January 1992

What we can learn from the February 1992 Floods in Ventura County, California

Eve Gruntfest

Vanessa Taft

What We Can Learn from the February 1992 Floods in Ventura County, California

Eve Gruntfest
Vanessa Taft

University of Colorado, Institute of Behavioral Science, Natural Hazards Research and Applications Information Center

Quick Response Research Report
#50
1992

WHAT WE CAN LEARN FROM THE FEBRUARY 1992 FLOODS IN VENTURA COUNTY, CALIFORNIA

By

Eve Gruntfest and Vanessa Taft
Department of Geography and Environmental Studies
University of Colorado - Colorado Springs, CO

QUICK RESPONSE RESEARCH REPORT #50

1992

WHAT WE CAN LEARN FROM THE FEBRUARY 1992 FLOODS IN VENTURA COUNTY, CALIFORNIA

Eve Gruntfest and Vanessa Taft
Department of Geography and Environmental Studies
University of Colorado Colorado Springs, CO

A "Quick Response" Report
to the Natural Hazards Research and Applications Information Center University of Colorado Boulder, CO

May 29, 1992

WHAT WE CAN LEARN FROM THE FEBRUARY 1992 FLOODS IN VENTURA COUNTY, CALIFORNIA

Introduction

Between February 10-14, 1992 serious flooding occurred in Ventura County, California. As part of the quick response program sponsored by the Natural Hazards Research and Applications Information Center we travelled to Ventura County to assess the effectiveness of the warning system. Ventura County was particularly interesting because we had considered it a "success story" in our National Science Foundation study of flash flood mitigation in the U.S. (Gruntfest and Huber, 1989, 1991; Huber, 1992).

Paper Organization

The paper has two parts. First, we provide a discussion of the geographical context, the flood detection/warning system in Ventura County, the peripheral uses of the ALERT system, and the county flood history. The other section consists of a summary of our findings based on the February, 1992 floods, comments and controversial topics, and recommendations. A chronology of the flood events is provided as Appendix B.

1.1 Geographic Context

Ventura County has experienced rapid urbanization. In 1987 the population-at-risk was between 150,000 and 200,000 including the communities of Fillmore (11,000), Santa Paula (23,000) and Oxnard (123,000). The 1990 census indicates that the county's population rose to 669,000 from 26 percent between 1980 and 1990.

1.2 Flood History

Ventura County has witnessed many flood events. In 1969 11 people were killed at Ventura Harbor and more than 300 boats were destroyed. The 1969 storm caused great damage in Ventura, Ojai and Santa Paula. Over 22.77 inches of rain fell in Ventura during the 1969 rainy season.

Floods also occurred in 1938, 1909, and 1884. In 1884 Piru Creek deposited so much silt that it created the spot on which the town of Piru now stands. Lowell Hardison from Sespe homestead saw horses, steers and sheep by the hundreds float down the Santa Clara River and drown (Ventura County Star Free Press, February 13, 1992:A-2). In that storm Ventura had 11 days of straight rain. Santa Paula had more than 40 inches of rain that season and Ojai had more than 70 inches. In 1909 flood waters washed out miles of railroad tracks and 17 inches of rain fell in three days.

The 1938 flood occurred in March. Mud rolled off the hill behind city hall and came to rest window high against the building. The Ventura River burst its banks flooding 100 homes.

1.3 The Flood Detection/Warning System

The Fillmore flood of March, 1978 was the initial impetus for developing the Ventura County flood warning system. A 1980 flood increased support for the system. A 1985 fire denuded portions of the drainage basin and the system was expanded (Huber, 1992:16).

The Ventura County warning system monitors the Santa Clara River, including Sespe Creek (1612 square miles); Calleguas Creek, including Revolon Slough (322 square miles); and the Ventura River

(112 square miles).

The detection system was installed originally in 1979 at a cost of $36,000. Since then additional funds of $25,000 have come from the county, $46,000 from the U.S. Navy, $40,000 from Casitas Municipal Water District, $26,000 from the California Department of Water Resources, and $6,000 from the National Weather Service. There are 42 precipitation stations, 19 stream gages and 3 full weather stations. The data is transmitted by radio over three hydrologic frequencies. Radio repeaters also send information to Los Angeles County.

