Multi-Hazard Mitigation Plan
4.0 Risk Assessment

44 CFR 201.6(c)(2)(ii): "The risk assessment shall include…A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community".

Risk from natural hazards is a combination of hazard, vulnerability and exposure. The risk assessment process measures the potential loss to a community, including loss of life, personal injury, property damage, and economic injury resulting from a hazard event. The risk assessment process allows a community to better understand their potential risk and associated vulnerability to natural hazards. This information provides the framework for a community to develop and prioritize mitigation strategies and plans to help reduce both the risk and vulnerability from future hazard events.

This risk assessment for Placer County followed the methodology described in the FEMA publication 386-2 Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA, 2002) and was based on a four-step process: (1) Identify Hazards, (2) Profile Hazard Events, (3) Inventory Assets, and (4) Estimate Losses.

This risk assessment covers Planning Step 4: Assess the Hazard and Planning Step 5: Assess the Problem. It also includes a third component, Existing Mitigation Capabilities, where the risk and vulnerability are analyzed in light of existing mitigation measures such as building codes, warning systems and floodplain development regulations.

The risk assessment for this plan, between the County and the incorporated communities, covers the entire geographical extent of the Planning Area. Thus, the risk assessment for the County also includes and directly corresponds to the Placer County Flood Control and Water Conservation District.

All other districts participating on the HMPC and listed on pages 15-16 of this plan are geographical subsets of the planning area. Therefore the risk assessment for the County applies to and covers these districts as well.

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Multi-Hazard Mitigation Plan
4.1 Hazard Identification

The Placer County HMPC conducted a Hazard Identification study to determine what hazards threaten the planning area. This section of the plan documents the previous occurrence of natural hazards, those that might occur in the future, and the likelihood of their recurrence.

Utilizing existing multi-hazard plans available from participating jurisdictions as well as input from planning meetings, the HMPC agreed upon a list of those natural hazards of concern to the participating communities. Historical data from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC), CA-OES and other sources were also examined to confirm the significance of these hazards to the planning area. Significance was measured in general terms, focusing on key criteria such as frequency and resulting damage, including, deaths/injuries and property, crop, and economic damages to a community. The natural hazards evaluated as part of this plan include those that have either historically or have the future potential to cause significant human and/or monetary losses.

The natural hazards identified and investigated for the Placer County multi-jurisdictional plan include:

- Severe Weather
    - Heavy Rains/Thunderstorms/Wind/Lightning
    - Snow
    - Tornadoes
    - Fog
    - Drought
- Floods
- Dam Failure
- Landslides
- Avalanches
- Wildfires
- Earthquakes
- Volcanoes
- Agricultural Hazards
- Natural Health Hazards
    - West Nile Virus

Also discussed by the HMPC, the natural hazard listed below were eliminated from further consideration because: (1) they either occur rarely or not at all, and (2) when they do occur, they are limited in magnitude - no or very limited damages are sustained.

- Hurricanes

DISASTER DECLARATION HISTORY

One method to identify hazards based upon past occurrence is to look at what events triggered federal and/or state disaster declarations within the planning area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government's capacity is exceeded, a federal disaster declaration may be issued, allowing for the provision of federal disaster assistance.

Since the passage of the Stafford Act in 1988, FEMA Region IX has experienced 50 Presidential Disaster Declarations, obligating $10.4 billion to date. Within Placer County, there have been seven federal and four state declarations since 1950. All seven of the federal declarations and three of the state declarations were associated with flood events.

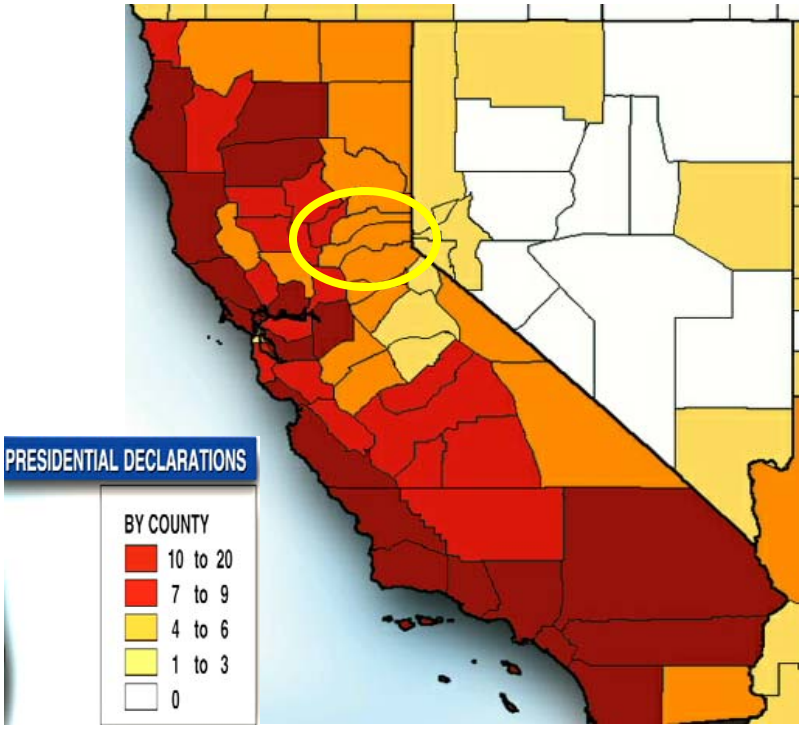
It is important to note that the federal government may issue a disaster declaration through the U.S. Department of Agriculture and/or the Small Business Administration (SBA), as well as through FEMA. The quantity and types of damage are the determining factors. In fact, recent SBA declarations included several declarations for Placer County making small, non-farm businesses eligible for Economic Injury Disaster Loans as a result of damages associated with extreme weather events occurring between January 2001 and September 2003. These include the following declarations:

- SBA – Placer County, January 2004 (Extreme heat followed by unseasonable rainfall)
- USDA - Placer County, December 2003 (Extreme heat followed by unseasonable rainfall)
- USDA – Placer County, November 2003 (Unseasonable rainfall)
- SBA #9ZG4 – San Luis Obispo and Placer Counties Ag losses, Oct/Nov 2003 (Unseasonable rainfall and wheat stripe rust)
- SBA #ZD6 – Placer County Ag Losses, August 2003 (rain, poor winter chill and high heat)
- SBA #9Z79 – Sutter and Yuba Summer Rain 2003 (unseasonable late rainfall)
- SBA #9Z00 – Colusa & Sacramento Agricultural Loss, June-August 2003 (extreme heat followed by unseasonable rainfall)
- SBA #9X85 – CA Statewide Agricultural Losses, March-May 2003 (excessive rain, hail, freezing temperatures & wheat stripe rust)
- SBA #9X63 – Nevada Drought, January 2003-ongoing (drought and insect infestation)
- SBA #9X60 – Rain & Wheat Stripe Rust March-May 2003
- SBA #9V58 – El Dorado & Placer Counties October 2002 Drought
- SBA #9V57 – Sutter County December 2002 Storms (rain & wind)
- SBA #9S95 – Nevada Drought 2003-02
- SBA #9O39 – Washoe County Fires & Drought
- SBA #9M64 – Placer County Drought, January 2001-ongoing

The following map, from the FEMA Website, displays the number of Presidential Disaster Declarations within the planning area between 1965 and 2002.

