

# What characteristics drive fire managers to make a decision

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# Intro

- Information has value
- 2200 wildfires and burned 36524 acres each year
- Survey only includes fire management relative people
- Endogenous and exogenous factors for decision

# Hypothesis

- People have different education level may use different level information
- People may use less information during wildfire happening

# Literature

- Idea is based on David R. Just(2002)
- Just(2002) collected data in four different commodity systems
- Frisvold(2013) examined that producers' characteristic
- Freebairn(2002) estimated mainly the benefits
- We only chosen fire managers this job
- Introduce community may affected people

# Data

- Reached 477. 206 valid. Response rate is 43.2%
- Websites, education, job, experience
- Using dummy Variables for each category

Table 1.

	Population	Sample
Forest Service	49.5%	47.6%
Bureau of Land Management	15.9%	13.1%
Bureau of Indian Affairs	12.2%	10.7%
AZ Department of Forestry & Fire Management	7.8%	9.7%
National Park Service	5.0%	5.3%
NM Forestry Division	2.9%	3.9%
Fish & Wildlife Service	2.7%	4.4%
Tribal Agencies	1.9%	1.5%
NOAA	1.5%	2.4%
AZ Department of Environmental Quality	0.6%	1.5%

Agency	Age	Experience	Role	Education	Dispatch center
C1_Forest service	C3_less than 30	C4_0-4 years	C5_Agency administrator	C6_High school graduate	AZ-ADC
C1_BLM	C3_30-39	C4_5-9 years	C5_Fire Manager(Fuels and fire)	C6_Some college	AZ-FDC
C1_Bureau of Indian Affairs	C3_40-49	C4_10-14 years	C5_Fire Manager, Suppression	C6_College Graduate	AZ-PHC
C1_National Park Service	C3_50-59	C4_15-19 years	C5_Other	C6_Masters/Professional degree	AZ-PDC
C1_Arizona Department of Forestry and Fire Management	C3_60 and more	C4_20-29 years		C6_Doctoral degree	AZ-SDC
C1_New Mexico Forestry Division		C4_30 and more years			AZ-TDC
C1_Other					AZ-WDC
C1_NOAA					NM-ADC
C1_Arizona Department of Environmental Quality					NM-ABC
					NM-SFC
					NM-SDC
					NM-TDC
					Other