The gages have specific alarm criteria. A stream ratio is developed based on the ratio of stream capacity to the forecast. When ".5" is reached, a watch changes to an alert. A "1" indicates overtopping of the stream. Precipitation gages are set to alert if a 10 year frequency is reached. The county estimates that each gage costs about $500 per year for maintenance. In the early years bears chewed through some of the cables but bear resistant antenna mounts were installed to solve the problem (Huber, 1992:17).

The Ventura County Flood Control mitigation system consists of five elements:

(1) A technician assigned to keep the system equipment regularly maintained and calibrated;

(2) A self-reporting rain and stream gauge network (ALERT) that collects rainfall and water-level data and transmit them to the Flood Warning Center;

(3) Local Flood Warning Center to convert the gauge data into models of 17 watersheds;

(4) The California-Nevada River Forecast Center, a branch of the National Weather Service which uses the same

information from the local warning center to forecast peak discharges, providing a necessary redundancy for quality control;

(5) A weather consultant to forecast amount of rain expected over the next 24 hours along with the maximum 6-hours amounts for the different watersheds, including those not modeled on the warning centers computer. (Taylor and Weikel, 1990)

1.4 Peripheral Uses of the ALERT system

During the drought, VCFCD was able to use its ALERT system to its advantage for the following purposes:

(1) to determine the burn index for the county fire department;

(2) to calculate the evapotranspiration rate to assist in wise watering, irrigation and conservation decisions;

(3) to help the county road department predict rock and landslides and develop suitable road maintenance plans;

(4) to satisfy the EPA weather report requirements for pesticide uses;

(5) to fulfill EPA requirements regarding water quality monitoring; and,

(6) to provide daily maximum and minimum temperatures for broadcast by local TV and radio stations.

VCFCD personnel anticipate that the next major peripheral use of the ALERT system will be monitoring and treating general source urban runoff to comply with the Clean Water Act (Huber, 1992:79).

The VCFCD receives information and converts it to hydrographic models for various areas in the county. With predictions of rainfall amounts, river levels, and their peaks, the VCFCD can take action before and during flood events. In addition flood channels and levees throughout the county carry the excess water to the ocean. With southern California's dry climate, reservoir management plays a large part in county water supply and flood control.

VCFCD has a strong relationship with the National Weather Service.

The detection system was tested successfully on March 1, 1983 with the largest flow ever recorded on Calleguas Creek. Point Mugu had time to close flood gates. Ranchers moved their equipment. Some crops were lost (Huber, 1992, 19-20).

2. Findings from our Review of the February 1992 Flood Events

2.1 The Flood

Prior to the February 1992 storms the region faced a serious drought. The last significant rainfall occurred in 1986. In the weeks before the flooding of February 10-15 an El Niño was forecast indicating unusual weather patterns and the potential for heavy rain.

The rainfall amounts varied throughout the county (See Figures 1-5). For example in the Tuesday event Woodland Hills received 2.78", Ventura received 1.47" and Point Mugu only .57". The storm dumped rain at a rate of .6 inch per hour early February 12th, sending a peak discharge of 58,700 cfs surging down the Ventura River. Figure 4 shows the relationship between the rainfall and the flooding on the Ventura River.

The recurrence interval of the flooding in Ventura County in February, 1992 ranged from a one-and-a-half year flood to over a 50 year flood depending on the particular part of the county.

National television coverage of the flooding showing dramatic helicopter rescues of individuals trapped in a recreational vehicle (RV) park. Media coverage of flooding in Los Angeles early the same week, including unforgettable footage of a 15 year old boy being

washed downstream, enhanced the drama of the floods.

Ventura County Flood Control District (VCFCD) personnel went to work at 2 AM February 12th. At 4 AM the district's private meteorologist alerted officials that a storm was poised to dump up to .68 inches per hour on Ventura County.

Karen Guidi of the Office of Emergency Services was called into work at 6 AM Tuesday. She immediately started calling other agencies, such as the Red Cross, the California Conservation Corps, California Highway Patrol, and Animal Control. At 8 AM an alarm alerted District Engineer John Weikel that the Ventura River was flowing at a rate of 30,000 cfs and rising fast. At 8:30 AM he called Ventura Beach RV Resort with a warning of impending flooding. Although Weikel did not have the authority to order an evacuation, he advised the park manager to check the river and consider evacuation. The manager looked around but did not think evacuation was warranted. Around 9 AM the river swamped the park. Approximately 12 of 54 vehicles registered were unable to evacuate. About 20 people were airlifted by helicopter form the tops of vehicles in the park and 10 from along the river bottom. At 10:01 the River peaked.

