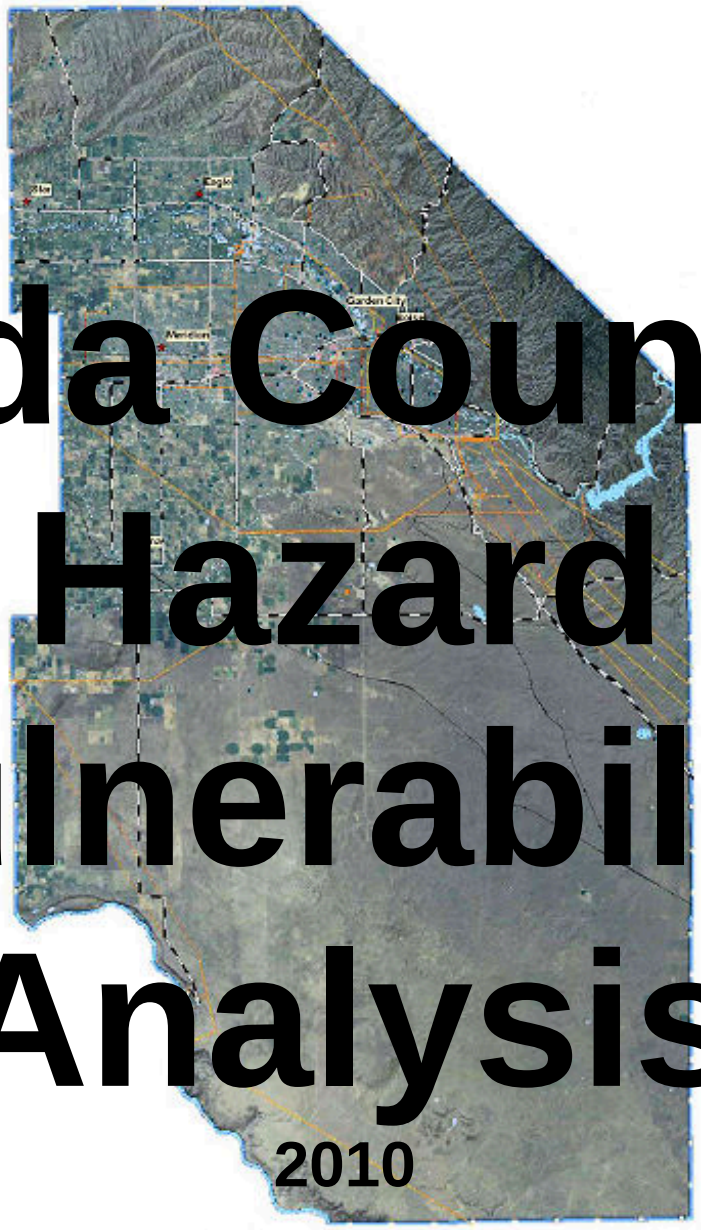


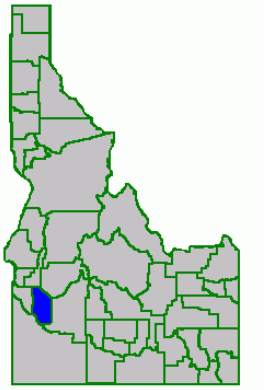
Ada County Hazard Vulnerability Analysis

2010

Table of Contents

INTRODUCTION

In order to plan for emergencies which might strike Ada County it is necessary to identify and understand the hazards that potentially could impact it. Only by understanding the hazards and their impacts is it possible to adequately mitigate, plan for, respond to, and recover from them. Therefore this Hazard Analysis serves as a basis for the development of plans, public education programs, responder training, and disaster exercises. Although this analysis does not cover all hazards, it does address those believed to have a reasonable potential for impacting the people, property, economy and environment of Ada County.



Ada County Profile

Ada County is located in the southwestern part of the State of Idaho. The area was originally inhabited by Native Americans. British fur trappers were the first explorers on record to enter the Boise Valley. The old Oregon Trail, based upon trails created by nomadic Native Americans passes through the county. In 1862 gold was discovered in the Boise Basin. On March 4, 1863, the United States Congress established the Territory of Idaho. In July 1863 the US Army built Fort Boise on what is now the northeast part of Boise City. The Idaho Territorial Legislature created Ada County on December 22, 1864. The county is named for Ada Riggs; the first pioneer child born in the area. In 1869 the territorial prison was built.

There are six incorporated cities in Ada County: Boise, Eagle, Garden City, Kuna, Meridian, and Star. The City of Boise is the county seat, as well as the capital of the State of Idaho. In 2009 the population of Ada County was estimated to be just over 400,000 people. This represents nearly 25% of the state's population.

Geography and Climate

The county is approximately 1,060 square miles is size. Roughly half of this is public land, while the other half is privately owned. The county includes many acres of grassland/sagebrush and a small amount of timbered lands. Terrain ranges from 5,750 feet in elevation in the northern mountains, to 2,260 feet elevation along the broad southern floodplains. Elevation in Boise ranges from 2500 feet to 2850 feet. Elevation in the City of Star, at the western end of the county is about 2,470 feet. The Snake River forms part of the county's southern boundary. The southern half of the county is largely undeveloped, as it is mostly federal land. The Boise River flows through the county from east to west and eventually drains into the Snake River.

