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## **A Public Opinion Survey on Wildland Fire in Grand Canyon National Park**

### **Introduction**

IN 1933, GEORGE WRIGHT CHALLENGED NATIONAL PARK MANAGERS to recognize naturally occurring fires as a natural part of park ecosystems (Davis and Halvorson 1996). After decades of research by scientists and overcoming resistance by land managers, fire has returned to most national park ecosystems through a wildland fire program resulting in ecological restoration (Covington et al. 1997, 2000; Davis and Halvorson 1996; Fulé 1995). However, the public has not been as supportive of these programs as have biologists (Manfredo 1990). While scientists are privy to the intimate details of the biological reasons behind the role and need for fire as a disturbance in natural ecosystems, the public may not be as aware.

Visitors to national parks, in particular Grand Canyon National Park, may have an awareness of fire's role because of the increase in urban-interface fires with subsequent destruction of homes and businesses (Shindler et al. 2001). This may influence the opinion of those who live in an urban-interface setting. Several surveys have assessed public awareness on a variety of fire and natural resources issues (Cortner et al. 1984; Taylor and Daniel 1984; Carpenter et al. 1986; Manfredo et al. 1990; Bright et al. 1993). Cortner et al. (1984) conducted a poll of Tucson residents in 1981 on fire knowledge and tolerance of management of public lands with regard to the "new" practice of controlled fires (also referred to as *let-burn* and *prescribed* fires). They found

respondents were most concerned about local issues and how it would affect them as well as wildlife in the fire area. Those most likely to approve of low-intensity fires were males over 30 years of age with some college education. Cortner et al. (1984) emphasized the importance of educational material and quoted Stankey's (1976) report on fire, which linked public support for fire management to educating the public about fire's role in the ecosystem. To apply this information, knowledge of the public's recreational choices can be beneficial.

In 1984, Stankey and McCool looked at the choices visitors make when they venture out to use recreational areas. They found the setting, what they plan to do there, and how it is managed (e.g., *little* if

they want solitude or *heavily* if they want a guided tour) play a role in visitors' use decisions. They found there is security in routine behavior and that many visitors like to repeat experiences. Perhaps this may explain the angst visitors feel when the setting they prefer is altered—a forest's appearance after a fire, for example. With decades of fire suppression, natural areas in national parks show little evidence of the passing of fire and an expectation of unmarred beauty has entered the national psyche. A study of the acceptability rating of aesthetic views (Taylor and Daniel 1984) found that even in the early 1980s, those who supported and understood the role of fire in the ecosystem still did not like the visual setting that moderate to severe fire created. Interestingly, small fires that brought in new growth for several years post-fire were given a high approval rating. The authors concluded there would be more tolerance for these types of results than crown fires. They, like other authors (Shindler et al. 2001; Stankey and McCool 1984) emphasized the importance of education to develop public acceptance for management decisions.

The importance and credibility of the educational message was illustrated in the Carpenter et al. (1986) study. In a survey using open-ended and closed-ended questions, they found that the message being provided should address the concerns of the target audience. They noted that messages citing the benefits of fire, its effects on wildlife, and its origins, combined with trust in the professionalism of the forest managers, were key components. In this early work, they found no easily defined segment of the population to target and suggested the messages be directed toward all visitors.

Manfredo et al. (1990) assessed the

public's preferences for control, let-burn, and prescription fires. They suggested that gaining public support for prescription fire was key in making policies on fire management. After the Yellowstone fires in 1988, prescription fires in National Park Service areas were stopped, due in large part to public sentiment, as well as a re-evaluation of fire's role in the ecosystem and how it would be utilized in future ecological restoration. It was then, more than ever, that fire policy gained a critical sociopolitical component (Manfredo et al. 1990). This study was followed up in Yellowstone by a survey in 1993 (Bright et al. 1993) that studied the effects of changing attitudes and beliefs on support of controlled-burn policies. The investigators first assessed the attitude of visitors to Yellowstone of controlled burns. They followed this up with specific negative messages and a survey to those in support of the fire, with no message and a survey to controls. In turn, positive messages and a survey were sent to non-fire supporters, with no message and a survey to controls. They found some changes in attitude with the targeted messages, but they were not universal. They found it was important to know the character of the audience (sociodemographics) as well as the weight the prior attitude and subjective norm played. They found all messages must have credibility to be effective.