2.2 Comments and Controversial Issues

<u>During flood events one person cannot effectively manage all the data for the entire county</u> The system too large and complex. If there were two engineers on hand Tuesday morning one person could have been watching the Calleguas Creek situation where a levee had been breached by the flood waters. The other person could

have been monitoring the Ventura River and other places in the county.

Years of drought reduce the accuracy of the flood models which serve as the basis for the detection system. In this instance the peak times predicted by the models were accurate. However, the expected flood levels were well below what actually occurred.

The success of the ALERT system depends on committed trained personnel. The ALERT system in Ventura County depends on three people. The technical person travelled through dangerous terrain during the height of the storm to replace a battery on one of the transmitters. If he had not been as familiar with the roads and had not been able to get through, the system would have been totally useless during the flooding. The cooperation and communication between the agencies and individuals concerned was superb, especially considering the limitations of the technical support system. The success of the VCFCD detection system depends on three very unusually dedicated individuals.

If the RV park was not allowed in the floodway the flood's impacts would have been minor. Land use decisions are most important in terms of long term minimization of losses from floods. The county opposed the location of the RV park at the mouth of the Ventura River because of the flood threat. The County finally agreed to allow the RV Park when Ventura City Council required the RV park owner to declare himself legally responsible for flood damage to residents' vehicles, prohibiting any vehicles from remaining in the park longer than 30 days, and installing a flood

warning system for the park. In February, 1992 several vehicles had been in the RV park for more than two years.

There are unrealistic expectations for flash flood warnings. An editorial in the Los Angeles Times called for immediate implementation of NEXRAD and the other tools of the modernized National Weather Service so that the public would be adequately warned before the next serious flash floods. Even with NEXRAD the highly localized nature of the flooding combined with their intensity are unlikely to provide a much longer leadtime.
The public at-risk must be prepared to take initiative during a flash flood. Environmental cues, such as intense rainfall for an extended period of time or rainfall when the ground is already saturated, should be considered warnings.

Even when evacuation orders were not followed residents took mitigation measures. In Ventura County many residents are keenly aware of the flood and landslide potential. Most residents of Matilija Canyon refused to evacuate during the February floods. However, they did prepare by stocking up on food and water and sandbagging flood prone areas. The VCFCD has a strong rapport with the media providing figures and flood preparedness information throughout the week of the flooding (See Figure 6).

After flooding on Monday February 10, 1992 most newspapers had lists of where the public could get free sandbags. More than 186,000 sandbags were distributed (Wells, 1992). However there was not much information given on what individuals should do or where they should go in the event of a flash flood. People did take some

actions in response to the flooding threats.

2.3 Recommendations

More base stations are needed. There is no base station in the Emergency Operations Center. During the emergency, the senior hydrologist, Dolores Taylor, went to the EOC, but she was isolated from information from the computer models at Flood Control office. She reached the Flood Control office by telephone but those phone numbers were often tied up by other incoming calls. If she had direct access to the ALERT data she could have provided better real time data to other decisionmakers at the EOC. There is such a connection with Point Mugu Naval Station, but the system needs to be expanded to County facilities that are staffed 24 hours a day.

An understanding must be reached between the priorities of riparian habitat preservation and flood channel capacity. County officials and the RV park owner contend that willows planted in the channel contributed to the severity of the flood. To what degree do these willows, which the county must plant, reduce the channel flow capacity? Will these have a severe impact in a more serious flood? The willow advocates argue that the willows simply bend over and do not clog with debris or significantly reduce the flow capacity.

> "The bulking of the flow due to debris combined with the excessive growth in the river bottom, resulted in the innundation of an area nearly matching the theroetical 100-year floodplain used in the environmental impact report for the RV park project" (Taylor, 1992: 4).

Protocols for emergency management must be developed in the Flood Control office. The public had direct access to the flood control engineer. His individual attention to particular

residents' calls reduced his ability to provide services to the greater public at-large. Officials calling in could not get through. A public information officer or a referral to the public information officer at the Sheriff's department would be a simple way to handle these calls concerning evacuation and road closures.