# Model

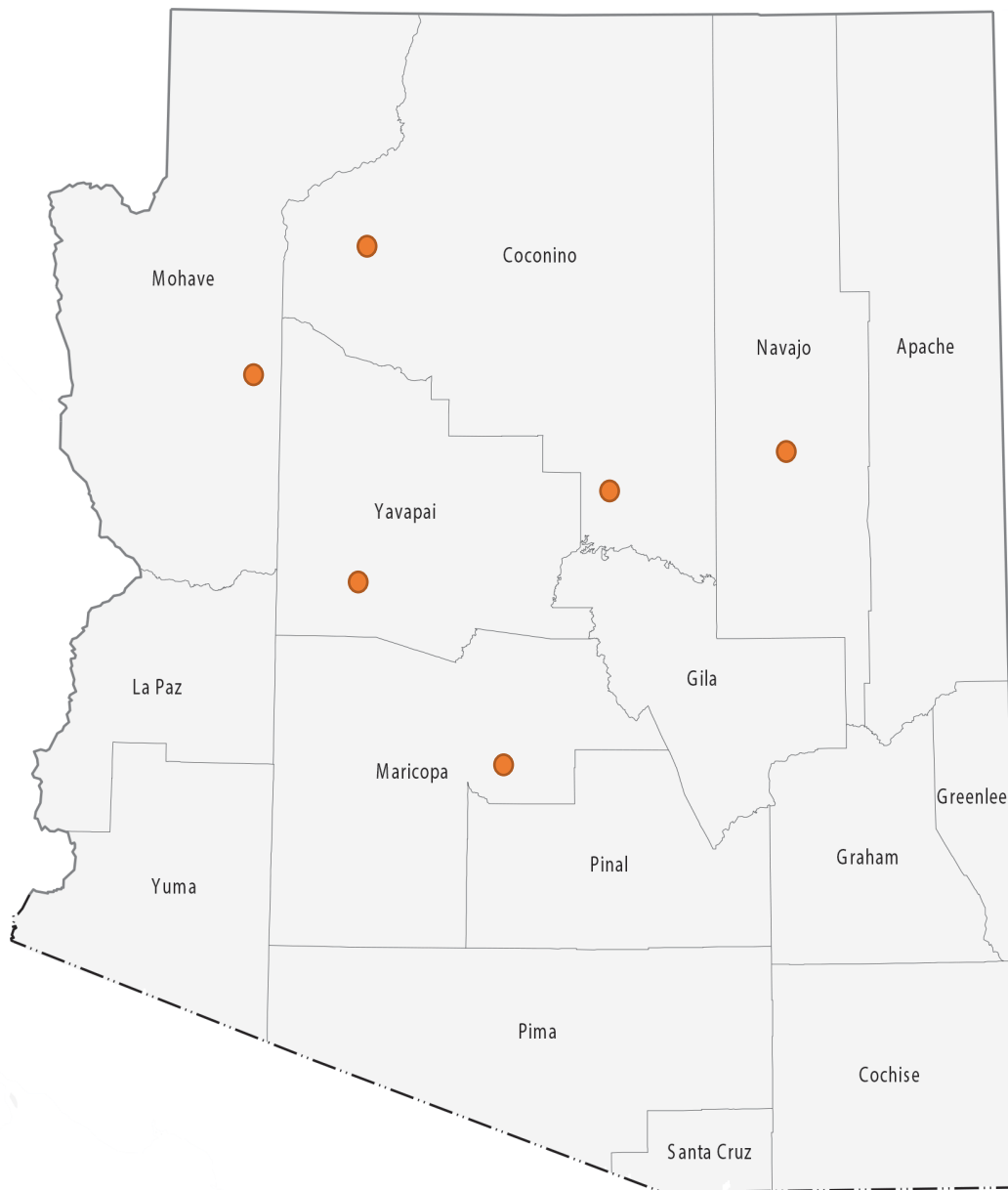
TotalSources

$$\begin{aligned} &= \beta_0 + \beta_1 \text{During} + \beta_2 \text{TotalDecisions} + \beta_3 \text{Agency} \\ &+ \beta_4 \text{Age} + \beta_5 \text{Experience} + \beta_6 \text{Role} \\ &+ \beta_7 \text{Education} + \beta_8 \text{Dispatch} + \text{error} \end{aligned}$$

