

## 5.1 INTRODUCTION

California Government Code Section 65302(g) requires that each city and county develop a Safety Element, "... for the protection of the community from any unreasonable risks associated with the effects of seismic activity, dam failure, slope instability leading to mud or land slides, flooding and wildfires." The purpose of the General Plan Safety Element for the City of Dunsmuir is to promote public safety and the protection of residents and property from fires (both urban and forest in origin), natural and geological hazards, and hazardous materials spills.

In addition, the City of Dunsmuir participated in the development of a Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) for the County of Siskiyou. The MJHMP was developed in accordance with the Disaster Mitigation Act of 2000 (DMA 2000) and followed FEMA's 2011 Multi-Jurisdiction Hazard Mitigation Plan guidance. The MJHMP incorporates a process where hazards are identified and profiled, the people and facilities at risk are analyzed, and mitigation actions are developed to reduce or eliminate hazard risk. The implementation of these mitigation actions, which include both short and long-term strategies, involve planning, policy changes, programs, projects, and other activities. The MJHMP is incorporated into the City of Dunsmuir General Plan Safety Element by reference and can be found on the City of Dunsmuir website under Initiatives - Emergency Preparedness at: [www.ci.dunsmuir.ca.us/emergency-preparedness](http://www.ci.dunsmuir.ca.us/emergency-preparedness).

## 5.2 BACKGROUND

The City of Dunsmuir is located at an average elevation of 2,289 feet above sea level in the Upper Sacramento River Canyon approximately 12 miles south of Mount Shasta (a dormant volcano with a height of 14,162 feet). The steep canyon walls around the City are heavily forested. Much of these lands are productive timberlands managed by the U.S. Forest Service or owned by private timber companies. Two major surface transportation facilities, Interstate 5 and the Union Pacific Railroad, share a corridor through the canyon and through the City of Dunsmuir. Box Canyon Dam on the Sacramento River (which impounds Lake Siskiyou) is located eight miles north and upstream of Dunsmuir.

Dunsmuir's geographical setting presents several unique public safety concerns:

- Mount Shasta presents potential hazards from possible future volcanic activity.
- Landslides caused by seismic or heavy rainfall events or ground subsidence could cause property damage at certain sites in Dunsmuir.
- Certain areas in Dunsmuir are susceptible to flood damage, especially along the Sacramento River, caused by over-abundant rainfall or snowmelt in the surrounding mountains.
- The collapse of Box Canyon Dam could inundate much of Dunsmuir within 15 minutes of collapse.
- Dunsmuir is in an area that has substantial forest fire risks and hazards. Wildfires close to Dunsmuir could endanger portions of the City.
- A toxic or hazardous chemical accident on either Interstate 5 or the railroad could have serious and immediate implications in Dunsmuir.

## Volcanic Hazards

Mount Shasta, located twelve miles northeast of Dunsmuir, is a large and imposing volcano. It is believed to have erupted approximately ten or eleven times during the last 3,400 years, and at least three times in the last 750 years. While it has not erupted at regular intervals, its history suggests that it erupts at an average rate of roughly once every 250 to 300 years. The last eruption was believed to have occurred in 1786. Even though the volcano has not been active for two centuries, Mount Shasta, like Mount St. Helens before 1980, is only dormant and almost certainly will erupt again. (*Volcanic Hazards at Mount Shasta, California*, by Dwight R. Crandell and Donald R. Nichols. U.S. Geological Survey, pamphlet, 1987.)

The 1987 USGS pamphlet, “*Volcanic Hazards at Mount Shasta*” describes the characteristics of volcanic activity which would most likely affect the area near the mountain. Each of these characteristics are discussed below along with the possible effect upon the City of Dunsmuir. For a visual representation of potential impacts, please refer to **Figure 5-1** through **5-3** at the end of this element.

Pyroclastic Flows: Pyroclastic flows are streams of hot ash and rock fragments, mixed with hot air and other gases, that move rapidly along the ground surface during an eruption. These flows are especially dangerous due to their high temperatures and their high speeds which may be more than 100 miles per hour. Due to the speed of pyroclastic flows, escape is nearly impossible. They are best avoided by evacuation of threatened areas before an eruption.

Lateral Blasts: This type of blast is a sideways-directed volcanic explosion that carries large pieces of rock and ash at a very high speed along and above the ground surface. The rock debris carried by the lateral blast of Mount St. Helens in 1980 had an initial speed of more than 250 miles per hour, and it was still moving about 60 miles per hour near its outer limit about 15 miles from the volcano. Lateral blasts may cause fatalities as the result of impact, burial or heat.

Dunsmuir is located in Zone 3 for pyroclastic flows and lateral blasts. This is the outer limit of the area potentially affected by these activities, so the likelihood of the threat is limited.

Lava Flows: Lava flows are rarely life-threatening because they move slowly enough for people to get out of their way and seldom occur at the outset of an eruption. Dunsmuir’s distance from the volcano is sufficient that such flows are not particularly life threatening. However, lava flows can destroy property and ignite wildfires.

