



United States
Department
of Agriculture

Forest Service

Intermountain
Research Station

Research Note
INT-418

October 1993



Some Economic Impacts of the 1988 Fires in the Yellowstone Area

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FEB 22 1994

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Abstract—Four types of economic impacts associated with the 1988 fires in and around Yellowstone National Park were studied. The park was headed for a record attendance year in 1988. Based on projections in this study, summer visitation would have increased from about 2.1 million visits in 1987 to 2.3 million in 1988 and 2.5 million in 1989, had the fires not occurred. Instead, visitation dropped to 1.7 million visits in 1988 and had risen only to 2.2 million by 1989. The visitation loss meant that expenditures based on tourism were down about \$21 million in 1988, \$13 million in 1989, and \$26 million in 1990. Government payments related to the fires partially offset the loss of tourist expenditures. But of the \$33.1 million in payments, only an estimated \$10.8 million went to communities around the park. Though the fires had a minimal effect on annual tourism industry wages, summer-season wages declined more dramatically. In addition, about \$715,000 in damage claims had been paid to firms and individuals in the local area by late 1992, with several major claims still awaiting settlement.

Keywords: economic impact analysis, Yellowstone National Park, forest fires, tourist expenditures, tourism research

The 1988 forest fires that burned lands in Yellowstone National Park and surrounding areas began in June (Carrier 1989) and, despite the efforts of thousands of firefighters, burned until autumn snow and rain put them out. By mid-October, a group of 130 researchers met at Montana State University in Bozeman "to assess the research needs and to begin

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to develop a comprehensive, long-term research plan to study the effects of fires that burned portions of the Greater Yellowstone Area during the summer of 1988" (Schmitt 1988). That meeting resulted in a research agenda consisting, in part, of socioeconomic studies focused on economic impacts: (1) to describe the probable economic effects of the fires on adjacent communities and (2) to assess long-term local economic effects based on the number of visitors and the composition of visitation.

During the fall of 1989, the U.S. Congress appropriated \$400,000 for research related to the 1988 Yellowstone fires. One of those studies was to deal with the economic impacts. By early spring 1990, the Forest Service's Intermountain Research Station selected a research proposal submitted jointly by the University of Montana's Bureau of Business and Economic Research and the University's Institute for Tourism and Recreation Research. A formal research agreement was signed by the University and the Station. Study objectives were to assess the economic impacts of the 1988 fires on affected communities, comparing 1988 and a year after the fires to a baseline year before the fires.

GENERAL APPROACH

It is easy to speculate about the nature and extent of economic impacts associated with the 1988 Yellowstone fires. It is wholly another matter, however, to quantify that speculation and develop defensible, objective estimates of the impacts. Clearly, the economic impacts of the 1988 Yellowstone fires were wide ranging, too wide ranging for a single study. We concentrated on four areas of impact: (1) government payments to local firms for goods and services related to fire suppression; (2) the effect of changes in tourist expenditures on local tourism industries; (3) the overall effect of the fires on employment and wages in local communities; and (4) government payments for personal damages caused by the fires. All analyses were conducted

in terms of constant 1989 dollars, using the Index of Personal Consumption Items for deflation (U.S. Department of Commerce, Bureau of Economic Affairs 1990).

Geographical Scope

In assessing the economic impacts of the 1988 fires, we focused primarily on the counties and communities adjacent to Yellowstone National Park. Obviously, areas farther away were also affected, because purchases were made in communities throughout the country and by firefighters returning home with wages.

Counties were studied in some cases, while towns were studied in others. Entire counties were used in Teton and Park Counties in Wyoming and Teton and Fremont Counties in Idaho. The spatial unit of analysis for tourist expenditures, government payments, and income or employment in Montana were the towns of West Yellowstone, Gardiner, and Cooke City-Silver Gate. Figure 1 shows that each community is immediately adjacent to Yellowstone National Park. None was the dominant community in its county, nor was it the county seat; consequently, these communities cannot be accurately described or analyzed by using county-wide totals or averages. We use the term Primary Impact Communities to refer to all counties or communities we studied.

Industry Classifications

To provide a consistent framework for analyzing the economic activity associated with the Yellowstone fires, we used the Standard Industrial Classification (SIC) codes (OMB 1987). SIC codes are the industrial

classification system developed by the U.S. Government that underlie most economic data for industries. Government agencies assign each firm a numerical SIC code, depending on the type of good or service it produces.

Most SIC industries correspond to easily identified economic activities. The tourism industry, however, is not so easily defined. Tourists patronize firms in a number of different SIC categories, including grocery stores in the retail trade industry, lodging places in the services industry, and travel agents in the transportation industry. Additionally, many firms catering to tourists also serve local residents. We defined the tourism industry to include portions of three SIC industries:

- SIC 58 for eating and drinking places;
- Selected miscellaneous retail, including SIC 5912 (drugstores), SIC 5941 (sporting goods stores), SIC 5942 (book stores), and SIC 5947 (gift and souvenir stores);
- SIC 70 for lodging places.

Although this definition is not perfect, expenditure surveys indicate that most tourist expenditures are made in these categories (Moisey and Yuan 1989).

Timeframe

The overall timeframe for this study was 1987 through 1991, although the analyses concentrated on the years 1987 to 1989. Partial information was available for 1990 and 1991. For the 1987 to 1989 period, 1987 was used as the base year, a point of reference for comparison; 1988 was the year of the fires; and 1989 was the year providing for the evaluation of the fires' economic impacts.