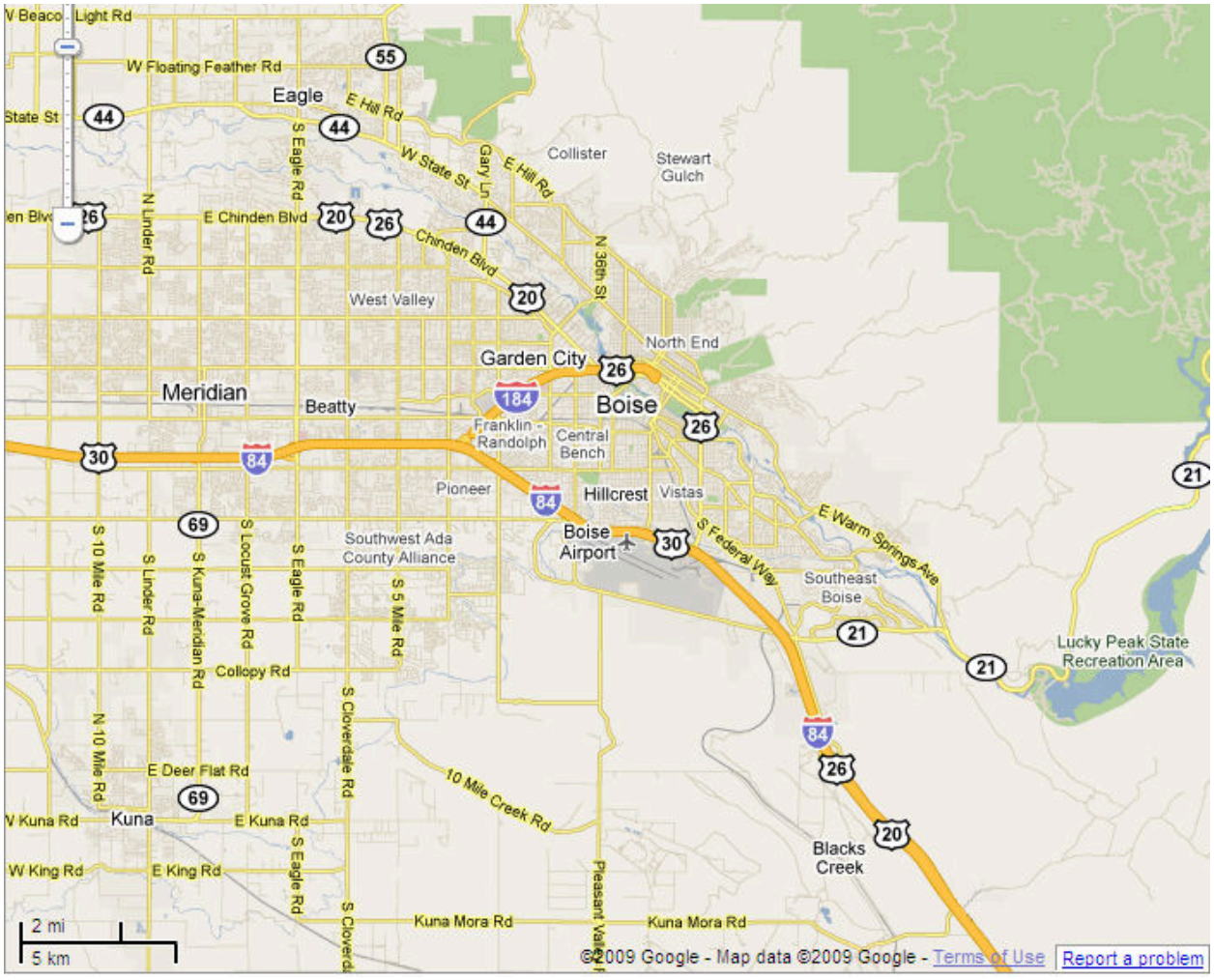
The Cascade and Blue Mountain Ranges in Oregon and Washington modify Pacific air masses as they move east to the Treasure Valley. The result is that these air masses are considerably drier once they reach Southwest Idaho. In addition, the Rocky Mountains to the east act as a barrier to cold shallow air masses moving southward from Canada in winter. The effect from all these Mountain ranges is to make Ada County semi-arid with relatively mild winters for its northern location. Native vegetation consists primarily of sagebrush, sparse desert grasses and other

Great Basin Flora. A large variety of native and non-native trees thrive in the Boise River Basin. Agricultural land in Ada County is heavily dependent on irrigation, with this moisture playing a role in modifying the local climate to some extent.

During most winters periods of stormy and mild weather alternate. Most summers are dominated by a typical upland continental climate, with rainfall confined to occasional afternoon or evening thundershowers. Maximum temperatures of 100 degrees or higher occur nearly every summer. Annual precipitation ranges from about ten inches in the southwest to twenty-plus inches in the foothills north and east of Boise. Boise City averages about 12 inches of precipitation a year.

Transportation

Principal transportation routes are Interstate 84 and US Highways 20, 26, 30, which all traverse the county along the same four lane highway from southeast to northwest. Idaho State Highway 44 is a two-lane route that parallels I-84 from Boise to its connection with I-84 in Canyon County. Idaho State Highway 16 provides access north to Emmett and State Highway 55 provides access north to Horseshoe Bend and Valley County. Idaho Highway 21 provides access to the central mountains via Idaho City and Stanley.



Definitions

Hazard – is a dangerous event or circumstance that has the potential to lead to an emergency or disaster.