Mudflows: A mudflow is a mass of water-saturated rock debris that moves downslope generally as a fluid. Mudflows can form when lava flows, pyroclastic flows or hot lateral blasts melt snow on the side of a volcano. Mudflows tend to follow stream valleys and can travel long distances generally at a rate of 10 to 20 miles per hour, but faster on steep slopes. Due to their slower speed and distance from Dunsmuir, should a mudflow occur, there should be adequate time in Dunsmuir to evacuate to higher ground. However, before a mudflow would reach Dunsmuir, it would pass Lake Siskiyou. A heavy flow into the reservoir could cause the lake to breach the dam or could weaken the dam itself causing a structural failure and flood that would reach Dunsmuir in 15 minutes or less.

Landslides: A volcanic explosion, severe earthquake or heavy rains could start landslides of rock debris from the side of the volcano. A landslide triggered by an earthquake at Mount St. Helens on May 18, 1980, traveled about 14 miles beyond the volcano. Mount Shasta has also

been subject to mudflows that have been triggered by heavy rains on top of snow, although this type of mudflow is not considered to be a threat to Dunsmuir.

**Volcanic Ash:** Ash resulting from an eruption could cover a large area and could reach a depth of two inches or greater, depending on the amount of ash released into the atmosphere and the direction of wind at the time. Given that the prevailing winds generally blow in an area between the northeast and southeast, the probability is high that most ash would fall east of the volcano and away from Dunsmuir. However, the area does experience periodic winds from the north.

Experience with Cascade Range volcanoes including Mount St. Helens (1980 to present) and Mt. Lassen (1911-1920), demonstrates that eruptive episodes can and do occur in present time involving volcanoes that are generally considered inactive.

### Seismic Hazards

There are numerous faults near the City that present potential dangers in the form of ground shaking, landslides and subsidence, and possible collapse of the Box Canyon Dam eight miles north of Dunsmuir on the Sacramento River. An unnamed fault runs southwest from Cedar Lake and ends near the Box Canyon Dam. Another north-south fault runs beneath Mount Shasta. Other faults run north-south on Soda Creek Ridge to the east of Dunsmuir. While none of these faults are known to be active, an earthquake with a 3.1 local magnitude occurred 3 miles southeast of Dunsmuir on November 29, 2005. Earthquake activity in Siskiyou County, as reported by the Siskiyou County General Plan Seismic Element, has been very limited. There has been limited structural damage in the past and there have been no known deaths.

### Flooding

The Sacramento River and its local tributaries are subject to flooding caused by unusually heavy rains, snowmelt or both. Flooding at varying levels of intensity occurs frequently and occasionally presents a significant hazard to life, property and infrastructure. The “Big Flood” of 1974 floated houses down the river. The flood of January 1997 also caused major property and infrastructure damage.

The Federal Emergency Management Agency (FEMA) has developed a Flood Insurance Rate Map for Dunsmuir to identify flood prone areas. Flood hazard areas affecting Dunsmuir are indicated in **Figure 5-4** at the end of this element. Zone A as identified on the map represents the area of greatest flood hazard as might be expected to occur once every 100 years (or a 1 percent chance in any given year). Zone B is an area expected to have lesser impacts due to the shallower flood depth anticipated. Within these areas properties are required to carry flood insurance. The rates for insurance are dependant on the floodwater depth on the affected parcel. New construction is required to meet the City’s Flood Protection ordinance. Typically, placement of the ground-level floor is required to be at least one foot above the 100-year flood level. The key areas subject to flooding located in the A Zone are:

Gill Avenue	Approx. 6 lots
Cave Avenue	Approx. 22 lots
Butterfly Avenue	Approx. 39 lots
Scherrer Avenue	Approx. 12 lots
Gillis Street	Approx. 3 lots

Additionally, a large area north of Grover Street to a point approximately 200 plus feet north of Oak Street is subject to shallow flooding from Alder Creek. Continued implementation of the

Flood Ordinance will protect new construction from serious flooding and will help correct the current flood hazard over a long period of time as remodeling activities in the area bring additional structures into compliance with the Ordinance as a means to reduce flood impact and insurance rates.

### **Dam Failure**

Box Canyon Dam, which impounds Lake Siskiyou, is located approximately eight miles north and upstream of Dunsmuir on the Sacramento River. While it is certainly not expected to occur, dams can and do occasionally fail. The Box Canyon Dam lies in the path of potential mudflows from Mount Shasta, should there be that type of volcanic activity, and near an unnamed fault running southwest-northeast from Cedar Lake to a point near the Dam. Significant events in either one of these areas could result in water breaching the dam or actual dam failure. Aging or other geologic effects could also affect the stability of the structure.