2.4 Conclusions

Initial media coverage of the February storms indicated severe flooding. The interruption of services, blocked roadways, closed schools, flooded businesses, and other cancelled activities was notable. However, looking at Ventura County's flood history and the statistics from this event the 1992 floods should serve as a close call and a warning compared with what can be expected. The county's population at-risk has grown dramatically. While all systems worked reasonably well this year, a more severe flood would likely result in more damages and more deaths. The County must hold firm on land use regulations. There is little evidence that this flood has taught that lesson as plans go forward to reestablish the RV park at the mouth of the Ventura River (Taylor, 1992).

APPENDIX A

Interview questions

1. When did you think that this storm might lead to flooding? Did you receive any official warning? From whom and when?

2. What factors led you to think this? (environmental/ unofficial/official)

3. What actions did you take?

4. How do you think the warning system worked?

5. Did people take appropriate action?

6. How do you think the system could be improved?

7. Who else do you think we should speak to?

List of people interviewed

Sergeant Jim Burell-Public Information Officer Ventura County Sheriff's Office.

Steve Dwyer-Acting Chief of Emergency Services, U.S. Army Corps of Engineers.

Virginia Fox-Fox Weather

Carol Green-Assistant to Ventura city manager.

Karen Guidi-Director Ventura County Office of Emergency Services.

Bob Hicks-Forecaster Point Mugu Naval Station.

Martharuth Lefever-Director Red Cross Ventura County.

Rick Liefield-Assistant Chief of Engineers, U.S. Army Corps of Engineers.

David Servaes-CalTrans.

John Weikel-Hydrologist, Ventura County Flood Control District.

Sandi Wells-PIO, Ventura County Fire Department.

Additional people we interviewed (but without particularly asking the set of questions)

Bob Armogeda-U.S. Army Corps of Engineers

Bill Bielecki-Manager Ventura Beach R V park.

Marvin Hansen- Hydrographer Ventura County Flood Control District.

Lee Krogh-National Weather Service, Salt Lake City.

Dolores Taylor-Senior Hydrologist, Ventura County Flood Control District.