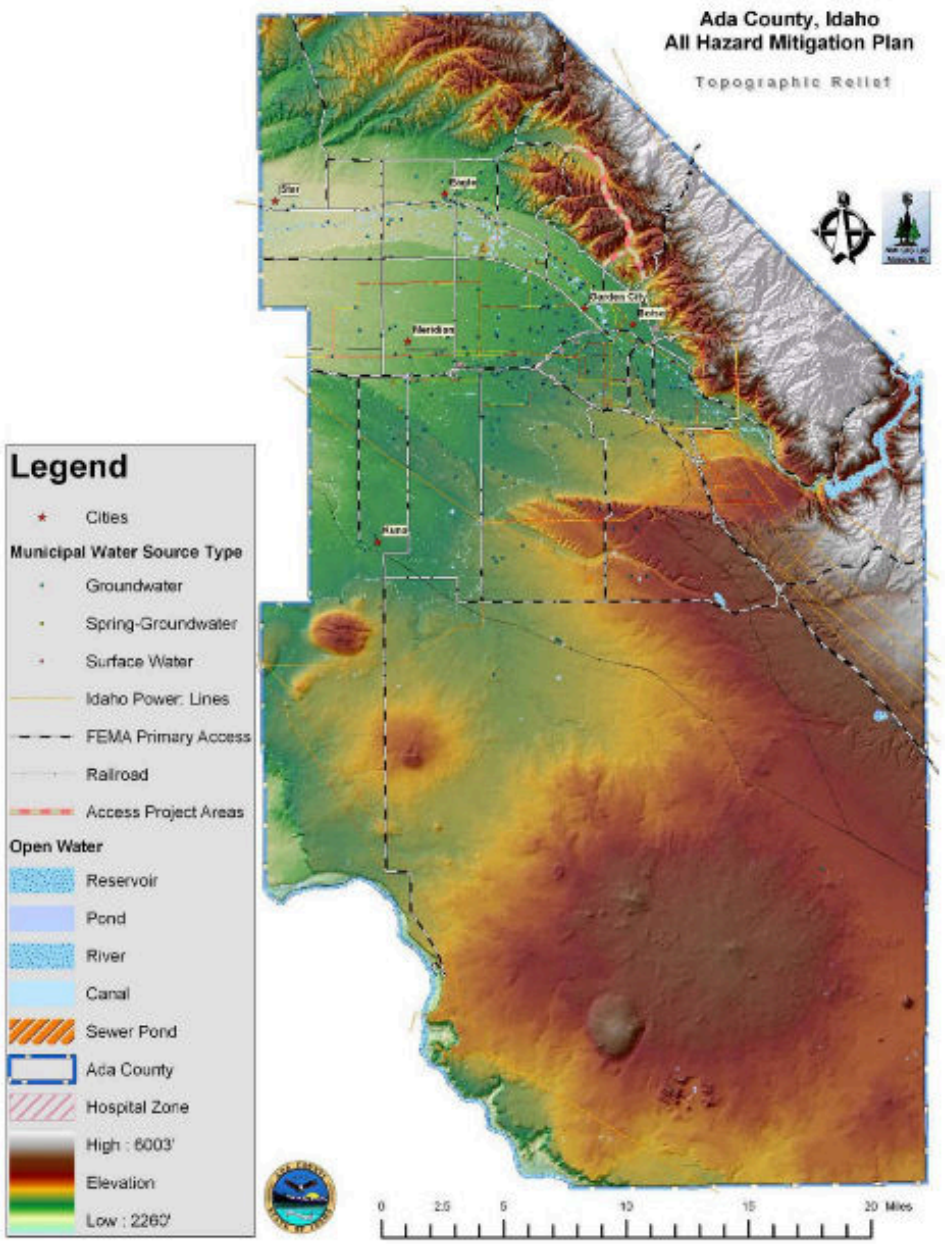
Vulnerability – is the susceptibility of life, property, or the environment to damage if a hazard occurs.

Risk – is the probability of suffering those damages. For hazards in this document risk will be assigned as one of four levels:

- very low
- low
- medium
- high

Websites:
http://www.adaweb.net/
http://idaho.gov/aboutidaho/county/ada.html
http://www.accem.org

Topographic Relief of Ada County



DAM FAILURE

A dam is a barrier across flowing water that obstructs, directs or slows down the flow, often creating a reservoir, lake or impoundments. There are about 80,000 dams in the United States today and the vast majority of them are earthen dams. About 95% of dams are privately owned. Other owners are state and local authorities, public utilities, and federal agencies. The Federal Emergency Management Agency (FEMA) defines dam failure as: a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release.

When full, dams are subject to unimaginable pressures from water in the reservoirs behind them. Dam collapse can occur from too much rainfall and melted snow, earthquakes, engineering or construction mistakes, inadequate maintenance, and a variety of other causes. Regardless of the reason, when a dam collapses huge quantities of water rush downstream with great destructive force. Thousands of people have been injured, many killed and billions of dollars of property damaged by dam failures in the United States.

Dams are generally classified in one of three categories which identify the potential hazard to life and property should a failure occur.

- High Hazard – Where a dam's failure would most probably result in the loss of lives and extensive property damage.
- Moderate Hazard – Where failure could possibly result in the loss of life and appreciable property damage.
- Low Hazard – Where failure results in only minimal property damage.

It must be remembered that *high hazard* does not mean that a dam is in any way unsound, only that loss of life and property damage would likely result from failure. Also, the hazard classification assigned to a dam can change over time. For example, a low hazard dam built 30 years ago may now be high hazard because of development downstream since its construction.

A dam failure may occur with or without warning. However dam failure without warning, while possible, is very rare. The Federal Dam Safety Act and Idaho law require examination of dams, identification of needed repairs, and preparation of inundation studies in the event of failure. Dams ten feet or higher or which store more than 50 acre-feet of water are regulated by the Idaho Department of Water Resources.

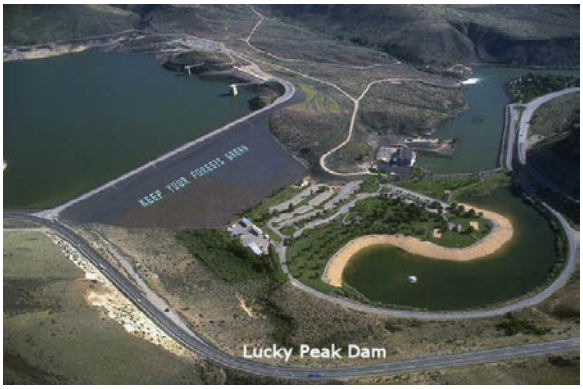
Dam failures pose a serious threat to many communities located downstream from major dams. Reasons for dam failures include:

- Overtopping – 34% of all failures nationally
    - Inadequate spillway design
    - Debris blockage of spillway
    - Settlement of dam crest
- Foundation defects – 30% of all failures nationally
    - Differential settlement
    - Sliding and slope instability
    - High uplift pressures

    - Uncontrolled foundation seepage
- Piping and seepage – 20% of all failures nationally
    - Internal erosion through a dam caused by seepage "piping"
    - Seepage and erosion along hydraulic structures such as the Outlet
    - Conduits or spillways, or leakage through animal burrows
    - Cracks in dam
- Conduits and valves – 10% of all failures nationally
    - Piping of embankment material into conduit through joints or cracks
- Other – 6% of all failures nationally

Boise River Dams

There are three large dams on the Boise River: Lucky Peak, Arrowrock, and Anderson Ranch. These reservoirs have a combined total storage capacity of approximately one million acre-feet. The reservoirs are used to control water flowing in the Boise River for irrigation, flood control, power generation, recreation, and fish and wildlife purposes. It is likely that failure of Anderson Ranch or Arrowrock Dam would result in failure of Lucky Peak Dam.