Dam failures, when they do occur, have resulted in significant damage and some deaths since they can fail unexpectedly with little or no warning. A study prepared in 1983 by the Siskiyou County Public Works Department (*Emergency Action Plan-Box Canyon Dam*), identified areas subject to flooding and the approximate time floodwater would reach Dunsmuir (see **Figure 5-5**). North Dunsmuir would, of course, be hit first after about eight minutes of failure. Central Dunsmuir would be hit in about 13 minutes and the southerly City limits in about 16 minutes. The water depth would be significant, approaching Dunsmuir Avenue as it passes near the downtown area. Actual depth of the water would depend on the magnitude of the failure and the size and location of temporary debris dams that occur as the flood clears the river canyon of nearly everything in its path. With early warning, residents within the flood area may have time to reach higher ground. Significant damage would occur, wiping out bridges, power and other infrastructure. Residents could be stranded across the river without a means to cross and emergency services would be severely hampered.

### **Landslides**

The 1985 General Plan identified eleven sites where landslide activity has either occurred or is believed to have the potential to occur. The source for this information has not been identified, nor has a recent survey of landslide prone areas in and around Dunsmuir been conducted. The 1985 General Plan did, however, identify each of these sites on a rough map. These areas have not been identified in this document due to the uncertainty of the past data and the lack of more current studies. Caution must be taken whenever new construction is proposed on steep slopes in order to ensure the safety of future occupants.

### **Wildfires**

The City of Dunsmuir is rated as being in a "Very High Fire Hazard Severity Zone" pursuant to California Government Code Section 51179. Being located in a heavily forested canyon with steep hillside slopes, the potential for a wildfire is very high. Fires in this type of situation are particularly dangerous since they are not readily accessible by most fire equipment due to the steepness of the terrain. Depending on the wind direction, the impacts to Dunsmuir structures from a major fire in the canyon could vary from relatively little damage to major destruction. A fire with limited wind assistance may simply burn up the side of the canyon and away from the City, while a wind blowing from the south could push a fire north through the City in addition to going up the side of the canyon. In this latter scenario, major structural damage in the City is likely. While these scenarios are bad enough, potential mudflows from heavy winter rains on fire-denuded slopes could result in significant damage to property below.

In the past, residential development adjacent to the City has occurred on the fringe of the canyon where steep grades and heavy vegetation cover exist. In some of these situations roads are very narrow, steep and dead-end with only one way in and out. These roads also usually lack adequate turnarounds for fire vehicles. Many of these areas lack fire hydrants as well. Some of the problems mentioned above regarding development outside of City limits also apply to isolated areas within the City. Numerous streets on the west side of the City, especially near Interstate 5, are steep, narrow, lack adequate turnarounds and, in some instances, have heavy vegetation. These characteristics slow the response and effectiveness of fire fighters and could result in a fire quickly getting out of control.

While the airport property and lands north of the north Dunsmuir Avenue/I-5 Interchange have received little development pressure at present, this area of the City poses a challenge for timely response by fire equipment due to distance and grade. The airport is over three miles from the Fire Station and requires the equipment to climb over 900 vertical feet on Interstate 5 in that distance. It is anticipated that, as this area of north Dunsmuir develops, a satellite fire station would be needed.

The Dunsmuir-Castella Fire Department provides fire and emergency medical services to the City of Dunsmuir and is comprised of three different governmental entities: the City of Dunsmuir, the Dunsmuir Fire Protection District, and the Castella Fire Protection District. The Department has a response area of over 30 square miles, with responders travelling as far north as Mott Road and as far south as Slate Creek. In addition, the Department maintains an automatic mutual aid agreement with the Mt. Shasta City Fire Department. ~~and the Dunsmuir Fire Protection District. It is also contracted to provide emergency medical services to the Castle Rock Fire Protection District. The Department consists of approximately 25 volunteers.~~

### Hazardous Materials

With two major transportation routes passing through the City, Interstate 5 and the Union Pacific Railroad, and after the experience of the 1991 “Cantara Spill”, it is very possible that a toxic material spill may again affect the City at some point in its future. Winter road conditions and local topography increase the possibility of an accident involving toxic materials. Concerning the transport of materials on Interstate 5, the California Vehicle Code assigns the California Highway Patrol the responsibility for serving as statewide information, assistance and notification coordinator on all hazardous material spill incidents occurring on highways. The County Health Department and state and federal agencies would be actively involved on a similar incident with the railroad.

The Cantara Spill of 1991, which is sometimes regarded as California’s largest inland ecological disaster, dramatized the risk of hazards in the Dunsmuir area related to the transport of toxic materials and the potential effects of toxic spills. On July 14, 1991, railcars of a Southern Pacific train derailed at the hairpin turn of the Cantara Loop at one of the crossings of the Sacramento River. One railcar was ruptured by the fall and spilled approximately 19,000 gallons of the herbicide metam sodium into the river. As the metam sodium mixed with the water, highly toxic compounds were created. Virtually all aquatic life in the river between the Cantara Loop, through Dunsmuir and down to Shasta Lake was destroyed.