Recent surveys (Shindler et al. 2001; Brunson et al. 2002) have incorporated demographic inquiries along with questions on forest management, forest conditions, and the role of fire. Survey focuses included trust in management and land management agency practices, the effects of smoke, and erosion, as well as asking if fire and mechanical thinning are legitimate tools in land management. Shindler et al.

(2002) found that public opinions are provisional and can change. For instance, following the Los Alamos fire in New Mexico, Shindler et al. (2001) found that there was an increase in negative feelings about the use of prescribed fire.

The ability to influence public opinion and behavior is well documented through the theory of reasoned action (TRA). It has been used to predict respondent behavior by obtaining knowledge of the respondent's attitude toward the behavior and the influence of a subjective norm (e.g., significant others) (Fishbein and Ajzen 1975; Manfredo 1992). If the weight of the influence is sufficient and the discussion specific, attitudes and beliefs can be a good predictor of the respondent's intent to engage in a specific behavior. This predictive relationship among belief, attitude, intention, and behavior allows managers and educators to use effective means of influencing behavior—in this case, supporting fire in national parks. In particular, utilization of active participation (e.g., interpersonal contacts and public speeches) and persuasive communication (brochures and other written information with integrity) are the most effective means of achieving this end (Fishbein and Ajzen 1975; Terry et al. 1993; Dwyer and Williams 2002).

We conducted a survey to obtain data from visitors to Grand Canyon National Park about their knowledge and opinion of fire. The survey consisted of a demographic section, a questions section, and an open comments section. Comparing visitors' opinions with selected demographic variables related to these opinions enabled us to better understand the visitors' opinions about the role of fire in the national park ecosystem. Results of statistical analysis of the answered questions will help managers

and educators target populations and groups of people who do not appear to have a grasp of fire's role in national parks. The open comment section of the survey provided additional insight as to the intent of the respondents to perform a given behavior, i.e., support or not support natural and/or prescribed fires, through the TRA (Fishbein and Ajzen 1975).

## Materials and Methods

**Survey document.** The survey document was two pages long with ten questions aimed at soliciting demographic information and opinions from respondents. Questions about age, gender, education, U.S. state or foreign country of origin, residence in an urban or rural community, as well as the number of times participants had visited national parks in America were included. The question, "If there was a way to prevent all fires in national parks, should they be prevented?" asked for a "yes" or "no" answer. A section was left open for written comments, prefaced by the question, "Is there anything else you would like to tell us about fires in national parks in America?" The survey was in English.

**Survey administration.** Permission to administer the survey was facilitated through the Science Center and Division of Interpretation at Grand Canyon National Park through which a National Park Service (NPS) research permit was obtained. The surveys were placed in two trays on either side of a closed collection box on a portable table (the survey station). Pens and a poster inviting participation in the survey were on the table. The survey station was placed in the Canyon View Information Plaza (CVIP) from April 16, 2001 to September 1, 2001. During that period, 5,000 surveys were made available to visitors. A non-NPS

employee was hired to check the status of the survey station twice a day, keep it supplied, and retrieve completed surveys.

**Analysis.** The precision and accuracy of the information obtained from a survey hinge on the quality and the quantity of the responses. Based on the manner in which the questionnaire was administered, it is believed that the information provided by the respondents visiting the CVIP is of high quality. The initial goal of obtaining 5,000 survey documents was made in an effort to make precise conclusions about the true proportion of visitors who gave an affirmative answer to the question, "If there were a way to prevent all fires in national parks, should they be prevented?" From April 1, 2001 to September 1, 2001, 2,116,203 visitors entered the park gates on the South Rim. Roughly 4.5 million people visit Grand Canyon National Park each year (National Park Service 2002). The proportion of affirmative responses to the above question from a sample size of 5,000 is within 1.4% of the true proportion with 95% confidence. A sample size of 5,000 would thus yield a precise estimate of the true proportion of affirmative responses to the fire prevention question. In actuality, however, fewer than 5,000 survey documents were filled out. Of 5,000 surveys placed for public participation, 4,618 (92.4%) were returned. Surveys filled out by children younger than 16 years of age were not analyzed. Furthermore, of the questionnaires returned, some were incomplete or contained responses that were obviously incorrect (e.g., age of individual exceeding 120 years). Even with these complications, the sample size in this study is large enough to yield precise results. It is noted that the typical sample size for a Gallup poll designed to represent the U.S.