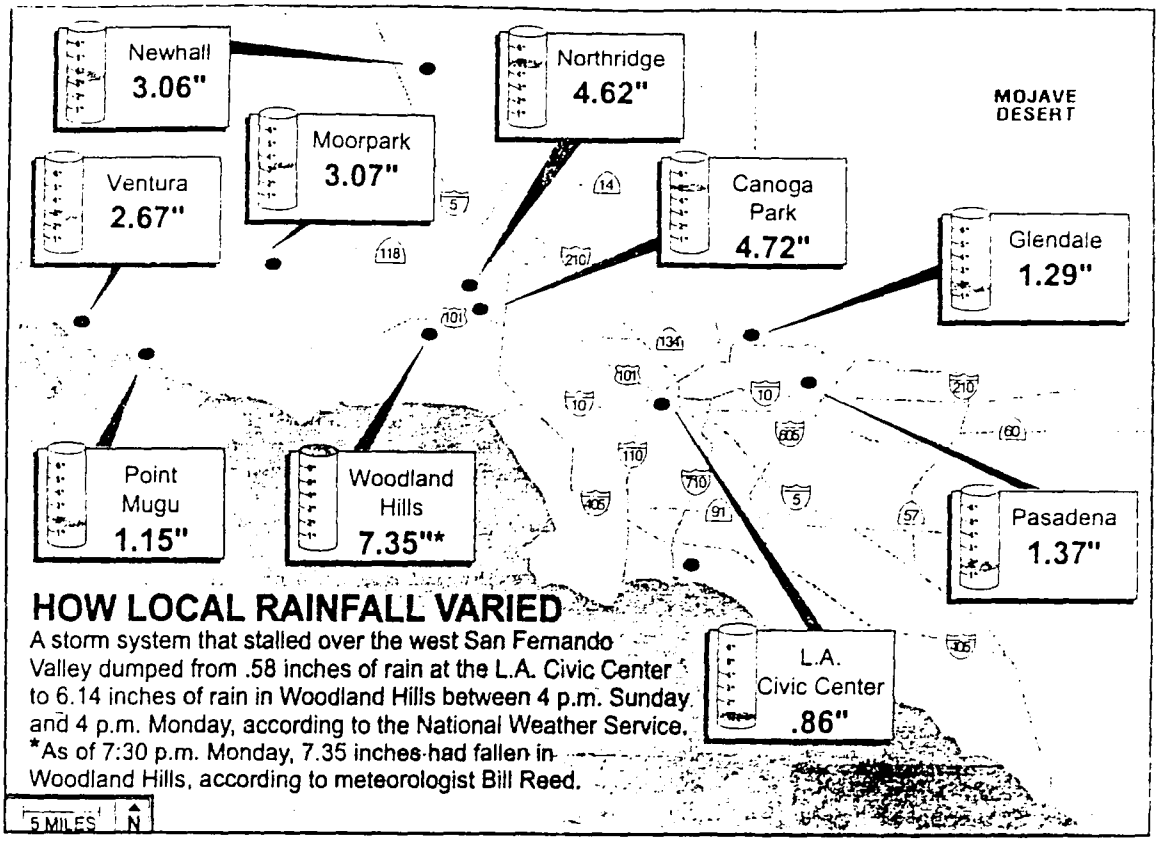

Figure 1. Map Showing Rainfall Variations from 4 PM Sunday and 4 PM Monday from Daily News February 12, 1992, p. 14.

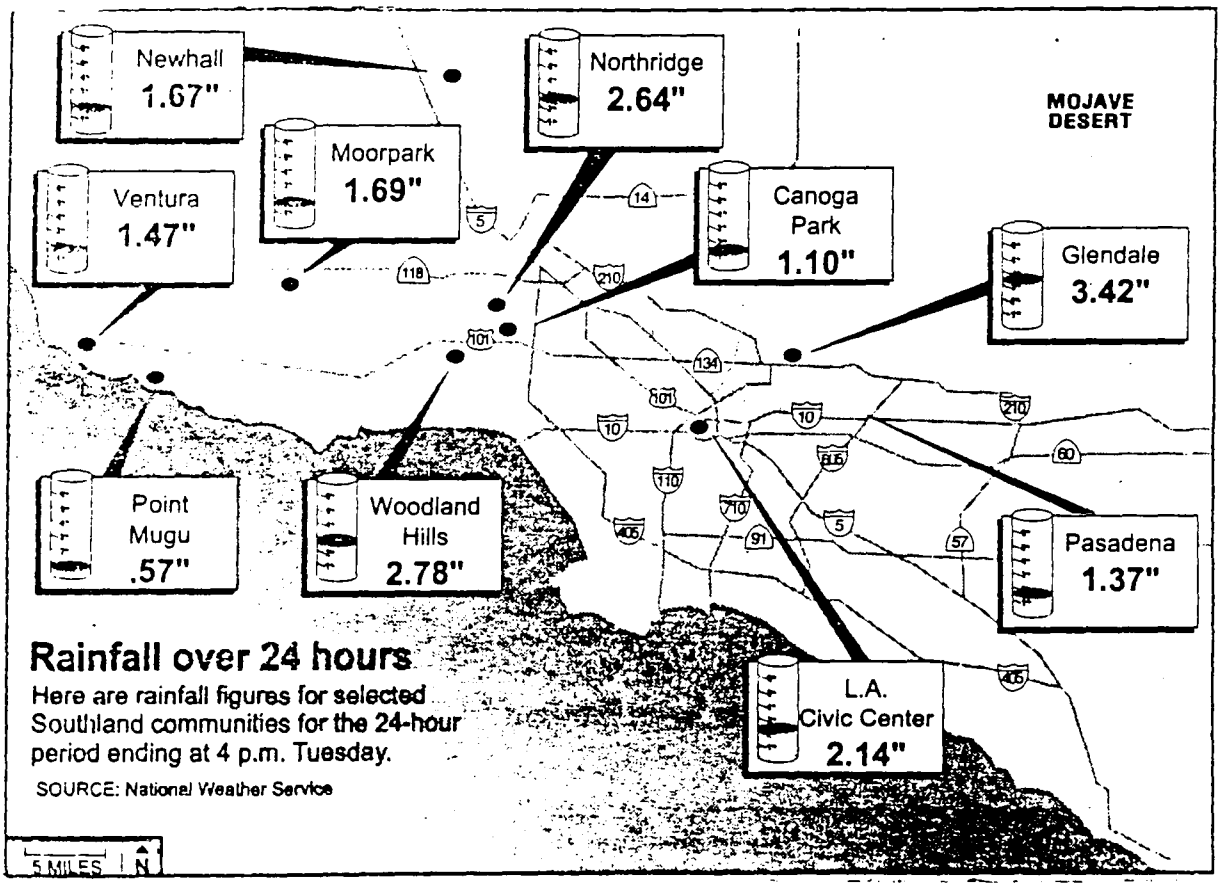

Figure 2. Map Showing Variations in Local Rainfall from 4 PM Monday to 4PM Tuesday February 10-11, 1992 from Daily News, February 11, 1992, p. 7.