The river ecosystem has slowly recovered, but the spill had a significant impact on the river as well as the community. During the first six days after the spill, an estimated 480 residents left their homes and went to evacuation centers. While the stay of some residents in the centers

were short, others were there for several weeks. Some residents were forced to temporarily leave the area to stay with friends or relatives in unaffected communities. There were many and various health-related complaints as a result of the spill.

In spite of corrective measures taken by the railroad, continued incidences demonstrate that the City is still at risk from railroad-related hazardous material spills. In July 2003, five railcars from a Union Pacific train plunged into the Sacramento River just two miles from the site of the 1991 toxic spill. In January 2005, another Union Pacific train derailment occurred in the canyon just south of Dunsmuir, this time spilling approximately 30 gallons of diesel fuel into the river. Fortunately, neither these or other recent accidents have had a significant effect on the environment or the City, but they demonstrate the continuing vulnerability of the Dunsmuir area to accidents of this kind.

### 5.3 GOALS, OBJECTIVES, POLICIES AND IMPLEMENTATION MEASURES

***GOAL S-1: - A city prepared for necessary action, including evacuation if needed, due to disasters including volcanic or seismic action, wildfires, or failure of Box Canyon Dam.***

**Objective:** Major disasters are usually beyond the ability of the City to prevent, yet it is important to be prepared to respond when emergencies occur. It is the City's objective to be well prepared for emergencies and, where possible, control the exposure of people to hazards in known hazardous areas.

**Policy S-1.1:** The City shall take measures to minimize impacts to the City and its citizens should a natural disaster strike.

**Implementation Measure S-1.1.1:** The City shall periodically review, and update as necessary, emergency plans that advise City staff, emergency services and residents on actions that should be taken in response to an emergency. These plans should be readily available for public distribution. Where practical, these plans should also be written to satisfy the requirements of a Local Hazard Mitigation Plan as mandated by the Governor's Office of Emergency Services.

**Implementation Measure S-1.1.2:** If located within an area identified as subject to a specific hazard, the City shall not approve applications for uses that will house infirmed, non-ambulatory persons, seniors or children without adequate provisions to mitigate known hazards.

***GOAL S-2: - A city that has minimized, to the maximum extent feasible, potential impacts to structures as a result of flooding.***

**Objective:** Flooding occurs on a fairly regular basis on the Sacramento River and local tributary streams. It is the City's objective to ensure that all development in flood prone areas is done in a manner that minimizes the potential for damage as a result of flooding.

**Policy S-2.1:** Development within identified floodplains shall be controlled to reduce potential damage from floods.

**Implementation Measure S-2.1.1:** When relevant, the City shall deny proposed development that would have unacceptable exposure to flood hazards.

**Implementation Measure S-2.1.2:** The City will continue to apply the City's Floodplain Management Ordinance to development of properties within the FEMA identified flood plain.

**Implementation Measure S-2.1.3:** The City will encourage residents within the floodplain to take all practical steps to flood-proof their dwellings, including the use of low interest loans and grants if such are available for this purpose.

***GOAL S-3: - A community protected from landslides.***

**Objective:** Due to steep hillsides and soil types in the Dunsmuir area, the potential for landslides exists. It is the City's objective to protect its citizens from the potential impacts of landslides.

**Policy S-3.1:** Areas known to have slopes or soils that are prone to sliding should only be developed when all necessary steps are taken to protect life and property.

**Implementation Measure S-3.1.1:** Large hillside areas known to have soils prone to sliding should be protected with an open space or resource zone district having a development density of not greater than one dwelling unit per 20 acres.

**Implementation Measure S-3.1.2:** The City should review landslide prone areas in and around the City in order to update the landslide information that was referenced in the 1985 General Plan.

**Implementation Measure S-3.1.3:** The City should review the sites referenced in the 1985 General Plan, as well as any recently noted landslide-prone areas, and determine if these areas should and can be stabilized through plantings or other soil stabilization techniques.

***GOAL S-4: - A community protected from the hazards of wildfire.***

**Objective:** Areas within and adjacent to Dunsmuir are identified as wildfire hazard areas and are subject to potentially devastating fires. It is the City's objective to reduce both the likelihood of wildfires and the impact of fires on the community should they occur.

**Policy S-4.1:** The City shall support programs to prevent and prepare for wildfires and will consider fire-related hazards in review of all project proposals.

**Implementation Measure S-4.1.1:** The City shall adopt and enforce standards similar to the "Fire Safe Regulations" outlined in Title 14 of the California Code of Regulations for all new development within the City.

**Implementation Measure S-4.1.2:** Where practical, emergency access to dwellings that are isolated due to steep, narrow dead-end roads should be improved. Development on vacant lots in such areas should be limited until basic safety standards have been satisfied.

**Implementation Measure S-4.1.3:** The City shall not approve development proposals without ensuring adequate water storage and capacity for fire protection.

