, even with the disturbance of the fire treatment. Research suggests that in some conditions burning can actually remove *T. caput-medusae* from plant communities (Miller et al. 1999), and burning in Harvey Meadow could potentially have limited the spread of this species.

LITERATURE CITED

Brooks, M. and D. Pyke. 2000. Interactions between fire and invasive plants in the deserts of North America in Fire Conference 2000: The First National Congress on Fire Ecology, Prevention and Management. Pages 1-2 University Extension, University of California, Davis, Davis, CA.

Dufrene, M. &P. Legendre. 1997. Species assemblages and indicator species: the need for a flexible asymmetrical approach. Ecological Monographs 67:345-366.

Hironaka, M. 1994. Medusahead: natural successor to the cheatgrass type in the northern grasslands in Proceedings-Ecology and Management of annual rangelands. Pages 89-91 in Monsen, S. B. and S. G. Kitchen (eds.) . General Technical Report. USDA Forest Service, Intermountain Research Station, Ogden, UT.

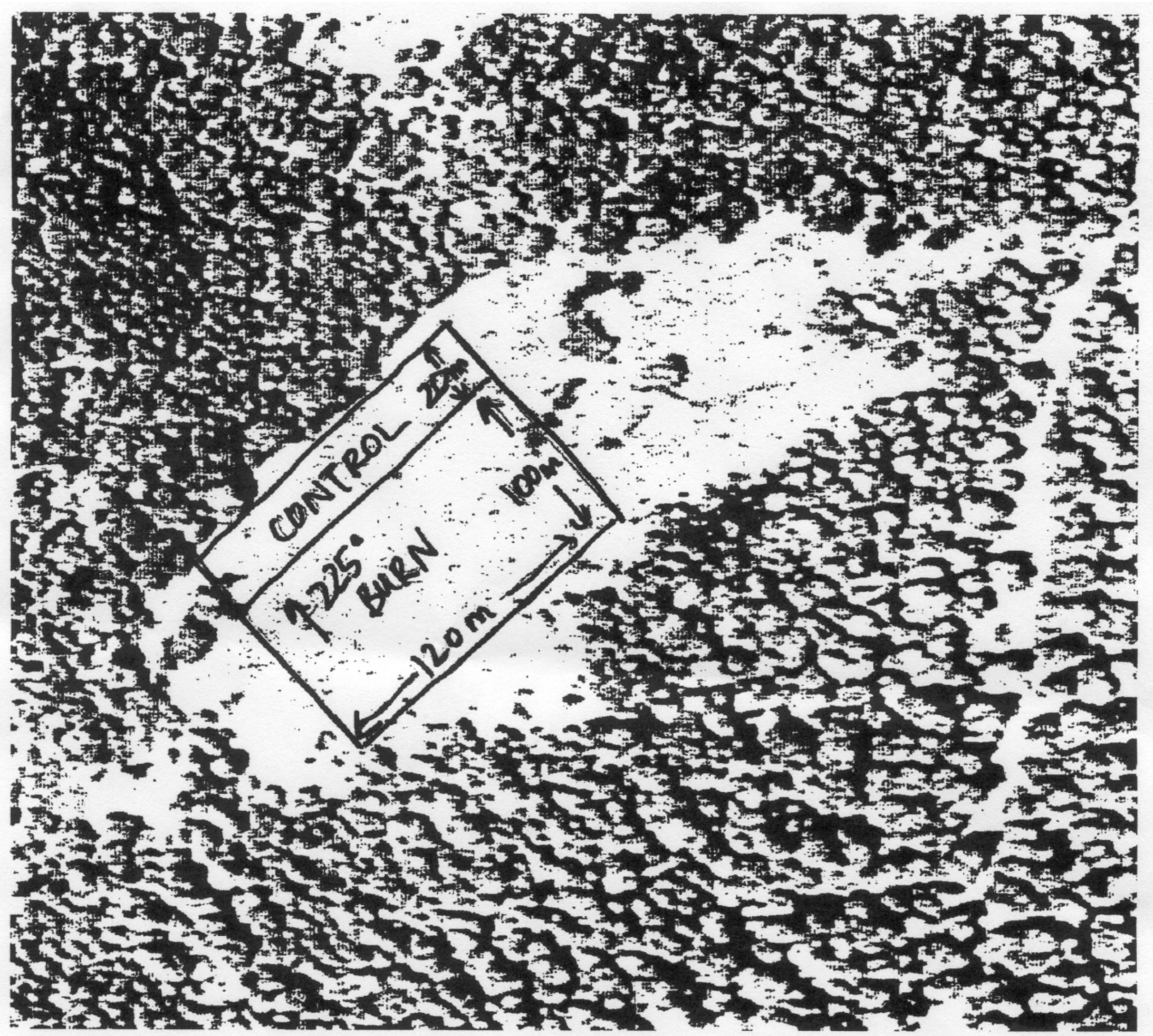
McCune, B., and M.J. Mefford. 1999. PC-ORD. Multivariate analysis of Ecological Data. Version 4.0. MjM Software, Gleneden Beach, OR.

Miller, H.C., Clausnitzer, D. and M.M. Borman. 1999. Medusahead. Pages 271-281 in Sheley, R.L. and J. K. Petroff (editors), Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, Oregon.