Anderson Ranch Dam. Anderson Ranch Dam is located on the South Fork of the Boise River in Elmore County, about 45 miles southeast of Boise. This is the largest dam on the river and has a storage capacity of approximately 493,000 acre-feet. This earthen dam is owned and operated by the US Bureau of Reclamation. Anderson Ranch Dam was completed in 1950.

Arrowrock Dam. Arrowrock Dam is the middle dam of the system and is located approximately 22 miles east of Boise on the Elmore-Boise County boundary. It has a storage capacity of about 286,000 acre-feet. This dam is owned and operated by the US Bureau of Reclamation. Arrowrock Dam is a concrete-arch dam. It was completed in 1916 and raised another five feet in 1937.

Lucky Peak Dam. Lucky Peak Dam, the lowest of the three major dams, is located about nine miles southeast of Boise. Storage capacity of this dam is about 307,000 acre-feet. This dam is owned and operated by the US Army Corps of Engineers. Lucky Peak Dam is an earthen dam that was completed in 1955.

Snake River Dams

From Ada County upstream there are five large dams on the Snake River. From west to east they are: Swan Falls, CJ Strike, Minidoka, American Falls, and Palisades. The three easternmost dams are of interest because of the effect they would have on CJ Strike and Swan Falls dams should they fail. However it would be many hours before floodwaters arrived and this should allow time to warn and evacuate the area.

CJ Strike Dam. CJ Strike is located on the Snake River approximately 75 miles south of Boise. It is owned and operated by Idaho Power and has a storage capacity of 250,000 acre-feet. CJ Strike is an earthen dam completed in 1952.

Swan Falls Dam. Swan Falls Dam is located on the Snake River about 40 miles south of Boise. Idaho Power owns and operates this dam which has a storage capacity of 7,500 acre-feet. Swan Falls Dam is a concrete gravity dam that was completed in 1925. Steep basalt walls surround the Swan Falls reservoir.

Other Dams

Aikman Dam. This dam is located on Willow Creek in Gem County about 16 miles northwest of Boise. This dam has a storage capacity of 2,150 acre-feet. This earth dam was completed in 1999.

Barber Dam. Barber Dam is located on the Boise River approximately three miles east of the City of Boise. This dam is basically a run-of-river control structure with negligible active storage of around 180 acre-feet. Barber Dam was completed in 1906 and is a timber-crib dam.


Boise Diversion Dam

Blacks Creek Dam. This dam is located on Blacks Creek about 10 miles southeast of Boise. The storage capacity of this dam is just over 3,600 acre-feet. Blacks Creek Dam was completed in 1905 and is an earth dam.

Boise River Diversion Dam. This dam is located on the Boise River about seven miles southeast of Boise. It has a storage capacity of 1,200 acre-feet. This dam was built primarily to divert water into the New York Canal and Penitentiary Canal. This concrete-rubble dam was completed in 1908.


Hubbard Dam

Hubbard Dam. Hubbard Dam is located approximately eight miles southwest of Boise on an unnamed tributary of Mason Creek. The New York Canal supplies water to this dam, which has a capacity of about 570 acre-feet. Hubbard Dam is an earthen dam completed in 1902.

Indian Creek Dam. This dam (also known as Orchard Dam) is located about 14 miles southeast of Boise on Indian Creek. It has a storage capacity of about 2,435 acre-feet. This earth dam was completed in 1903.

There are a few other small impoundments in the county, but none have very much storage capacity. Of these smaller dams only Barber Dam has a system for prompt warning of failure.

Vulnerability

Since the year 2000 more than 45 dam failures have been documented throughout the US.

- Anderson Ranch Dam. Failure of Anderson Ranch Dam would flood the entire river canyon down to Arrowrock Dam.
- Arrowrock Dam. Failure of Arrowrock Dam would flood the river canyon down to Lucky Peak Dam.
- Lucky Peak Dam. A worst case failure of Lucky Peak Dam would inundate the area between Hill Road in the north and the Boise Depot on the south bench. It would require the evacuation of all low-lying areas in Boise and virtually all of Garden City, Eagle, and Star, as well as cities further downstream. City and county governments in the pathway would have to relocate. Property damage would be massive. In addition, following a major dam failure utilities such as electricity, water, sewer, telephone, the Internet, cell towers and other communications equipment would be disrupted for a prolonged period and would affect people beyond the immediate inundation area. Bridges and roads near the river would also be damaged or destroyed. The farther downstream a location is, the more time they would have to evacuate and take other protective actions.
- CJ Strike Dam. A failure of CJ Strike Dam would cause flooding along the Snake River downstream to the headwaters of the Brownlee Reservoir. Grand View, Swan Falls and other populated areas downstream would have to be evacuated, as well as recreationists within the canyon. Numerous highway and railroad bridges across the Snake River would most likely be severely damaged or destroyed. The impact upon the power grid caused by failure of either CJ Strike or Swan Falls dam is difficult to determine because of the varying size and number of dams on the Snake River.
- Swan Falls Dam. Floodwaters from a failure of Swan Falls Dam would be contained within the canyon walls for about ten miles downstream until the valley widens. Populated areas downstream would have to be evacuated, as well as recreationists within the canyon.
- Aikman Dam. Failure of this dam would primarily affect residents along Willow Creek in Gem, Ada, and Canyon counties.
- Barber Dam. Failure of Barber Dam should not exceed the 100-year flood; however people recreating immediately below the dam may be at risk and failure may cause damage downstream as a result of released sediment.
- Blacks Creek Dam. Failure of this dam would primarily affect residents along Ten Mile Creek and the Idaho State Penitentiary wastewater pond.
- Boise Diversion Dam. Failure of this dam would likely be contained by the river channel; therefore the population at risk would be recreationists.
- Hubbard Dam. Failure of Hubbard Dam may cause some damage to agricultural lands and any residences along Mason Creek.
- Indian Creek Dam. Failure of this dam would mostly affect undeveloped land and a subdivision about eight miles away.

Risk.
For Anderson Ranch Dam, Arrowrock Dam, Lucky Peak Dam, CJ Strike Dam, and Swan Falls Dam the risk is: very low.

For all other dams the risk is: low.

History
May 1991, Kirby Dam near Atlanta Idaho, collapsed cutting off electrical power to residents and dumping arsenic, mercury and cadmium into the Middle Fork of the Boise River.