adult population of 187 million is 1,000 (Newport et al. 1997).

The SAS JMP Version 5 Statistical software program (SAS Institute 2002) was used for the database and statistical analyses. Each of the completed surveys was individually entered into the program. The statistical analysis conducted in this paper looks at the relationship between answers to the question, "If there were a way to prevent all fires in national parks, should they be prevented?" and the following characteristics of the individuals: age, gender, number of children with individual on trip, education level, citizenship (U.S. or not), individual's community (urban, rural), and number of visits to U.S. national parks in the individual's lifetime.

Age was recorded as a quantitative variable; the other attributes are qualitative since respondents selected a category for each variable. For example, when answering the question, "About how many times in your life have you visited a national park area in America?" respondents could select one of the following categories: first time, 1-5 times, 6-10 times, or more than 10 times.

To determine if there was a statistically significant relationship between each of the above attributes and the answer to the fire question, appropriate statistical tests were conducted. For each of the categorical variables, a chi-square test of independence was performed to determine if sample evidence suggested an association between the variable and the fire question. To determine if age was related to the "prevent all fires" question, a logistic regression model was used with age as the predictor variable and the response variable being the logit function of the probability of saying "yes" to the fire question. In addition, multiple logistic

regression models were employed to examine how the demographic information considered jointly influences the probability of saying “yes” to the fire question.

The written comments were categorized by opinion and the categories validated by a second reviewer. The categories were: comments in favor of fire in general, specifically in favor of fire, specifically in favor of prescribed fire, in favor of both natural and prescribed fire, not in favor of any fire. Results are given as percentage answers of total respondents.

## Results

**Survey questions.** This section focuses on the attributes of individuals and how they related to opinions concerning fire.

- *Age.* The mean age of 4,598 respondents was 38.6 years. The largest single age group of respondents were 16 years old and numbered 274, or 6% of the surveys. The oldest respondent was 95 years of age.
- *Gender.* Male — 1,724 (38%); female — 2,780 (62%).
- *On this trip, how many children are traveling with you?* None — 2,791 (61%); one — 506 (11%); two — 739 (16%); more than two — 553 (12%).
- *Education.* Less than high school diploma — 357 (8%); high school diploma — 576 (13%); some college studies — 674 (15%); college degree — 1,286 (28%); some graduate studies — 455 (10%); graduate degree — 1,193 (26%).
- *State or country of origin.* Foreign country — 827 (18%); USA — 3,766 (82%). The most state visitors were from California (17%) and Arizona (10%). All 50 states were represented by at least one visitor. The most foreign visitors

were from The United Kingdom (26%) and Germany (15%) with 66 other countries represented.

- *Type of community.* Urban — 3,121 (70%); rural — 1,366 (30%).
- *Number of visits to U.S. national parks.* First time — 410 (9%); 1–5 times — 1,375 (30%); 6–10 times — 785 (17%); more than 10 times — 1,991 (44%).
- *If there were a way to prevent all fires in national parks, should they be prevented?* Yes — 1,355 (33%); No — 2,791 (67%).

