



Figure 1. Sign of the times—warm weather and rains combined to melt the alpine snowpack in Yosemite National Park in early 1997, resulting in widespread damage to park facilities, park closures, and reductions in local, regional, and state tourism spending.

Economic analysis of national park issues:

An assessment of the impacts of the 1997 floods in Yosemite National Park

By CHRIS NEHER AND JOHN DUFFIELD

For anyone who has visited small towns such as West Yellowstone, Montana, or Mariposa, California, one thing quickly becomes evident. Communities that are adjacent to large national park units have economies that are highly dependent on travel spending by park visitors. This degree of dependence can vary dramatically from park to park depending on such factors as location and annual visitation to the nearby park and the size and complexity of the local economy. The highest level of economic dependence is found in small tourism-oriented communities in relatively rural areas. It is not surprising, therefore, that when either natural events or shifts in park policy lead to substantial changes in visitation to these parks, local residents can become quite concerned. The issue of how declines in park visitation will impact the local economy is of more than just academic concern for these tourism dependent communities. Because of the close ties between some park units and local economic activity, it is important for park managers to have an understanding of the tools and methods used to explore this type of economic interdependence.

The National Park Service (NPS) has long had an in-house tool (called the Money Generation Model or MGM) to estimate the economic impacts of visita-

tion changes. A recent review of this model identified limitations in the parameters used by the model, including multipliers, expenditure estimates, and assumptions concerning measures of visitation changes (Duffield et al 1997a). This article provides a brief overview of an NPS-sponsored 1997 study (Duffield et al 1997b) that utilized tools other than the MGM to analyze the impacts of the 1997 flood in Yosemite National Park on economic activity in surrounding communities and counties.

Between January 1 and 3, 1997, Yosemite National Park was struck by the largest flood in the park in over 40 years (figure 1). Heavy rains combined with a large snowpack led to high water that immersed much of Yosemite Valley and washed out roads and utilities in the park and downstream along Highway 140 to El Portal. The flood caused significant damage to the park infrastructure, buildings, roads, employee housing and visitor services. The park was fully closed in January and only partially open in February and March. By late January 1997 (just one month after the onset of the flood) the park was able to provide a preliminary damage assessment and outlined a \$178 million estimate of the costs to fully restore roads, trails, utilities, buildings, and grounds (NPS 1997). Damages to private property (primarily park concessioner

property) were estimated at \$7 million (Yosemite Concession Services Corporation 1997).

Because of the substantial economic impacts of the flood, visitor closure, and proposed recovery actions, the National Park Service chose to conduct an economic assessment of the flood. This assessment identified, described, evaluated, and estimated the economic impacts of the flood, park closures, and the reconstruction spending on the local, regional, and state economies. Economic impacts associated with the flood were expected to fall into two general classes: (1) negative impacts on local economic activity and on the visiting public due to park closures and travel restrictions, and (2) positive impacts on local economic activity due to reconstruction spending within the park.

Our study used two very different but complementary economic perspectives to examine these impacts: regional economic modeling and models of demand for outdoor recreation. Regional economic modeling was used to identify the relationship between changes in expenditures (in this case expenditures by visitors to Yosemite, on food, lodging, and other retail items) and overall activity in the local economies. The usual measures of expenditure impact are changes in personal income, em-

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ployment, output, and tax revenues. Regional economic modeling describes the impacts of local expenditure changes on individuals and business. Our study used the basic input-output models and data sets provided by the impact analysis planning (IMPLAN) software (Minnesota IMPLAN Group, 1996).

The impacts of park closure or travel restrictions on people unable to visit Yosemite, or the Yosemite area, are not measured within the regional economic framework, but rather using models of demand for outdoor recreation. Regional economic models are based only on market transactions (the buying and selling of goods or services). The impacts associated with consuming services, such as entry into Yosemite National Park, that are not priced in the market (or are only marginally priced) cannot be fully measured within the regional economic framework. Visitation to Yosemite is only minimally priced (until March 1997 at only \$5 per car, and \$20 per car today) and does not reflect the full value of the service derived. When individuals will pay upwards of \$100 per day for golf green fees or \$50-\$100 per day to fish rivers in areas such as Montana or Idaho, one can be sure that the market price to visit Yosemite is not \$5 or even \$20. Recreation demand models such as travel cost models or contingent valuation models can be used to estimate the value associated with these nominally priced services. (An overview of these types of models is provided in Ward and Duffield 1992, and Braden and Kolstad 1991).

