The Great Flood of 1997: An Examination of Landowner Perceptions in the Applegate Valley

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Abstract

This study was aimed at understanding landowners' responses and experiences during the extreme flood of 1997. Specifically, it focused on perceptions and considerations of how landowners' views might have affected their behavior and responses both during and after the flood. The Applegate Valley provided an excellent opportunity to examine the interactions between land use and humans as the exposure to the threat of this flood event caused area residents to search for ways to buffer its harmful effects by building such structures as levees and retention walls. An unusually heavy mountain snow pack pounded by days of warm, torrential rain caused the Applegate and Rogue Rivers to overflow their banks and wrought devastation on both Jackson and Josephine counties. While floods are, of course, essentially natural events, this study showed that floods tend to be exacerbated by human environmental management and social structures. Research methods included document analysis, newspaper accounts, participant observation, field trip, and non-representative qualitative face-to-face interviews with three landowners. Results showed that landowners were skeptical of flood preventing structures. They believed that flooding was an unavoidable, natural phenomenon that will always occur on

a regular basis, as it is part of the cycle of a river. Considering that humans have been a part of the Applegate Watershed for thousands of years, the increased understanding of landowner perceptions in the Applegate Valley will provide important information in understanding the Applegate River's current state, as well as its potential future.

Introduction

Floods may be the most destructive of all natural disasters because they are the most common, cause the greatest number of deaths, and result in the most damage (Miller 1997). Flooding of rivers and streams is the most frequent type of flooding recorded around the globe, most often stemming from long periods of rain or from rain combined with melting snow and ice. River floods inundate the largest areas of land and destroy more lives and property than any other form of flooding (International Federation of Red Cross and Red Crescent Societies 1999).

From 1965 through 1989, flooding and flood related events accounted for 77 percent of all United States Presidential Disaster Declarations (L. R. Johnston Associates 1992). This is not surprising considering the fact that flooding is common in all 50 states, although the frequency and type of flood varies considerably from state to state (White, 1942). Hundreds of riverine floods, great and small, occur annually in the United States, resulting in drastic and widespread detriment to lives, property, and the environment (L. R. Johnston and Associates 1992). An estimated 2,300 deaths and $27.7 billion to $277 billion in combined property and crop losses were recorded over the past two decades in the U.S. as a consequence of flooding (Mileti 1999).

Curiously, most areas flooded since 1965 have had some form of flood control works (Ericksen 1996). In spite of efforts to control them, floods and related losses continue to occur. There is a paradox in our growing susceptibility to flood losses at a time of increased technological capacity to control and manipulate our river systems. Our ecological dominance over nature has conferred great benefits on society by preventing losses and increasing the resource base (Ericksen 1996). However, researchers have identified this paradox in other countries and for other hazards (White, ed., 1974; Burton, Kates and White, 1978).

Geographers have long held that to understand this paradox researchers must examine in ecological perspective the impacts of natural events, such as floods, on society and society's responses to those impacts (Barrows, 1923; White, 1945; Burton, et al., 1968; Kates, 1970; and Burton, et al., 1978). This sort of examination requires that researchers analyze both physical and social processes in order to gain understanding of not only the physical impact on social systems, but also the social adjustments to the impacts and their influence on the patterns of loss (Ericksen 1996). All too often, however, individuals' perceptions are ignored when analyzing natural hazards (Wong *et al*, 2000). Therefore, this study has two main focuses:

1. Elucidating landowners' responses to an extreme flooding event they experienced in 1997.
2. Examining landowners' perceptions and how their views might affect their behavior and responses during and after the flood.

Specifically, this study sought answers to the following questions:

1. How do landowners perceive the adjustments such as

levees, flood control dams that are made to both the physical and human systems in order to reduce the hazard effects?

2. How do these adjustments increase or decrease the flood hazard?
3. What effects do such adjustments have on the river channel?

Study Area

The Applegate River Valley is located in Jackson and Josephine counties on the northeastern flank of the Siskiyou Mountains in southwestern Oregon. The watershed, bounded by Jackson and Josephine counties, encompasses an area of approximately 493,000-acres (770-square-miles). Applegate Sub-basin includes lands in Jackson County, Oregon (approximately 410 square miles), Josephine County, Oregon (approximately 270 square miles), and Siskiyou County, California (approximately 90 square miles). The Applegate Valley is estimated to have 12,650 people, based on disaggregated census data (Preister, 2000). The watershed is an extensive river drainage system with headwaters in the Siskiyou Mountains and joins the Rogue River near the city of Grants Pass, Oregon. The topography of the basin is rugged, and includes high mountains, steep slopes ranging in elevation from 850 feet to 7,418 feet above sea level, dense networks of streams, and gentle valley floors. Figure 1 shows the location of the Applegate Sub-basin within the Rogue Basin and in Oregon. Figure 2 shows the rural communities and primary tributaries, in the Applegate Sub-basin.

