

# Measuring the Economic Impacts From Wildland Fire

*By William Riggs, Don Breazeale, and Gordon Myer*

## Introduction

During the summer of 1999 northern Nevada experienced its worst fire year with over 1.6 million acres of federal, state, and private rangeland being consumed by wildland fires. Lightning from electrical storms was the primary cause of these late summer devastating fires. At one point during the fire period, more than 56% of the nation's federal fire fighting resources were involved in fighting the fires, (BAER, 1999). Ninety-seven percent of the land in Nevada is public land but private lands are scattered throughout the area. The acres burned were largely confined to the five counties of Elko, Eureka, Lander, Humboldt, and Pershing. The area damaged by fire represents approximately 6% of the total acres in northern Nevada. Rangeland in Nevada is the primary source of grazing for the state's livestock industry. The fires had a major impact on the livestock industry in the State; approximately 60% of the state's cows and calves and 64% of the sheep and lambs are located in this five-county area, affected by the fire (Nevada Agricultural Statistics, 1998-1999).

In any natural disaster, there is a need for immediate monetary impact analysis. The impact information is used to initiate federal and state emergency programs as well as provide information to private insurance companies. Federal agencies also use the impact information to help prioritize disaster relief funds and determine needs for additional appropriations. The impacts are also necessary for the mitigation planning that invariably occurs following a natural disaster.

## Abstract

Wildland fires ravaged northern Nevada in 1999. Public decision makers requested rapid fiscal impact assessments be developed. Economic theory provided the basis for the development of surveys, data analysis, and the reporting of estimated economic losses. This information was used to acquire emergency funding and support for ranchers and rural counties.



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The objective of this paper is to provide a description of a process developed and implemented to measure the economic impacts from northern Nevada wildland fires. The economic damages include impacts measured at the ranch level and tracking those impacts through the communities, in the five-county region affected by the fire. This paper does not describe asset valuation methods but rather provides a framework for financial management professionals to consider when developing disaster impact analyses.

### Data Collection Process

Burned Area Emergency Rehab (BAER) teams were established by congress as a means of providing support to communities within urban and suburban wildland and wildfire interface areas. The BAER teams are comprised of specialist that create sub teams that are charged with analyzing natural disasters and then developing a comprehensive plan to address the losses associated with the disaster. These are basically first response teams that develop plans that are then fast tracked to congress for funding.

In response to the large Nevada fire disaster, various teams of professionals were organized to address numerous impacts relating to fire. In order to predict economic losses, as requested by federal agencies, state and local elected officials, and private landowners, a survey team with expertise in ranch and community economics was formed. The economics survey team-included representatives from the University of Nevada Cooperative Extension, USDA's Natural Resource Conservation Service (NRCS), and Eureka County Public Lands Department. Additional information was provided to the team by Nevada Farm Bureau, Nevada Cattlemen's Association, USDI Bureau of Land Management, Nevada Division of Forestry, USDA Farm Service Agency, Nevada Division of Wildlife, BAER reports, and local county officials. This local team was formed at the onset of the fires and was charged with gathering needed information and generating economic impacts.

The economic team utilized a survey instrument to solicit information from private and public landowners and/or managers concerning losses and damages resulting from the fires. The instrument was designed to gather information concerning major losses yet still allow for a quick response time. Survey categories and their corresponding questions were designed in cooperation with those people impacted, to determine what economic losses would be measured, what amount was lost, and for how long would that loss be continued. For example, the instrument included questions on animal unit months (AUM) of forage impacted, miles of fence lost or damaged, type of structures damaged, livestock killed or injured, and ranch inputs devoted to fighting the fires (i.e. labor, supplies, equipment, etc.).

Once the instrument was designed, personnel at the county level were assigned to gather the information. Given emergency constraints all methods of data collection, telephone surveys, mail in surveys, producer meetings, etc., were incorporated to gather the needed information. The methods used depended on resources available in each county. Current data from University enterprise budgets, commodity market reports, and input prices were used to assign monetary value.

County data were sent to University of Nevada Cooperative Extension offices in Pershing, Humboldt and Eureka counties where it was compiled into spreadsheets. Cooperative Extension then generated and distributed economic impact reports to other agencies and public officials.

Data derived from the survey provided the basis for determining direct fiscal impacts. A direct impact does not include multiplier effects, which are measurements of economic impacts to sectors other than agriculture. Indirect and induced impacts, the multiplier effects, across other community sectors are measured utilizing Input-Output economic models. These economic models determine the interactions between industries and households in the communities. Deriving economic multipliers for different sectors within counties or communities involves complex economic research, but the effort is necessary because direct economic impacts account for only a part of the total. The multipliers for this study had been developed for the counties of Humboldt and Eureka prior to the disaster through outside research efforts. These multipliers were also applied to counties in which multipliers were not available, Pershing, Lander, and Elko.

### Economic Impacts for Five County Area

Table 1 provides a summary of the survey categories and the associated economic impact across counties and for the region. The total losses for the five-county area were estimated to be \$13,265,442.

### Sector Multipliers

University studies for Humboldt (Harris, 1993) and Eureka (Harris, 1998) counties estimated the final demand multiplier for livestock to be 2.32, and 1.90, respectively. Since similar studies were not available for the other counties, the multiplier from Humboldt is assumed for Pershing County and the Eureka multiplier was used for Lander and Elko counties.