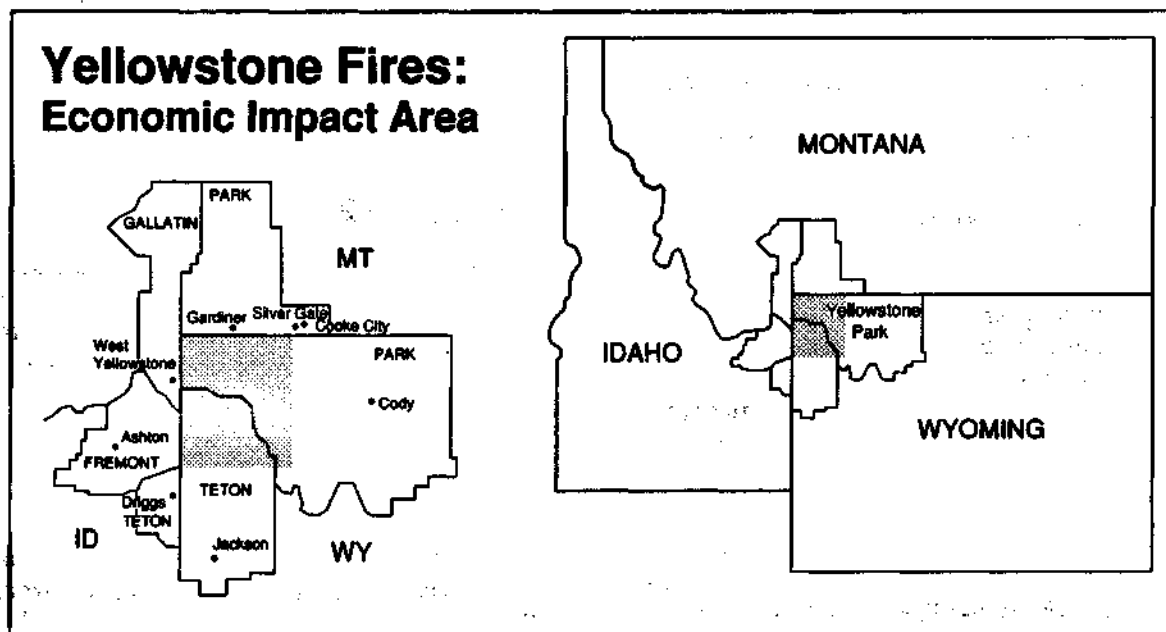


Figure 1—Map of Primary Impact Communities in the Yellowstone area.

Most study calculations and analyses focused on the summer tourist season, July to September, referred to as the "third quarter." The summer season was emphasized because: (1) it reduced the "background noise" of events unrelated to the fires; and (2) it provided comparability between tourist expenditure data, government payment data, and wage and employment information. Preliminary analysis concluded that many important trends were hidden when annual data were used. Annual economic activity data do not necessarily reflect what happened in the park as a result of the fires, because overall area visitation was not altogether dependent on events at Yellowstone National Park. Use of third-quarter data focused the analysis on events that were directly attributed to the Yellowstone fires. Third-quarter data also better reflect the seasonality of use in Yellowstone National Park than do annual data. Analysis of Yellowstone travel characteristics during 1988 and 1990 showed that about 97 percent of the visitation occurs when the park's roads are open (University of Montana, Institute for Tourism and Recreation Research 1989).

Indirect and Induced Effects

Part of this study estimated changes in tourist expenditures and government payments resulting from the 1988 fires. We chose not to convert those estimates to estimates of wages and salaries for affected industries. This decision was based on the lack of directly relevant data for the Primary Impact Communities. However, Yuan and others (1989) found a 4:1 ratio of nonresident travel expenditures to wages and salaries in Montana's tourism industry, meaning that about 25 percent of tourist expenditures are reflected in tourism industry wages and salaries. Because the Primary Impact Communities constitute a smaller economy than the State, the 25 percent level probably overestimates wage and salary impacts. We suggest using a more conservative 20 percent level for the Primary Impact Communities.

Similarly, this study estimated only the direct effects of fire-related expenditures and payments. Wages and salaries associated with those payments are partially spent in the Primary Impact Communities. Additional employment associated with that spending is termed the "indirect and induced" effects. Direct effects are converted to total effects (direct + indirect + induced) with a multiplier developed through input-output analysis. We did not estimate total effects because the available input-output analysis tool was not directly applicable to the Primary Impact Communities. However, an earnings multiplier of 1.549 was derived from the IMPLAN system (Taylor and others 1992) for the tourism industry in the counties that include and surround Yellowstone National Park. This means that \$1.55 of total earnings are generated for each dollar

of earnings in the tourism industry. The 1.549 multiplier should be considered a maximum, with 1.000 being the minimum.

GOVERNMENT PAYMENTS FOR GOODS AND SERVICES

Probably the most obvious economic impact associated with the fires was expenditures associated with fire suppression. We examined the local expenditures made by assistant disbursement officers (ADO's), government administrative officers authorized to make payments for onsite expenditures related to fire control. The payments are primarily for supplies and materials, but may also be for services such as those provided by temporary firefighters and equipment rental businesses.

We did not examine local expenditures made by firefighters or government purchases made by anyone other than the ADO's. Firefighters are typically sequestered in camps and staging areas and do not have extensive contact with the local economy. A preliminary study of the Yellowstone fires concluded few local expenditures for firefighting supplies and equipment were made by anyone other than ADO's (Phillips and Taylor 1989). For example, aircraft fuel used by slurry bombers was not purchased locally. Such purchases would have affected the economies of Missoula, MT, or Boise, ID, not those of the communities surrounding Yellowstone National Park. In other words, some items consumed or expended in the vicinity of the fires may have been overlooked by focusing on local expenditures by ADO's; those items are likely to have been purchased elsewhere. Such purchases, however, would not have affected the economies of the Primary Impact Communities.

Determining Payments by Assistant Disbursement Officers

Emergency firefighting purchases were made by specially assembled administrative units. Most expenditures were paid by checks on the U.S. Treasury written by the ADO's. Teams of ADO's from both the Forest Service, U.S. Department of Agriculture, and National Park Service, U.S. Department of the Interior, were assigned to the Yellowstone fires. Additionally, payments were made from special funds (imprest funds) maintained in the Supervisors' Offices of the various National Forests.