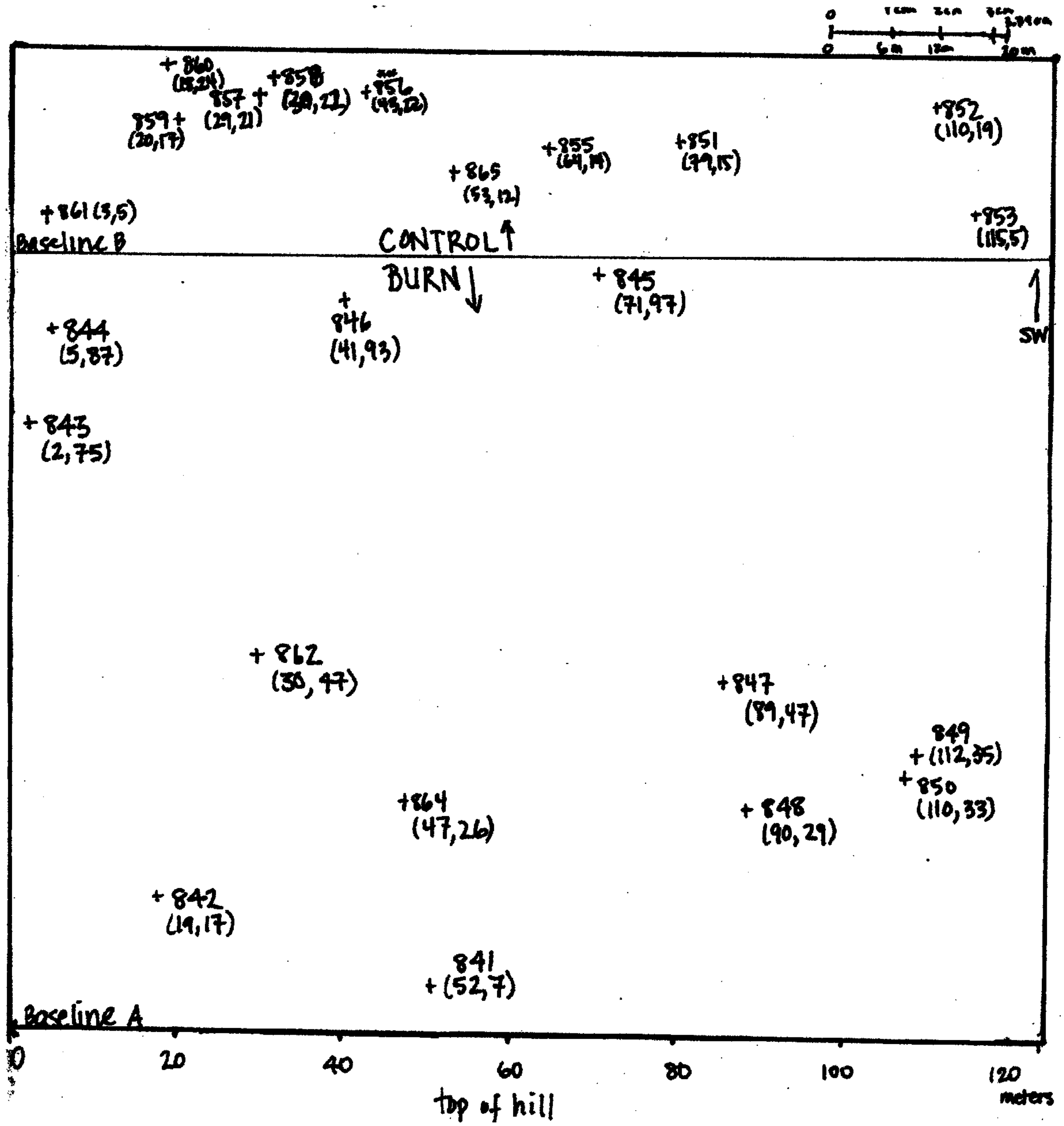
Spaderna, L. 2001. Fire in the dry meadows of the western Cascades. Bulletin of the Native Plant Society of Oregon 34:121-130.

Young, J. A. 1992. Ecology and management of medusahead (Taeniatherum caput-medusae ssp. asperum [Simk.] Melderis). Great Basin Naturalist 52(3): 245-252.

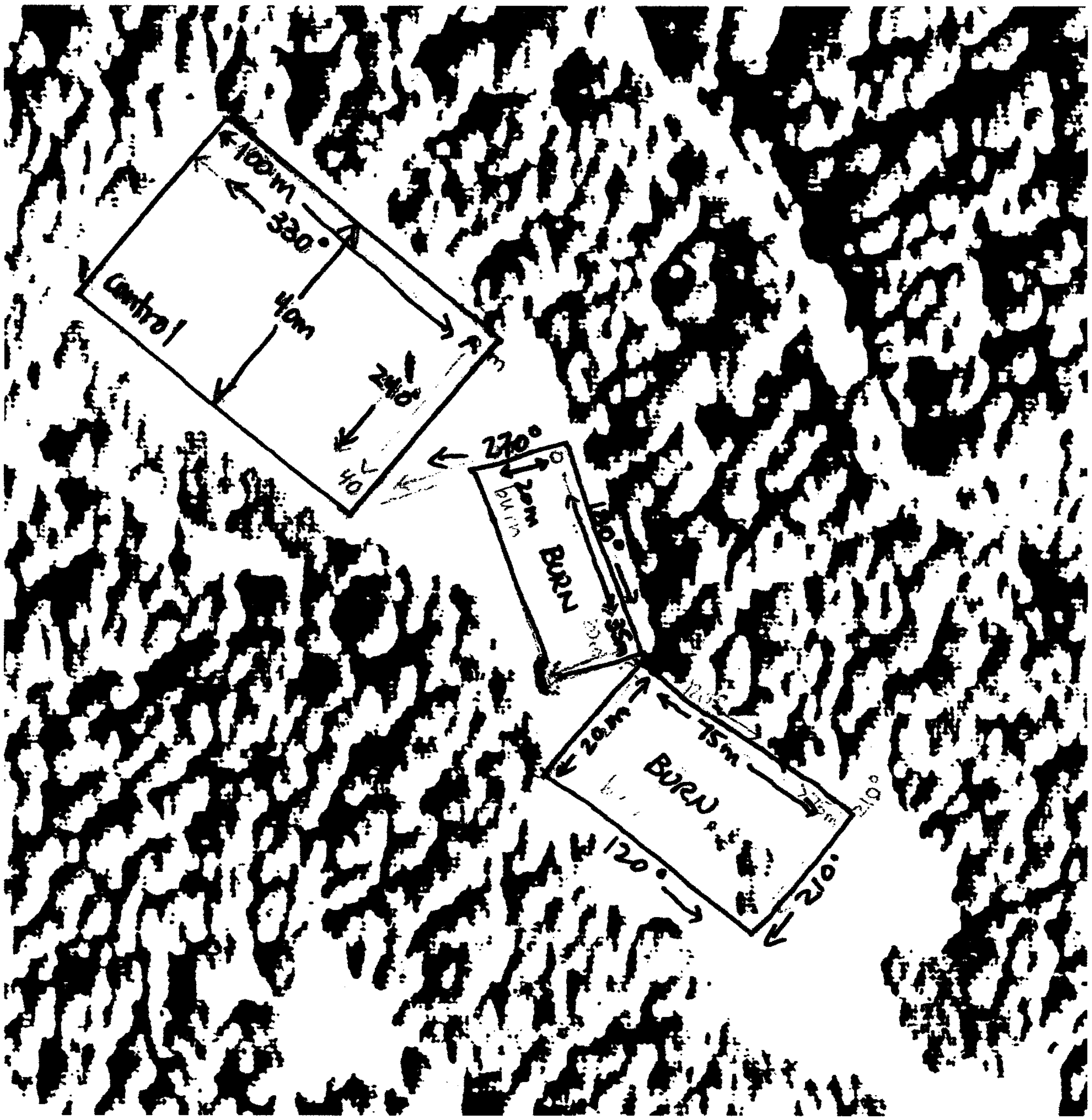
APPENDIX 1: Aerial photos and Sketch-Maps