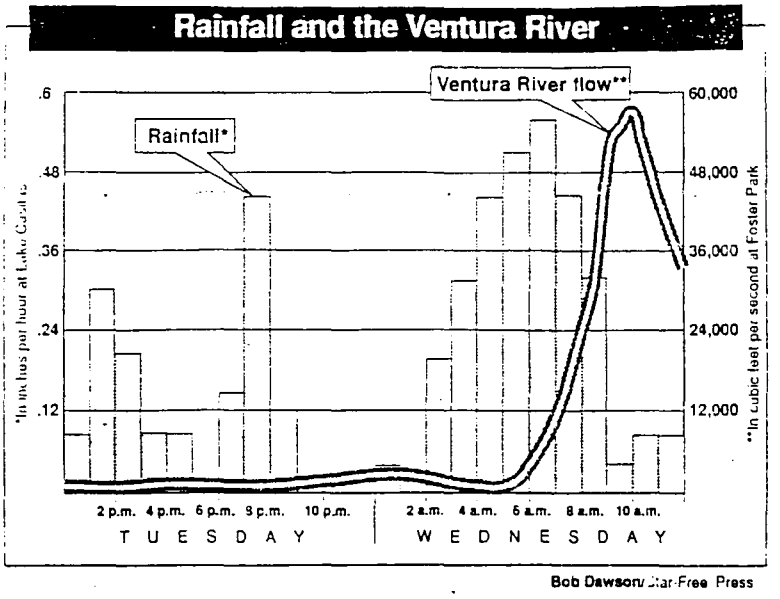

Figure 3. Rainfall and the Ventura River from Ventura County Star Free Press, February 13, 1992, February 13, 1992, A-3.

Rainfall as of 7 p.m. Wednesday

Location	Storm	Season total	Normal to date
Camarillo	1.39	12.19	8.27
Govt. Center	1.74	13.78	9.84
El Rio	1.23	12.25	9.23
Fillmore	4.07	17.69	11.70
Upper Ojai	3.85	21.24	14.00
Oxnard	1.63	12.90	8.90
Santa Paula	3.02	17.77	10.88
Simi Valley	2.71	15.02	8.65
T. Oaks	2.18	15.16	9.33

*Rain season began Oct. 1.

Figure 4. Rainfall figures as of 7 PM Wednesday February 13, 1992 from Ventura County Star Free Press, February 13, 1992, February 13, 1992, A-3

Rainfall Figures

Precipitation for the five-day period ending 4:30 p.m. Friday.*

	Burbank	Encino	Northridge	Woodland Hills	Newhall	Palmdale	San Fernando	Westlake Village
Monday	4.00	4.57	4.62	6.14	3.06	1.42	0.96	6.00
Tuesday	2.18	3.04	2.64	2.78	1.67	1.51	5.82	1.10
Wednesday	3.30	3.57	4.24	3.61	3.92	1.19	1.52	3.50
Thursday	0.50	0.32	1.12	0.72	1.24	0.21	2.23	0.95
Friday	0.00	tr	0.00	tr	0.00	0.00	0.11	0.00
Total	9.98	11.5	12.62	13.25	9.89	4.33	10.64	11.55

Information provided by WeatherData Inc., Continental Weather Services, Inc., Burbank Fire Department, Palmdale Water District, San Fernando Public Works Department, Westlake Village Fire Department.

*San Fernando precipitation measured at 7 a.m.

Figure 5. Rainfall figures for five-day period ending 4:30 PM Friday February 15, 1992, from Los Angeles Times, February 15, 1992, B-9.