TotalSource: how much sources they use when firing

During: during fire is 1, prior fire is 0

TotalDecisions: how to control fire





agency

age

experience

role

education

Dispatch  
center

TotalSources	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
During	1.334951	.5685524	2.35	0.019	.2169818	2.452921
TotalDecisions	1.223951	.1762567	6.94	0.000	.8773698	1.570533
C1_BLM	-1.733178	.9684238	-1.79	0.074	-3.637433	.1710766
C1_BureauofIndianAffairs	2.098136	1.061888	1.98	0.049	.0100994	4.186173
C1_NationalParkService	-1.801812	1.522782	-1.18	0.237	-4.796126	1.192503
C1_ArizonaDepartmentofForestr	-6.610028	1.532392	-4.31	0.000	-9.623239	-3.596817
C1_NewMexicoForestryDivision	1.451292	1.671458	0.87	0.386	-1.83537	4.737954
FWS	-.2545894	1.533061	-0.17	0.868	-3.269116	2.759937
Tribal	-2.491801	2.718392	-0.92	0.360	-7.837097	2.853494
C1_NOAA	5.399141	2.808889	1.92	0.055	-.1241029	10.92238
C1_ArizonaDepartmentofEnviron	2.971957	3.781929	0.79	0.432	-4.464617	10.40853
C3_4049	-1.90273	1.018996	-1.87	0.063	-3.906426	.1009658
C3_5059	-2.171218	1.100931	-1.97	0.049	-4.336027	-.0064086
C3_60andmore	-1.029843	1.526774	-0.67	0.500	-4.032006	1.972321
C4_59years	-2.338481	2.099291	-1.11	0.266	-6.46641	1.789448
C4_1014years	-2.019567	1.893278	-1.07	0.287	-5.742404	1.70327
C4_1519years	.9160674	1.784412	0.51	0.608	-2.592701	4.424836
C4_2029years	-1.728447	1.89674	-0.91	0.363	-5.458091	2.001197
C4_30andmoreyears	-.0931845	2.047652	-0.05	0.964	-4.119573	3.933204
C5_FireManagerFuelsandfire	1.72824	1.854875	0.93	0.352	-1.919082	5.375563
C5_FireManagerSuppression	2.56719	1.911738	1.34	0.180	-1.191945	6.326325
C5_Other	1.452083	1.781261	0.82	0.415	-2.05049	4.954656
C6_Somecollege	2.612383	1.286574	2.03	0.043	.0825354	5.14223
C6_CollegeGraduate	1.286048	1.268767	1.01	0.311	-1.208786	3.780882
C6_MastersProfessionaldegree	2.361168	1.483851	1.59	0.112	-.5565947	5.27893
C6_Doctoraldegree	1.807206	3.425174	0.53	0.598	-4.927865	8.542276
AZADC	0	(omitted)				
AZFDC	-5.588611	1.518514	-3.68	0.000	-8.574531	-2.60269
AZPHC	-6.289909	1.732474	-3.63	0.000	-9.69655	-2.883269
AZPDC	1.42036	1.571801	0.90	0.367	-1.670342	4.511062
AZSDC	-1.766272	1.6757	-1.05	0.293	-5.061275	1.528731
AZTDC	-5.493876	1.44684	-3.80	0.000	-8.338861	-2.64889
AZWDC	-6.337374	2.294637	-2.76	0.006	-10.84942	-1.825328
NMADC	-4.608623	1.458699	-3.16	0.002	-7.476928	-1.740318
NMABC	-.4158596	1.526267	-0.27	0.785	-3.417026	2.585307
NMSFC	-1.849996	1.364611	-1.36	0.176	-4.53329	.8332982
NMSDC	-3.551163	1.409014	-2.52	0.012	-6.32177	-.7805562
NMTDC	-6.545602	1.529913	-4.28	0.000	-9.553938	-3.537265
Other	-7.892644	3.45303	-2.29	0.023	-14.68249	-1.102799
_cons	11.81851	1.397605	8.46	0.000	9.070338	14.56668

# Results

TotalSources	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
During TotalDecisions	<b>1.334951</b>	<b>.5685524</b>	<b>2.35</b>	<b><u>0.019</u></b>	<b>.2169818</b>	<b>2.452921</b>
	<b>1.223951</b>	<b>.1762567</b>	<b>6.94</b>	<b><u>0.000</u></b>	<b>.8773698</b>	<b>1.570533</b>
<b>_cons</b>	<b>11.81851</b>	<b>1.397605</b>	<b>8.46</b>	<b><u>0.000</u></b>	<b>9.070338</b>	<b>14.56668</b>

# Results: agency

Totalresources	Coef.	Std. Err.	t	p
C1_BLM	-1.733178	.9684238	-1.79	<u>0.074</u>
C1_BureauofIndianAffairs	2.098136	1.061888	1.98	<u>0.049</u>
C1_NationalParkService	-1.801812	1.522782	-1.18	0.237
C1_ArizonaDepartmentofForestr	-6.610028	1.532392	-4.31	<u>0.000</u>
C1_NewMexicoForestryDivision	1.451292	1.671458	0.87	0.386
FWS	-.2545894	1.533061	-0.17	0.868
Tribal	-2.491801	2.718392	-0.92	0.360
C1_NOAA	5.399141	2.808889	1.92	<u>0.055</u>
C1_ArizonaDepartmentofEnviron	2.971957	3.781929	0.79	0.432

Base line is forest service

# Results: age

Totalresources	Coef.	Std. Err.	t	p
C3_4049	-1.90273	1.018996	-1.87	0.063
C3_5059	-2.171218	1.100931	-1.97	<u>0.049</u>
C3_60andmore	-1.029843	1.526774	-0.67	0.500

Base line is less than 40

# Results: experience

Totalresources	Coef.	Std. Err.	t	p
C4_59years	-2.338481	2.099291	-1.11	0.266
C4_1014years	-2.019567	1.893278	-1.07	0.287
C4_1519years	.9160674	1.784412	0.51	0.608
C4_2029years	-1.728447	1.89674	-0.91	0.363
C4_30andmoreyears	-.0931845	2.047652	-0.05	0.964