Our analysis of the regional economic impacts associated with reduced visitation to Yosemite National Park required two primary data: (1) the estimated reduction in visitor days due to the flood impacts, and (2) the estimated expenditures per day for these types of visitors. Information on park visitors and their expenditures was collected in 1990-91 by James Gramann (1992a, 1992b). Estimates of visitor expenditures per day were developed based on Gramann and other sources. Yosemite National Park visitation statistics were obtained through NPS staff at the park and at Lakewood, Colorado.

Estimates of visitation reductions

In undertaking this analysis, there was some uncertainty in projecting the timing and scale of both the recovery activities and future visitation to the park. Similarly, it was difficult to project exactly how visitation levels would respond to interrelated factors including reductions in lodging and camping units, ongoing road construction, and changes in visitor fees associated with the Fee Demonstration Program.

Based on the combined effect of the reductions in lodging, campsites, and road capacity, we estimated that the flood effects would result in between 204,000 and 630,000 fewer recreational trips to the park in 1997, depending on the set of assumptions concerning when facilities would be repaired and available for use. We further estimated that in 1998, 122,000 fewer recreational visits would be made to Yosemite National Park due to flood impacts.

Regional economic models and findings

Using IMPLAN, regional economic models were developed for the state of California and four counties surrounding the park: Mariposa, Merced, Tuolumne, and Madera. In the most heavily impacted county, Mariposa County, we estimated that 1997 personal income would be reduced by \$1,159 per capita (\$18 million for the entire county). Additionally, Mariposa County was estimated to lose 956 jobs and \$1.67 million in county occu-

pancy and sales tax revenues. The personal income loss amounts to a 6.6% decline in this measure of economic activity. The remaining three counties we studied all showed much lower income losses (the estimated per capita personal income losses for Madera, Tuolumne, and Merced Counties were \$27, \$50, and \$7 respectively). This result is consistent with our finding that among the four counties Mariposa County has, by far, the highest percentage of its output and employment tied to tourism-related economic sectors.

The spending associated with the 1997 emergency action and reconstruction activities in the four-county area to some extent offset the decline in visitor spending. However, even assuming that 20% of direct reconstruction dollars went to businesses in the four counties, losses from visitation reductions still lead to large net personal income losses in 1997. Considering net losses associated with reduced visitor expenditures and gains from reconstruction spending within the counties, we estimated that net aggregate 1997 personal income in the four-county area would be reduced by \$24.23 million and that 1,301 jobs would be lost. It is important to note that these estimated losses are annual averages. While employment may have been down significantly during the January-March shutdown period, it may have largely recovered later in the year.

Recreation demand model and findings

Our recreation demand analysis focused on losses suffered by visitors who *would have* visited Yosemite except for the flood-related closures (estimated to be between 204,000 and 650,000 in 1997). Based on estimates of visitor benefits derived from previously published studies, the value per recreational visitor trip was estimated to be between \$124 and \$358 in 1997 dollars (Walsh 1990, Clawson 1959, and Duffield 1992). The 1997 visitor losses were estimated to be within the rather wide range of \$26 million to \$233 mil-

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lion. These loss estimates are an upper bound since they do not take account of substitute activities a visitor may have chosen to pursue instead of visiting Yosemite.

While those would-be visitors who were prevented from visiting the park due to the flood suffered economic losses, in the longer-term (post-recovery), it is likely that the total benefits visitors derive annually from the park will be *increased* by the change associated with the recovery activities. It is expected that Yosemite Valley will be more aesthetically pleasing and better organized due to a reduction and

reorganization of structures. In addition, the shift of some lodging, camping and administration activities outside of Yosemite Valley should reduce congestion as noted in the General Management Plan (NPS 1980).

Estimates in retrospect

From the perspective of two years after our initial report, we know that the actual decline in Yosemite National Park visitation between 1996 and 1997 was 375,000 visitors. This estimate falls well within our estimated range of visitation losses. At the time of our 1997 analysis there was a great deal of uncertainty regarding the speed of infrastructure re-

Yosemite in 1998 was \$196. This estimate is near the midpoint of the range of estimates used in our 1997 study.