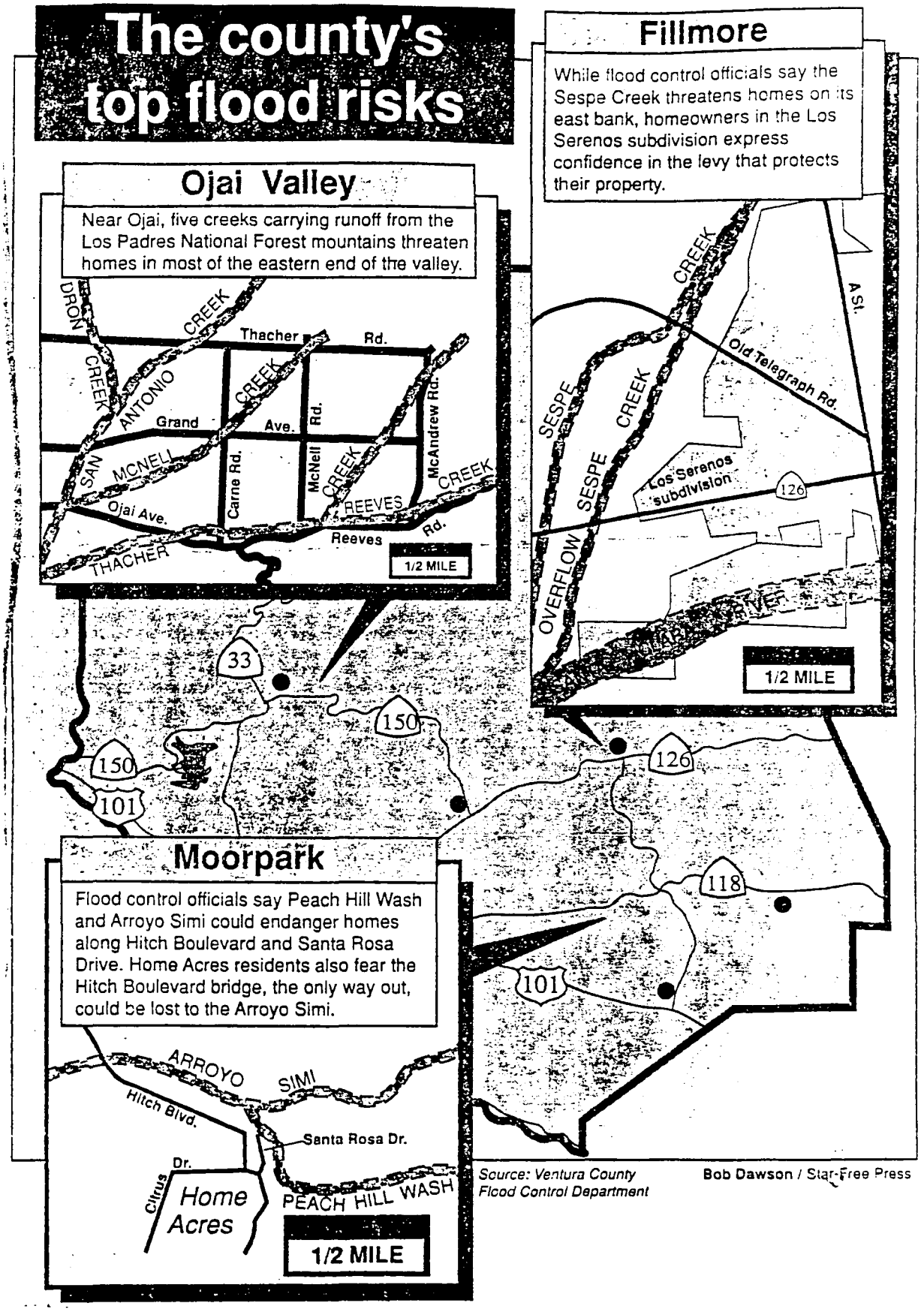

Figure 6. Public Information on Flood Risks provided by the Ventura County Flood Control Department and published by the Ventura County Star Free Press, February 16, 1992, A-5.

BIBLIOGRAPHY

Technical Reports and Articles

Gruntfest, E. and C.Huber, Flash Flooding Toward a Comprehensive National Assessment of Flash Flooding in the United States, Episodes March 1991, p. 26-35.

Gruntfest, E. and C.J. Huber, "Status Report on Flood Warning Systems in the United States" in Environmental Management, v. 13, no.3, p. 279-286.

Huber, Carole J. "Comparative Assessment of Flood Warning Systems in the United States 1987-1991" unpublished Master's Thesis, University of Colorado, Boulder, 1992.

Proceedings of the ALERT Users Group Annual Conference, Asilomar Conference Center, California, May, 19-22, 1991.

Taylor, Delores, "Floods in Ventura County - The Computer is Not Always Right" Natural Hazards Observer May 1992, p. 4-5.