To determine if there was a statistically significant relationship between each of the categorical variables and “prevent all fires” question listed above, a chi-square test of independence was performed. The hypotheses under consideration were,  $H_0$ : Variable of interest and response to the fire question are not associated, versus  $H_a$ : Variable of interest and response to the fire question are associated. Based on the magnitude of the test statistic and accompanying p-value, sample evidence suggested that the following categorical variables are related to the way individuals answer the “prevent all fires” question: gender, number of children with individual on trip, education level, citizenship (U.S. or not), and number of visits to U.S. national parks in the individual’s lifetime (Table 1). The p-value for each of these separate tests was less than 0.0001. Sample evidence did not substantiate the hypothesis that there is an association between community type (urban, rural) and response to “prevent all fires” (yes, no) since  $p\text{-value} = 0.73$ . The logistic regression using age as the predictor variable while the response variable is the logit function of the probability of saying “yes” to the fire question suggested that age is a useful predictor of the logit function. In other

Variable	Yes (%)	No (%)	Frequency
<b>Gender<sup>*</sup></b>			
Male	29	72	1564
Female	36	64	2491
<b>Number of children on trip<sup>*</sup></b>			
0	30	70	2542
1	34	66	456
2	34	66	654
more than 2	45	55	473
<b>Education<sup>*</sup></b>			
Less than high school diploma	51	49	291
High school diploma	47	53	510
Some college education	31	69	609
College degree	31	69	1183
Some graduate education	30	70	420
Graduate degree	24	76	1079
<b>Citizenship<sup>*</sup></b>			
Foreign country	42	58	719
USA	31	69	3422
<b>Community type</b>			
Urban	32	68	2910
Rural	33	67	1249
<b>Visits to national parks<sup>*</sup></b>			
First visit	61	39	351
1-5 visits	44	56	1214
6-10 visits	32	68	711
more than 10 visits	20	80	1945
<sup>*</sup> Chi-square significant $p < 0.0001$			

Table 1. Comparison of select demographic variables and responses to the survey question, "If there were a way to prevent all fires in national parks, should they be prevented?"

words, sample evidence suggested that the proportion of individuals with an affirmative answer to the fire question was different for people of different ages.

The above results are based on examining the relationship between responses to the fire question and each of the other variables individually. A more complete analysis was used to determine how the variables

age, gender, number of children with individual on trip, education level, U.S. citizenship, type of community, and number of visits to U.S. national parks in the individual's lifetime considered together were related to responses to the fire question. A multiple logistic regression model was used to accomplish this task. The goodness of fit test indicated that gender, number of chil-

dren with individual on trip, education level, and number of visits to U.S. national parks considered jointly provide a reasonable model. Age, U.S. citizenship, and type of community do not add an appreciable amount of information to the model given that gender, number of children with individual on trip, education level, and number of visits to U.S. national parks are already considered as predictors to the logit function of the probability of saying yes to the fire question.

**Survey comments.** A section for open-ended comments was provided on each survey. It began with the question, “Is there anything else you would like to tell us about fires in national parks in America?” Of the 4,618 returned surveys, 583 (13%) included written comments. These were grouped into the following categories:

- *Comments in favor of fire in general* (66 respondents/surveys = 11%), for example, “Some fires are actually healthy. New trees grow once the old ones are burned. It is a healthy process sometimes.”
- *Comments specifically in favor of natural fire* (70 = 12%), for example, “Fires in national parks help to continue the cycle of life. As long as they are naturally started and don’t endanger homes or property, they should be let burn.”
- *Comments specifically in favor of prescribed fire* (27 = 5%), for example, “Prescribed burns are an important management tool. Something must be done to overcome the damage caused by the fire management policies of the past.”
- *Comments in favor of both natural and prescribed fire* (15 = 3%), for example, “A sound fire management program,

including natural and prescribed burns, is essential to a healthy ecosystem. Avoid public or political pressure to suppress all fires.”