**Implementation Measure S-4.1.4:** When appropriate, steps should be taken to provide a secondary fire station with basic equipment at or near the airport to serve both the airport and this most-northern area of the City.

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**Implementation Measure S-4.1.5:** The City shall take appropriate measures to support a well-trained, equipped and staffed volunteer fire department.

**GOAL S-5: - A city protected from potential hazardous material spills.**

**Objective:** With two major transportation routes and the daily transport of hazardous materials through the City, it is likely that a hazardous material spill will affect the City at some point in its future. It is the City's objective to minimize both the potential for a hazardous materials spill and the resulting impacts should one occur.

**Policy S-5.1:** In order to diminish the likelihood of future hazardous materials spills in the Upper Sacramento River Canyon, the City shall advocate its concerns with regard to rail and highway safety.

**Implementation Measure S-5.1.1:** The City shall advocate for stricter laws governing rail safety in the Upper Sacramento River Canyon, especially in the Cantara Loop area. This may entail maintaining lines of communication with appropriate members of Congress and with regulatory agencies in an effort to amend the Federal Railroad Safety Act.

**Implementation Measure S-5.1.2:** The City shall maintain an open dialogue with Caltrans and the California Highway Patrol to ensure that the City's concerns with regard to the transport of hazardous materials along Interstate 5 are adequately addressed by those agencies.

**Policy S-5.2:** The City shall take all necessary steps to prepare for a hazardous materials spill, as well as protect its residents should one occur.

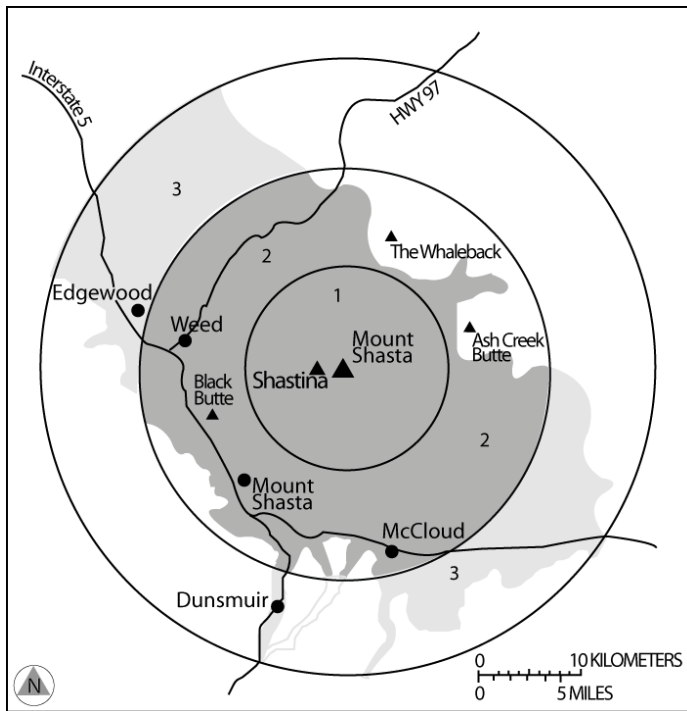
**Implementation Measure S-5.2.1:** The City will identify the proper emergency contacts to notify in the case of hazardous materials spill and make this information readily available to City staff and emergency services personnel in order to facilitate a rapid response should the need arise.

**Implementation Measure S-5.2.2:** The City will identify necessary steps to be taken in order to protect residents in the case of a hazardous materials spill, as well as be prepared to quickly implement these measures in the event of an accident.

**Implementation Measure S-5.2.3:** The City shall work with the owner of the railroad, currently Union Pacific, and the California Highway Patrol to ensure that rapid notification of residents occurs in the event of a spill.

**Implementation Measure S-5.2.4:** The City will continue to promote the training of, and the provision of appropriate protection gear for, local "first responders" who would respond to hazardous material spills in the Dunsmuir area.

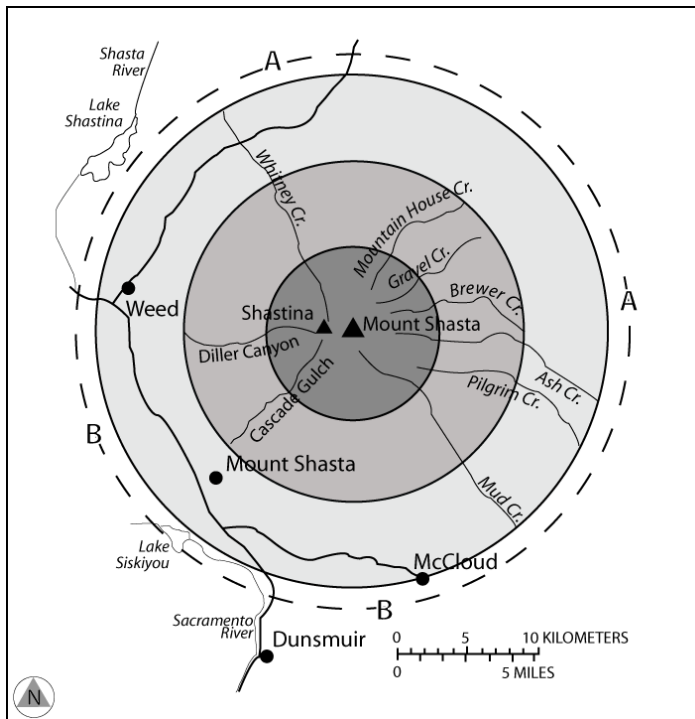




Crandell and Nichols, 1987.