### Lost AUMs

Data derived from the surveys and BAER team reports indicated that approximately 22,204 AUMs lost in Humboldt County, 18,622 in Pershing County, 28,000 in Eureka County, 27,525 in Lander County, and 37,312 in Elko County.

The value of livestock output per AUM was estimated to be \$35.35. Multiplying \$35.35 by the lost AUMs results in the calculation of the direct impact. The value, \$35.35 is derived from University research publications relating to livestock enterprises. This corresponds to the dollar amount that each AUM contributes to the range cattle sector's total gross value of production (or gross value of output). The total AUMs lost due to wildfire in these five counties during 1999 were estimated to be 133,663, resulting in a direct impact to the livestock sector of \$4,724,987 (133,663 x \$35.35). The total economic impact consisting of direct, indirect and induced in these five counties, utilizing final demand multipliers in year one, was \$9,583,619.

### Cost for Fence Maintenance and Infrastructure

The cost to producers and landowners for rebuilding fences lost in the fire could be one of the higher costs. Approximately 459 miles of new fence was required and 230 miles of fence needed to be rebuilt. The cost to replace fence including removal of old material, labor and new materials is estimated to be \$5,000/mile. The cost to repair or rebuild fence runs approximately \$2,500/mile. A combination of new and rebuilt fencing was calculated to be \$2,869,200.

### Fire Fighting Costs

Fire fighting costs include expenses incurred by the rural fire districts, county road departments and private fire control efforts over and above annual budgeted amounts. These efforts resulted in a cost of \$227,573.

### Structure Loss

Structure losses include buildings, corrals, commercial pipelines or power poles, and other physical items lost due to fires. Estimates were calculated at \$270,800.

### Livestock Loss

An estimated \$314,250 worth of livestock perished in the fires. This value was determined through the summation of fair market value, at the time of loss, for each class of livestock. Most of the livestock death losses occurred in Eureka and Pershing counties. This cost most likely underestimates the total cost of livestock lost because it includes only death loss and not loss of production to fire related health problems such as orphaned animals, burned udders, respiratory problems or other illnesses.

### Unaccounted Losses

There were at least two major costs that will be incurred by ranchers but were not included in the original impact estimates. First, future reseeding costs of private lands may be incurred by some ranchers. Since the survey was taken immediately following the fire the extent of reseeding was not known. As a result the cost of reseeding was not included. A second major cost involves the replacement of forage that was lost due to fire. Again at the time of the survey the ranchers did not know how much feed would have to be purchased. Part of the reason for not knowing was that it was unclear how much reseeding BLM would carry out. It would certainly be possible to include reasonable estimates of this cost.

Other impacts were not surveyed or evaluated but will contribute to the total economic impact. Examples of unknown impacts are loss of wildlife and recreation, erosion, increased maintenance on roads and interstates to keep them cleared, decreased ecological state of the land and loss of human life.

### Summary and Conclusions

The economic impact on Elko, Eureka, Lander, Humboldt, and Pershing counties due to the rangeland wildfires experienced in the summer of 1999 was approximately \$13 million. Impacts include lost production from grazing, livestock deaths, and the

Table 1. Estimated Economic Impacts from Rangeland Wildfires Northern Nevada Counties.

| County   |           | Pershing     |             | Lander       | Elko         | Total          |
|--|-----------|--------------|-------------|--------------|--------------|----------------|
| Livestock Sector Multiplier                    | 2.32      | 2.32         | 1.9         | 1.9          | 1.9          |                |
| Lost Amuse of Grazing                          | 22,204    | 18,622       | 28,000      | 27,525       | 37,312       | 133,663        |
| Direct impact with output value of:            | \$35.35   | \$784,911    | \$658,288   | \$989,800    | \$973,009    | \$1,318,979.20 |
| Total Impact with Multiplier                   |           | \$1,820,994  | \$1,527,227 | \$1,880,620  | \$1,848,717  | \$2,506,060.48 |
| Cost for Fence & Maintenance of Infrastructure |           | \$45,000     | \$380,000   | \$1,227,500  | \$757,400    | \$459,300      |
|  |           |              |             |              |              | \$2,869,200    |
| Fire Fighting Costs - County Related           | \$100,000 | Not Reported | \$124,873   | \$2,700      | Not Reported | \$227,573      |
| Structures Lost                                | \$140,000 | \$87,000     | \$43,800    | Not Reported | Not Reported | \$270,800      |
| Livestock Lost                                 | \$10,500  | \$88,000     | \$210,450   | \$560        | \$4,740      | \$314,250      |
| <b>Total Estimated Impact Per County</b>       |           | \$2,116,494  | \$2,082,227 | \$3,487,243  | \$2,609,377  | \$2,970,100    |
| <b>Total Estimated Impact 1999</b>             |           |              |             |              |              | \$13,265,442   |

rebuilding of structures and fences. However this total does not include the future costs for reseeding, forage replacement, erosion control and repair of infrastructure.

The purpose of this paper was to present the process that was used to calculate the economic losses for the wildland fires that occurred during the summer of 1999 in Northeastern Nevada. Demands for information required that the process or appraisal be comprehensive yet rapid. By utilizing accepted economic methods and practices, professionals have the ability to collect and analyze fiscal impacts from natural disaster. This fiscal information can be used as a basis for decision making by local, state, and federal officials to support the authorization of emergency funding sources and to help shape future land use policy. It is hoped that this information will be helpful to other professionals.

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