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AJAE Appendix for “Forecasting Resource Allocation Decisions Under Climate
Uncertainty: Fire Suppression with Assessment of Net Benefits of Research”

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Note: The material contained herein is supplementary to the article named in the title
and published in the American Journal of Agricultural Economics (AJAE).

Table A1. Poisson Model Estimates (1980-2004) of Perfect Foresight Cost-Minimizing Agency Fire Crew Hires, Under an Assumption that Half of Agency Crew Days Have No Idle Day Productive Work on 50 Percent of Idle Days or Variable Amounts of Productive Work on Idle Days, Forest Service Region 6^f

	50% Idle ^e	Variable Idle
	Parameter Estimate	Parameter Estimate
	(Standard Error)	(Standard Error)
Constant	2.27 ***	2.50 ***
	(0.20)	(0.17)
Region 6 PDSI, ^a Quarter 2 _t		-0.14 ***
		(0.04)
Region 6 PDSI, ^a Quarter 1 _t	-0.21 ***	
	(0.06)	
Region 6 PDSI, ^a Quarter 4 _{t-1}	0.36 ***	0.12 ***
	(0.06)	(0.04)
Region 5 PDSI, ^a Quarter 2 _{t-1}	-0.08 ***	
	(0.03)	
SOI ^b August _{t-1}	-0.20 ***	
	(0.06)	
SOI ^b May _{t-1}	-0.32 ***	-0.15 ***
	(0.05)	(0.05)
PDO ^c November _{t-1}		0.09 ***
		(0.05)

Niño-3 SSTA ^d , October _{t-1} to February _t Average	-0.58 ***	-0.18 ***
	(0.08)	(0.06)
Accumulated Cyclonic Energy, Atlantic _{t-1}	-0.014 ***	-0.0063 ***
	(0.002)	(0.0016)
Named Storms, Atlantic _{t-1}	0.22 ***	0.10 ***
	(0.03)	(0.02)
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Log-Likelihood, model	-66.95	-73.01
	-	
Log-Likelihood, $\beta=(1,0)$	207.60	-115.95
Likelihood Ratio Statistic	281.30 ***	85.87 ***

Note: Triple asterisk (***) indicates significance at 1% or smaller.

^a “PDSI” is “Palmer Drought Severity Index” (hydrological index).

^b SOI is “Southern Oscillation Index.”

^c PDO is “Pacific Decadal Oscillation.”

^d Niño-3 SSTA is the Niño-3 sea surface temperature anomaly, in degrees centigrade.

^e The 50% idle day cost model is based on data from 1986-2004, only.

^f A negative binomial alternative for the 50 percent idle day productive work model had a curvature parameter estimate of -3.30 (standard error of 0.72), significant 1 percent; for a variable idle day cost, the curvature parameter estimate was -5.27 (standard error of 2.35), significant at 5 percent.

Table A2. Agency Crew Hires, Under an Assumption that Half of Agency Crew Days Have No Idle Day Productive Work on 50 Percent of Idle Days, Perfect Foresight Hires (1980-2004), and Actual Hires (1997-2004), Forest Service Region 6

Season	Two-Stage Approach Agency Hires	Single-Stage Approach Agency Hires	Forced-Biased Single-Stage Approach Agency Hires	Perfect Foresight Agency Hires	Actual Agency Hires
	(a_0)	(\hat{a}_*)	(\tilde{a}_*)	(a^*)	(a_g)
1980	14			4	
1981	14			6	
1982	16			6	
1983	16			2	
1984	16			17	
1985	13			33	
1986	13	41	33	23	
1987	13	25	20	23	
1988	13	56	45	39	
1989	13	12	9	14	
1990	13	12	10	21	
1991	13	41	33	18	
1992	14	19	15	25	
1993	17	2	2	0	
1994	18	43	35	99	
1995	19	12	9	23	
1996	26	60	48	51	

1997	23	18	14	6	10
1998	25	29	23	18	8
1999	21	4	3	10	6
2000	19	33	26	13	13
2001	18	31	25	47	22
2002	18	87	69	71	34
2003	18	62	50	51	33
2004	27	14	11	32	28

Table A3. Total Crew Costs, Under an Assumption that Half of Agency Crew Days Have No Idle Day Productive Work on 50 Percent of Idle Days, Made with Alternative Modeling Approaches, Perfect Foresight Hires (1980 or 1986-2004), and Actual Hires (1997-2004), Forest Service Region 6 (Values in Millions of 2006 US \$)