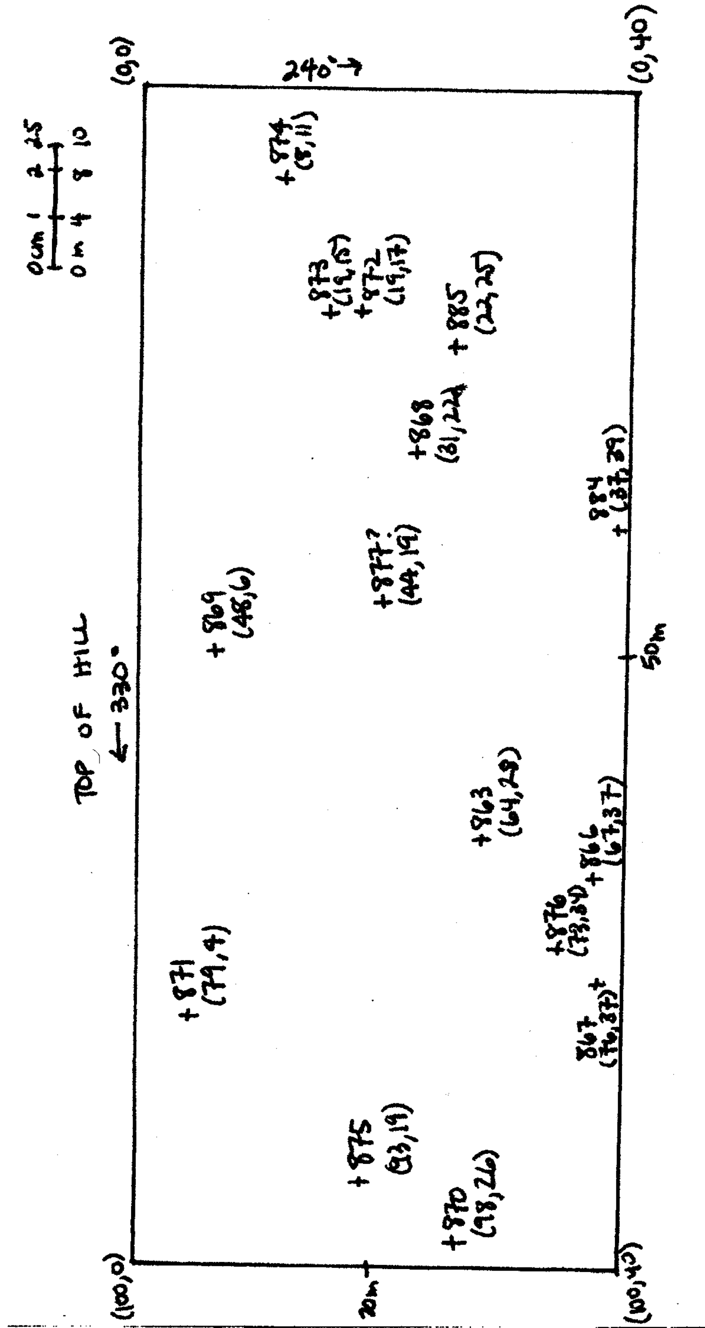
Appendix A. Aerial photograph of Layng Meadow showing location of plot areas.



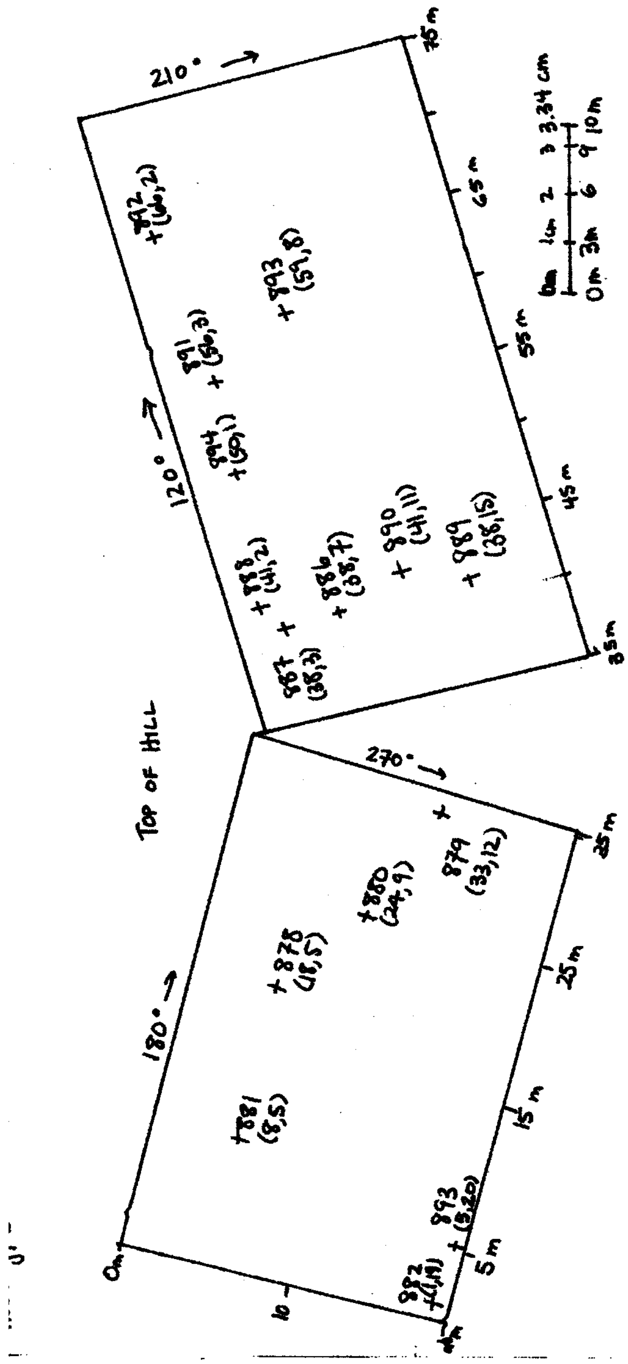
Appendix B. Layng Meadow sketch-map of plot layout. A "+" indicates a plot location, and the numbers indicate the plot number and coordinates in parentheses, e.g., "841 (52,7)." The coordinates are relative to Baseline A.