November 5, 1977, Kelly Barnes Dam, Toccoa Falls, Georgia, was an earthen dam in Stephens County, Georgia. It collapsed after a period of heavy rainfall and the resulting flood killed 39 students and college staff, and caused $2.5 million in damages.

July 19-20, 1977, Laurel Run, near Johnstown, Pennsylvania. Laurel Run Dam, a 42 foot high dam, failed killing over 40 people and causing $5.3 million in damages, including six houses destroyed and 19 homes damaged.

June 5, 1976, Teton Dam, 44 miles northeast of Idaho Falls in southeastern Idaho. This dam failed on the initial pool-fill, releasing about 300,000 acre-feet of water which flooded towns and farmland downstream. The floodwaters killed eleven people, 13,000 head of livestock, forced thousands to evacuate, and caused more than $1 billion in damages. The dam breached when piping caused the embankment to fail.

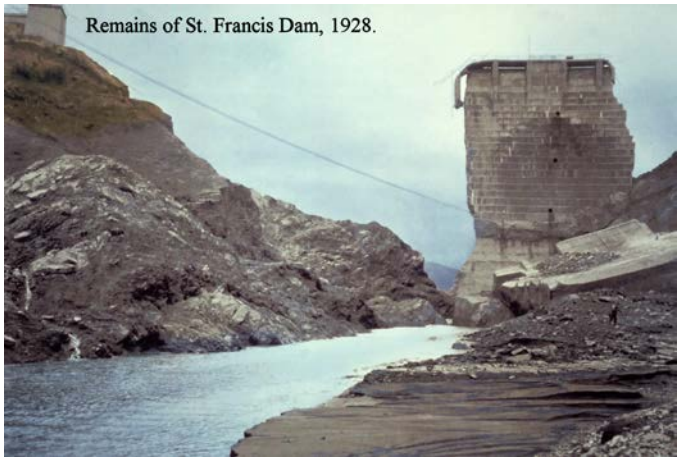
June 9, 1972, Canyon Lake Dam, Rapid City, South Dakota. During a 500-year rain event that had already killed many people Canyon Lake Dam collapsed. Out of a total of 237 people killed

perhaps 33 were killed from dam failure. Total damage was estimated at $60-164 million, 3,000 people were injured. Cause of the failure was overtopping of the 34-year-old earthen dam.

February 26, 1972, Buffalo Creek Dams, Logan County, West Virginia. The flood occurred when the Pittston Coal Company's coal slurry impoundment dams, located on a hillside, burst. The resulting flood unleashed approximately 132 million gallons of black waste water, cresting over 30ft high, upon the residents of 16 coal mining hamlets in Buffalo Creek Hollow. Out of a population of 5,000, 125 people were killed, $400 million in damages, 546 houses destroyed, 538 houses damaged, 4000 people left homeless.

June 8, 1964, Swift Irrigation Dam, Marias River tributary, Swift, Montana (Birch Creek Valley, northwest Montana) 19 people killed. Cause unknown.

April 13, 1945, Wewoka Dam Wewoka, Oklahoma. On April 13-14 about 14.6 inches of rain at Seminole. 8 dead(?), 80 people forced from homes, town under 4' of water.


Remains of St. Francis Dam, 1928.

March 12, 1928, St. Francis Dam, California. The dam was located 40 miles northwest of Los Angeles, near the present city of Santa Clarita. Although it was inspected at noon on the same day, three minutes before midnight on March 12, 1928, the dam failed catastrophically, killing somewhere between 450 and over 600 people. It also caused more than $5.5 million in damages: 1,240 homes & other buildings destroyed; 23,500 acres of farmland flooded; 4 railroad bridges, 8 miles of railroad track, unknown miles of roads; 10 bridges. Most likely cause: instability of underlying soil. This collapse is probably the worst US engineering failure, in terms of loss of life, in the last 125 years.

August 2, 1916, Unnamed (maybe John Thompson's Mill Dam) on Barren Creek in Claiborne County, Tennessee. The dam broke following nine inches of rainfall in five hours, sending a wall of water 25 feet high crashing down the river. 24-28 lives lost in flood, number related to dam failure unknown. Many houses, mills, other buildings, crops, and livestock destroyed, railroad damaged. More than $30,000 in property damage (possibly $50,000 to $100,000).

Sept. 30, 1911, Bayless Pulp & Paper Mill, Austin, Pennsylvania. 88 dead. Practically without any warning the people of Austin were caught in the flood and drown, fire added to the destruction wrought by the waters.

January 21, 1916, Lower Otay, near San Diego, California. 30 dead. Overtopping, failed on first filling. Cause: inadequate spillway capacity.

April 6, 1900, Austin Dam, Austin, Texas. In 1900, a dam at the site of what is now Tom Miller Dam, which forms Lake Austin, gave way. Seven to 10 people -- accounts vary -- were killed while watching the flood from a hydroelectric powerhouse atop the dam. The powerhouse was also destroyed.

May 31, 1889, South Fork Dam, Johnstown, Pennsylvania. This dam was a 37 year old earthen embankment, originally built as part of the Pennsylvania Canal System and later bought by the exclusive South Fork Fishing & Hunting Club as a recreational lake. The dam, 14 miles upstream from the city, had a deficient outlet and spillway and had been improperly maintained. Very heavy rains, estimated at 6-10 inches in 24 hours, caused the dam to be overtopped and washed out. The failure unleashed 20 million tons of water in a 30-40 ft-high flood wave (which had reached a peak height of 89'), traveling at speeds between 20-40 mph. It took 57 minutes to hit Johnstown; within another 10 minutes almost the entire city was destroyed. 2209 people were killed (more than 1 in every 5 residents of Johnstown). The victims included 99 entire families, 396 children under the age of 10, and 755 unidentified victims. It caused $17 million in damages; almost the entire city was destroyed (1600 homes, 280 businesses demolished). Cause: overtopping.

May 16, 1874, Mill River, on the Connecticut River, Williamsburg, Massachusetts. The failure killed 139 people (incl. 43 children under age of 10) and destroyed factories and 740 homes in Williamsburg, Leeds, Skinnerville, and Haydenville. Cause: faulty construction.