Individual ADO payment records were examined to determine the payee's location and industry. Records for the National Park Service ADO teams were obtained from the University of Wyoming (Phillips 1991). Forest Service ADO records were more difficult to acquire, because ADO teams came from different Forest Service Regions and National Forests; each team maintained

its own records depository. Ultimately, the necessary information was provided by Forest Service personnel in the Regional Office of the Northern Region in Missoula, MT, the Regional Office of the Intermountain Region in Ogden, UT, and the Supervisor's Office of the Shoshone National Forest in Cody, WY.

The ADO records were processed to determine the amount of payments made in Primary Impact Communities and elsewhere. Recipient ZIP Codes were recorded for each payment. The following ZIP Codes correspond to the Primary Impact Communities:

Geographical Area	ZIP Code
Montana	
Cooke City	59020
Silver Gate	59081
Gardiner	59030
West Yellowstone	59758
Wyoming	
Teton County	
Jackson	83001
Moose	83012
Moran	83013
Wilson	83014
Teton Village	83025
Park County	
Cody	82414
Meeteetse	82433
Powell	82435
Ralston	82440
Wapiti	82450
Idaho	
Fremont County	
Ashton	83420
Chester	83421
Island Park	83429
Mack's Inn	83433
Menan	83434
Newdale	83436
Parker	83438
Rexburg	83440
Rigby	83442
St. Anthony	83445
Sugar City	83448
Teton City	83451
Teton County	
Driggs	83422
Tetonia	83452
Victor	83455

The next step was to assign an SIC code to each Primary Impact Community recipient. Most recipients could be classified using: (1) the recipient's name as listed on the ADO payment stub or (2) telephone directories and phone calls to Chambers of Commerce. Other local persons were contacted to help classify recipients with ambiguous names.

A small number of recipients remained who could not be classified to an SIC industry. For the most part, they consisted of individuals who rented equipment, such as pickup trucks or tractors, to firefighting units. These recipients were given a special code and payments were recorded.

The ADO payments were summarized by Primary Impact Community and SIC code. In most cases, community totals were very close to those reported in a preliminary Forest Service study completed shortly after the fires (Sorenson 1988). But in several cases, differences were significant; in those cases our estimates of payments were roughly one-third to one-half lower than the Forest Service study. Conversations with Forest Service personnel revealed that their data included other sources of payments, specifically payments made with "imprest cash" funds. Because of these additional payments, Forest Service totals were judged more complete. Accordingly, we used the payment total reported in the Forest Service study and adjusted our ADO estimates for areas and industries accordingly.

The ADO records suggest that all payments were made onsite at the time of the fires. Although the date the check was written was not reported, services were generally rendered from July to October of 1988. Therefore, all ADO payments were assigned to the third quarter of calendar year 1988.

Assistant Disbursement Officer Payments

Expenditures by Forest Service and National Park Service ADO teams for Yellowstone fires totaled about \$33 million (Sorenson 1988). Roughly \$10.8 million (32.7 percent) was paid to vendors in the Primary Impact Communities.

We prepared separate estimates of the ADO payments in the Primary Impact Communities to tourism industry firms and other firms (table 1). Payments to tourism-related establishments (eating and drinking, miscellaneous retail, and lodging places) were about \$3.3 million, roughly 30.4 percent of the total payments in Primary Impact Communities. Other firms received about \$7.5 million, 69.6 percent of the total. Approximately \$2.2 million, 20.7 percent, of the ADO payments in Primary Impact Communities were made to individuals or vendors who could not be classified to an SIC category; the payments were included in the total for the firms other than those associated with the tourism industry.

A total of about \$12.9 million was spent in Montana, roughly \$3.3 million in Primary Impact Communities and about \$9.5 million elsewhere, including sizable amounts in Billings, Missoula, and Helena (table 2). Idaho received about \$5.0 million in ADO payments; about \$2.7 million was received by persons and firms

Table 1—Estimated assistant disbursement officer payments, by industry and community, 1989

	West Yellowstone, MT	Gardiner, MT	Cooke City- Silver Gate, MT	Park County, WY (Cody)	Teton County, WY (Jackson)	Fremont County, ID (Ashton)	Teton County, ID (Driggs)	Total
----- 1989 dollars -----								
Agriculture	0	0	0	0	110,302	0	0	110,302
Mining	0	0	0	0	0	0	0	0
Construction	3,998	0	1,941	36,911	0	334,357	0	377,207
Manufacturing	0	0	0	66,146	11,292	191,535	7,571	276,549
Transportation, communications, and public utilities	88,347	0	0	342,282	756,134	102,048	10,514	1,299,325
Wholesale trade	100,172	0	0	38,862	8,396	64,228	0	211,658
Retail trade	709,592	269,627	19,997	124,581	786,424	811,001	35	2,721,257
Eating and drinking places	366,845	89,568	8,102	43,188	122,929	127,662	35	758,293
Selected misc. retail	62,523	22,383	0	23,137	85,704	2,525	0	196,308
Finance, insurance, and real estate	0	0	0	0	0	0	0	0
Services	1,105,929	510,590	74,727	649,377	807,515	171,645	18,580	3,338,363
Lodging places	989,682	235,775	53,288	404,194	394,377	162,196	0	2,239,512
Government	41,080	24,455	479	57,494	112,688	9,287	7,579	253,061
All other individual	151,033	106,925	71,137	794,766	48,732	999,173	10,975	2,236,741
Total	2,200,153	965,596	168,281	2,110,418	2,641,482	2,683,274	55,255	10,824,459

in Primary Impact Communities and \$2.3 million was received by those outside such communities, with Idaho Falls and Boise being the major outside recipients. Wyoming's Primary Impact Communities received about \$4.8 million in ADO payments; the remainder of the State received \$3.8 million, with most of the outside payments made in Greybull, Riverton, and Rock Springs. The ADO teams spent about \$6.6 million outside of Montana, Wyoming, and Idaho (table 2). The States receiving the most payments were California (\$3.8 million) and Oregon (\$1.5 million). Nevada, Utah, and Washington each received between \$0.1 and \$0.4 million. The ADO payments to all other States were less than \$100,000.