Appendix C. Aerial photograph of Harvey Meadow showing location of plot areas.



Appendix D. Harvey Meadow sketch-map of plot layout in the control portion of the meadow. A “+” indicates a plot location, and the numbers indicate the plot number and coordinates in parentheses, e.g., “841 (52,7).”



Appendix E. Harvey Meadow sketch-map of plot layout in the burn portion of the meadow. A "+" indicates a plot location, and the numbers indicate the plot number and coordinates in parentheses, e.g., "841 (52,7)."

APPENDIX 2.

Raw data from vegetative plots in burned and control areas of Harvey and Layng Meadows, 2001-2004.

trtmt	burn	burn	burn	burn	burn	burn	burn	burn	burn	burn	burn	burn	control	control	control	control	contro	control	contro
site	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng	layng
year	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001
Plot	**864**	**841**	**842**	**843**	**844**	**845**	**846**	**847**	**848**	**849**	**850**	**862**	**851**	**852**	**853**	**855**	**856**	**857**	**858**
Alchemilla occidentalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium glomeratum	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0.5	0	0
Chrysanthemum leucanthemum	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum perforatum	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypocharis radicata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis discolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sherardia arvensis	1	1	4	0.5	1	0.1	2	0.5	0.5	0.5	1	5	1	1	2	0.5	1	1	4
Sonchus asper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Veronica arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achillea millifolia	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Agoseris heterophylla	1	1	1	0	1	0.1	0.5	2	1	0.5	0	0.1	2	0	12	2	1	0	0
Allium crenulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Arenaria douglasii	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
Aspidotis densa	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Brodiaea spp.	7	1	1	10	1	33	0	28	3	34	55	0.5	1	30	4	35	15	3	4
Calochortus tolmeii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clarkia sp.	0	0	0	0	0	0	0.1	0	0	0	0	1	1	0	2	0	0	0	0.5
Claytonia perfoliata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collinsia parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
Cryptantha intermedia	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus pusillus	1	10	2	0	1	0	1	0.1	1	1	1	3	2	0	0	0	1	1	5
Galium aparine	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Gilia capitata	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0.1	0	0.1	0
Githopsis speculariodia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Linanthus bicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatium hallii	3	0.1	2	5	3	3	0	0	4	0	0	4	0	3	1	1	0	0	0
Lomatium triternatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatium utriculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lotus micranthus	0	1	0	0	0	0	0.5	0	0	0.1	0	0	1	0	0	0	1	0	0.1
Lupinus bicolor	0	0	0	1	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Madia gracilis	0.1	0	0	0	0	0	0	0	0	0	0	0	8	0	0	1	2	0.5	0.5
Marah oreganum	0	0	0	0	0	0	30	0	0	0	0.5	0	0	0	0	0	0	0	0
Mimulus alsinoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mimulus guttatus	0.1	0	0	0.1	0.1	0.5	0	0.5	0	0	0	0.1	0	1	0.1	2	1	0.1	0
Orthocarpus attenuatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocarpus hispidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocarpus pusillus	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Phacelia hastata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectritis congesta	9	0	0.5	0	0	0	0	0	0.1	2	5	0	0	0	0	1	0	0	0
Prunella vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptyrogramma triagularis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus occidentalis	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanguisorba officianalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanicula crassicaulus, bip.	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saxifraga integrifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selaginella wallaceii	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	2	0	0
Sidalcea virgata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium microcephalum	0.1	0	0	0.1	1	0	0	2	0	0.5	0	0.1	1	2	1	3	1	0.1	0
Trifolium variegatum	2	0	0	0.1	0.1	0.1	0	0	1	0.1	0	1	0	0	0	0	0.5	0	0.5
Zygadenus venenosus	12	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Agrostis microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aira caryophyllea	6	1	2	0.5	1	0	2	0	0.5	2	1	2	3	0	2	0	1	3	5
Bromus mollis	6	0	0	1	7	0	0	1	14	0	2	1	1	0	4	5	10	10	1
Bromus rigidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taeniatherum caput-medusae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus carinatus	0	0	1	0	0	1	0	0	0.5	0.5	0	1	0	0	0	0	0	0.5	0
Bromus sp. (hairy native perennia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynosurus echinatus	3	60	0.1	0.5	45	3	25	1	7	8	2	15	50	5	10	18	15	22	16
Danthonia californica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus glaucus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca californica	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Koelaria christata	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Luzula campesteis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipa lemmonii	2	1	0	0	0	0	0	0	0.5	4	0	0.5	1	0	0	0	0	0	0
Bromus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa secunda	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0
Vulpia myuros	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berberis aquifolium	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
Pseudotsuga menziesii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