Websites:
http://www.jaha.org/FloodMuseum/history.html
http://www.idwr.idaho.gov/WaterManagement/StreamsDams/DamSafety/dams.htm
http://www.fema.gov/hazard/damfailure/index.shtm

DROUGHT

A drought is a period of unusually persistent dry weather that lasts long enough to cause serious problems such as crop damage and/or water supply shortages. Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size and location of the affected area.

Droughts result from long-term shifts in storm tracks away from the affected region, or persistent wind patterns that reduce the flow of moisture into a region. Often, "blocking weather patterns" that feature persistent, stationary high-pressure regions over an affected area are observed with droughts.

There are actually four different ways that drought can be defined.

- Meteorological - a measure of departure of precipitation from normal. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- Agricultural - refers to a situation where the amount of moisture in the soil no longer meets the needs of a particular crop.
- Hydrological - occurs when surface and subsurface water supplies are below normal.
- Socioeconomic - refers to the situation that occurs when physical water shortages begin to affect people.

Vulnerability

Ada County has the third largest number of farms in Idaho, with 1,220 farms. Crop lands in Ada County are mostly irrigated. Prolonged drought – two winters of below normal precipitation combined with extreme summer heat - may cause reduced irrigation water allocations and some crop loss.

Dry cropland along the eastern county line would suffer severe crop reduction in a drought year. Dry land farming is cyclic and risky, so modest drought is taken into account in farm planning.

The rangelands and some trees on public lands suffer severe distress during long hot spells. Reduced forage growth may result in premature withdrawal of livestock from the range with an eventual sharp increase in forage expense.

The greatest danger from drought is wildfires, which will be discussed in another section. The loss of even small amounts of forage and threats to adjacent crops and farm structures can have a devastating effect on individual ranchers and farmers.

Some degree of drought occurs about two years out of five. Drought can cause a reduction in income for individual ranchers, but has not reached catastrophic proportions within the local agricultural community.

Southern Idaho is an arid area with long periods of drought. In Ada County drought is generally associated with a sustained period of low winter snowfall. Although deaths and injuries are rarely a direct outcome, persistent droughts can have significant impacts on the economic, environmental, and social well-being of Ada County residents.

Risk
Risk of drought is: moderate.

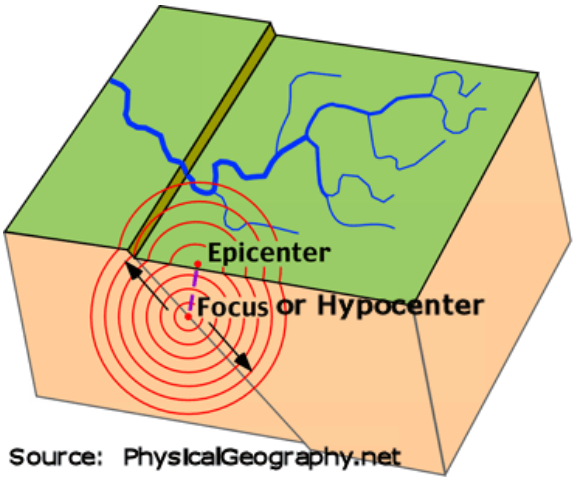
History
In 2005 the County Commissioners declared a drought in Ada County. In southwestern and central Idaho, the six year drought from 1987-1992 was more severe than the 1930s drought.

Idaho Department of Water Resources reports that drought conditions existed in the state approximately 30% of the time during the period 1931-1982. Drought in Idaho, indicated by stream flow records, occurred during 1929-41, 1944-45, 1959-61, 1977, and 1987-92. In 1977 water shortages around Idaho resulted in a federal drought declaration. The most prolonged drought in Idaho was during the dustbowl years of the 1930s.

Websites:
http://www.drought.unl.edu/dm/DM_west.htm
http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/nadm-map.html
http://www.nwrfc.noaa.gov/westernwater/
http://www.noaawatch.gov/themes/droughts.php
http://www.drought.gov/

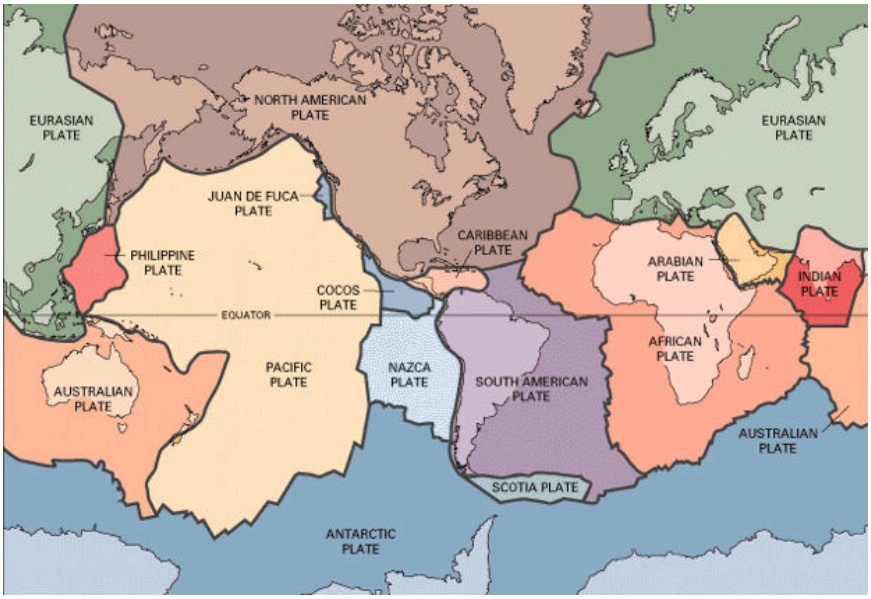
EARTHQUAKE

An earthquake is a sudden movement of the earth's crust caused by the release of stress accumulated along geologic faults or by volcanic activity. Earthquakes strike without warning and they can occur at any time of the day or any time of the year. In addition, a powerful earthquake may be felt over great distances, even many thousands of square miles. An earthquake's point of initial rupture is called its hypocenter. The term epicenter refers to the point at ground level directly above the hypocenter.