Various stages of conifer and hardwood timber provide diverse wildlife habitat. The valley floor contains grassland, oak savannahs, chaparral, and riparian vegetation. Agriculture and

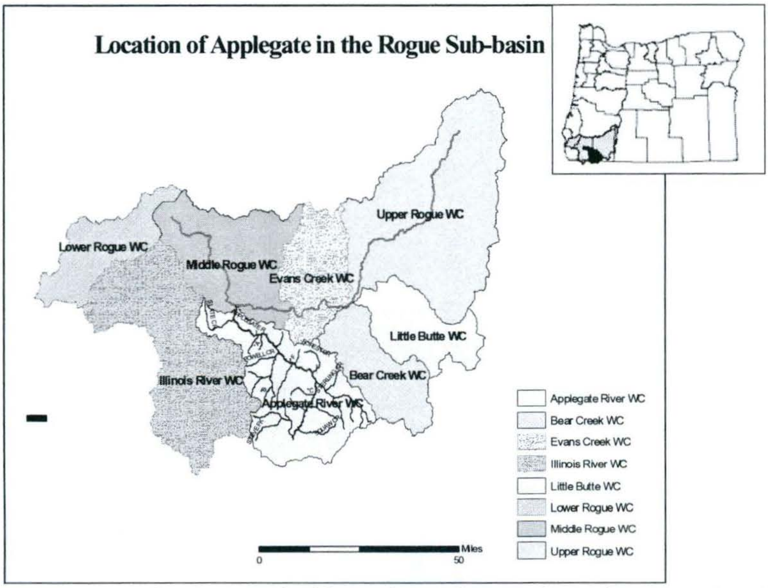

Figure 1. Applegate watershed located in Jackson and Josephine Counties of Southern, Oregon. (Source: Army Corps of Engineers.)

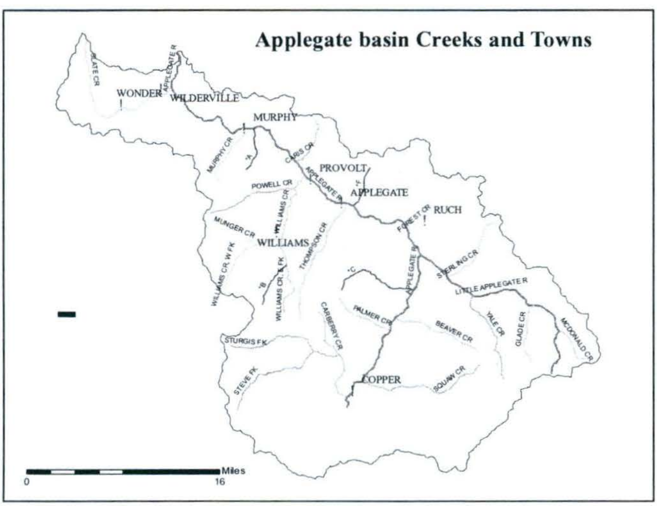

Figure 2: Applegate Basin

private forestland are the predominant land uses on the valley floor. Wine grape acreage is increasing annually.

The dam at the head of the Applegate system near the California border was completed in 1980. The dam has modified natural flow regimes relative to the creation and maintenance of fish habitat. Regulated water releases have modified the cleansing effects of flood flows on spawning gravels, riparian vegetation, and debris-filled, off-channel fish-protection sites. While cutting off some historical fish habitat, the dam has several beneficial impacts on both the human and salmon id populations. The dam controls flood flows, cools summer water temperatures, assures flow during normally low flow years, and is a boon for human recreation and agriculture. Water withdrawals are used for hay and pasture irrigation, livestock watering, and watering of gardens and lawns. In earlier days, extensive mining was done in the Applegate Basin. Today most of the mining is recreational.

Significance of Study

The Applegate Watershed, encompassing 312.48 square miles with 6,473 residents (see Figure 1) provides an excellent opportunity to examine the interactions between land use and humans. The exposure to the threat of an extreme flood event of 1997 might have caused the residents of this area to search out ways of buffering its harmful effects such as with flood abatement or flood diversion. An increased understanding of landowner perceptions in the Applegate Valley is of significant importance in understanding the Applegate River's current state, as well as its potential future, because the Applegate River has had some engineering modifications such as the flood control dam completed in 1980 and some levees. The character of the floodplain has also changed to accommodate agriculture and urbanization.