Base line is 0-5 years

# Results: role

Totalresources	Coef.	Std. Err.	t	p
C5_FireManagerFuelsandfire	<b>1.72824</b>	<b>1.854875</b>	<b>0.93</b>	<b>0.352</b>
C5_FireManagerSuppression	<b>2.56719</b>	<b>1.911738</b>	<b>1.34</b>	<b>0.180</b>
C5_Other	<b>1.452083</b>	<b>1.781261</b>	<b>0.82</b>	<b>0.415</b>

Base line is agency administrator

# Results: education

Totalresources	Coef.	Std. Err.	t	p
C6_Somecollege	<b>2.612383</b>	<b>1.286574</b>	<b>2.03</b>	<b><u>0.043</u></b>
C6_CollegeGraduate	<b>1.286048</b>	<b>1.268767</b>	<b>1.01</b>	<b>0.311</b>
C6_MastersProfessionaldegree	<b>2.361168</b>	<b>1.483851</b>	<b>1.59</b>	<b>0.112</b>
C6_Doctoraldegree	<b>1.807206</b>	<b>3.425174</b>	<b>0.53</b>	<b>0.598</b>

Base line is high school

# Results: dispatch center

Totalresources	Coef.	Std. Err.	t	p
AZADC	0	(omitted)		
AZFDC	-5.588611	1.518514	-3.68	<u>0.000</u>
AZPHC	-6.289909	1.732474	-3.63	<u>0.000</u>
AZPDC	1.42036	1.571801	0.90	0.367
AZSDC	-1.766272	1.6757	-1.05	0.293
AZTDC	-5.493876	1.44684	-3.80	<u>0.000</u>
AZWDC	-6.337374	2.294637	-2.76	<u>0.006</u>
NMADC	-4.608623	1.458699	-3.16	<u>0.002</u>
NMABC	-.4158596	1.526267	-0.27	0.785
NMSFC	-1.849996	1.364611	-1.36	0.176
NMSDC	-3.551163	1.409014	-2.52	<u>0.012</u>
NMTDC	-6.545602	1.529913	-4.28	<u>0.000</u>
Other	-7.892644	3.45303	-2.29	<u>0.023</u>

Base line is NMSWC



# Results: Full model minus age group

C4_59years	<b>-2.949944</b>	<b>2.083286</b>	<b>-1.42</b>	<b>0.158</b>
C4_1014years	<b>-2.445844</b>	<b>1.870646</b>	<b>-1.31</b>	<b>0.192</b>
C4_1519years	<b>.3508717</b>	<b>1.746975</b>	<b>0.20</b>	<b>0.841</b>
C4_2029years	<b>-2.871398</b>	<b>1.783085</b>	<b>-1.61</b>	<b>0.108</b>
C4_30andmoreyears	<b>-.9125113</b>	<b>1.88999</b>	<b>-0.48</b>	<b>0.630</b>

Base line is experience is 0-5 years

# Results: Full model minus Experience

c3_4049	<b>-2.417304</b>	<b>.9257393</b>	<b>-2.61</b>	<b><u>0.009</u></b>
c3_5059	<b>-2.409925</b>	<b>1.04773</b>	<b>-2.30</b>	<b><u>0.022</u></b>
c3_60andmore	<b>-.6469399</b>	<b>1.355236</b>	<b>-0.48</b>	<b>0.633</b>

Base line is age less than 40

# Results: $R^2$

Source	SS	df	MS	Number of obs	=	412
Model	7216.70573	38	189.913309	F(38, 373)	=	5.70
Residual	12419.0103	373	33.2949337	Prob > F	=	0.0000
				R-squared	=	0.3675
				Adj R-squared	=	0.3031
Total	19635.716	411	47.7754648	Root MSE	=	5.7702

Adjusted  $R^2$  is 0.3

There still has 70% unknow relationships in fire managers making decision and using information.

# Conclusion

- Many factors could impact people in making decision and using information
- In this case, more education means more information used.
- Smaller dispatch center prefers use less information