Within the Primary Impact Communities, Fremont County (Ashton), ID, was the single largest recipient of ADO payments; vendors there were paid about \$2.7 million, roughly one-fourth of the Primary Impact Communities' total. Fremont County has no direct access to Yellowstone National Park and receives little in the way of tourist expenditures (see figure 1). In addition, Fremont County accounts for less than 10 percent of the Primary Impact Communities' employment.

The ADO payments to Primary Impact Communities were not closely related to community employment. Payments in the two largest communities, Park and Teton Counties, were \$4.8 million, about 44.4 percent of the Primary Impact Communities' total. In contrast, these communities accounted for about 82.5 percent of the total employment in the Primary Impact Communities.

West Yellowstone received \$2.2 million in ADO payments, about 27.2 percent of the total, while its share of the Primary Impact Communities' employment was only 3.3 percent. ADO payments for Gardiner were about \$1.0 million (11.9 percent of the total); payments for Cooke City-Silver Gate were about \$0.2 million (2.1 percent of the total). Both communities' share of ADO payments was greater than their employment share.

TOURIST EXPENDITURES

The second economic impact we studied was expenditures associated with tourists visiting Yellowstone National Park. Changes in these expenditures led to changes in wages, salaries, and employment for persons working in tourism-dependent industries. Expenditure categories included lodging, travel, food, and other recreation-related items. Changes in tourist expenditures attributable to the fires were defined as the difference between actual tourist expenditures (the "with-fires" situation) and expenditures that would have been made if the fires had not occurred (the "without-fires" situation).

Tourist Expenditure Methods

Changes in tourist expenditures were estimated from expenditure information and statistical models of visitation. With-fires (actual) tourist expenditures were estimated for 1987, 1988, 1989, and 1990. Various

Table 2—Assistant disbursement officer payments by State and major city, 1988¹

	Payments (thousand 1989 dollars)	Percent of total		Payments (thousand 1989 dollars)	Percent of total
Montana	12,856	38.9	Iowa	3	(²)
Primary Impact Communities ²	3,334	10.1	Kansas	(²)	(²)
Billings	743	2.2	Maine	(²)	(²)
Bozeman-Belgrade	2,162	6.5	Massachusetts	1	(²)
Missoula	1,676	5.1	Michigan	12	0.4
Helena	581	1.8	Minnesota	96	0.3
Idaho	5,039	15.2	Mississippi	1	(²)
Primary Impact Communities ³	2,739	8.3	Missouri	14	(²)
Idaho Falls	1,663	5.0	North Carolina	1	(²)
Boise	21	(²)	North Dakota	1	(²)
Wyoming	8,514	25.7	Nebraska	1	(²)
Primary Impact Communities ⁴	4,752	14.6	New Jersey	1	(²)
Greybull	728	2.2	New Mexico	61	0.2
Riverton	598	0.2	Nevada	346	1.0
Gillette	111	0.3	Reno	256	0.8
Rock Springs	136	0.4	Ohio	1	(²)
Alabama	(²)	(²)	Oklahoma	14	(²)
Arizona	36	0.1	Oregon	1,525	4.6
Arkansas	(²)	(²)	Newport	385	1.2
California	3,810	11.5	Klamath Falls	650	2.0
Orange	2,098	6.3	Pennsylvania	2	(²)
Colorado	39	0.1	South Dakota	28	0.1
Connecticut	(²)	(²)	Tennessee	(²)	(²)
District of Columbia	1	(²)	Texas	5	(²)
Florida	(²)	(²)	Utah	291	0.9
Georgia	1	(²)	Salt Lake City	178	0.5
Illinois	3	(²)	Washington	385	1.2
Indiana	(²)	(²)	Goldendale	137	0.4
			Total, all States	33,086	100.0

¹Sources: Sorenson (1988) and the authors.

²West Yellowstone, Gardiner, and Cooke City-Silver Gate.

³Teton and Fremont Counties.

⁴Less than 0.1 percent.

⁵Teton and Park Counties. The main towns in these counties are Jackson (Teton) and Cody (Park).

⁶Less than \$1,000.

data sets were used. Without-fires expenditure estimates used those data, visitation data, and statistical projection procedures.

With-Fires Expenditures—The methodology used to estimate with-fires tourist expenditures was based on the Montana non-resident travel studies (Moisey and Yuan 1989). An expenditure is defined as any purchase of a good or service. Actual tourism expenditures in the Yellowstone area were defined as total gross tourist expenditures outside Yellowstone Park plus total gross tourist expenditures inside Yellowstone Park. Four types of data were required: (1) total number of tourists; (2) average daily group expenditures for lodging, travel, food, and miscellaneous items; (3) average number of days and nights spent while in the study area; and (4) average group size.

For each study year, visitation data were obtained from Yellowstone National Park statistics (USDI NPS 1990), highway traffic counts from the Montana Division of Highways (Montana Department of Transportation, Division of Highways 1990), and vehicle counts from selected highways (Moisey and Yuan 1989). Average daily group expenditures, length of stay, and group size data were obtained from various primary and secondary sources. Data for 1987 were from the 1987 Visitor Services Project (University of Idaho, Cooperative Park Studies Unit 1987), which studied Yellowstone National Park visitors and their expenditures. Information from the Montana Travel Surveys satisfied data needs for 1988 (Yuan and McCool 1988; Yuan and McCool 1989). In those studies, visitors were interviewed at survey sites close to Gardiner, West

Yellowstone, and Red Lodge during the 1988 fires. Information on group size and length of stay for 1989 was obtained from the 1989 Visitor Services Project (University of Idaho, Cooperative Park Studies Unit 1989). Expenditure information for 1989 was calculated from several secondary sources, including accommodation taxes (University of Montana, Institute for Tourism and Recreation Research 1989; Yuan and McCool 1989) and resort taxes (Montana Department of Revenue, Income Tax Division 1990).

