

Initial Prevention Efficacy Parameter Estimates from a Florida Prevention Study

(Report to be delivered to the Fire Program Analysis Implementation Team)

A Deliverable of the Joint Fire Science Study, “A Fire Prevention Effectiveness Assessment for Multiple Ownerships”, JFSP Project 09-1-9-2

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Funded JFSP Study

The Joint Fire Science Program funded in 2009 a study to quantify the efficacy of alternative fire prevention activities on various kinds of unintentional, human-ignited wildfires. The study area is the national forests in Forest Service Regions 3, 4, and 5; Bureau of Land Management Units in Utah; and Bureau of Indian Affairs Units nationwide. If data and collaborators from other areas and agencies become available, we will include those areas in the analysis. The analysis will assemble historical fire records from these locations and combine them with information on fire prevention education efforts, other prevention actions (e.g., fuels management), and other factors linked to fire ignition processes in these locations (e.g., weather, climate, societal factors). Statistical models will be developed that quantify the effects that the prevention efforts have on the number of fire ignitions by major “unintentional” ignition sources, including debris escapes, camp fires, discarded smoking materials, and children. This study is currently in the data gathering phase.

Results from Previous Analyses

The above JFSP study will employ some of the techniques used in an ongoing analysis of wildfire prevention education (WPE) effectiveness in Florida. In that study, Prestemon, Abt, Butry, and Ronda Sutphen (Florida Division of Forestry) quantified how various kinds of WPE efforts lead to changes in fire ignitions, area burned, wildfire management costs, and wildfire losses. Journal manuscripts (Butry et al. 2009, Prestemon et al. 2009) are in review, and copies of current versions may be obtained from Jeff Prestemon (jprestemon@fs.fed.us or 919-549-4033).

Statewide in Florida, wildfires burned an average of 243,000 Ac per year from 2002 through 2006, the period over which we analyzed the effectiveness of WPE. The unintentional sources that we evaluated were responsible for an average of about 20,000 Ac of wildfire per year, or about 8.2% of the statewide total. Table 1 lists the WPE activities that we analyzed including media announcements, brochure distribution, home visits, hazard assessments and presentations. Other activities, including signage, workshops, booths at fairs, and staffing at parades, were not specifically addressed, but are assumed to occur in conjunction with the above activities across the state of Florida.

Unintentional ignitions include fires caused by debris escapes, camp fires, cigarettes and children. The statistical models we estimated modeled the number of unintentional ignitions that resulted from current and lagged levels of WPE, prescribed fire acres, lagged wildfire acres, fire weather, law enforcement, population, and economic conditions.

Our analysis for Florida showed that Media (public service announcements) occurring in the current and previous six months, Presentations in the current and previous six months, Hazard assessments in the current month, and Brochures distributed in the previous six months reduced unintentional ignitions. Visits to Homes and Hazard assessments in the previous six months did not significantly reduce unintentional ignitions.

Results of this analysis showed that WPE was effective at reducing unintentional ignitions significantly in the state (see Table 2). We found that an increase of 10% in expenditures on WPE in Florida would be expected to reduce unintentional ignitions by about 13.8%, or 181 fewer ignitions ($0.138 \times 1,311 = 181$) than current average levels. Because of the long-run effects of wildfire in reducing future wildfire, there is a smaller effect on acres burned (only 0.5% reduction of the statewide area burned but a 5.8% reduction in area burned by unintentional sources), and on wildfire costs plus losses averted statewide (a 0.6% reduction).

Statewide expenditures on WPE efforts significantly outweigh their costs however, producing a marginal benefit-cost ratio of 35. This benefit-cost ratio implies that, for an additional dollar spent (from current levels) on WPE programs in the state, a \$35 reduction in wildfire damages is expected. Because wildfire suppression comprises 15.3 % of this \$35 reduction, an additional dollar of WPE is expected to reduce suppression expenditures by \$5.32.