**Figure 5-1:** Map of hazard zones for pyroclastic flows and surges from future eruptions at or near the summit of Mount Shasta.

Sites in zone 1 are most likely to be overrun by future flows, whereas those in zone 3 are only likely to be affected by pyroclastic flows longer than any that have occurred during the past 10,000 years. Sites in zone 3 may, however, be affected by pyroclastic surges sweeping out ahead of pyroclastic flows from the inner zones.



Crandell and Nichols, 1987.

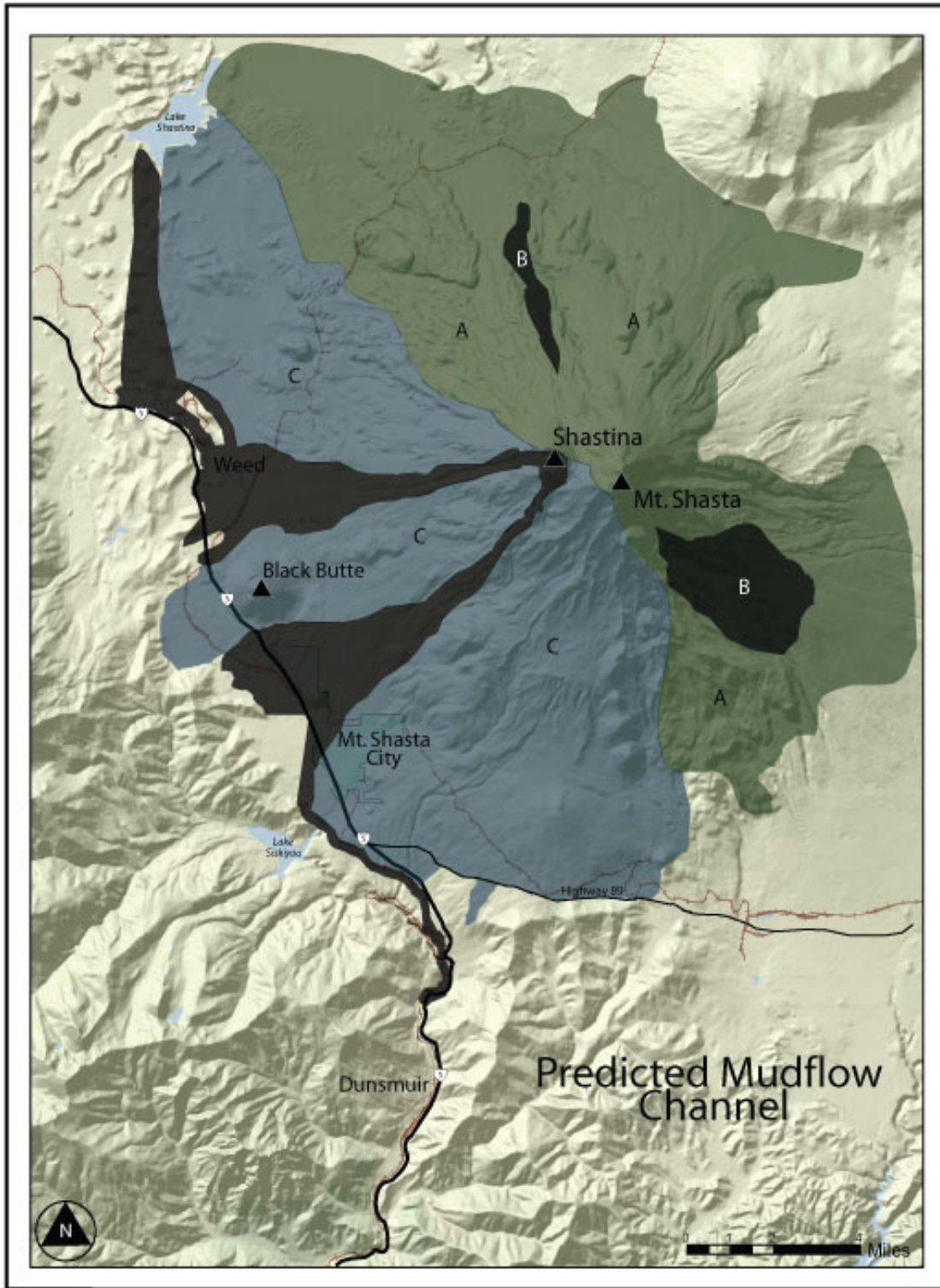
**Figure 5-2:** Map of hazard zones for lava flows from future eruptions at or near the summit of Mount Shasta.