control	control	control	control	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	contr	burn	burn	burn	burn	burn	burn
layng	layng	layng	layng	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harve	harvey	harvey	harvey	harvey	harvey	harvey
2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001
859	**860**	**861**	**865**	**863**	**866**	**867**	**868**	**869**	**870**	**871**	**872**	**873**	**874**	**875**	**876**	**877**	**884**	**885**	**878**	**879**	**880**	**881**	**882**	**883**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.5	2	0.5	1	1	1	1	0.1	1	0.5	0	1	0.5	1	0	4	0	0	0	0	0.5	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
0	0	0	0	0	0	0	2	0	0	0	0.5	1	4	0	0	0	0	2	4	0	0	5	0	3
1	2	10	3	1	1	1	3	0	3	2	2	1	2	1	0	0	0.1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	4	35	14	2	3	0	20	0	1	2	40	40	20	3	0	0	0	0	9	2	10	0	10	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	0	0	1	3	0	0	1	0	0.1	0	0	0.1	2	0	1	3	2	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.1	0	0.5	1	5	1	2	1	2	1	0	1	10	2	2	4	0	1	1	0	3	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	0	1	0	1	0	0.5	0	0.5	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	1	0	0	4	4	0.1	0	0	0	2	1	0	0	3	0	7
0	0	2	0	6	1	1	8	0	4	0	0	0	4	3	0	0	0	0	8	0.5	5	15	0	3
0	0	0	0	0	0	0	0.1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.1	0	0.1	4	1	0	0	0	0	0	0	0	6	1	0	4	0	3	0	0	0	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.5	0	0	2	2	6	2	2	0.5	1	0	0.5	4	0	1	4	0	1	0	4	2	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.1	2	0.1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0.1	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	14	12	10	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
1	0.1	0	3	5	2	1	13	0	0	0	2	0	0	3	3	1	0.1	5	1	0.5	0	2	0	0
0	0	0	0	5	4	3	0	2	0.5	0.5	6	8	0	6	2	1	1	0	5	0	3	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
1	3	4	2	7	1	0.1	5	8	0	10	10	0.5	0	4	6	17	1	0	2	3	8	2	3	0
10	1	8	3	5	6	4	1	4	3	0	4	19	4	8	2	0	10	3	3	3	4	10	18	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	3	10	13	0	0	0	0.1	20	0	0	0	0	3	0
0	0	0	3	1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	15	18	60	6	0	0	10	3	0.1	3	5	17	10	3	0	0	0	3	50	3	8	35	15	50
0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	4	3	1	0	4	0	0	0	0	0	0	2	0	6	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2001	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002	burn harvey 2002
886	**887**	**888**	**889**	**890**	**891**	**892**	**893**	**894**	**878**	**879**	**880**	**881**	**882**	**883**	**886**	**887**	**888**	**889**	**890**	**891**	**892**	**893**	**894**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	1	2	1	0	0.5	0.5	0	0	0	0.1	0	0.1	0	0.5	0.1	0.1	0.1	0.1	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.1	0.5	0	0	1	2	1	2	0.1	0.5	0.5	1	0.1	0	0.1	0.1	0.5	0.5	0.1	1	0	0.5	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0.1	0	0.5	0.5	0.1	1	0.1	2	1	0.1	1	1	2	0.5
0	0	0	0	0	0	0	0	0	5	0	0	7	0	4	0	0	0	0	0	0	0	0	0
0.1	0.1	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0.1	0	0.5	1	0	1	2	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0.1	0	3	3	1	0.5	3	12	0	0.5	0	0.5	0.5	0	0	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	2	0	0	5	0	0	0	2	0.5	3	7	0	4	0.5	0.1	2	1	0.1	1	1	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.1	0	0	0	0	1	2	0	0	0	0	0.5	0	0	0.5	0	0	0	0	1	0.5	0.5	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0.5	1	0	0.1	0	0	0.5	0.1	3	0	0	0	0	0	0	0.1	0.1	0
2	0	0	0	0	0	0	0	0	3	2	2	5	0	3	1	0.1	0	0.1	0	0	1	0	0
0	0	0	0	0	0	0	0	0.1	0	0	0	0	1	0	0	0	0	0.5	0.5	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0.1	0	0.5	0.1	0.1	1	0.5	0	0	0	0.1	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	1	1	2	2	1	1	1	0	2	1	0	2	0	0.5	0	0	2	2	0.1	0.5	4	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.1	0	0	0	2	0	0	0	0	0.5	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0.5	0	0
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0
0	0	0	3	3	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
3	18	0	5	2	7	4	15	0	2	1	0	0	0	0	0.5	1	0.1	0.5	1	1	1	2	0
3	0.1	8	4	1	7	12	15	2	0.1	0.5	0	3	0	0	2	0.5	2	0.1	0.1	3	2	4	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0.1	10	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0.5	0.5	4	3	4	8	20	1	15	0.5	6	20	17	45	0.1	0.5	2	1	2	0	6	10	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	3	3	4	1	4	0.5	0	0	0	0.5	0.5	3	0.5	4	0
0	0	0.5	0	2	0	0	0	0	2	1	3	4	1	0.5	0	1	2	0.5	1	0	0	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	0	0	1	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1