Presidential Disaster Declarations Map

January 1, 1965 to November 1, 2002



Other Disaster data obtained by the HMPC is provided, in chronological order, in the table below. In general, this data is incomplete and inconsistent from source to source.

Date	Event	Location	Declaration Type	Damages*	Source of Data	Notes
11/21/1950	Flooding	Placer County	State		CA-OES	CA OCD 50-01
12/23/1955	Flooding	Placer County	Federal		CA-OES	CD 47-DR-CA
01/13/1957	Thunderstorm, Wind	Placer County			NCDC	
02/26/1958	Flooding	Placer County	State		CA-OES	CDO 58-03
04/04/1958	Flooding	Placer County	Federal		CA-OES	CD 82-DR-CA

Date	Event	Location	Declaration Type	Damages*	Source of Data	Notes
10/24/1962	Flooding	Placer County	Federal		CA-OES	OEP-138-DR-CA
02/07/1963	Flood and Rainstorms	Placer County	Federal		CA-OES	145
12/29/1964	Late Winter Storms/Flooding	Placer County	Federal		CA-OES	OEP-183-DR-CA
09/18/1965	Major and Widespread Fires	Placer County	County	113,766 acres/41 buildings destroyed	CA-OES	
12/12/1967	Severe Winter Storm	Placer County		$8,620.69	Sheldus: USC Hazards Research Lab	FIPS: 6061
01/26/1969	Storms	Placer County	Federal	47 dead; 161 injured; $185 million – public; $115 million-private	CA-OES	
04/17/1972	Freeze and Severe Weather	Placer County	County	Crop loss-$$	CA-OES	
1/16/1973	Severe Thunderstorm	Entire State of California			Sheldus: USC Hazards Research Lab	FIPS: 6061
02/28/1973	Storms and Floods	Placer County	County	$1.357 million – public; $507,000 – private -	CA-OES	
01/12/1977	Drought	Placer County	State		CA-OES	GP – 1977 Drought
12/23/1979	Severe Winter Storm				Sheldus: USC Hazards Research Lab	FIPS: 6061
04/03/1980	Heavy Rains/ Flooding	Placer County	State		CA-OES	
03/15/1983	Winter Storms	Placer County	Federal	$151,185,641 – public; $158,641 – private	CA-OES	FEMA 682-DR-CA
03/22/1983	Tornado	Placer County		$250,000	NCDC	

Date	Event	Location	Declaration Type	Damages*	Source of Data	Notes
02/18/1986	Springs Storms/ Flooding	Placer County	Federal	$157,987,493 – public; $249,551,411 – private; 12,477 homes damaged; 1,382 homes destroyed; 967 businesses damaged; 185 businesses destroyed.	CA-OES	FEMA 758-DR-CA
09/10/1987	Wildland Fires	Placer County	County	$18 million (estimated); 1,070 fires; 534,661 acres burned; 835 sq. miles; 38 homes destroyed	CA-OES	
04/23/1990	Tornado	Placer County		$3,000	NCDC	
01/10/1995	Severe Winter Storms/ Flooding	Placer County	Federal	$3,395,399 PA; $299.6 million – public; 128.4 million – individuals; 58.4 million – businesses; $158 million – highways; $97 million – agricultural.	CA-OES, PA Costs only	FEMA 1044-DR-CA
01/10/1995	Late Winter Storms	Placer County	Federal	$190.6 million – public; $122.4 million – individual; $46.9 million – businesses; $79 million – highways; $651.6 million – agricultural.	CA-OES	FEMA 1046-DR-CA
12/22/1996	Thunder Storm, Wind	Roseville			NCDC	
01/04 /1997	Winter Storms/ Flooding	Placer County	Federal	$28.7M total or 1.8 billion total; $3,339,568 PA; 300 square miles of land flooded; 23,000 homes, 2,000 businesses damaged or destroyed; 8 deaths.	NOAA/ Sheldus: USC Hazards Research Lab/ CA-OES	FEMA 1155-DR-CA
01/22/1997	Flash Flood	Roseville			NCDC	Included in FEMA 1155

Date	Event	Location	Declaration Type	Damages*	Source of Data	Notes
01/26/1997	Flash Flood	Roseville			NCDC	Included in FEMA 1155
01/26/1997	Flash Flood	Granite Bay		$150,000	NCDC	Included in FEMA 1155
04/02/1997	Wind	Kings Beach		$20,000	Sheldus: USC Hazards Research Lab	FIPS: 6061
01/12/1998	Heavy Rain	Placer County			NCDC	
01/18/1998	Severe Storm	Placer County			Sheldus: USC Hazards Research Lab	FIPS: 6061
09/05/1998	Heavy Rain	Brockway			NCDC	
09/05/1998	Heavy Rain	Kings Beach			NCDC	
09/26/1998	Thunderstorm, Hail, Wind	Kings Beach		$1,000	NCDC	
09/26/1998	Waterspout	Tahoe City			NCDC	
01/22/2000	Heavy Rain	Auburn, Blue Canyon, Newcastle, Roseville			NCDC	
02/11/2000	Heavy Rain	Roseville		$10,000	NCDC	
07/11/2001	Thunderstorm, Wind/hail	Auburn			NCDC	
09/19/2002	Wildfire (Sierra Fire)	Placer County	Federal – Fire Management Assistance Grant	$59,730	CA-OES	FMAG – 2463
11/07/2002	Heavy Rain	Homewood			NCDC	
07/23/2003	Hail	Kings Beach			NCDC	

*Note: Damage totals are for all affected areas and may not be specific to Placer County.

SEVERE WEATHER

Almost all of Placer County's state and federal disaster declarations are a direct result of extreme weather conditions. For this plan, severe weather is discussed in the following subsections:

- Heavy Rain/Thunderstorms/Wind/Lightning
- Snow
- Tornadoes
- Fog
- Drought

Severe weather conditions such as extreme heat and cold also occur in the County. As there were no documented damages associated with these weather conditions beyond crop-related damages, these are discussed in the section on agricultural disasters.

Weather conditions can vary greatly from the western portion to the eastern portion of Placer County due to topographical changes and variance in elevation. Therefore, for the purpose of this Section, the County will be described as two distinct sections: western Placer County, which is mostly below an elevation of 4,000 feet above sea level, is generally below the snowfall region, and includes the Community of Foresthill and all land to the west (including all incorporated cities and towns); and eastern Placer County, which is generally above 4,000 feet above sea level, receives snowfall, and includes all of the County east of Foresthill.

Heavy Rain/Thunderstorms/Wind/Lightning

Severe storms/thunderstorms in the planning area generally include heavy rains often accompanied by strong winds, lightning, and hail. Tornadoes often occur during these big storms. Thunderstorms can produce a strong rush of wind known as a downburst, or straight-line winds which may exceed 120 miles per hour. These storms can overturn mobile homes, tear roofs off of houses and topple trees.

Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: (1) Hail, three-quarters inch or greater; (2) Winds gusting is excess of 50 knots (57.5 mph); or (3) A tornado.

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning can occur throughout the year and are not always accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be directly struck and this impact may result in an explosion, burn, or total destruction. Or, damage may be indirect when the current passes through or near it.

Past Occurrences

As discussed further in the following sections, heavy rains and severe storms occur in the planning area primarily during the late fall, winter and spring seasons.