Season	Two-Stage Approach Agency Hires	Single- Stage Approach Agency Hires	Forced- Biased Single- Stage Approach Agency Hires	Perfect Foresight Agency Hires	Actual Agency Hires
	$(R_{0,})$	(\hat{R}_*)	(\tilde{R}_*)	(R_{*})	$(R_{g,})$
1980	0.32			0.29	
1981	0.60			0.59	
1982	0.33			0.28	
1983	0.26			0.19	
1984	0.52			0.52	
1985	1.33			1.26	
1986	5.18	5.19	5.18	5.17	
1987	3.54	3.50	3.51	3.50	
1988	1.68	1.67	1.62	1.61	
1989	2.67	2.67	2.68	2.66	
1990	2.90	2.90	2.92	2.88	
1991	0.79	0.88	0.81	0.77	

1992	1.49	1.47	1.48	1.47	
1993	0.26	0.16	0.16	0.15	
1994	5.63	5.50	5.52	5.43	
1995	1.20	1.21	1.21	1.20	
1996	4.57	4.56	4.56	4.56	
1997	0.52	0.48	0.46	0.43	0.44
1998	0.93	0.94	0.93	0.92	0.94
1999	0.80	0.78	0.78	0.77	0.77
2000	1.61	1.63	1.62	1.60	1.60
2001	3.22	3.18	3.20	3.14	3.21
2002	4.71	4.69	4.65	4.65	4.69
2003	2.76	2.62	2.61	2.61	2.66
2004	1.27	1.29	1.29	1.27	1.27
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Total (×14), 1980-2004, \$10 ⁶	640.03	634.71	632.69	626.98	
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Change From Perfect, 1986-2004, \$10 ⁶	13.05	7.73	5.70		
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Change From Perfect, 1986-2004, %	2.08	1.23	0.91		
<hr/>					
Total (×14), 1997-2004, \$10 ⁶	221.48	218.54	217.48	215.46	218.18
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Change From Perfect, 1997-2004, \$10 ⁶	6.02	3.08	2.02		2.72
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Change From Perfect, 1997-2004, %	2.79	1.43	0.94		1.26
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Table A4. Agency Crew Hires, Under an Assumption of Variable Amounts of Productive Work on Idle Days, Made with Alternative Modeling Approaches, Perfect Foresight Hires (1980-2004), and Actual Hires (1997-2004), Forest Service Region 6

Season	Two-Stage Approach Agency Hires	Single-Stage Approach Agency Hires	Forced-Biased Single-Stage Approach Agency Hires	Perfect Foresight Agency Hires	Actual Agency Hires
	(a_0)	(\hat{a}_*)	(\tilde{a}_*)	(a^*)	(a_g)
1980	20	17	16	10	
1981	18	20	19	12	
1982	19	13	12	12	
1983	19	10	10	10	
1984	20	22	20	19	
1985	18	47	45	31	
1986	17	25	24	26	
1987	18	23	21	26	
1988	17	35	33	28	
1989	17	18	18	20	
1990	18	14	13	18	
1991	18	21	20	24	
1992	20	24	23	25	
1993	20	11	10	10	
1994	21	30	29	47	
1995	20	18	17	23	
1996	22	17	16	31	

1997	21	14	14	10	10
1998	22	26	25	20	8
1999	20	9	9	14	6
2000	20	14	13	20	13
2001	20	30	28	28	22
2002	20	45	43	27	34
2003	20	36	34	51	33
2004	21	27	26	21	28

Table A5. Total Crew Costs , Under an Assumption of Variable Amounts of Productive Work on Idle Days, Made with Alternative Modeling Approaches, Perfect Foresight Hires (1980-2004), and Actual Hires (1997-2004), Forest Service Region 6 (Values in Millions of 2006 US \$)

Season	Two- Stage Approach Agency Hires	Single- Stage Approach Agency Hires	Forced- Biased Single-Stage Approach Agency Hires	Perfect Foresight Agency Hires	Actual Agency Hires
	(R_0)	(\hat{R}_*)	(\tilde{R}_*)	(R^*)	(R_g)
1980	0.28	0.26	0.26	0.25	
1981	0.55	0.56	0.56	0.55	
1982	0.27	0.25	0.25	0.25	
1983	0.21	0.16	0.16	0.16	
1984	0.49	0.49	0.49	0.49	
1985	1.28	1.31	1.30	1.26	
1986	5.13	5.11	5.11	5.11	
1987	3.49	3.47	3.47	3.46	
1988	1.63	1.60	1.60	1.60	
1989	2.62	2.62	2.62	2.61	
1990	2.85	2.87	2.88	2.85	
1991	0.74	0.74	0.74	0.73	
1992	1.44	1.43	1.44	1.43	