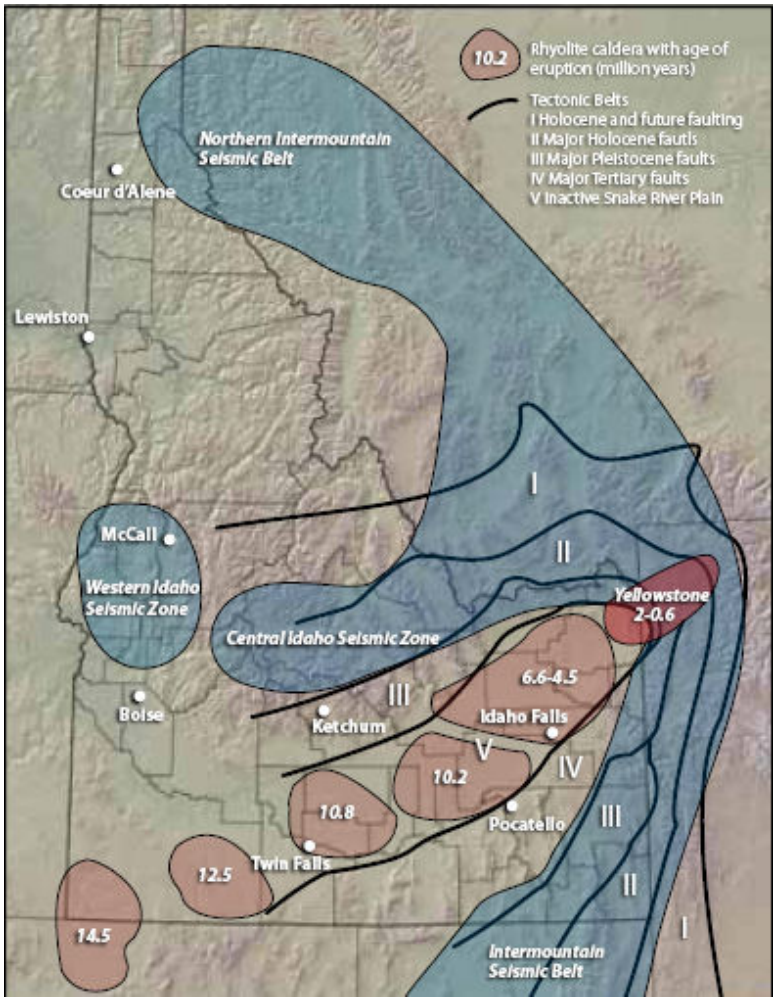
More than 30,000 earthquakes that are strong enough to be felt occur worldwide annually. Most of these are minor tremors and do very little damage. Only about 75 significant earthquakes take place each year, and many of these occur in remote regions. Occasionally, however, a large earthquake occurs near a large population center. Under these conditions, an earthquake is among the most destructive natural forces.

According to the Theory of Plate Tectonics the earth's crust may be thought of as a jigsaw puzzle of large and small plates that move relative to one another as they ride atop the hotter, more mobile material of the mantle. There are eight major and many minor plates. The plates move at an average rate of 2-3 centimeters per year. Most of the earth's earthquakes and volcanic activity take place along the edges of the plates where they collide, move apart or slide past one another.



Idaho is not on a plate boundary, but many faults in the state can produce large earthquakes. A fault is a fracture in rock strata that, together with movement, displaces the sides relative to one another. Tectonic forces within the western part of the North American Plate combine with high heat flow from the underlying mantle to stretch the crust in a northeast-southwest direction. In response to this stretching, the rigid crust breaks and shifts along faults, and the fault movement produces earthquakes. Faults are classified as active or inactive. Generally faults are considered

to be active if they have moved one or more times in the last 10,000 years. Active faults are likely to have another earthquake sometime in the future.



Other Idaho earthquakes may be caused by the extremely active geological hotspot beneath Yellowstone National Park. The North American Plate has been moving southwesterly across a stationary mantle hotspot at a rate of about 2 centimeters per year for the last 16.5 million years. During that time massive eruptions left immense craters along the landscape from the Nevada-Oregon border, along Idaho's Snake River Plain, to the Yellowstone area which now sits atop this hotspot. Yellowstone's thermal activity is evidenced by its geysers, hot springs, fumaroles (steam vents), and mudpots. Although less obvious, the Yellowstone Hotspot is also the source of 1,000 to 3,000 earthquakes a year, many of which are felt in Idaho.

Ada County is situated near two fault zones, the Western Idaho Fault System and the Owyhee Mountains Fault System. The Squaw Creek, Big Flat, and Jakes Creek faults are active structures that are near Emmett, about 25 miles north of Boise. The most important of these, the Squaw Creek fault, has geologic evidence for movement as recently as 7,600 years ago. About 57 miles southeast of Boise and 13 miles from Grand View is the Water Tank Fault. Only discovered in 1997, this fault was active as recently as 3,000 years ago. Numerous other faults are present in and around Ada County but these faults do not appear to be active.

Measuring Earthquakes

Earthquakes are measured in two ways; one determines power, the other describes the physical effects. The Moment Magnitude Scale (abbreviated as MMS) is used by seismologists to measure the size of earthquakes in terms of the energy released. The scale was developed in the 1970s to succeed the 1930s-era Richter Magnitude Scale. Even though the formulae are different, the new scale retains the familiar continuum of magnitude values defined by the older one. The MMS is now the scale used to estimate magnitudes for all modern large earthquakes by the United States Geological Survey. Like the Richter scale, the MMS is logarithmic; on the scale, an earthquake one number higher is approximately thirty-one times more powerful (for

example, a 7.0 is about thirty-one times the power of 6.0, or more than 950 times the power of a 5.0).

However the Moment Magnitude scale does not describe and classify the damage an earthquake causes. The damage we see from earthquake shaking is due to several factors including: energy released (magnitude), distance from the epicenter, and local soil types. A more useful measure of earthquake shaking is the Modified Mercalli Intensity Scale. Whereas Magnitude is measured by machines, Intensity is evaluated by people's reactions to events and observed damage to structures and possessions.