Heavy rain is the most frequent occurrence of severe weather occurrences within the County. The bulk of the rain occurs during the months of November through April but can be quite variable depending on different regions of the County. Due to the dramatic change in elevation from the western portion of Placer County to the eastern limit (from approximately 100 feet to more than 9,000 feet above sea level), precipitation and temperature can vary greatly throughout the County. According to available NCDC data, two weather stations are located within western Placer County (Auburn and Colfax) and two stations are located in eastern Placer County (Blue Canyon and Tahoe City). Weather data is also provided for Rocklin, however, only through 1976.

In addition to the weather stations, both the Placer County Flood Control and Water Conservation District and the City of Roseville maintain a system of ALERT Flood Warning gages, including 28 precipitation gages and 22 stream level gages located throughout western Placer County.

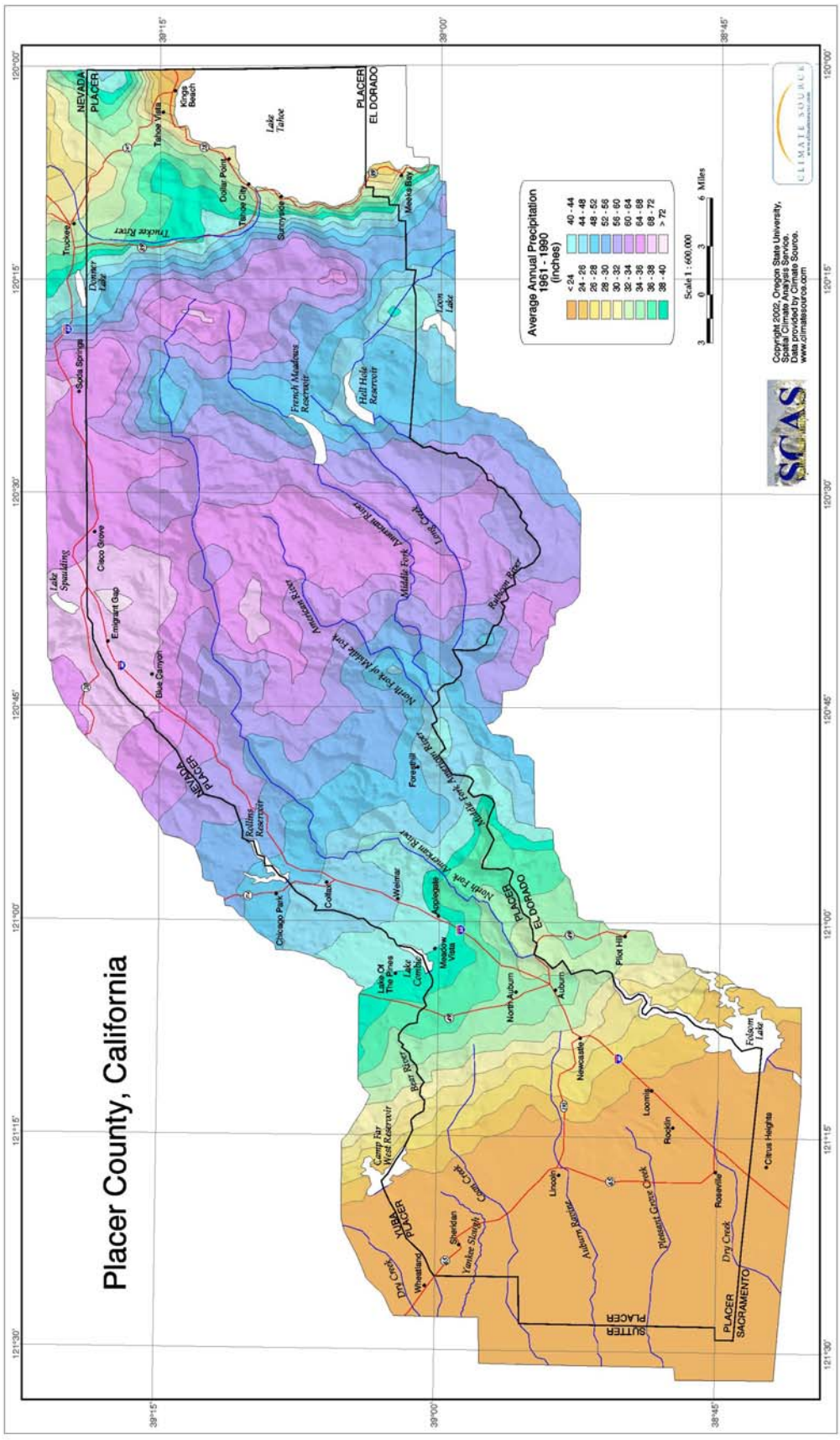
Western Placer. Average annual rainfall in western Placer County ranges from about 23 inches to 45 inches per year. From 1914 through 2001, annual rainfall averaged 34.63 inches in the City of Auburn. During the same time period, the highest recorded annual rainfall for Auburn is 64.87 inches in 1983; the highest recorded rainfall for a 24-hour period in Auburn is 5.41 inches on October 13, 1962. The lowest annual rainfall total in Auburn is 11.6 inches in 1976. Between 1948 and 2002 the highest recorded annual rainfall for Colfax is 86.91 inches in 1983; the lowest annual rainfall in Colfax is 15.38 inches in 1976. The highest recorded rainfall for a 24-hour period in Colfax is 10.02 inches on October 13, 1962.

In western Placer County, monthly average maximum temperatures in the warmest months (May through October) range from the mid 70's to the low 90's. Monthly average minimum temperatures from November through April range from the mid 30's to the mid 40's. The highest recorded daily extremes in western Placer County include 115 degrees Fahrenheit (°F) on June 16, 1961 in Rocklin, 113°F on July 14, 1972 in Colfax, and 111°F in Auburn on August 10, 1978**.** The lowest recorded daily extremes include 9°F in Colfax on December 10, 1972, 15°F on December 11, 1972 in Rocklin, 16°F on December 9, 1972 in Auburn.

Eastern Placer. Average annual rainfall in eastern Placer County ranges from 45 inches to 75 inches. From 1914 through 2001, annual rainfall averaged 68.21 inches in Blue Canyon in the northern portion of the County. A large area, which centers on Tahoe National Forest, receives 55 to 65 inches of precipitation per year. A small pocket of the County located approximately 10 miles east of Blue Canyon receives the largest amount of precipitation on average at 75 to 85 inches per year. Between 1948 and 2002 the highest recorded annual rainfall for Blue Canyon is 121.71 inches in 1983; the lowest annual recorded rainfall is 23.48 inches in 1976. Tahoe City's highest recorded annual precipitation was 66.41 inches in 1996.

Average maximum temperatures in eastern Placer County during the months of May through October range from the low 60's to high 70's, whereas monthly average minimum temperatures from November through April range from the low 20's to high 30's. The highest recorded daily extremes in eastern Placer County include 94°F in Tahoe City on August 15, 1933 and 97°F in Blue Canyon on August 8, 1978. The lowest recorded temperatures include 3°F for Blue Canyon on December 9, 1972, and -16°F for Tahoe City, on December 11, 1972.

The map on the following page shows average annual precipitation for Placer County, California.