Without-Fires Expenditures—Projections of the economic impacts without the fires required two basic assumptions: (1) visitor characteristics (length of stay, group size, and average daily expenditures) stayed constant between the with-fires and without-fires years; and (2) Yellowstone Park visitation would have reflected ongoing travel trends in Montana and the United States. Except for projected visitation levels, all other data used in projecting without-fires tourism expenditures were the same as those used in with-fires calculations.

Without-fires tourist expenditure estimates required projecting the total number of summer-season visitors to Yellowstone National Park as if the fires had not occurred. Multiple regression analysis was used to do so. The objective was to reliably forecast park visitation, not to test hypotheses concerning the determinants of visitation trends. Time-series information for summer-season (third-quarter) Yellowstone visitation since 1971 (USDI NPS 1990) was the dependent variable (fig. 2). Potential independent variables were evaluated for inclusion in the prediction model, including visitation to Big Horn National Recreation Area (USDI NPS 1990), nonresident visitation to Montana (University of Montana, Institute for Tourism and Recreation Research 1989), Forest Service RIMS visitation data (USDA FS 1991), and travel activity in the United States (U.S. Travel Data Center 1991). The best models from the analysis were identified on the basis of adjusted R^2 and Mallows' C_p (Draper and Smith 1981). Four acceptable models were identified with adjusted R^2 's ranging from 84.0 to 96.3 percent. All models yielded similar, though not identical, projections of increasing visitation for Yellowstone National Park between 1988 and 1990. The model selected was the one with the highest adjusted R^2 .

Tourist Expenditure Results

The 1988 fires had substantial effects on Yellowstone National Park visitation. Figure 2 shows that park summer visitation has dropped markedly three times since 1971. The first drop occurred shortly after the Organization of Petroleum Exporting Countries was formed and coincides with the first oil embargo. There were long waiting lines at gasoline pumps; gasoline prices soared. The second substantial drop in park

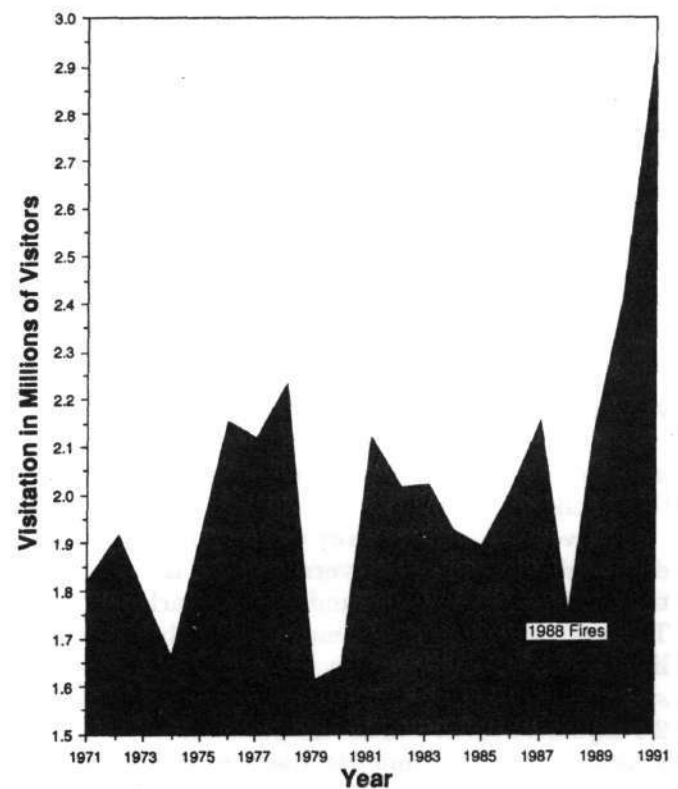


Figure 2—Yellowstone National Park summer-season visitation.

visitation coincided with the second oil embargo. The third drop occurred in 1988, coinciding with the 1988 Yellowstone fires. Extrapolating the trend in the years before the fires, 1988 would probably have been a record year for Yellowstone National Park visitation. Figure 2 shows that park visitation did not return to the prefire trajectory in the two years following the fires. Instead, actual visitation may still be below potential visitation.

With-Fires Tourist Expenditures—Yellowstone Park's entrances correspond to some of the communities evaluated in this study. West Yellowstone traditionally has the greatest number of park visitors, about 34 percent of the total (table 3). The southern entrance, Jackson, is the next busiest, with about 27 percent of total summer-season visitation. The total number of visitors entering the park during the summer season dropped from about 2.15 million in 1987 to 1.72 million in 1988, rebounding to 2.2 million in 1989. Visitation in 1990 rose to 2.4 million, a 9 percent increase from 1989.

The proportion of visitors to each community stayed fairly constant during the 1987 to 1990 period. Overall, the fires caused few changes in the spatial distribution of visitors, presumably because the fires were distributed throughout the park, affecting all areas.

The average group size of visitors remained constant among communities at about 3.6 people. Group size

Table 3—Number of visitors to Yellowstone National Park from Primary Impact Communities, June through September 1988

Year	Gardiner	Cooke City-Silver Gate	Cody	Jackson	West Yellowstone	Total
----- <i>Thousand visits</i> -----						
1987	309.2	120.3	398.7	614.8	705.9	2,149.0
1988	283.2	91.2	332.3	431.0	577.9	1,715.9
1989	311.2	123.2	402.8	651.5	708.2	2,197.1
1990	338.0	128.2	444.4	658.2	831.8	2,400.7

was also the same for locations inside and outside the park. The group size similarity was probably because most groups visited several of the communities during their Yellowstone trip.

The average length of stay was determined for both days and nights. These averages were then apportioned to the inside-park and outside-park averages. The analyses could not be more precise because only limited data were available. The average length of stay remained fairly constant, about 3.5 days. About 2.0 days were spent outside the park and about 1.5 days were spent inside. Similarly, the total nights remained about the same during the study period, approximately 2.8. Nights spent outside the park were about 1.6, while nights inside the park were about 1.2. Overall, the fires did not have a substantial effect on the length of stay; these averages remained fairly constant throughout the study period.