contro	contro	contro	contro	contro	contro	contro	contro	contro	control	contro	contro	contro	contro	contro	contro	contro	contro	contro	contro	contro	contro	contro	contro
harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	harvey	layng	layng	layng	layng	layng	layng	layng	layng	layng
2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002
863	**866**	**867**	**868**	**869**	**870**	**871**	**872**	**873**	**874**	**875**	**876**	**877**	**884**	**885**	**851**	**852**	**853**	**855**	**856**	**857**	**858**	**859**	**860**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0.1	0	0.1	0	0	0.5	0	0	0.1	0.1	1	0	0	0	0	0.1	0	0	0.5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0.1	0.5	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0.1	0.1	0	0.1	0	0.1	0.5	0.5	0	0.1	0.1	0.1	0.5	2	0.1	0.5	0.5	0.1	0.5	0.5	0.5	0.5	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.1	1	0	1	0	0	0	0.1	1	0	0	0.1	0	0.1	0	0	0	0.1	0	0	0.1	0	0.1
0	0	0	2	0	0	0	0.5	0	5	0	0	0	0	1	1	0	0	0	0	0	0	0	0
1	0.1	0.1	1	1	1	1	0	1	0.1	0.5	3	2	1	0	0.5	2	3	10	0	0.5	0	2	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	0.1	0	0	0	0	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	0.1	25	0.5	2	8	20	20	12	7	0.5	1	0	3	8	45	15	55	1	2	2	12	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.5	0.1	0	2	0.5	0.1	0	0	0.1	0.1	0.1	0	0.1	1	3	0	0	0	0	1	0.5	0	1
0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.5	1	4	0.1	1	0.5	0	0.1	3	0.1	2	0.5	0	0.5	0.5	0	0	0	0	2	2	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.5	0	0.1	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
0	0	0	4	0	0	0	4	0.1	0.5	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0
10	0.5	1	2	0	0.5	0	0	0	3	2	0	0.5	0	0	0	7	1	4	0	0	0	0	0
0	0	1	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0.5	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	4	0.1	0	0	0	0	0	0
0.5	0.1	0	0	0	0	0	0	0	0.1	2	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
3	3	3	2	1	0.5	2	1	0	2	0.5	4	1	0.5	2	1	0.5	0	1	1	0.5	1	2	1
0	0.1	0	0	0	0	0	1	0.5	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.1	0	0.1	0	4	0	0	0.1	0	0	0	0.5	0	0.5	0.5	1	2	0.5	0	0	1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.5	0.1	1	0	0	0.1	0	0	0.5	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	6	5	12	8	0	0	0	0	0	0	0	0	3	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.1	0.1	0	3	0.1	0.1	0	0	0	0.1	0	0.1	0.1	0.5	5	0.5	0.5	0.5	0	2	0.1	0	0.1	5
0.5	0.1	0.5	0	0	0	0.5	2	0	0	0.1	0.5	0.1	1	0.1	0	0	0	0	0.5	0.5	0.1	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0		0	0	0	4	0	0	0.5	0	1	2	0	5
4	0.1	0.5	2	1	0	4	0	0.1	0.5	1	2	2	0.5	0.1	0	0.5	2	0	1	0	0	0.5	0
3	4	1	0.5	0.5	2	0	0	0.1	0	1	1	1	4	7	1	0	0.5	1	0.5	1	0.1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.5	0.5	0	0	0	0	0	0	0.5	0	0.1	0	0.1	0	0.5	0	3	0	0	8	4	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	20	1	2	3	3	15	10	2	0.1	0.5	0.1	4	33	4	6	15	4	4	5	10	4
2	0	0.5	0	2	2	0	2	20	1	4	0	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	0	0.5	0	0	0	0	0
0.1	0.1	0	0	0	0	0	0	0.5	8	2	1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0.5	0	0.5	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	2	0	0	0	0	1	0	2	0.1	6	7	0	1	0.5	0	0	0	0	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

contro layng 2002	contro layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2002	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003	burn layng 2003
861	**865**	**864**	**841**	**842**	**843**	**844**	**845**	**846**	**847**	**848**	**849**	**850**	**862**	**841**	**842**	**843**	**844**	**845**	**846**	**847**	**848**	**849**	**850**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
0	0	0	0	0	0	0.1	0	0	0.5	0	0	0	0	0	0	0	0.5	0	3	0	0	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.5
0.5	0.5	0	2	1	0	0	0.5	0.5	0.1	0.5	2	2	0	7	6	1	0.5	0.1	3	0.5	1	5	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.5	0	0	0	0	0	1	0	0	0	0.5	0.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	1	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	1	0	0	0.1	0	4	0.5	0.5	0.1	2	4	1	4	0.5	2	2	1	5	2	4	0	5
0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0.1	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.5	0.1	0
0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	2	0	0	0	0	0	0	0
8	17	45	3	0.5	12	0	65	0.5	50	3	18	60	45	4	1	19	4	50	0	35	12	18	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	2	1	1	0.5	0.5	2	0	0.1	0	0.5	0	2	2	1	0	0.1	0	0	0.5	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.1	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
0	0	1	0	0	0	0.5	0	0.5	0.5	2	1	0	1	4	4	0.1	2	0.1	1	0.5	2	5	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	1	0.5	1	12	3	4	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	3	2	0	0	4	0.1	0
0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0.1	10	2	0	0	0	0.5	0	0	0.1	1
0	0	0.5	0	0	2	0	0	0	0	0.5	0.5	0	0.5	0.5	0	1	0	0	0	0.5	0	0	0
1	0	0	0	0.1	0.1	0.5	0	0	0.5	0	0	2	0	0	3	1	2	0	0	0.1	0	2	1
0	0	0	0	0	0	0	0	10	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	1	2	0	0	1	0.5	0.1	0	4	0.1	1	2	2	0	0	2	0.5	0	0	1	0.5	2	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	3	0	0.5	0.5	0.5	0	0	0	0	2	4	3	0	0.5	0.5	0	0	0	0	0	0.5	0.5
0	0	0	0.1	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	3	0	0	0
0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.1	0	0	0	0.1	0	0.5	0.1	0.1	0	0	0.1	0	0	2	16	0.1	2	3	0.5	0.5	1
0	0	0.1	0	0	0.1	2	0	0	1	0.1	0	0	0.1	0	0	0.5	4	0	0	0	1	1	0
0	0	12	1	0	0	0	0	0	4	0	0	0	12	1	0	0	0	5	0	0	2	0	0
0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	2	1	0.5	0.5	1	0.5	1	0.5	2	2	0	2	2	3	2	0.5	1	4	1	1	1	0.5
0.1	1	0.5	0	0	0	0	0	10	0.5	1	0	0	0	0	0	1	0.5	15	0.1	0.1	0.5	0	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	0	1	8	6	0	0	0	0.1	0.5	2	0	0.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
12	25	1	7	0.5	2	4	2	0	0.5	4	8	2	1	10	2	5	18	6	12	0.5	15	23	13
0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	4	4	0	0	0	0	0	0	6	15	0	4	3	0	0	0	0	0	0	0	2	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