Placer County, California
Average Annual Precipitation
1961 - 1990
(inches)
< 24
24 - 26
26 - 28
28 - 30
30 - 32
32 - 34
34 - 36
36 - 38
38 - 40
40 - 44
44 - 48
48 - 52
52 - 56
56 - 60
60 - 64
64 - 68
68 - 72
> 72
Scale 1 : 600,000
0
3
6 Miles
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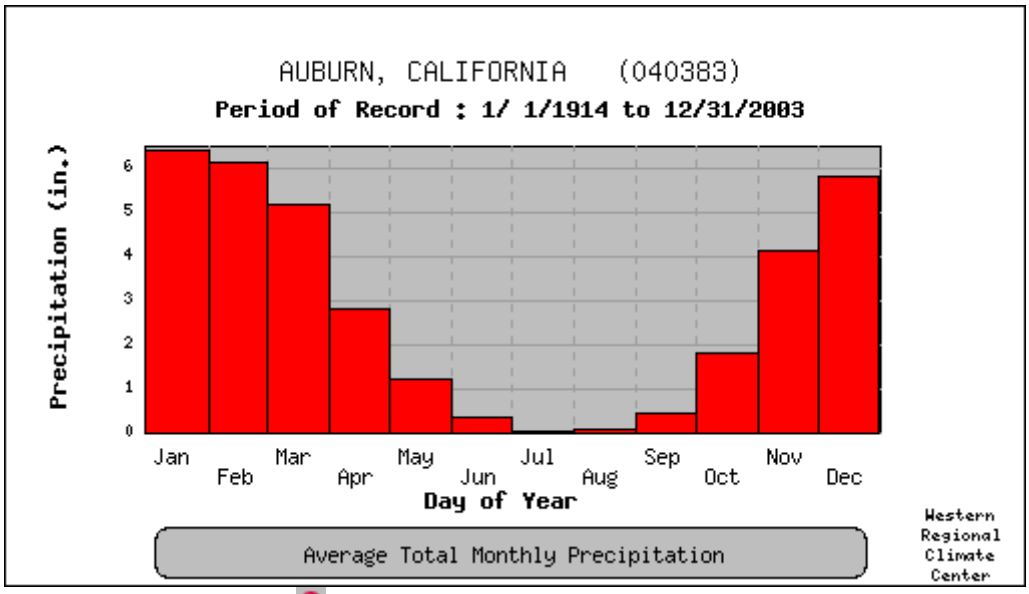
SCAS
NEVADA
PLACER
EL DORADO
SUTTER
YUBA
SACRAMENTO
Lake Tahoe
Truckee River
American River
Middle Fork American River
North Fork American River
North Fork of Middle Fork
Rubicon River
Long Creek
Dry Creek
Bear River
Coon Creek
Pleasant Grove Creek
Truckee
Kings Beach
Tahoe Vista
Dollar Point
Tahoe City
Sunnyside
Meeks Bay
Donner Lake
Soda Springs
Lake Spaulding
Cisco Grove
Emigrant Gap
Blue Canyon
Lyon Lake
French Meadows Reservoir
Hell Hole Reservoir
Foresthill
Rollins Reservoir
Chicago Park
Colfax
Weimar
Applegate
Meadow Vista
Lake Of The Pines
Lake Combie
North Auburn
Auburn
Pilot Hill
Folsom Lake
Newcastle
Loomis
Rocklin
Roseville
Citrus Heights
Camp Far West Reservoir
Sheridan
Wheatland
Yankee Slough
Lincoln
Auburn Ravine

The following graphs illustrate recorded weather conditions for specific areas within Placer County.

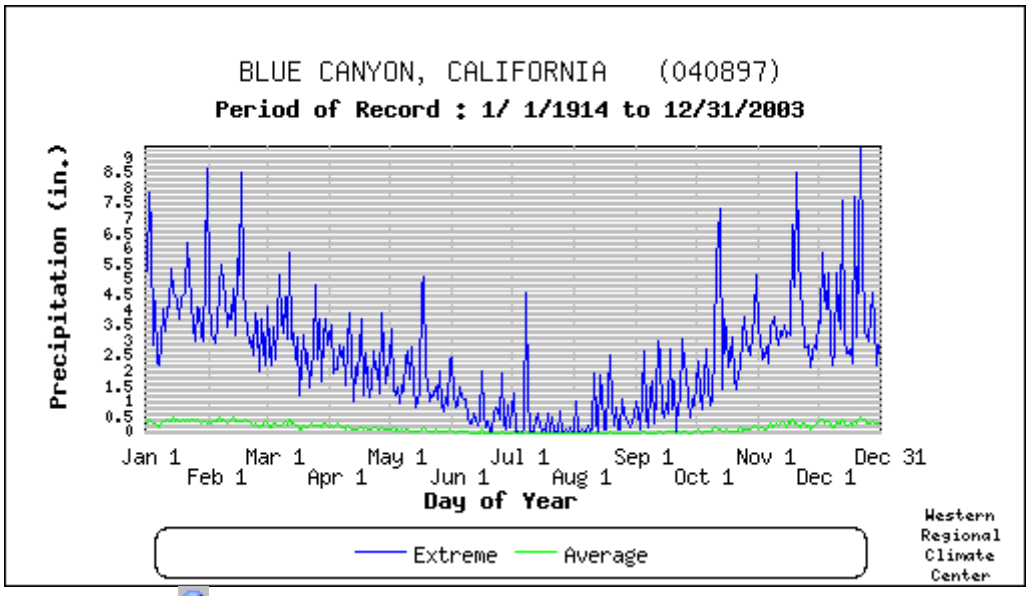
Auburn, California
Monthly Average Total Precipitation



- Average precipitation recorded for the month.

(Source: Western Regional Climate Center)

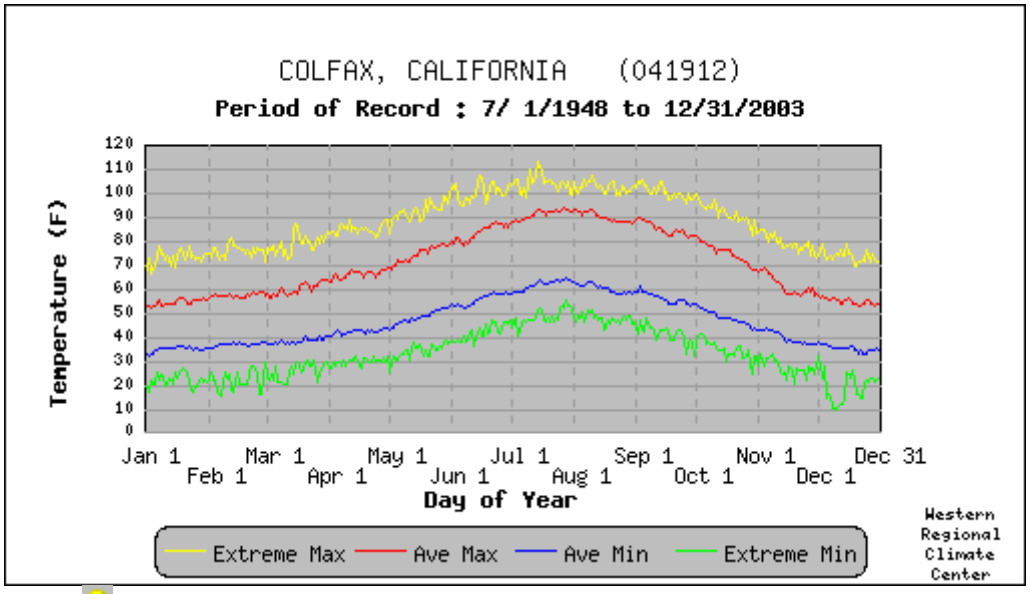
Blue Canyon, California
Daily Precipitation Average and Extreme



- Extreme is the greatest daily precipitation recorded for the day of the year.
- Average is the average of all daily precipitation recorded for the day of the year.