Average daily expenditures for each community and inside the park are shown in table 4. West Yellowstone had the highest average daily expenditures among the communities studied, followed by Jackson and Cody. Expenditures in Gardiner and Cooke City-Silver Gate were about equal. Larger communities may offer more opportunities for tourists to make purchases. Inside-park average expenditures were consistently greater than those outside the park. The outside average daily expenditure rose from about \$32 per day in 1987 to about \$37 in 1990, a 16 percent increase. Inside-park expenditures increased from an average of \$39 per day in 1987 to about \$44 in 1990, a 13 percent increase. Overall, the average daily expenditures grew at a rate of about 4 percent a year between 1987 and 1990.

Visitors were more likely to make an expenditure in certain communities than others. These expenditure patterns may reflect each community's tourism dependency and the availability of goods and services for tourists. West Yellowstone had the highest percentage of visitor groups making an expenditure in a community, about 49 percent. This rate implies that nearly one out of every two groups spent some money in West Yellowstone. Jackson was a close second with 45 percent. Cooke City-Silver Gate had only 22 percent, meaning that only about one in every five groups going through these communities spent money.

The 1988 fires had different impacts on each community. West Yellowstone lost the most tourist expenditures, about 20 percent of the total. Jackson was next (about 16 percent of the total loss), followed by Cody, Gardiner, and Cooke City-Silver Gate in that order. Total gross expenditures declined from 1987 to 1988 in every community but Gardiner. Tourist expenditures increased in Gardiner because its proportion of the total visitors increased in 1988. In 1989, Jackson's proportion of total expenditures increased; but the increase did not continue through 1990, when Jackson's proportion returned to 1987 levels. Overall, the fires affected Jackson the most in 1988, but Jackson also had the greatest proportional increase in expenditures after the fires.

The proportion of expenditures made inside and outside the park remained relatively stable during the study period, about 54 percent outside the park, compared to 46 percent inside the park. Total expenditures declined by about 8 percent from 1987 to 1988. In 1989, the year after the fires, total expenditures

Table 4—Average daily expenditures for visitor groups inside and outside Yellowstone National Park, June through September 1988

Year	Gardiner	Cooke City-Silver Gate	Cody	Jackson	West Yellowstone	Outside average	Inside average
----- <i>1989 dollars</i> -----							
1987	27.00	26.80	28.40	32.80	35.40	31.70	39.90
1988	28.90	28.70	30.50	35.20	37.90	33.80	40.40
1989	30.30	30.00	31.80	36.90	39.50	35.50	42.20
1990	31.90	31.60	33.40	38.80	41.70	37.40	44.20

Table 5—Gross expenditures for visitors inside and outside Yellowstone National Park, June through September 1988

Year	Gardiner	Cooke City-Silver Gate	Cody	Jackson	West Yellowstone	Outside average	Inside average	Yellowstone area total
----- Million 1989 dollars -----								
1987	4.133	1.580	5.618	10.059	12.385	33.776	29.680	63.457
1988	4.420	1.399	5.466	8.233	11.837	31.357	26.816	58.174
1989	5.474	2.134	7.468	14.023	16.345	45.446	38.736	84.183
1990	6.255	2.336	8.668	14.903	20.199	52.362	44.526	96.889

increased by 46 percent over 1988, increasing an additional 15 percent in 1990.

The total expenditures for 1987 were the sum of the expenditures outside the park (\$33.78 million) and inside the park (\$29.68 million), \$63.46 million (table 5). The 1988 expenditures totaled \$58.17 million, 1989 expenditures totaled \$84.18 million, and 1990 expenditures totaled \$96.89 million.

Without-Fires Tourist Expenditures—Determining the without-fires expenditures required estimating the number of travelers that would have visited Yellowstone National Park if the fires had not occurred. The final model selected to forecast annual visits to Yellowstone Park contained three variables: nonresident visits to Montana (MT), Forest Service RIMS visitation data (RIMS), and visitation to Big Horn National Recreation Area (BH):

$$\text{Visitation} = -4,811,759 + 0.804(\text{MT}) + 12.1(\text{RIMS}) + 1.04(\text{BH})$$

$(t = 7.41) \quad (t = 4.12) \quad (t = 3.51)$

This model produced a very high adjusted R^2 (96.3 percent) and a very low Mallows's C_p (2.7), suggesting a high level of confidence in the visitation forecasts. Table 6 shows the actual level of visits for Yellowstone National Park during 1987, along with the projections to 1990 produced by the forecasting model. As shown in table 6, the model's projections of Yellowstone Park

Table 6—Actual and projected summer-season visits to Yellowstone National Park

Year	Projected	Actual	Difference (Projected - actual)
1980	1,662,457	1,635,970	26,487
1981	2,155,965	2,122,458	33,507
1982	1,993,211	2,009,234	-16,023
1983	2,043,337	2,020,801	22,536
1984	1,888,994	1,920,816	-31,822
1985	1,910,629	1,884,364	26,265
1986	2,003,334	2,000,557	2,777
1987	2,148,807	2,149,093	-286
1988	2,338,482	—	—
1989	2,536,048	—	—
1990	3,040,578	—	—

visits are very close to the actual visits, lending credibility to the model.

The projected visits to Yellowstone in 1988, if the fires had not occurred, were about 2.338 million, up about 9 percent from the park's 1987 visits of 2.149 million (table 6). In 1989, visits would have increased another 8 percent, to 2.535 million; in 1990 visitation would have increased another 20 percent to 3.04 million. Comparing these estimates of projected visitation to actual visitation suggests that 1988 visitation was only about 73 percent of what it might have been without the fires. In 1989, actual visits increased to about 87 percent of the without-fires projections. In 1990, the actual visits were 79 percent of projections. Examining the figures for actual and projected visits suggests that the fires caused a decrease in visitation about equal to 1 year's growth. The actual visits in 1990 are very close to what the 1989 visits are projected to have been without the fires. The 3 million visits in 1991 are similar to those projected in 1990 if the fires had not occurred. It is unknown how long this potential 1-year lag in growth will continue.