1993	0.19	0.14	0.13	0.13	
1994	5.58	5.53	5.53	5.50	
1995	1.16	1.16	1.17	1.16	
1996	4.55	4.58	4.58	4.53	
1997	0.43	0.40	0.40	0.40	0.40
1998	0.88	0.89	0.89	0.88	0.92
1999	0.73	0.74	0.74	0.73	0.76
2000	1.56	1.56	1.56	1.56	1.56
2001	3.17	3.16	3.16	3.16	3.17
2002	4.67	4.69	4.69	4.65	4.65
2003	2.73	2.64	2.66	2.61	2.66
2004	1.24	1.25	1.25	1.24	1.25
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Total (×14), 1980-2004, \$10 ⁶	670.37	666.74	666.74	662.23	
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Change From Perfect, 1980-2004, \$10 ⁶	8.15	4.51	4.51		
<hr/>					
Change From Perfect, 1980-2004, %	1.23	0.68	0.68		
<hr/>					
Total (×14), 1997-2004, \$10 ⁶	215.84	214.83	214.80	213.09	215.20
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Change From Perfect, 1997-2004, \$10 ⁶	2.75	1.75	1.71		2.11
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Change From Perfect, 1997-2004, %	1.29	0.82	0.80		0.99
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Table A6. Poisson Model Estimate (1980-2004) of Perfect Foresight Cost-Minimizing Agency Fire Crews Hired Under, Under an Assumption of Variable Amounts of Productive Work on Idle Days, Forest Service Region 3^d

	Parameter Estimate (Standard Error)	
Constant	3.08 (0.04)	***
SOI ^a November _{t-1}	0.16 (0.04)	***
AO ^b May _{t-1}	0.27 (0.05)	***
Niño-3 SSTA ^c , October _{t-1} to February _t Average	0.11 (0.07)	*
Log-Likelihood, model	-74.34	
Log-Likelihood, $\beta=(1,0)$	-91.22	
Likelihood Ratio Statistic	33.77	***

Note: Triple asterisk (***) indicates significance at 1% or smaller, single asterisk (*) at 16%.

^a “SOI” is the Southern Oscillation Index.

^b “AO” is the Arctic Oscillation index.

^c “Niño-3 SSTA” is the Nino-3 sea surface temperature anomaly in degrees centigrade.

^d A negative binomial alternative for this model had a curvature parameter estimate of -5.33 (standard error of 2.98), significant 10 percent.

Table A7. Cost-minimizing Agency Crew Hires (1980-2004), Made with Alternative Modeling Approaches, Under an Assumption of Variable Amounts of Productive Work on Idle Days, Forest Service Region 3

Year	Variable Idle Day Crew Hires			Variable Idle Day Crew Costs (2006 \$ Million)		
	Two-Stage Approach Agency Hires (a_0)	Single-Stage Approach Agency Hires (\hat{a}_*)	Perfect Foresight Agency Hires (a_*)	Two-Stage Approach Agency Hires (R_0)	Single-Stage Approach Agency Hires (\hat{R}_*)	Perfect Foresight Agency Hires (R_*)
1980	16	22	24	3.73	3.70	3.69
1981	16	13	12	1.09	1.08	1.08
1982	18	22	12	0.76	0.81	0.71
1983	16	17	12	1.23	1.23	1.21
1984	16	16	12	1.15	1.14	1.12
1985	16	16	14	3.06	3.06	3.05
1986	16	12	18	2.15	2.16	2.15
1987	16	20	24	5.21	5.17	5.16
1988	16	20	20	3.01	3.01	3.01
1989	15	31	26	3.96	3.92	3.89
1990	16	19	16	2.18	2.19	2.18
1991	16	21	17	1.45	1.46	1.45
1992	16	21	22	2.11	2.11	2.11
1993	18	21	22	4.50	4.49	4.49

1994	18	27	31	6.07	5.99	5.98
1995	22	31	34	5.24	5.19	5.19
1996	22	15	26	3.67	3.72	3.66
1997	22	20	16	1.51	1.51	1.49
1998	22	14	22	2.15	2.19	2.15
1999	22	18	14	1.32	1.30	1.29
2000	22	26	43	4.81	4.77	4.68
2001	22	23	22	2.07	2.08	2.07
2002	22	32	28	3.41	3.41	3.40
2003	22	13	20	4.17	4.18	4.17
2004	22	24	22	3.11	3.11	3.11
<hr/>						
Total (×14),						
1980-2004				1,023.84	1,021.37	1,014.88
<hr/>						
Change						
From						
Perfect,						
1980-2004,						
\$10 ⁶				8.96	6.48	
<hr/>						
Change						
From						
Perfect,						
1980-2004,						
%				0.88	0.64	
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