(Source: Western Regional Climate Center)

Colfax, California
Daily Temperature Averages and Extremes



- Extreme Max. is the maximum of all daily maximum temperatures recorded for the day of the year.
- Ave. Max. is the average of all daily maximum temperatures recorded for the day of the year.
- Ave. Min. is the average of all daily minimum temperatures recorded for the day of the year.
- Extreme Min. is the minimum of all daily minimum temperatures recorded for the day of the year.

(Source: Western Regional Climate Center)

In conjunction with those weather events previously listed in the Disaster Declaration Section of the Plan, the additional storm events and details were identified by the HMPC:

February 1, 1990 – A rain storm caused water damage to a floor in the Forresthill Union School District causing $4,680 in damages.

February 20/21, 1990 – Excessive rain and wind closed the school in Colfax and Iowa Hill; damages unknown.

December 1990 – Freezing temperatures cause the fire sprinkler pipes to burst in the main office of the Placer County Office of Education causing $107,487 in damages.

March 4, 1991 – High winds caused a roof to blow off a building in the Forresthill Union School District causing $ 10,629 in damages.

December 17, 1992 – Heavy snows on a roof caused damages to a building located in the Forresthill Union School District causing $ 3,371 in damages.

January 10/11, 1995- Excessive rain and wind closed the school in Colfax; damages unknown.

March 23, 1995 – Excessive snow closed the school in Colfax; damages unknown.

1995 Winter Storms – The roof drains of the Placer Union High School gymnasium became clogged, damaging the roof and flooding the gymnasium. Damages were incurred and FEMA paid out disaster monies in the amount of $7,108.33.

December 12, 1995 – High winds caused a power outage resulting in the closure of Franklin Elementary, Placer Elementary, and Loomis Grammar School (Loomis Union School District).

1996 – Heavy rain clogged storm drains causing flooding in the Cavitt School gymnasium in south Placer County. Total damage was $85,976 covered by Emergency Services under a disaster declaration.

January 26, 1999 – Excessive snow closed the school in Colfax; damages unknown.

December 16, 2002 – Excessive rain and wind closed the school in Colfax; damages unknown.

December 20, 2002 – High winds caused a power outage resulting in the Franklin Elementary school closure (Loomis Union School District).

October 31, 2003 - Winds associated with heavy storms caused a power outage and closure of Truckee Elementary School. The area affected Truckee, California and Donner Pass Road. Costs associated with closure was paid for by the State insurance program.

Likelihood of Future Occurrences

Given the history of severe weather events in Placer County, severe weather, including thunderstorms, heavy rain, wind and lightning are very likely to continue to occur annually in the Placer County planning area.

Snow

The western portion of Placer County does not receive snowfall on a regular seasonal basis; however, the eastern portion of the County receives abundance of snow, mostly between the months of November and March. Between the period from 1914 to 2002 and based on the sum of monthly averages, the City of Auburn received an annual average of 1 inch of snow per year. On the other extreme, in the eastern limit of the County, Tahoe City receives 188.3 inches of snow on average with a record annual snowfall of 499.3 inches in 1952. Between 1948 and 2002 Blue Canyon averaged 251 inches of snow per year with an annual record of 591.1 inches in 1952. Within the 54-year time period, it snowed less than 1 inch per month on average in Blue Canyon during the months of June through September, whereas the highest average was 52.4 inches for the month of March.

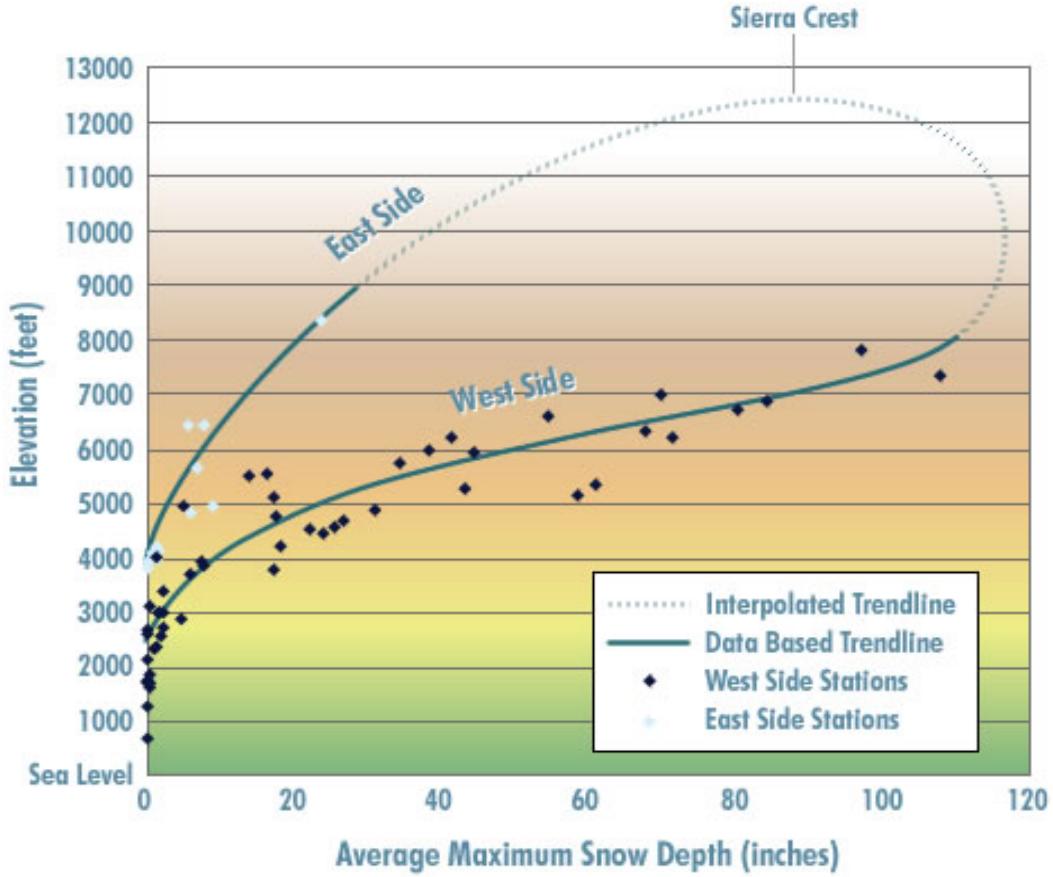
Other notable records found at http://www.sierranevadaphotos.com/about.html include:

- 1 day snowfall: 67 inches (5.6 ft.) at Echo Summit, Jan 4, 1982 (2nd in US)
- Single storm snowfall: 186.6 inches (15.6 ft.) at Donner Summit, 1982 (2nd in US)

- 1 month snowfall: 390 inches (32.5 ft.) at Tamarack, Jan. 1991 (US record)
- Total winter snowfall: 884 inches (73.7 ft.) Tamarack, 1906-07
- Greatest snow depth: 451 inches (37.6 ft.) at Tamarack, Mar. 11, 1911 (US record)
- Highest average March snow depth: 108 inches (9 ft.) at Echo Summit