Studies such as the current one are of interest to the Applegate Watershed Council, the Applegate Partnership, and local landowners who are continuously working towards the promotion of ecosystem health and natural diversity across the entire watershed.

Related Literature and Studies

The theoretical footing of this paper is set in a body of literature within natural hazards studies concerned with scientific endeavors that provide systematic analyses of the physical mechanism of natural hazards (Frazier 1979; Foster 1980; Smith 1992). It has become patently clear that no one can control every element of nature in order to eliminate risks (Wong *et al,* 2000). Indeed, human factors are just as much a cause of natural hazards as are extreme geophysical processes (Hewitt 1983; Tobin and Montz 1997). The effect of the flood hazard at any time depends on the size of flood event and state of human activity, including the types of adjustments adopted on the floodplain. For instance, an event that does not overflow the stop bank may nevertheless cause indirect losses due to low emergency actions that are disruptive of normal social and economic activities (Ericksen, 1986).

Previous studies have focused on the behavior of individuals before, during, and after hazardous events (Burton and Kates 1964; Kates 1971). A new perspective has emerged that views hazards as basic elements of environments and as constructed features of human systems, rather than extreme, unpredictable events (Wong *et al*, 2000). In that way, people can either attempt to stop natural hazards from occurring (prevention) or recognize that they will happen and modify their lifestyles to deal with those events. Therefore, when hazards and natural disasters are viewed as integral parts of the environment and human systems, they become essential tests of individual and societal adaptation and sustainability (Mileti 1980). The perceptions of individuals, however, are frequently ignored when analyzing natural hazards (Wong *et al*, 2000).

The Problem and its Background: The Flood Regime

Past research indicates that floods in coarse-grained braided rivers are frequent events, closely related to major rainstorms, or snowmelt cycles (Miall 1985). Like other large, coarse-grained braided rivers, the Applegate River in Southwestern Oregon has had a record of frequent large flood events. Thus, in any given year, there is a 5% chance of 33,000-35,000 cubic feet per second flood. Such a flood occurs, on average, every 20 years. From 1927-1997, flood events roughly equal to or greater than the 1997 flood (~30,000 cubic feet per second) occurs on average every 14.4 years (Applegate Watershed Council Report, 1999), generally between December and March.

On December 31, 1997, an unusually heavy mountain snow pack pounded by days of warm, torrential rain caused the Applegate and Rogue Rivers to overflow their banks and devastate Jackson and Josephine counties. This New Year's flood was one of the worst flooding disasters on these two rivers in over two decades. The flood came on the heels of two months of very wet weather that had saturated local soils. The dramatic events unfolded quickly. By January 2, for example, Bear Creek had one-eighth the flow of the day before when officials estimated its flow at 16,100 cubic feet per second. This level broke a record set during the storm of December

14, 1962, when the creek flowed at approximately 14,500 cubic feet per second (Mail Tribune, 1997).

