FOFEM Consumption and Emissions Test Case

Environmental Scenarios

Input Parameter	Fire Effect		
	Low	Moderate	High
10-hr fuel moisture (%)	18	10	5
1000-hr fuel moisture (%)	25	12	8
Duff fuel moisture (%)	40	30	25
Duff Moisture Method	Entire	AdjNFDR	Lower
Region	PacificWest	SouthEast	InteriorWest
Season	Spring	Fall	Summer

Stands: Three stands were simulated in each of the three environmental scenarios. The fuel loading data of the three stands were based on FCCS2 fuelbed # 24 (Pacific ponderosa pine -- Douglas-fir forest), 41 (Idaho fescue -- bluebunch wheatgrass grassland), and 237 (Huckleberry -- heather shrubland).

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Input Fuels Data	Unit	Stand ID					
		24		41		37	
		IFTDSS	FOFEM	IFTDSS	FOFEM	IFTDSS	FOFEM
Fuel Category		Natural	Natural	Natural	Natural	Natural	Natural
Cover Group		None	None	None	None	None	None
1-hour Woody Fuel Loading (pre-fire)	tons/acre	0.1	0.1	0	0	0	0
10-hour Woody Fuel Loading (pre-fire)	tons/acre	0.2	0.2	0	0	0	0
100-hour Woody Fuel Loading (pre-fire)	tons/acre	0.75	0.75	0	0	0	0
1000-hour Sound Woody Fuel Loading 3-6 in. (pre-fire)	tons/acre	0.6	0.6	0	0	0	0
1000-hour Sound Woody Fuel Loading 6-9 in. (pre-fire)	tons/acre	1.4	1.4	0	0	0	0
1000-hour Sound Woody Fuel Loading 9-20 in. (pre-fire)	tons/acre	0.8	0.8	0	0	0	0
1000-hour Sound Woody Fuel Loading 20+ in. (pre-fire)	tons/acre	0	0	0	0	0	0
1000-hour Rotten Woody Fuel Loading 3-6 in. (pre-fire)	tons/acre	0.54	0.54	0	0	0	0
1000-hour Rotten Woody Fuel Loading 6-9 in. (pre-fire)	tons/acre	1.26	1.26	0	0	0	0
1000-hour Rotten Woody Fuel Loading 9-20 in. (pre-fire)	tons/acre	0.2	0.2	0	0	0	0
1000-hour Rotten Woody Fuel Loading 20+ in. (pre-fire)	tons/acre	0.5	0.5	0	0	0	0
Litter Fuel Loading (pre-fire)	tons/acre	1.98	1.982	0.52	0.52	1.263	1.26
Duff Fuel Loading (pre-fire)	tons/acre	4.96	4.96	0	0	0	0
Herbaceous Fuel Loading (pre-fire)	tons/acre	0.5	0.5	0.65	0.65	0.06	0.06
Shrub Fuel Loading (pre-fire)	tons/acre	0	0	0	0	2.19	2.191245
Crown Foliage Fuel Loading (pre-fire)	tons/acre	3.8	3.79679	0	0	0	0
Crown Branch Fuel Loading (pre-fire)	tons/acre	3.8	3.79679	0	0	0	0
Duff Depth (pre-fire)	inches	0.6	0.6	0	0	0	0
Percent of Crown Burn	percent	60	60	60	60	60	60