Concentric zones show possible hazard from lava flows with respect to distance from the top of the volcano. The recent history of Mount Shasta suggests that most future lava flows will originate at the summit or on the northeastern flank of the volcano in sector A. Sector B is less likely to receive lava flows.

Zone 1: areas likely to be affected most frequently. Most future flows from summit eruptions probably would stay within this zone.

Zone 2: areas likely to be affected by lava flows erupted from vents on the flank of the volcano or that move into zone 2 from zone 1.

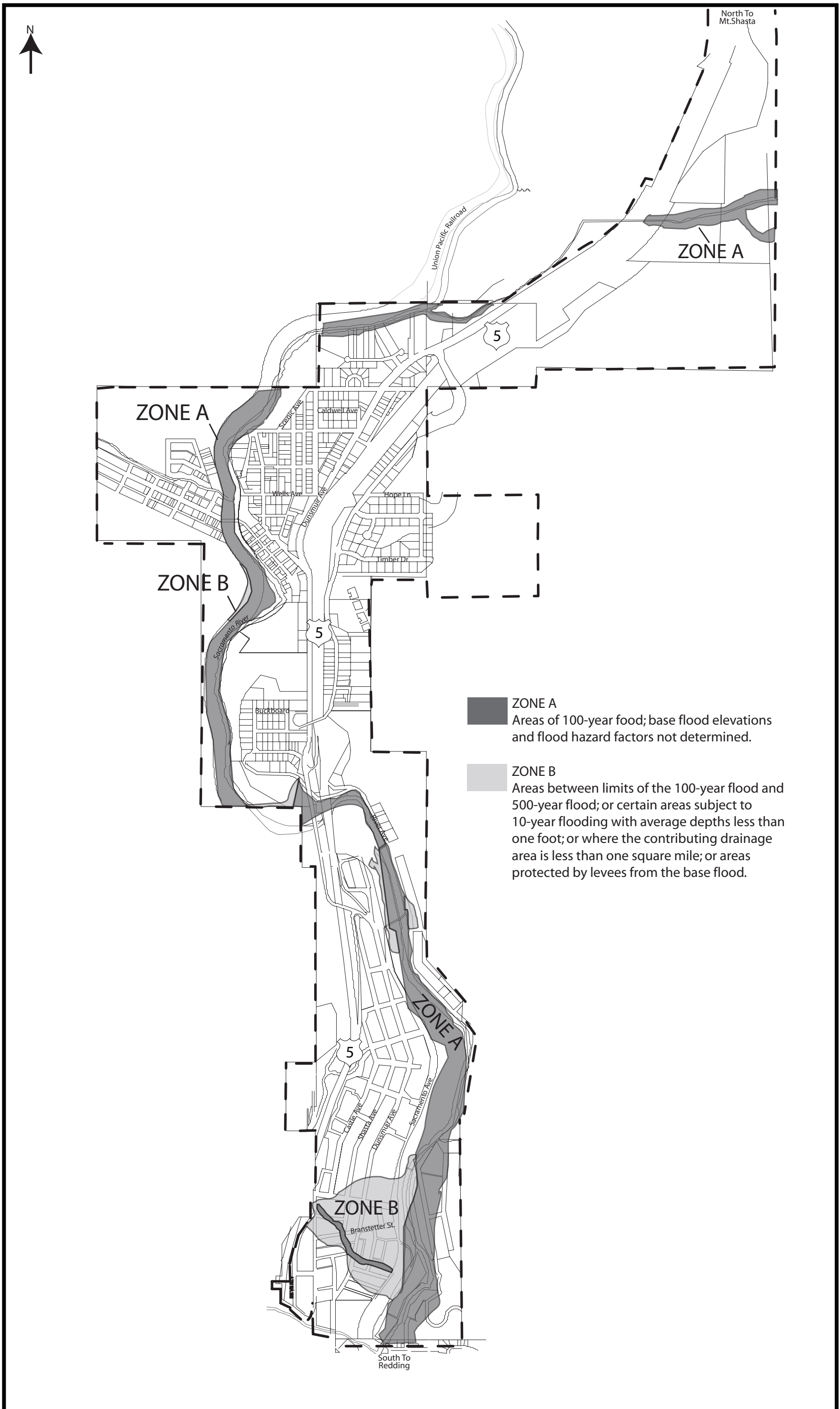
Zone 3: areas likely to be affected infrequently and then only by long lava flows that originate at vents in zones 1 and 2.