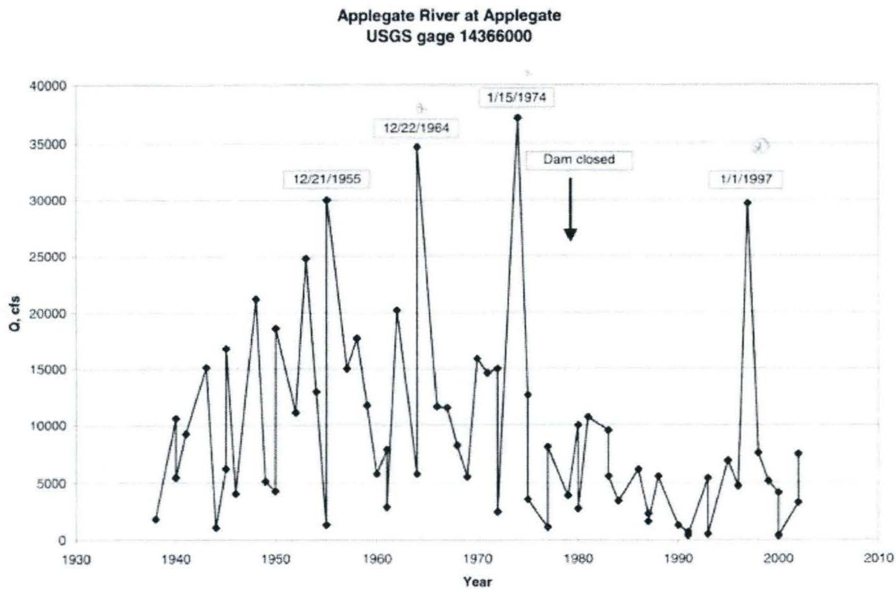

Figure 3: Flood History of the Applegate Valley

Flood Impact Damages and Public Reactions in the Applegate Valley

The 1997 flood is considered notable in the Applegate River Basin's flood history, and the flood significantly impacted the Applegate River Basin (Maiyo, 1999). Before the water receded, it caused tremendous damage to both property and businesses. A local newspaper published in Jackson County (Mail Tribune News, 1997) reported that more than 600 people were evacuated in Jackson County and another 300 in Josephine County that Christmas week of 1996. Both the Rogue and Illinois Valleys were isolated because main roads, including Interstate 5, were temporarily closed by high water or mudslides. The flood ripped out bridges along the Rogue, Applegate and Illinois Rivers, destroyed homes and stranded countless residents throughout the region. In Jackson County alone, the New Year's Flood caused $16 million in damages to housing, $12 million in damages to businesses, $9 million in damages to agriculture, and $13 million in damages to local government in costs and losses (Initial County Damage Assessment Report, 1997).

Other damages within the Applegate River Watershed included major adjustments in stream channels, failure of culverts and bridges, and landslides and debris flows that delivered large quantities of sediment and wood to streams (Maiyo, 1999). Floodwaters scoured streams of trees in the channel and floodplain, particularly along Steve and Sturgis Forks, Squaw and Elliott Creeks and Little Applegate River (Maiyo, 1999). (See Fig. 3.) Fortunately, no casualties were reported.

Methods

Landowners' perceptions of and responses to the 1997 flood were elicited by means of non-representative qualitative face-to-face interviews, walks through the owner's land, and document analysis of newspaper accounts. Three landowners were selected from a list of eight possible interviewees with the help of a member from the Applegate Watershed Council. Two of these participants live along the main stem of the Applegate, and the third lives along the little Applegate River. The questions asked had a historical component related to how much the river had changed. Four themes were systematically linked to this broad idea:

1. Implications of Living in Flood Prone Areas
2. Riparian Vegetation Changes

3. Water Quality and Fish habitat issues
4. River Changes

In order to standardize responses given by respondents and to facilitate subsequent data analysis, most questions were closed ended and were recorded using a digital recorder. The investigator also noted all cues that might reveal landowners' preparedness to combat flood losses. Two of the respondents were female and one male.

Prior to the interviews, I made a trip to the valley to attend a meeting with Watershed Council employees as a participant observer, as well as to look for cues, both physical and social, associated with the 1997 floods. During the visit, local Watershed Council officials informed me about the magnitude and impact of the flood and the rehabilitation work carried out afterwards. Other literature and newspaper articles provided information that helped to answer the questions noted above. The literature provided general background information on the social and physical dynamics in the study area as well as the academic framework for the study.

Results

Implications of Living in Flood Prone Areas

The responses to the question about implications of living in flood prone areas were surprising. There are at least three perspectives that might have profound implications for designing flood management strategies in the Applegate Valley which are described below.

1. Lack of Confidence in Large Engineering Structures

All the respondents stated that flood management in the Applegate Valley has historically been dominated by an engineering approach to flood control. The dominant sentiment by respondents was that flooding is unavoidable. This view is contrary to that of the Army Corps of Engineers, one of the principal agencies in charge of building flood control dikes, dams, and levees to regulate floodwaters. From respondent accounts, some of the structures that were supposed to contain floodwater did not withstand the 1997 flood. The repeated incidence of culvert and bridge collapses weakened some respondents' confidence in some of these engineering structures. For many of these landowners, flood-preventing structures do not prove to be an effective way of reducing flood risk.

The respondents seemed to be prepared to live with floods and called for better understanding and collective action by landowners. Fore example, one respondent said, "We need to find harmony in living close to nature because eventually rivers flood" (Dorothy, 2005).

2. Rehabilitation and Reconstruction

Disaster rehabilitation and construction work started immediately after the flood receded (Maiyo, 1999). Rehabilitation was targeted at short-term activities to restore vital life support systems to their minimum operating standards. Reconstruction focused on long-term measures to mitigate flood effects and prevent future disasters. Two landowners surveyed had part of their properties damaged, and the Army Corps of Engineer has since put in retention walls and a levee for them.