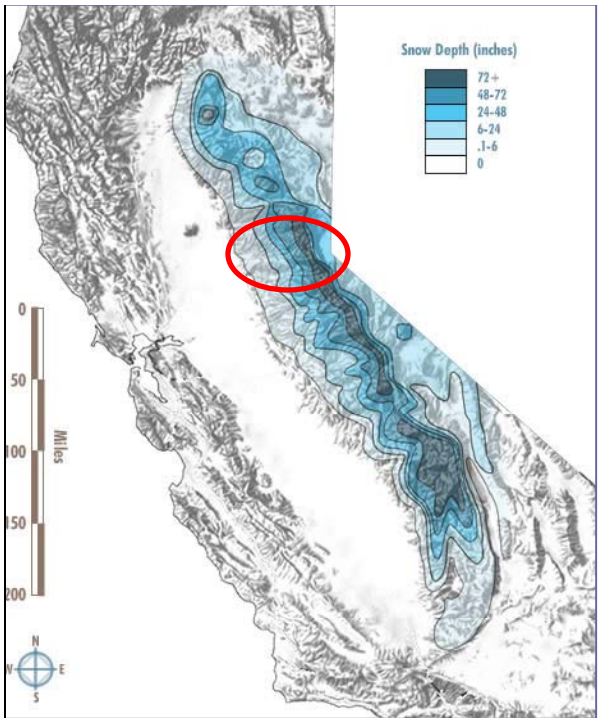
Snowfall in the Sierra increases with elevation. The lower foothills rarely receive any measurable snow. Middle elevations receive a mix of snow and rain during the winter. Above about 6,000 ft., the majority of precipitation falls as snow. It is not unusual, in some locations, to have ten feet of snow on the ground for extended periods.

However, snow accumulation does not directly follow precipitation in the Sierra. While the greatest total precipitation occurs in the northern part of the range, the greatest snow accumulation occurs in the central and high southern parts of the range, due to higher elevations and colder temperatures which inhibit snow melt. The west side of the Sierra Nevada acts as trap for winter storms, ringing out the moisture before it can get to the east side. Weather stations located on the west side begin registering measurable snow between 2,500 and 3,000 feet elevation. On the east side, measurable snow accumulation doesn't begin until about 4,000 feet and increases more slowly with altitude. Snow depths drop dramatically on the east side of the range due to the rain shadow effect as illustrated in the comparative east side/west side snow depth chart shown on the following page.



(Source: http://www.sierranevadaphotos.com/geography/east_west_snow_depth.html)

The following map shows the average maximum measured snow depth in the Sierra Nevada for the month of March (the month of greatest average snow depths).



(Source: http://www.sierranevadaphotos.com/geography/snow_depth.asp)

Past Occurrences

1999 - A severe freeze caused broken pipes at three schools in the Eureka Union School District (Oakhills, Ridgeview, Cavitt) in South Placer County. Total damage to carpet, drinking fountains, and miscellaneous supplies was $10,281 ($1000 deductible, remainder insurance).

February 2003 – A severe snowstorm caused a variety of damages to schools located in the areas of Truckee, Donner Pass, Tahoe City, West Shore, Polaris Road and Timberline. The snowstorm caused an underground propane leak at one school, a district-wide power outage, and damages resulting from roof snow loading and removal. Schools closures ranged from two days to two weeks.

The heavy levels of snow combined with other inclement weather in the northern and eastern portion of Placer County create many issues that impact the area. These include:

- Heavy rain/snow melt weakens the root structure of trees. When significant wind events occur, trees fall onto power lines and homes. While the HMPC could not recall injuries or deaths associated with this type emergency, there have been numerous close calls. Actual data on property loss amounts for these types of events is not maintained. This kind of emergency will continue to occur on an annual basis.

- Heavy snowfall creates numerous challenges for emergency responders. In the higher elevations at Lake Tahoe, snowfall will bury fire hydrants and street signs, not to mention periodically stranding residents until the Placer County Road Department can open up surface streets. It can often take the fire district weeks to dig out the approximately 2500 fire hydrants. This is exacerbated by County snow plows/blowers re-burying the hydrants in subsequent plowing efforts. Inaccessible hydrants and/or delayed responses can impact life and property. Also occurring periodically is having to respond to individuals that have been buried in snow, typically when caught in snow shedding off roofs. Responders have also experienced the danger during residential structure fires when firefighters are in the path of snow shedding off roofs. Finally in the category of heavy snow, the fire district trains in avalanche response (mostly in Alpine Meadows) when snow takes out homes and cars along Alpine Meadows Road. Avalanche conditions also create unique challenges of emergency responders.

- Winter weather including snowfall and rain, leads to an increase in the number and severity of traffic accidents. This occurs every year and can only be partially mitigated by sanding and salting roadways by the County and State road departments. Additionally, road closures occurring as a result of winter weather conditions can adversely impact interstate commerce.

According to the California Highway Patrol (CHP), Auburn Area (whose jurisdiction on I-80 extends from the Placer/Sacramento County line to the western edge of Colfax), weather-related incidents resulting in metering, chain control, accident control, holding, and closure are annual occurrences. From January 1, 2000 through June 30, 2004, the Auburn CHP daily log cited 60 days where traffic on I-80 was affected due to adverse weather conditions. Of these, five were associated with dense fog; the remaining were a combination of rain, hail, sleet, and snow conditions.

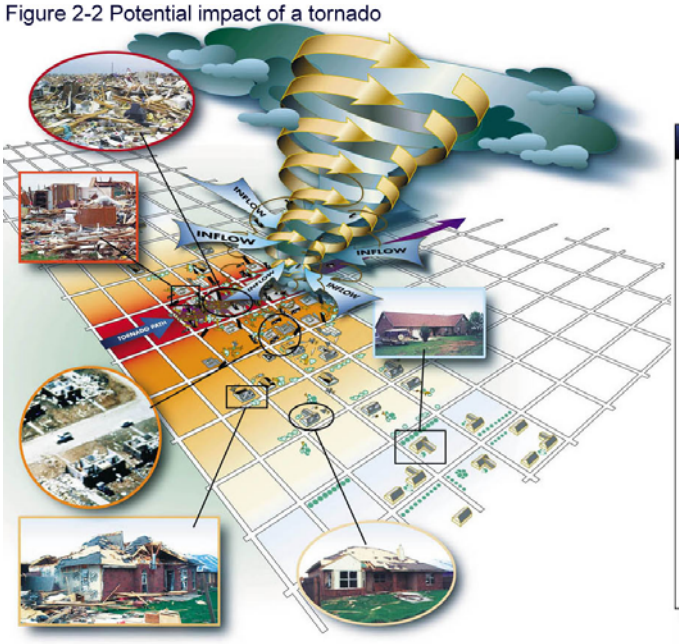
Likelihood of Future Occurrences

Given the history in Placer County, severe snow events are very likely to continue to occur annually in the Placer County planning area.

Tornadoes

Tornadoes are another weather-related event that affects the planning area. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can be comprised of the same pressure differential that fuels 300-mile wide hurricanes across a path only 300 yards wide or less.