Source: Crandall and Nichols, 1987

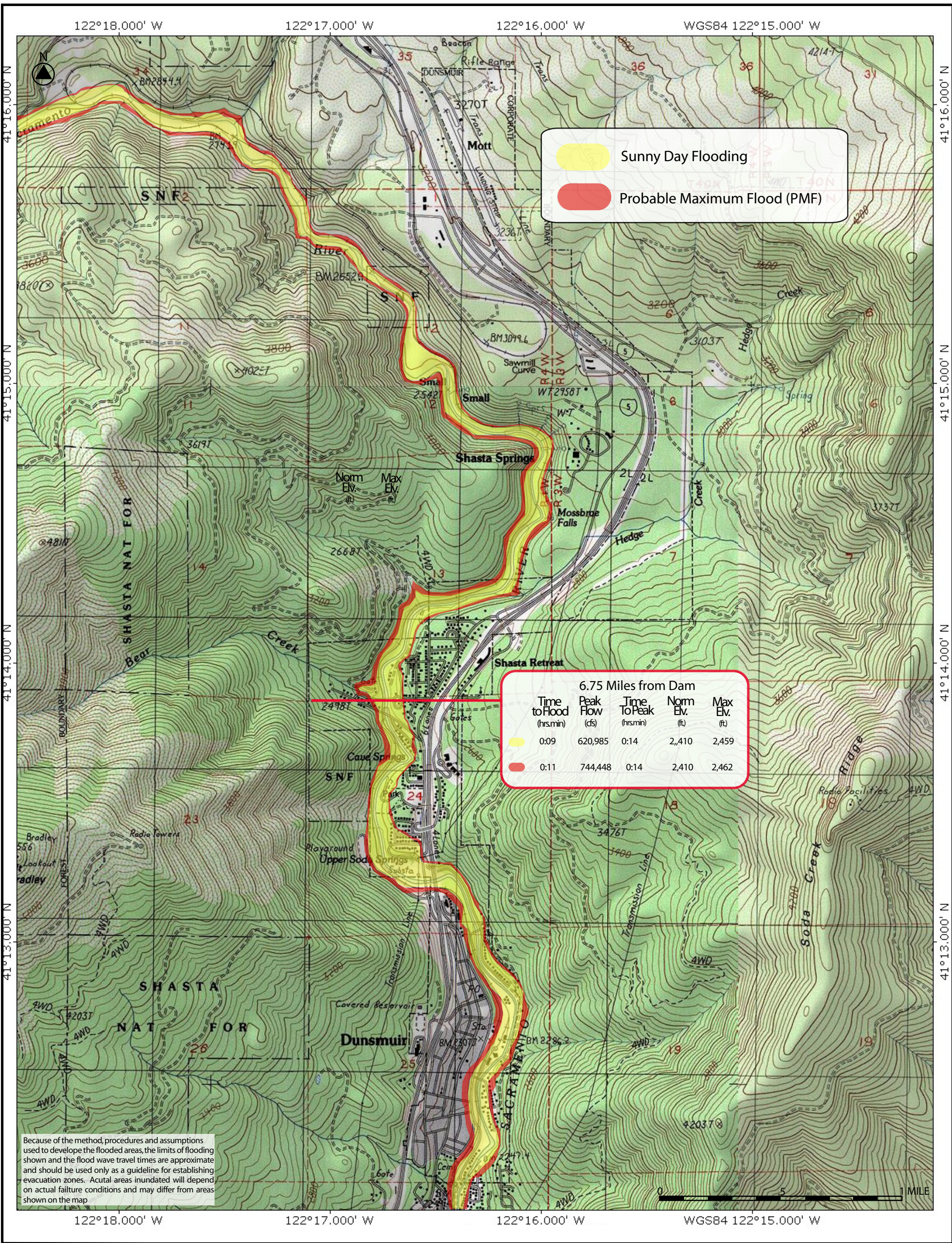
**FIGURE 5-3  
Mudflow**

Zones designated by letters A-C show relative likelihood of being affected by future mudflows. Zone A is most likely and zone C is least likely to be affected. No mudflow hazard exists on high areas within or beyond the zones. Hazard decreases within the zones with greater height above stream channels and greater distance from Mount Shasta.



Source: FEMA FIRM Panel # 060363 0001 B

**FIGURE 5-4**  
**FLOOD HAZARD MAP**  
JOINT 31 (S)  
PNC

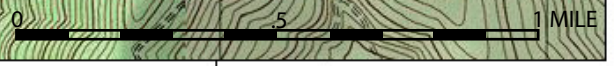


Sunny Day Flooding  
 Probable Maximum Flood (PMF)

6.75 Miles from Dam

	Time to Flood (hrs:min)	Peak Flow (cfs)	Time to Peak (hrs:min)	Norm. Elev. (ft)	Max Elev. (ft)
Yellow	0:09	620,985	0:14	2,410	2,459
Red	0:11	744,448	0:14	2,410	2,462

Because of the method, procedures and assumptions used to develop the flooded areas, the limits of flooding shown and the flood wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Actual areas inundated will depend on actual failure conditions and may differ from areas shown on the map.



SOURCE: Siskiyou County Public Works Department, TOPO!

FIGURE 5-5  
BOX CANYON  
DAM BREAK FLOODING  
PMC