3. Functional Adjustment Approaches

Undoubtedly, living with floods has become a reality for many people living in flood prone areas in the United States. The respondents in this study conceived flood hazard as a perpetual phenomenon that caught them in a cycle of disaster- damage- repair -disaster. Experience with flooding seems to have resulted in these landowners becoming accustomed to the impacts of recurring floods. One landowner was born in the Applegate Valley and has experienced many floods, while the other two only experienced the 1997 flood. All the landowners interviewed gradually developed various functional adjustments to combat flood hazards. For example one respondent stated that he now has a flashlight that operates by cranking, and that he now stock canned foods, battery radios, and kerosene pumps.

Riparian Vegetation Changes

The respondents repeatedly told stories of how there used to be fewer trees along the river and how blackberries used to dominate most parts of the river. Since the 1997 flood, however, they have started to see riparian vegetation and plants growing again along the river channel. When asked to explain what they thought was causing this re-growth of trees along the river, all the landowners linked it to the 1997 floods. Respondents associated the re-growth of trees partly to a natural phenomenon and partly to some state and local Watershed Council efforts in stream restoration.

River Changes

Responses to questions about river changes echoed response to the questions about riparian vegetation changes. All the landowners declared that changes in the river channel occurred after the flood of 1997. Two landowners attributed the changes in the river channel to direct and indirect human management activities. For example, one respondent claimed that it was not only natural but essential to a healthy ecosystem for water to transport soil across the landscape and down the river. Land uses in the watershed, however, exposed more bare earth to erosion that created such an abundance of available sediments during the flood that they were too much for the river to move. She attributed some of the direct and indirect causes to roads built alongside the stream, logging and past removal of trees within the channel and riparian zone, and the presence of road culverts that restricted flow of wood from tributaries into the main channel, thus altering the stream's sediment load. The importance of that insight cannot be over stated. Stream channels are formed, maintained and altered by the water and sediment the carry.

These responses reflect the massive transformation that the Applegate River underwent after the New Year's Eve flood in 1997. Indeed, two landowners recalled how water came down the river and its tributaries, ripping out trees, claiming several acres of adjacent farmland, and re-depositing tons of river rock in ways that changed the course and configuration of the river. Today, as one walks along the river, one notices huge logs lying in the flood plain on gravel beds. These large pieces of wood debris, if left in the river, provide homes for small mammals. Birds, such as the winter wren, and fish such as trout and salmon also use the large wood debris for their offspring can grow in the deep pools beneath the mass of wood.

Water Quality and Fish Habitat issues

Responses to the question about water quality and fish habitat seemed to vary depending on what activities were happening upstream from each landowner's property. The dam up stream, the logging, and gravel mining seemed to be major concerns. Some claimed that logging and mining were the root causes of the turbidity in the river, while the dam caused temperature variation in the stream. For example, one respondent noted that the "logging industry is only interested in what's good for the money. The silt washing down into the river from logging makes the river muddy that could possibly kill fish." Another interviewee referred to septic tanks built closer to the river as a threat to water quality. On the little Applegate, interestingly enough, irrigation was not seen to be a threat to water quality as only small-scale farmers use water along this river.

Discussion

As the Applegate experience illustrates, flood hazard is defined as the interaction between two systems: the physical flood event and human use of the floodplain. Clearly, then, the flood event is not in itself the *flood hazard.* Its potential for hazard is not realized until related to people and their works. Thus, flood hazard potential defined mainly in terms of human casualties, property damages, and social disruption depends not only on characteristics of the flood event, but also on characteristics of human activity on the floodplain.

In the Applegate Valley, human activity in the floodplain included adjustments to the physical and human systems in order to reduce the hazards effect. These adjustments form part of the human activity system that continues to define the flood hazard in this area. After the 1997 flood, landowners claimed that adjustments increased the flood hazard and its effects. For example, landowners claimed that retention walls actually augment the flood impact by holding back floodwater. In contrast to the claims that stop banks or levees in the Applegate seemed to increase the hazard, land use management decreased it.

Conclusion

This study revealed the collective values of these landowners in the Applegate Valley. Contrary to expectations, landowners were quite skeptical of large flood prevention engineering structures. Although only a handful of people participated as interviewees for this study, their comments were instructive. Further, those comments suggest the potential usefulness of conducting a new study with a larger sample of participants.

The dominant sentiment of respondents was that flooding is unavoidable. It is a natural phenomenon that will always occur on a regular basis, and it is part of the cycle of a river. In other words, rivers will always flood. No matter what protection techniques are used, floods will always cause damage, but extending support networks and applying hazard resistant designs could mitigate flood hazards. Clearly, people seem to have empowered themselves by increasing their ability to live with floods.

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