- *Comments not in favor of any fire* (27 = 5%), for example, “I have seen Yellowstone before the fires and after, Yellowstone will never be the same. Please stop! all fires, I believe they destroy more than they save and do good. I am very thankful for seeing it before it burned, I will never see it again;” and, “I wish you national park people would quit starting fires in our parks like you did in Yellowstone and Mesa Verde because that you think some seeds will grow. You destroy the park for years like Yellowstone has been destroyed of its beauty for generations. Quit it.”
- *Comments related to fire but opinion unclear or mixed* (147 = 25%), for example, “I always thought any fire was bad. Now I am not so sure!”
- *Comments not related to fire* (205 = 35%), for example, “I think it’s interesting that Smokey Bear represents the Forest Service and tells us to protect the trees so they can be given to lumber companies dirt cheap!”
- *Comments not related to fire discussion* (26 = 4%) and eliminated due to offensive language, unreadable text, or personal name given as exclusive answer.

## Discussion

Due to the method of survey administration, these results cannot be construed as typical of the average visitor who comes to Grand Canyon National Park. Only those who came to CVIP and filled out the survey are represented. Not all visitors to Grand Canyon from April 1 to September 1 found

their way to CVIP, and of those who did, not all participated in the voluntary survey. However, among those who did participate, there are some intriguing trends based on demographics and opinions about fires in national parks.

Based on the multiple logistic regression model, answers to the question of whether to prevent or allow all fires in national parks showed a trend based on gender, family size, education level, and number of visits to U.S. national parks. If taken literally, females who are traveling with more than two children, possess the lowest education level (i.e., less than high school diploma), and have made the fewest number of visits to U.S. national parks have a greater chance of responding that all fires should be prevented in national parks than do other individuals. Specifically, the estimated probability that females in this category who are visiting a U.S. national park for the first time will say that all fires should be prevented in national parks is 0.82. In contrast, the estimated probability that males having graduate degrees traveling with no children who have visited U.S. national parks more than ten times will say that all fires should be prevented in national parks is 0.12. This is a significant finding.

However, targeting such a specific group could be quite difficult without complete knowledge of visitor demographics. What we have found is that there are specific groups of visitors that may benefit from more specific information about the role of fire in the natural ecosystem of Grand Canyon National Park. Educational material can be targeted to persons visiting Grand Canyon, e.g., those with families and little experience with national parks. For instance, a publication might be titled "Your First Visit, or Natural History for

Families." In guided walks, talks, and other interpretive programs, the interpretive ranger can establish group demographics at the start of the program through informal questions and answers and focus their presentation toward the results of this exercise.

The open comments results showed more respondents in favor of fire than opposed to fire. Together, those that support some form of fire in national parks represent 31% of the respondents who provided comments. There is a definite trend among respondents to mention natural fires more than prescribed fires. This may show an attitude to accept natural fires over those started by land managers. Those respondents who opposed all fires represented only 5% of the commenters. Overall, six times more respondents were in favor of fires in some form in national parks than those opposed. While the survey was conducted in Grand Canyon National Park, most respondents did not hesitate to specifically mention other park and natural areas, such as Yellowstone and Mesa Verde national parks, in their comments.

Of the respondents who chose to comment about fire, 35% were either definitely for or against fire. Another 25% made fire-related comments, but gave no clear opinion. This left almost 40% of the commenters who stated no definite opinion on fire. Many of these persons chose the survey as a forum to complain about facilities or comment positively about their overall park experience. It seemed that having a venue to voice their opinion was more important than adhering to the spirit and theme of the fire survey itself.

Using TRA, land managers at Grand Canyon National Park can utilize interpretive and educational means of active participation through ranger-guided activities to



respond to concerns of park visitors. For example, interpretive programs on fire in national parks can focus on reaching families and first-time visitors. In addition, the public participation programs can specifically elicit the knowledge of the participant group and tailor their presentations accordingly. Other means of sharing fire information include persuasive communication in the form of the park newspaper, wayside exhibits, and brochures. These could be produced in multiple languages, if one is concerned with assisting foreign visitors in their understanding of fire's role in national parks.

Utilizing the results of this survey by combining demographic information with public opinion, managers at Grand Canyon National Park can target specific groups of visitors for information dissemination. In addition, specific responsible and positive actions in the natural and prescribed fire program in the park may be the best means of influencing public opinion. These can include manageable prescribed fires that fulfill the park's fire-needs prescriptions and stay within specific parameters. Together, such actions will boost public confidence in and support of the park's fire program.

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