burn layng 2003	burn layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	contro layng 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003
862	**864**	**851**	**852**	**853**	**855**	**856**	**857**	**858**	**859**	**860**	**861**	**865**	**878**	**879**	**880**	**881**	**882**	**883**	**886**	**887**	**888**	**889**	**890**
0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
0.1	0.1	0	0.5	0	0	3	0	0	0	0.5	0	0	4	0	0	0.5	0.5	7	1	0.1	2	0.1	0
0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
3	2	1	0.5	0.5	0.5	2	2	0.5	1	1	2	0.5	2	1	4	6	1	2	1	0.5	2	2	2
0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.1	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.5	0.5	0.5	0	0.5	0.5	0.1	0
0	0	0.1	0	0	0	0	0	0	0	0	0	0	3	0	0	5	0	2	0	0	0	0	0
0	1	2	4	12	5	0.5	2	1	12	1	15	4	0	0.5	0	0	0	0	7	0	0	0.5	2
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	50	20	25	20	45	8	4	4	12	10	35	20	5	7	0.5	2	5	5	2	0.5	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0.5	0	3	3	0.1	1	0	0	2	1	2	2	0	2	0.5	0.5	2	1	0.1
0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	0.5	1	2	3	2	3	5	5	5	0.1	0	3	2	4	8	3	0	0	3	1	1	1	0.5
1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	1	1	6	0	0	0	0	0
8	0	0	4	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.5	0	0	1	0.5	0	0	0	0.1	0.5
0	2	0	1	0.5	4	0	0	0	0	0	5	0	4	1	1	3	0	4	3	0	0	0	0
1	0	2	0	0	0	0.5	0.5	1	0	1	1	0	3	0	0.5	5	0	6	0.5	0	0	0.1	0.1
0	1	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	2	1	1	0.5	5	1	0	1	2	1	3	3	5	2	5	2	0	0	0	1	0.5	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	0	0
1	5	0	1	1	1	0	0	0	2	0.5	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0
0	0	0	0.5	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	2	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.5	0	1	0.5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0
0	3	10	1	1	1	20	6	1	6	7	1	0.5	2	0	0.5	2	2	3	0	0	0	0	0
6	2	0	0.1	0.1	0	5	1	0.5	2	4	0.5	0	3	0.5	1	2	0	1	0.1	0.5	0	1	1
0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	3	2	0.5	4	0	3	2	3	2	3	1	2	15	7	4	0	1	0	4	10	0.5	2	3
3	0.5	15	0	3	12	7	4	2	10	3	3	4	3	3	2	12	3	0.5	2	0.5	3	4	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0.5	0.5	0	0	0	0	0
3	1	20	3	3	10	20	12	32	22	15	5	35	20	6	10	8	17	15	1	1	0.5	8	1
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	2	4	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0.1	0	0	1	0	1	1	1	4	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	2	0	2	1	5	2	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