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Scenario	StandID	Method	1-hour Woody Fuel Loading (consumed)	10-hour Woody Fuel Loading (consumed)	100-hour Woody Fuel Loading (consumed)	1000-hour Sound Woody Fuel Loading (consumed)	1000-hour Rotten Woody Fuel Loading (consumed)	Litter Fuel Loading (consumed)	Duff Fuel Loading (consumed)	Herbaceous Fuel Loading (consumed)	Shrub Fuel Loading (consumed)	Crown Foliage Fuel Loading (consumed)	Crown Branch Fuel Loading (consumed)	1-hour Woody Fuel Loading (post-fire)	10-hour Woody Fuel Loading (post-fire)	100-hour Woody Fuel Loading (post-fire)	1000-hour Sound Woody Fuel Loading (post-fire)	1000-hour Rotten Woody Fuel Loading (post-fire)	Litter Fuel Loading (post-fire)	Duff Fuel Loading (post-fire)	Herbaceous Fuel Loading (post-fire)	Shrub Fuel Loading (post-fire)	Crown Foliage Fuel Loading (post-fire)	O
			tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	
Low	24	IFTDSS	0.1	0.2	0.54	0.3	0.59	1.98	3.31	0.5	0	2.28	1.14	0	0	0.21	2.5	1.91	0	1.65	0	0	1.52	
		FOFEM	0.1	0.2	0.54	0.3	0.59	1.98	3.31	0.5	0	2.28	1.14	0	0	0.21	2.5	1.91	0	1.65	0	0	1.52	
	41	IFTDSS	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
		FOFEM	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
	237	IFTDSS	0	0	0	0	0	1.26	0	0.06	1.31	0	0	0	0	0	0	0	0	0	0	0.88	0	
		FOFEM	0	0	0	0	0	1.26	0	0.06	1.31	0	0	0	0	0	0	0	0	0	0	0.88	0	
Moderate	24	IFTDSS	0.1	0.2	0.54	0.41	0.74	1.98	2.51	0.5	0	2.28	1.14	0	0	0.21	2.39	1.76	0	2.45	0	0	1.52	
		FOFEM	0.1	0.2	0.54	0.41	0.74	1.98	2.5	0.5	0	2.28	1.14	0	0	0.21	2.39	1.76	0	2.46	0	0	1.52	
	41	IFTDSS	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
		FOFEM	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
	237	IFTDSS	0	0	0	0	0	1.26	0	0.06	1.6	0	0	0	0	0	0	0	0	0	0	0.59	0	
		FOFEM	0	0	0	0	0	1.26	0	0.06	1.6	0	0	0	0	0	0	0	0	0	0	0.59	0	
High	24	IFTDSS	0.1	0.2	0.68	0.72	1.11	1.98	4.17	0.5	0	2.28	1.14	0	0	0.07	2.08	1.39	0	0.79	0	0	1.52	
		FOFEM	0.1	0.2	0.68	0.72	1.11	1.98	4.17	0.5	0	2.28	1.14	0	0	0.07	2.08	1.39	0	0.79	0	0	1.52	
	41	IFTDSS	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
		FOFEM	0	0	0	0	0	0.52	0	0.65	0	0	0	0	0	0	0	0	0	0	0	0	0	
	237	IFTDSS	0	0	0	0	0	1.26	0	0.06	1.31	0	0	0	0	0	0	0	0	0	0	0.88	0	
		FOFEM	0	0	0	0	0	1.26	0	0.06	1.31	0	0	0	0	0	0	0	0	0	0	0.88	0	