Conclusions

The results of our study of the economic impacts of the 1997 Yosemite floods underscored the strong linkages between visitation to the park and employment and income in the counties and communities surrounding the park. Those counties and communities closest to and with the strongest economic ties to tourism and tourist spending were the most heavily impacted by visitor reductions. However, a tentative conclusion of our study is that *on aggregate* the net losses to

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construction within the park and the response of visitors to the flood damage and constraints imposed by reconstruction activities. Our 1997 report assumed that all park lodging constraints would be removed by July, 1998, and the park would be back to full visitation levels that month. Conversations in January, 1999, with Mike Osborne (the fee coordinator for Yosemite) indicated that the park still has not fully recovered from the flood. The park currently has 200 fewer lodging units and 350 fewer campsites than before the flood. Additionally, road closures and traffic delays continue to cause difficulties for park visitors. Actual visitation to Yosemite in 1998 was about 389,000 below visitation for 1996. It is clear that negative impacts of the 1997 flood in Yosemite are still affecting visitation levels to the park. A complicating factor is that beginning in 1997 fees were increased in Yosemite. However, preliminary analysis of other similar parks such as Yellowstone indicate that any price response to fee changes to date has been negligible (Duffield et al. 1999).

While our 1997 report relied on previously published data and value estimates, in 1998, an NPS-sponsored visitor survey in the park asked questions on visitor willingness to pay for their trip to Yosemite National Park. From these survey question responses we estimated that the median willingness to pay for a trip to

potential visitors from the Yosemite flood and travel restrictions substantially exceeded the losses suffered by employees and business owners in the adjacent counties. The most heavily impacted specific *individuals*, however, were undoubtedly among the local business owners and their employees rather than visitor populations. The per trip loss for the average visitor was on the order of \$200 but the per capita losses in Mariposa County, the most heavily impacted county, (allocated over the entire county population) was approximately \$1,200. This latter estimate would be much higher if computed for the most affected subpopulations—business owners and employees in tourism-related sectors. **P_S**

References

- Braden, J., and C. Kolstad. 1991. Measuring the Demand for Environmental Quality. New York: New Holland.
- Clawson, M. 1959. Methods of Measuring the Demand for and Value of Outdoor Recreation. Resources for the Future Reprint No. 10 (February). Washington, D.C.
- Duffield, J., C. Neher, J. Boyer, and J. Carey. 1997. Economic Assessment of the Highwater 97a Incident Yosemite National Park. Report for the National Park Service. Denver, CO.

Duffield, J., D. Patterson, and C. Neher. 1999. Evaluation of the National Park Service Fee Demonstration Program: 1998 Visitor Surveys. Report for the National Park Service. Moscow, ID.

Gramann, J. H. 1992a. Visitors, Alternative Futures, and Recreational Displacement at Yosemite National Park. Department of Recreation, Park, and Tourism Sciences, Department of Rural Sociology, Texas Agriculture Experiment Station, Texas A&M University, January 1992.

Gramann, J. H. 1992b. Expenditures by Auto Travelers Visiting Yosemite National Park. Department of Recreation, Park, and Tourism Sciences, Department of Rural Sociology, Texas Agriculture Experiment Station, Texas A&M University, January 1992.

Minnesota IMPLAN Group. 1996. IMPLAN Pro Software and Data.

National Park Service, United States Department of the Interior. 1997. Yosemite Flood Recovery 1997. Yosemite National Park, California, January 1997. 23 pp.

National Park Service, United States Department of the Interior. 1980. Yosemite National Park/California: General Management Plan, Visitor Use/Park Operations/Development. September, 1980.

Walsh, R. 1980. An Economic Evaluation of the General Management Plan for Yosemite National Park. Colorado Water Resources Research Institute, Colorado State University, Fort Collins, CO.

Ward, K., and J. Duffield. 1992. Natural Resource Damages: Law and Economics. John Wiley & Sons, New York.

Yosemite Concession Services Corporation. 1997. Damage Assessment Report. Yosemite National Park, California. January, 1997.

Dr. John Duffield is an Adjunct Research Professor of Economics at The University of Montana, Missoula, Montana and is president of Bioeconomics, Inc. a private economic consulting firm. He can be contacted at Bioeconomics, Inc., 315 South Fourth East, Missoula, MT 59801; (406) 721-2265 or e-mail: bioecon@montana.com.

Chris Neher is an economist working for Bioeconomics, Inc., a Montana economic consulting firm. He can be contacted at Bioeconomics, Inc., 315 South Fourth East, Missoula, MT 59801; (406) 721-2265 or e-mail: bioecon@montana.com