891	892	893	894	863	866	867	868	869	870	871	872	873	874	875	876	877	884	885	841	842	843	844	845
burn harvey 2003	burn harvey 2003	burn harvey 2003	burn harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	control harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	contro harvey 2003	Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	1	0.5	0	0	0	0	0.5	0	0	0.5	0.1	0.5	0.5	0.1	1	0	0	0	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0.5	0.1	0	0	0	0	0	0	0	0	0	0	0
2	4	4	2	4	2	1	2	3	1	0.5	1	5	1	2	0.5	3	1	1	4	0.5	0.5	0	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.5	1	0.5	0	0	0	0	0.5	0	0	0	0	0	0.5	0	1	0	0	0	0	0.1	0.1	0
0	0	0	0	0	0	0	1	0	0	0	0.1	0	2	0	0	0	0	0	0	0	0	0	0
0	4	3	2	2	0	0	3	1	2	3	5	5	5	2	3	6	2	0	9	2	1	0.5	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	0	0
1	2	5	0	3	4	2	35	1	1	8	25	15	4	15	2	4	1	3	2	3	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
0	2	1	0.5	2	1	0.5	2	3	1	0.5	0.5	0	0	3	0	1	1	1	0.5	5	0.5	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	2	0	1	1	4	3	7	1	5	1	0	4	4	2	4	2	3	1	5	4	0	3	0
2	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
0	0	0	2	1	2	0	0	0	0.5	0	0	0	0	0.5	0	0.1	0.5	0	0	0	0	0	0
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	2	0	0.5	0	2	0	0	0	0	0	0	0.5	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	1	0.5
0	0.5	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
0	0	0	0	8	1	1	2	0	1	0	0.5	0	4	0	0	0	0	0	0.5	4	0	0	0
0	0	0.5	0	3	0.5	0	4	0.5	0	0	2	1	2	7	0	2	0.5	6	4	0.5	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1	1	8	0.5	8	2	4	8	4	10	3	3	3	3	3	4	2	0	3	0	3	0.5	0	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
0	0	0	0	0	0.5	0	0	1	0	5	1	0.1	0.5	0	0	0.1	2	0	0	0	3	0.5	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	1	0	0.5	0	0	0	0	0	0	1	5	0.5	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3	0.5
0	0	0	0	0	0	0	0	0	0	12	0	5	7	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
0	0	0.5	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
0	0	0	0	0	0	0	0	0	0	2	1	0.5	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	6	1	0.5	8	0.1	0	0	25	4	8	0.5	5	3	2	18	0	0	1	35	0.1
0	0	0	0	6	4	2	0	10	0.5	0.5	0	0	0	0.5	3	5	3	2	0	0	1	7	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.1	0.5	2	3	0	0.5	3	6	1	5	0	0	1	2	1	6	1	0	8	5	0.5	1	1
1	5	8	0	14	4	2	3	4	2	0	0.5	5	5	12	3	3	3	7	1	0	3	0.5	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	20	0	0	0	0	4	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
3	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
1	5	8	3	2	0	0	5	1	1	1	1	15	10	2	0	1	2	1	10	3	4	4	5
0	0	0	0	0.5	0	4	0	0	3	0	0	0	0	3	0	0	0	0	0.5	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	2	0	4	1	0	2	0	0	0.5	0	0	0	10	0.5	2	25	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004	Burn layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contol layng 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004
846	**847**	**848**	**849**	**850**	**862**	**864**	**851**	**852**	**853**	**855**	**856**	**857**	**858**	**859**	**860**	**861**	**865**	**863**	**866**	**867**	**868**	**869**	**870**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0.1	0	0	0.5	0	0	0	0	0	0.1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.1	1	0	0	0	0.1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.5	0.5	4	1	0.1	0.5	0.5	3	0.1	0.5	1	5	10	9	2	3	0.5	0	0.5	0	0.5	2	0.1
0	0.1	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.1	0	1	0	0	0	0	0	0.5	0.1	0	0	0.1	0	0.1	0	0	0	0.5	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
3	11	4	4	2	11	1	6	8	4	15	1.5	0.5	0.5	1	1.5	10	2	1	0	0	8	2	0
0.1	2	3	8	6	0.5	0	0	0.1	0	2	0.5	0	0	0	0	0	2	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	0	0	20	0.5	20	4	0	0	1	1	5	0	15	0	0	0.5	0	20	0.1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.1	0	0	0	0	0.5	0	0.1	0	0	0	0	0.5	1	0.1	2	0	0.5	0.5	0.5	1	0	2	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
3	0.5	2	1	1	3	0.5	0.5	3	2	0	4	5	5	8	2	0	0	0	3	2	0.5	0.5	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	1	0	0	0
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
0	0	8	0	0	4	0	0	0.5	0.1	4	0	0	0	0	0	6	0	1	0.5	0.5	0.5	0	0.5
0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
1	0	0	0.5	0.5	0.5	0.5	0.5	0	0	0	0.5	0.1	0	0	0.5	2	0	2	0	0	0.5	0.5	0.1
0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.5	0	3	3	0	0.5	2	0	0.5	0	0	0	0	0.5	0	0.5	0.5	1	1	2	1	1	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.1	0.5	0.5	6	12	2	4	1	0.5	1	2	2	1	0.5	5	0.5	1	0.5	0	0.1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	2	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.1	2	0.1	0	0	0.5	0	1	2	0.1	0	0	0.5	2	2	0.1	0	0	0	0	0	0	0
0	0	0	0	0.5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	2	1	6	4	0	3	20	0.5	1	0.5	4	7	1	6	6	0	1	2	0	0.5	1	0.5	0
2	0	4	2	0.1	1	2	0	0.1	0	0	3	1	0.5	2	3	0.5	0	3	1	2	0	6	0.5
0	0	0	0	0.5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	2	2	1	3	4	2	0.5	1	0	3	2	2	2	1	2	2	1	0.5	0	1	1	0.5
4	2	3	0	1	2	0.5	20	0	1	30	1	3	3	1	2	7	2	15	5	1	4	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0
0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1	8	7	0	5	10	2	2	6	12	8	6	12	2	10	20	2	0	0	25	0.5	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	9	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	5	0.5	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Control harvey 2004	Contro harvey 2004	Contro harvey 2004	Control harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Contro harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004	Burn harvey 2004
871	**872**	**873**	**874**	**875**	**876**	**877**	**884**	**885**	**878**	**879**	**880**	**881**	**882**	**883**	**886**	**887**	**888**	**889**	**890**	**891**	**892**	**893**	**894**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.5	0	0	0	0	0	0	0	0.1	0	0	0.5	0.1	0	0	0	0	0	0.1	0.5	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	0	0	0	0	0	0	0	0	0
0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.5	0.5	2	0.5	0.5	0	0.5	0.5	2	0.5	3	4	0.5	0.5	0.5	0	0.5	2	0.5	6	9	12	0.5
0	0.5	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0.1	0	0
0	0	0	0	0	0	0	0	0	0.5	0	0	2	0	1	0	0	0	0	0	0	0	0	0
2	3	1	1	2	2	6	0	3	0	0.5	0	0	0	0	0.5	0.5	0	0	0	0	0.5	0	1.5
0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0.1	0	0.5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	20	30	3	8	0.5	0	0	2	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0
0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.1	0	0	0	0.5	0	0.1	0	0	0	0.5	0	0.1	0	0	0.5	1	1	0.5	0.5	0.1	0.5	0.1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	2	0	4	0.5	2	2	2	0.5	1	2	3	0.5	0	0	1	0.5	2	0.5	0.1	1	3	0.5	0.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	2	0.5	1	0	0	0	0.1	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0
0	1	0.5	0	0	0	0.5	0	0.5	3	0	0.1	2	1	15	0	0	0	0	0	0	0.1	2	0
0	0	0	0	1	0	0	0	0	0.5	0	0.5	4	0	2	0.5	0	0	0	0	0	0.1	0	0
0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0.5	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.5	0	6	0	0.5	0	3	0.5	0	0.5	0.5	1	4	1	0	0	0	0.1	0	1	1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	1	10	3	1	1	0.5	3	1	4	6	4	5	0	0	0	0.1	2	0	0.5	2	0.5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	4	0.5	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0.5	0	0.5	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	5	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	4	2	0	0	0.5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0
0	6	3	1	0	2	2	1	2	0	0	0.5	0.5	3	2	0	0	0	0	0	0	0	0	0
0.5	0	0	0	1	2	0.5	2	0.5	5	0	3	0.5	0	0	0.1	0.1	0	1	0.5	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.1	1	1	2	0.1	0.1	0.5	0	1	1	2	0	0.5	1	0.5	1	0.5	0.5	0	0.5	0.5	1	0.5
0.5	3	10	1	4	2	1	1	6	50	1	30	40	7	20	3	0.1	0.5	1	0.5	2	4	6	0.1
0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	4	25	25	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0.1
0.5	3	10	1	1	0	1	0.5	4	10	6	15	29	10	20	0	0.1	0.5	2	0.5	2	7	2	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	0	8	0	3	20	0	0	0	1	15	10	3	2	12	1	2	0.5	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0