Taylor, Delores and J.G. Weikel, Importance of ALERT Data and QPF;s in Flood Control and Warning/Operation Ventura County, California Heavy Precipitation Workshop, Sparks, Nevada, March 13-16, 1990.

Newspaper Coverage

Los Angeles Times. February 10-19, 1992

Ventura County Star Free Press. February 11-19, 1992

Thousand Oaks Daily News. February 11, 1992

Daily News. February 11-14, 1992

Bakersfield Californian. February 13, 1992

Thousand Oaks News Chronicle. February 13, 1992

Star Free Press. February 15, 1992

Burbank Leader. February 15, 1992

APPENDIX B

VENTURA COUNTY FLOOD CHRONOLOGY

FEBRUARY 10-15, 1992

MONDAY 2/10

10 AM	Ventura County Fire Dept. receives flood warning from NOAA
afternoon	Buildings in Oxnard, Thousand Oaks, and Moorpark among other communities flood and are structurally damaged.
	Agricultural crops including lemon groves and Valentine's Day flowers are destroyed or damaged.
	County Fire Dept. handles 117 flooding and 23 traffic incidents. They also hand out approximately 36,000 sandbags to residents.
	The Ventura River, the Santa Clara River, and the Sespe Creek are only 1/3 full.
6 PM	Stormwaters crest the banks of the Calleguas Creek and breach a levee near the Camarillo State Hospital.

TUESDAY 2/11

morning	No significant precipitation occurs.
7 PM	Rain begins at an intensity of almost .4 inches an hour.
7:45 PM	Rain continues sporadically; gradually decreasing in intensity until midnight.
9 PM	A mudslide closes the Pacific Coast Highway near Point Mugu.

WEDNESDAY 2/12

12 AM	Rains resume.
2 AM	Dolores Taylor reports to Flood Control and informs the County Sheriff's Office that the rain is intensifying.

4 AM	Rain intensity at .68 inches per hour.
5 AM	Sheriff's Office decides to activate Emergency Operations Center (EOC).
6 AM	EOC notifications begin.
6:45 AM	The hillside above Encino Lane, north of Ventura liquifies and crashes into a home killing two occupants.
8 AM	Ventura River was flowing at 30,000 cfs and rising.
8:15 AM	Live Oak Creek in Ojai Valley overflowed and flooded 30 homes.
8:30 AM	John Weikel of Flood Control calls the Ventura Beach RV park to warn that the river is rising and suggested evacuation.
8:45 AM	A news helicopter from Channel 4 rescues a man stranded on an island in the Ventura River.
8:55 AM	Evacuations begin at the Ventura Beach RV park.
9 AM	Ventura River overflows near W. Main Street. Floodwaters prevent further evacuation of the RV park. Helicopters rescue people from the river bed and roofs of RVs.
	The storm passes through the Ventura area and heads east.
9:11 AM	City of Ventura Fire Dept. receives calls of people trapped on an island on the river one half mile north of the Main Street bridge. A mudslide covered 4 lanes of Highway 118 at Rocky Peak Road.
9:20 AM	Red Cross opens De Anza Middle School shelter.
9:35 AM	Two Sheriff's helicopters begin collecting 20 people from roofs of RVs and 10 more from the riverbed.
9:50 AM	Search and Rescue send divers to check inside submerged RVs for additional victims. Red Cross opens Nordoff High School as shelter.
10:01 AM	Ventura River peaks at 58,000 cfs, exceeding the 1969 flood levels.
11:40 AM	Lake Castaic overflows.

5:45 PM Governor Pete Wilson declares a State of Emergency in Ventura and Los Angeles Counties.

THURSDAY 2/13

all day No significant precipitation. Citizens clean up and prepare for the next predicted rains.

FRIDAY 2/14

10 AM City of Ventura declared local disaster area.

3 PM Flood planning meeting in EOC in response to forecasts for more rain.

4:30 PM EOC operations put on standby.

SATURDAY 2/15

6:45 AM EOC activated.

8 AM Coyote creek overflows its banks, but does not flood any homes.

8:20 AM Small rockslide at Highway 33 and Encino.

9:30 AM Hilltop and Santa Rosa Nursery floods. Nine people rescued by helicopter.

10 AM EOC deactivated. No further rain.

(Source: Ventura County Star Free Press 2/13 p A-3 and Ventura County Sheriff's Flood Activity Report)