Projected expenditures without the fires are shown in table 7. In 1988, the total of \$42.74 million in expenditures outside the park was added to the total of \$36.55 million in expenditures inside the park for total projected gross expenditures for the Yellowstone area of \$79.28 million. Similarly, total projected 1989 expenditures equaled \$97.13 million and 1990 expenditures \$122.71 million. For 1989, the Yellowstone area projected expenditures increased about 23 percent over 1988; in 1990, projected expenditures would have increased another 26 percent.

Projected expenditures differed among communities, with 1988 projections showing Gardiner with the greatest increase, 45 percent over 1987. Most other communities would have had about a 25 percent increase, except for Jackson which would have had only about an 11 percent increase. In 1989 though, the slow-growth communities would have shown faster growth. In 1990, community growth rates returned to 1988 figures. Because each community's projection was based on its visitation, the proportion of impacts remained relatively constant across communities, as well as inside and outside of the park, for the 3 years.

Table 7—Gross tourist expenditures projected inside and outside Yellowstone National Park if the fires had not occurred, June through September 1988

Year	Gardiner	Cooke City-Silver Gate	Cody	Jackson	West Yellowstone	Outside average	Inside average	Total
----- Million 1989 dollars -----								
1988	6.024	1.907	7.450	11.220	16.132	42.735	36.545	79.280
1989	6.206	2.462	8.617	16.180	18.859	52.436	44.693	97.130
1990	7.922	2.958	10.978	18.876	25.583	66.318	56.394	122.712

Net Changes in Tourist Expenditures—

Subtracting the projected without-fires expenditures of \$79 million in 1988 from the calculation of \$58 million with the fires produced a net negative impact of about \$21 million (table 8). In other words, the Yellowstone fires in 1988 cost the Yellowstone area about \$21 million in tourist expenditures. The 1988 actual economic impact of tourist expenditures was only 73 percent of the without-fires projection. The projected without-fires expenditures of \$97 million in 1989 was subtracted from the actual expenditures of \$84 million for a net loss of about \$13 million. In 1990, the without-fires estimate of \$123 million was subtracted from the actual figure of \$97 million to yield a loss of about \$26 million. The total loss between 1988 and 1990 was about \$60 million.

On balance, the Yellowstone fires produced lower tourism expenditures during 1988, 1989, and 1990. The loss during 1989 was partially offset by an increase in summer visitation immediately after the fires. It is unknown how long this visitation increase lasted or will last (Snepenger 1989; Yuan and Yuan 1990). Even though the economic loss was reduced in 1989, the increase in visitation did not match the increase that would have occurred without the fires. Most

communities' tourism suffered the same level of economic impacts, since the fires were spread throughout the area. The long-term impacts are unknown, since the surrounding communities have different levels of dependency on tourism. The more tourism-dependent communities may be affected the most because they do not have the economic diversity to compensate for the loss in tourism.

EMPLOYMENT AND WAGE IMPACTS

The ADO payments and tourist expenditures lend themselves to a "bottom-up" approach to impact analysis. Overall impacts are the sum of individual impacts. Another approach is to use employment and wage data to identify changes in trends that may have been caused by the fires.

Employment and Wage Impact Methods

The Primary Impact Communities could not be analyzed using traditional approaches because they are in a combination of counties, cities, and unincorporated areas. Readily available data for income and employment are published only for counties. Information

Table 8—Difference between the actual (A) and projected (P) gross tourist expenditures inside and outside Yellowstone National Park if the fires had not occurred, June through September 1988

Year	Gardiner	Cooke City-Silver Gate	Cody	Jackson	West Yellowstone	Outside average	Inside average	Total
----- Million 1989 dollars -----								
1988A	4.420	1.399	5.466	8.233	11.837	31.357	26.816	58.174
1988P	6.024	1.907	7.450	11.220	16.132	42.735	36.545	79.280
Difference	-1.603	-.507	-1.983	-2.987	-4.294	-11.377	-9.729	-21.106
1989A	5.474	2.134	7.468	14.023	16.345	45.446	38.736	84.183
1989P	6.206	2.462	8.617	16.180	18.859	52.436	44.693	97.130
Difference	-.731	-.328	-1.148	-2.156	-2.513	-6.989	-5.957	-12.946
1990A	6.255	2.336	8.668	14.903	20.199	52.362	44.526	96.889
1990P	7.922	2.958	10.978	18.876	25.583	66.318	56.394	122.712
Difference	-1.667	-.622	-2.310	-3.972	-5.383	-13.955	-11.867	-25.823

about communities, cities, or subcounty areas is not generally available. Even the Census of Population, which provides data for communities and other subcounty areas, is not useful in evaluating fire impacts because census data refer to conditions as of April 1 for the census year. This date certainly does not reflect conditions during the rest of the year, especially in tourist-oriented economies with a summer peak in employment.

Primary Impact Communities were analyzed using special employment and wage tabulations. The Wyoming Department of Employment provided the data for Park and Teton Counties (Wyoming Department of Employment 1991), and the Idaho Department of Employment supplied the data for Teton and Fremont Counties (Idaho Department of Employment 1991).

For the Montana communities of West Yellowstone, Gardiner, and Cooke City-Silver Gate, employment and wage summaries were constructed from firm-level records for Gallatin and Park Counties provided by the Montana Department of Labor and Industry (1991). The summary for each community was constructed in several steps. First, countywide files were searched and the firms with ZIP Codes in any of the three communities were marked. Second, onsite visits and telephone inquiries were used to identify additional firms without local addresses that conducted business in the three communities. Finally, employers operating at more than one location were examined and their employment and wages in the three communities were estimated. For example, because Forest Service employment is reported only as a county total, the number of Forest Service workers in West Yellowstone was based on information provided by the Gallatin National Forest (USDA FS 1991).