Figure 2-2 Potential impact of a tornado



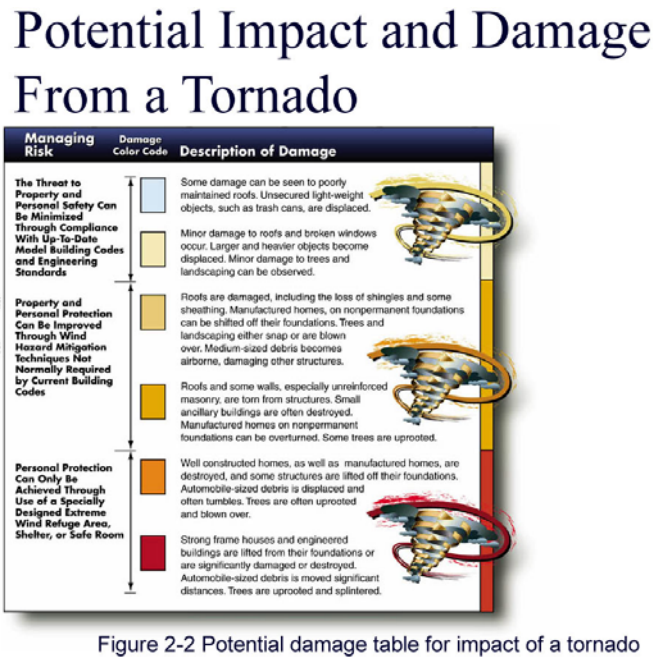


Figure 2-2 Potential damage table for impact of a tornado

Tornado magnitude is ranked according to the Fujita scale listed below:

Fujita Tornado Scale
F0: 40 - 72 mph (35-62 kt)
F1: 73-112 mph (63-97kt)
F2: 113-157 mph (137-179 kt)
F3: 158-206 mph (137-179 kt)
F4: 207-260 mph (180-226 kt)
F5: 261-318 mph (227-276 kt)

Past Occurrences

According to the Placer Operational Area OES, tornadoes, are rare and usually only affect the lower elevations in the western portion of the County. There of four documented incidents of tornadoes in Placer County. According to the NCDC data provided below, only one of the tornadoes that have struck the County has been rated as F1, while all others were rated F0.

October 15, ***1972*** **-** Magnitude F0, Property Damage $0

March 3, 1983 **-** Magnitude F0, Property Damage $0

March 22, 1983 **-** Magnitude F1, Property Damage $250K

April 23, 1990 **-** Magnitude F0, Property Damage $3K. In addition to the $3K in damages reported by the NCDC, the Penryn Elementary School District in Auburn incurred $7,835 in damages associated with the Tornado damaging a portable office and trees.

Likelihood of Future Occurrences

Based on data from 1950 – 1995, California ranks 32 of 50 (compared to other states) for frequency of tornadoes, ranking 36 for injuries and 31 for cost of damages. When compared to other states by the frequency per square mile, California ranks number 44 for the frequency of tornadoes, 44th for injuries per area and 40th for costs per area.

Four tornadoes in Placer County occurred during a 54-year period of record keeping , which equates to one tornado every 13 years, on average.

Fog

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. For example, rain can cool and moisten the air near the surface until fog forms. A cloud-free, humid air mass at night can lead to fog formation, where land and water surfaces that have warmed up during the summer are still evaporating a lot of water into the atmosphere – this is called 'radiation fog'. A warm moist air mass blowing over a cold surface can also cause fog to form-this is called 'advection fog'. Severe fog incidents can close roads, cause accidents, and impair the effectiveness of emergency responders.

Past Occurrences

The NCDC data shows no severe fog incidents for Placer County; however, the USC Sheldus data shows one incident of countywide severe fog on December 11, 1997 resulting in $300,000 in property damages. From January 1, 2000 through June 30, 2004, the Auburn CHP daily log cited 60 days where traffic on I-80 was affected due to adverse weather conditions. Of these, five were associated with dense fog; the remaining were a combination of rain, hail, sleet, and snow conditions.

Likelihood of Future Occurrences

Given the history in Placer County, severe fog events are likely to continue to occur annually in the Placer County planning area.

Drought

Drought is a complex issue involving many factors, with differing conditions and drivers throughout the state making this more of a regional focus. Drought can be defined regionally based on its effects:

- Meteorological - this type of drought is usually defined by a period of below average water supply.

- Agricultural - this type of drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.

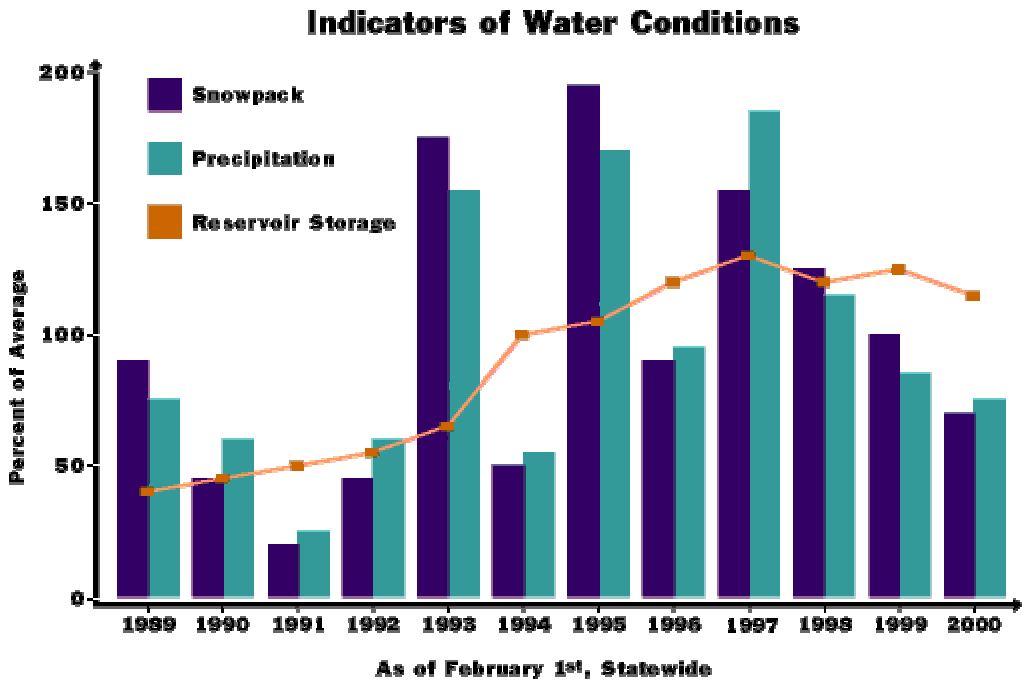
- Hydrological - a hydrological drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir and groundwater levels.

- Socioeconomic - a socioeconomic drought occurs when the results of drought impacts the health, well being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

According to the California Department of Water Resources (DWR), drought is defined as follows: "One dry year does not normally constitute a drought in California. California's extensive system of water supply infrastructure -- its reservoirs, groundwater basins, and inter-regional conveyance facilities -- mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions."

The drought issue is further compounded by water-rights specific to any state or region. Water is a commodity possessed under a variety of legal doctrines. In addition, the prioritization of water rights between farming and federally protected fish habitats in the state is also at issue.

The graphic below, from the California DWR website, illustrates several indicators commonly used to evaluate California water conditions. The percent of average values are determined for measurement sites and reservoirs in each of the State's ten major hydrologic regions. Snowpack is an important indicator of runoff from Sierra Nevada watersheds, the source of much of California's developed water supply.