Table 3 documents some of the basic calculations, statewide in Florida. The table shows the effects on reported unintentional wildfires, area burned, and costs and losses resulting from a simulated ten percent increase in prevention expenditures. The simulated effects are based on the statistical model estimated for the study (the same one yielding a 35-to-1 ratio of averted costs plus losses to a marginal change in prevention spending). It should be noted that Table 3 demonstrates the effects of a non-marginal (i.e., ten percent) increase in prevention spending statewide. As spending increases, the benefit-cost ratio of additional expenditures falls. For example, the benefit-cost ratio produced from the \$50,000 prevention spending increase illustrated in Table 3 is slightly less than 30.

Conclusions

Our analysis of fire prevention education efforts in Florida indicate that fire prevention efforts can achieve reductions in the count of unintentional fire types. These efforts occur in both the month they are made and over at least the six months subsequent to the efforts. In Florida, statewide spending over the period of our analysis was less than \$500,000 per year. Over that time, we estimate that unintentional wildfires were responsible for costs and losses (in terms of timber market losses, suppression expenditures, and other economic losses) of \$25 million per year statewide in Florida.

Our analysis shows that a reduction in the occurrence of these fire types can lead to cost and loss reductions that, departing only slightly from current levels, are 35 times higher than additional expenditure on WPE needed to achieve them. As WPE efforts are expanded, this high ratio of 35 would be reduced but still yield large net benefits for the State's residents.

We caution that the results we have found for Florida may apply only to Florida. The effectiveness of fire prevention efforts depend on the nature of fire, the population, the climate and the vegetation in the location where they are targeted.

Literature Cited

Butry, D.T., J.P. Prestemon, K.L. Abt, and R. Sutphen. 2009. Evaluating the tradeoffs of wildfire risk reduction strategies. (Unpublished Manuscript)

Prestemon, J.P., D.T. Butry, K.L. Abt, and R. Sutphen. 2009. Evidence on the long-run net benefits of fire prevention efforts. (Unpublished Manuscript)

Table 1. Average annual wildfire prevention education activities recorded by wildfire mitigation specialists in Florida, 2000 to 2007.

Type of Wildfire Prevention Education Activity	Annual average--statewide
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Media (Public Service Announcements)	
Radio	1,344
TV	2,256
Newspaper	1,968
Homes Visited	1,392
Presentations	
Presentations offered	192
Number attending presentations	7,776
WUI hazard assessments	29

Table 2. Poisson model estimate of the count of unintentional wildfires, 2002 to 2007, and associated elasticities, calculated at the mean of the data.

	Coefficient	Standard Error	Z	P> Z 	Elasticity	Δ Wildfire*
Media: 1-6						
months prior	-1.34E+03	5.87E+02	-2.29	0.022	-0.26	-3.4
Homes: 1-6						
months prior	4.50E+02	7.02E+02	0.64	0.521	0.04	0.5
Presentations: 1-						
6 months prior	-4.89E+04	8.69E+03	-5.63	0.000	-0.22	-2.9
Brochures: 1-6						
months prior	-2.15E+02	4.66E+01	-4.62	0.000	-0.24	-3.1
Hazard: 1-6						
months prior	6.54E+04	5.03E+04	1.30	0.194	0.07	0.9
Media: current						
month	-4.12E+03	1.34E+03	-3.08	0.002	-0.17	-2.2
Homes: current						
month	-1.29E+03	8.41E+02	-1.53	0.125	-0.03	-0.4
Presentations:						
current month	-2.97E+05	1.06E+05	-2.82	0.005	-0.23	-3.0
Brochures:						
current month	-6.62E+02	3.03E+02	-2.18	0.029	-0.14	-1.8
Hazard: current						
month	-6.35E+05	3.00E+05	-2.11	0.035	-0.12	-1.6

*Change in number of unintentional fire ignitions from a 1% increase in WPE.

Table 3. Effect of an increase in wildfire prevention education expenditures from \$500,000 per year to \$550,000 per year in Florida (a 10% increase).

Effect of wildfire prevention education	Response to 10% increase in prevention \$	Current Florida annual average	Numerical response to a 10% increase in prevention spending
Number of unintentional ignitions	-13.8%	1,311	-181 ignitions
Area burned from unintentional ignitions	-5.8%	20,034	-1,152 Ac burned
Long run costs plus losses from unintentional wildfire	-0.5%	\$1,267/Ac × 20,034 Ac = \$25.38 million	-\$1.48 million