Available wage and salary data understate total employment in a community because they do not include self-employed persons. Despite this omission, wage and salary data are the only measure of economic activity available for the Primary Impact Communities.

Employment and Wage Impact Results

The tourism industry consists of firms that operate eating and drinking places, businesses in miscellaneous retail trade, and lodging places. Short-term trends in this industry are best measured by inflation-adjusted wages rather than by employment. Firms are more likely to accommodate short-term fluctuations in demand by adjusting the hours worked and wage rates (paying overtime) rather than by hiring or firing workers.

The impact of the 1988 Yellowstone fires on the tourism industry is most clearly seen in the data for the third quarter, rather than totals for the calendar year. Looking at calendar-year totals for the Primary Impact Communities, the 1988 fires had a barely perceptible

effect; annual tourism industry wages increased 8.5 percent from 1987 to 1988, compared to 10.4 percent from 1988 to 1989 (table 9). The third-quarter data, however, show the impact when the fires were burning. Tourism industry wages in the Primary Impact Communities declined 2.2 percent from 1987 to 1988, rebounding with a 6.8 percent increase between 1988 and 1989.

Third-quarter data also provide a more precise picture of trends in the individual communities. For example, five of the seven communities experienced declines in wages and salaries in the tourism industry from 1987 to 1988, while six of the seven experienced significant increases from 1988 to 1989 (table 9). The trends are not as distinct in the annual data for these communities. In fact, none of the communities declined in 1988, based on the annual data.

The 1988 Yellowstone fires appear to have had different impacts in the various communities. The greatest relative declines in third-quarter wages were in Park County, WY (Cody, -7.4 percent), Teton County, ID (-6.1 percent), and West Yellowstone, MT (-5.0 percent). In terms of dollars, the greatest decreases were in Park County, WY (-\$302,000) and Teton County, WY (-\$159,000), the two largest of the Primary Impact Communities. Wages and salaries in the tourism industry increased in the communities of Cooke City-Silver Gate and in Fremont County during 1988.

Communities also differed substantially in the growth of tourism industry wages during the third quarter. The changes from 1988 to 1989 ranged from +53.0 percent in Gardiner, MT, to -7.0 percent in Fremont County, ID. The rapid growth in Gardiner may have been partially due to the new mine, which opened in 1989. The tourism industry in Fremont County, ID, experienced rapid growth during 1988 (21.0 percent); Fremont County was the only community to decline in 1989 (-7.0 percent). These trends may have been caused by the ADO payments made locally. This community received about one-quarter of the total ADO payments (table 1), while only accounting for about 10 percent of the total employment in the Primary Impact Communities.

DAMAGE PAYMENTS

Finally, we analyzed fire-related damage claims, including tort claims and special legislation claims. Torts are private or civil wrongs, independent of contract, involving a legal duty to perform in a particular manner. Persons filing tort claims for damages to private property caused by forest fires must prove negligence on the part of the U.S. Government. Claims may be filed in a number of venues—such as Forest Service Regional offices, National Park Service offices, and Federal and State courts. There is no centralized source of information to identify the fire-related tort

Table 9—Wages and salaries in the tourism industry for Primary Impact Communities¹

County	1987	1988	1989	1987-88	1988-89
	--- Thousand 1989 dollars ---			--- Percent change ---	
West Yellowstone, MT					
Annual	3,024	3,131	3,662	3.5	16.9
Third quarter	1,229	1,167	1,378	-5.0	18.0
Gardiner, MT					
Annual	552	696	868	26.1	24.6
Third quarter	223	213	325	-4.7	53.0
Cooke City-Silver Gate, MT					
Annual	141	181	220	28.7	21.2
Third quarter	85	99	127	15.4	28.0
Park County, WY (Cody)					
Annual	9,974	10,056	10,591	.8	5.3
Third quarter	4,070	3,768	4,011	-7.4	6.4
Teton County, WY (Jackson)					
Annual	27,602	30,733	34,175	11.0	11.2
Third quarter	12,303	12,144	² 12,815	-1.7	5.5
Teton County, ID (Driggs)					
Annual	578	597	716	3.2	19.9
Third quarter	200	188	274	-6.1	45.4
Fremont County, ID (Ashton)					
Annual	1,074	1,289	1,317	20.0	2.1
Third quarter	454	550	512	21.0	-7.0
Total all areas					
Annual	43,006	46,684	51,548	8.5	10.4
Third quarter	18,505	18,159	19,392	-2.2	6.8

¹Sources: Montana Department of Labor and Industry (1991), Idaho Department of Employment (1991), and Wyoming Department of Employment (1991).

²Estimated by the authors.

claims made so far, nor to estimate those still to be filed. Consequently, no accurate estimates can be reported regarding torts.

The U.S. Congress passed Public Law 101-302, which allows parties damaged by four 1988 fires to file for damages under special procedures that do not require the parties to prove negligence by the U.S. Government. Three of the fires were in the Yellowstone area—Storm Creek, Clover-Mist, and Mink. Damage claims were consolidated and processed at the Forest Service's Northern Region Headquarters in Missoula. We sent research personnel to the Regional Office to determine the geographic summary of these payments as they relate to the Primary Impact Communities.

Of the 184 claims filed under this procedure, about 125 pertained to the three Yellowstone area fires it covered (Ramos 1992). As of late 1992, only eight claims were still outstanding (not yet settled). Claims were paid no earlier than 1992, well after the study period.

Outstanding claims involve considerable amounts of money. Therefore, the totals reported here could change dramatically as additional claims are settled. To date, actual payments have amounted to about

\$4.0 million, with about \$2.1 million associated with the three fires in the Yellowstone area. Approximately \$715,000 has been authorized to claimants with ZIP Codes in the Primary Impact Communities (Ramos 1992).

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