(Source: California DWR Website)

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall -- ranchers engaged in dryland grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Criteria used to identify statewide drought conditions do not address these localized impacts. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Past Occurrences

Historically, California has experienced multiple severe drought conditions. According to the DWR website, droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California reservoirs. The table below compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77 and 1987-92 droughts. The driest single year of California's measured hydrologic record was 1977. California's most recent multi-year drought was 1987-92.

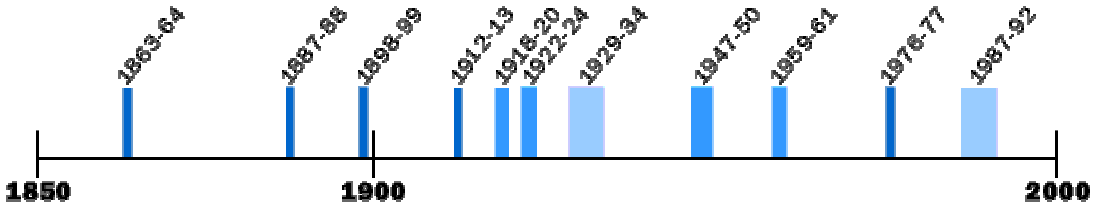
Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf/yr)	*(% Average 1901-96)*	*(maf/yr)*	*(% Average 1906-96)*
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47

(Source: California DWR Website)

Based on additional information provided by the DWR, measured hydrologic data for droughts prior to 1900 are minimal. Multi-year dry periods in the second half of the 19th century can be qualitatively identified from the limited records available combined with historical accounts, as illustrated in the figure below, but the severity of the dry periods cannot be directly quantified.

California's Multi-Year Historical Dry Periods
1850 - Present



1. Dry periods prior to 1900 estimated from limited data.
2. Covers dry periods of statewide or major regional extent.

(Source: California DWR Website)

With respect to Placer County, the following drought events were identified by the HMPC:

- In 1977, a Federal Disaster Declaration was declared as a result of a drought affecting Placer and surrounding counties. The Placer County Water Agency (PCWA) declared a water shortage and restricted water use for both irrigation and treated water users. The restrictions included 50 percent reduction in water usage by customers and rate increases. This shortage lasted until January 1978 when the Board terminated the water shortage restrictions.

- The next water shortage occurred in 1988. Again the PCWA Board passed a resolution declaring a water emergency. All customers had their water use reduced by 25 percent and rates were again increased for excessive usage. The County wide emergency prohibited washing of sidewalks, driveways, parking lots and other hard surfaces, restricted the washing of vehicles, airplanes and trailers to 3 gallons of water, prohibited

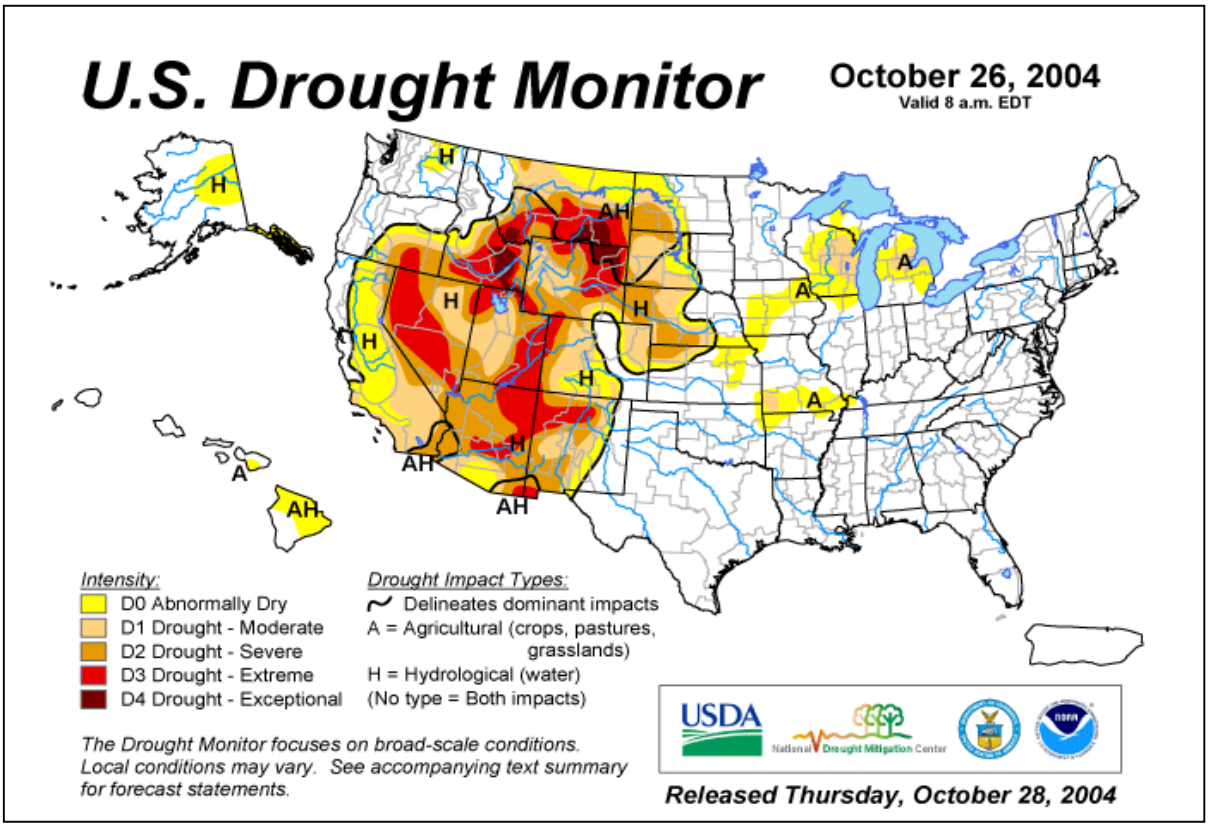
fire hydrant flushing and drills, prohibited filling of pools and prohibited new agricultural land irrigation.

- The most recent Drought Emergency declared by the PCWA Board was in 1991. In February 1991, an emergency was declared by the Board. Raw water customers had their water usage reduced: annually by 50 percent and seasonally by 25 percent. Treated water users were given most of the same restrictions and prohibitions as in 1988. Due to a very late storm season, the emergency was lifted by April 1991.

No hard costs for these emergencies were identified, although PCWA did incur increased operating costs and extra expenses along with an effect on revenue.

Other periods of identified drought have impacted the County, including, several SBA declarations for drought events affecting agriculture between 2001 and 2003 as previously identified in the Disaster Declaration Section of this Plan.

The map that follows provides a "snapshot in time" perspective of the current drought conditions during August of 2004. According to the U.S. Drought Monitor, most of Placer County is currently designated a D0 region, and is considered abnormally dry. This map illustrates that Placer County continues to be subject to drought conditions. The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. This map considers several factors including, the Palmer Drought Index, Soil Moisture Models, USGS Weekly Streamflows, Standardized Precipitation Index, and Satellite Vegetation Health Index.



Likelihood of Future Occurrences.

On average, about 75 percent of California's average annual precipitation falls between November and March; half occurs between December and February. A persistent high-pressure zone over California during the December through February period usually results in a dry water year. Northern California is much wetter than Southern California. More than 70 percent of California's average annual precipitation and runoff occurs in the northern part of the State. The amount of precipitation over the next few years will be a major factor in determining if Placer County continues in abnormally dry conditions. Based on historical drought activity in California, droughts will likely continue to occur on a cyclic basis.