utput Parameters

Crown Branch Fuel Loading (post-fire)	Duff Depth Consumed	Duff Depth (post-fire)	Mineral Soil Exposed	PM 10 (flaming)	PM 2.5 (flaming)	CH 4 (flaming)	CO (flaming)	CO 2 (flaming)	NOX (flaming)	SO 2 (flaming)	PM 10 (smoldering)	PM 2.5 (smoldering)	CH 4 (smoldering)	CO (smoldering)	CO 2 (smoldering)	NOX (smoldering)	SO 2 (smoldering)	Flaming Duration	Smoldering Duration	Flaming Consumption	Smoldering Consumption
tons/acre	inches	inches	percent	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	tons/acre	seconds	seconds	tons/acre	tons/acre
2.66	0.6	0	50.83	0.018	0.0155	0.0045	0.0385	10.49	0.019	0.006	0.13	0.11	0.0695	1.52	6.18	0	0.005	60	1680	5.9	5.03
2.66	0.6	0	50.83	0.018	0.0155	0.0045	0.0385	10.488	0.019	0.006	0.1345	0.114	0.0695	1.5195	6.185	0	0.005	60	1680	5.9	5.03
0	0	0	100	0.0035	0.003	0.001	0.0075	2.08	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.0035	0.003	0.001	0.0075	2.081	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.008	0.007	0.002	0.017	4.69	0.0085	0.0025	0	0	0	0	0	0	0	60	0	2.64	0
0	0	0	100	0.008	0.007	0.002	0.017	4.691	0.0085	0.0025	0	0	0	0	0	0	0	60	0	2.64	0
2.66	0.3	0.3	13.25	0.018	0.0155	0.0045	0.0385	10.51	0.019	0.006	0.12	0.1	0.0615	1.35	5.5	0	0.0045	60	1740	5.91	4.47
2.66	0.3	0.3	13.24	0.018	0.0155	0.0045	0.0385	10.5125	0.019	0.006	0.1195	0.1015	0.0615	1.35	5.494	0	0.0045	60	1740	5.91	4.47
0	0	0	100	0.0035	0.003	0.001	0.0075	2.08	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.0035	0.003	0.001	0.0075	2.081	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.009	0.0075	0.0025	0.019	5.19	0.0095	0.003	0	0	0	0	0	0	0	60	0	2.92	0
0	0	0	100	0.009	0.0075	0.0025	0.019	5.1945	0.0095	0.003	0	0	0	0	0	0	0	60	0	2.92	0
2.66	0.6	0	49.4	0.018	0.0155	0.0045	0.0385	10.56	0.019	0.006	0.19	0.16	0.0955	2.1	8.53	0	0.007	60	2115	5.94	6.94
2.66	0.6	0	49.4	0.018	0.0155	0.0045	0.0385	10.555	0.019	0.006	0.1855	0.157	0.0955	2.095	8.528	0	0.007	60	2115	5.94	6.94
0	0	0	100	0.0035	0.003	0.001	0.0075	2.08	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.0035	0.003	0.001	0.0075	2.081	0.0035	0.001	0	0	0	0	0	0	0	60	0	1.17	0
0	0	0	100	0.008	0.007	0.002	0.017	4.68	0.0085	0.0025	0	0	0	0	0	0	0	60	0	2.63	0
0	0	0	100	0.008	0.007	0.002	0.017	4.691	0.0085	0.0025	0	0	0	0	0	0	0	60	0	2.64	0

FOFEM Tree Mortality Test Case

	Parameter	Unit	Low Fire Effect		Moderate Fire Effect		High Fire Effect	
			IFTDSS	FOFEM	IFTDSS	FOFEM	IFTDSS	FOFEM
Outputs	Pre-fire Tree Density	trees/acre	3	3	10	10	15	15
	Post-fire Tree Density	trees/acre	3	3	9	9	3	3
	Trees per Acre Killed	trees/acre	0	0	1	1	12	12
	Percent Mortality	percent	6	6	12	12	80	80
	Pre-fire Basal Area	ft^2/acre	37.7	37.7	70.69	70.69	47.12	47.12
	Post-fire Basal Area Live	ft^2/acre	35.35	35.35	62.51	62.51	9.45	9.45
	Post-fire Basal Area Killed	ft^2/acre	2.35	2.35	8.17	8.17	37.67	37.67
	Pre-fire Canopy Cover	percent	6	6	15	15	14	14
	Post-fire Canopy Cover	percent	6	6	13	13	3	3
Inputs	Tree Species		Ponderosa pine		Douglas-fir		Jeffrey pine	
	Diameter at Breast Height	inches	48		36		24	
	Tree Height	ft	60		40		20	
	Crown Ratio		3		4		6	
	Flame Length	ft	5		10		15	
	Scorch Height	ft	10		20		10	
	Use Flame Length or Scorch Height?		Flame Length		Scorch Height		Flame Length	
	Fire Severity		Low		Moderate		Very High	