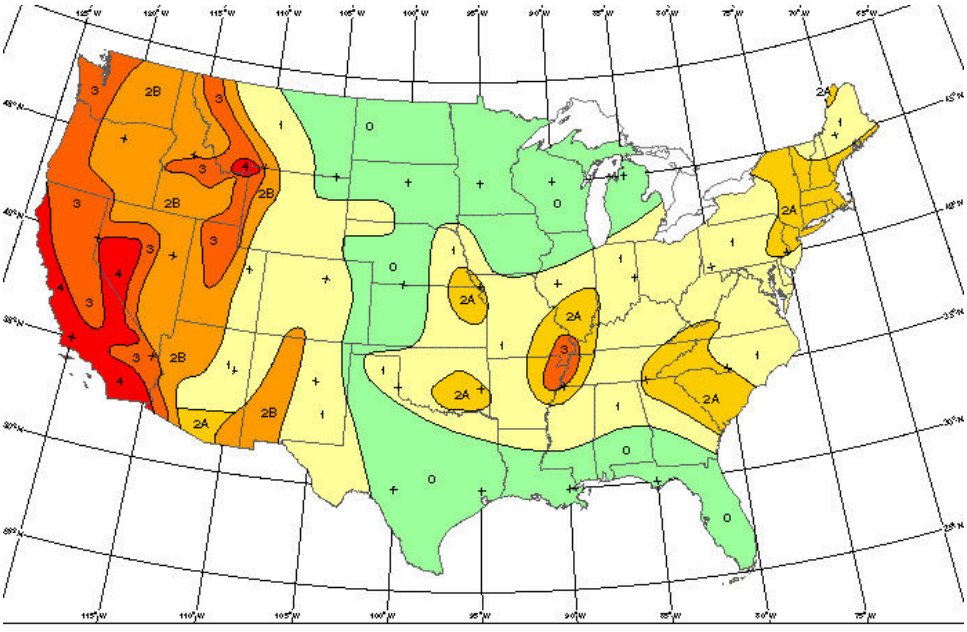
The Modified Mercalli Intensity Scale

The Mercalli Intensity Scale is the basis for the U.S. evaluation of seismic intensity. Unlike earthquake magnitude, which indicates the energy a quake expends, intensity denotes how strongly an earthquake affects a specific place. It has 12 divisions, using Roman numerals from I to XII:

I. Not felt except by a very few under especially favorable circumstances.
II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing truck. Duration estimated.
IV. During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, and doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motorcars rock noticeably.
V. Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction slight to moderate in well built ordinary structures; considerable in poorly built or badly designed structures. Some chimneys broken. Noticed by persons driving motor cars.
VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed over banks.
XI. Few, if any (masonry), structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII. Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

Vulnerability

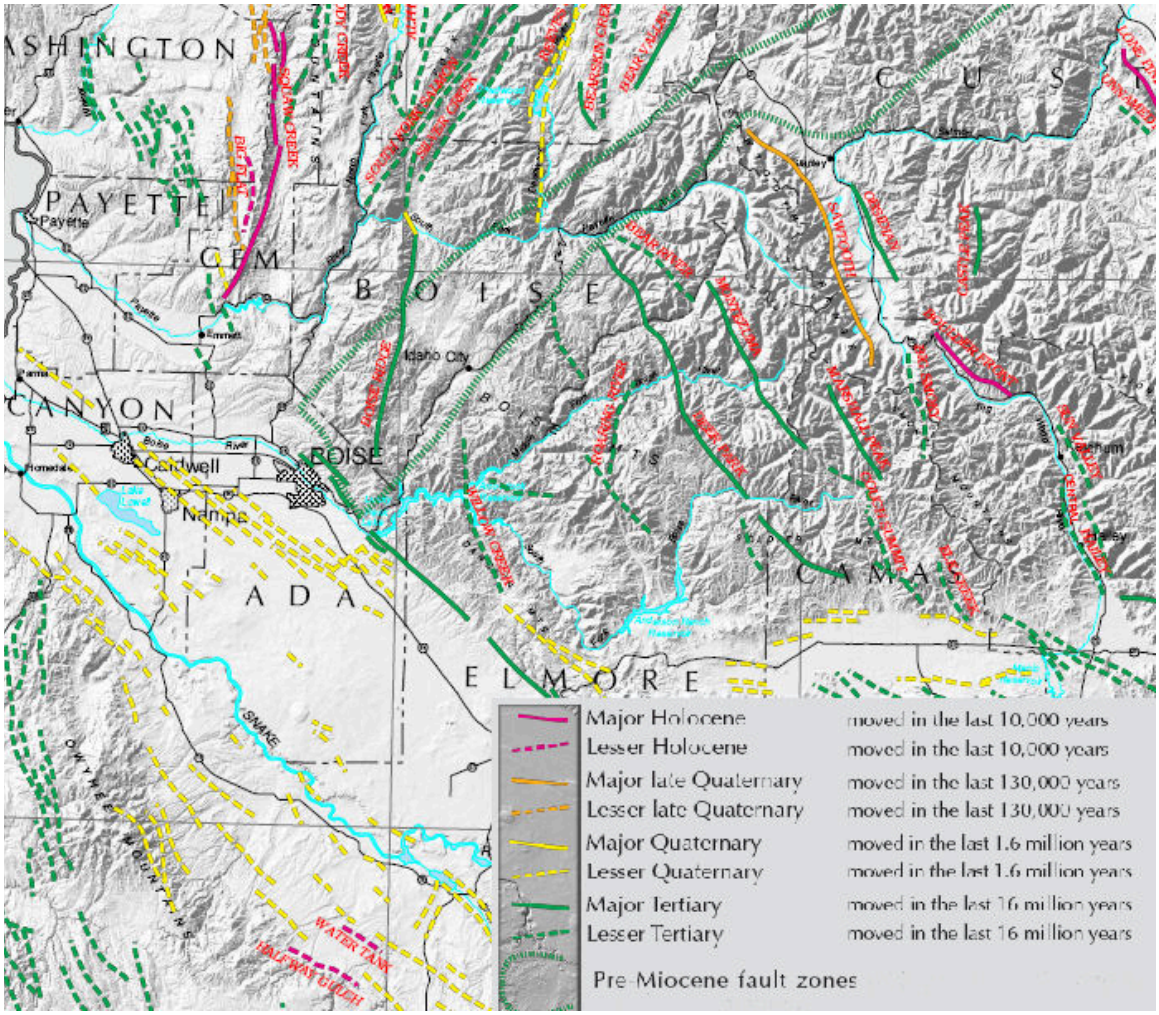
Since 1988 all buildings in Idaho have been required to conform to the Uniform Building Code (UBC). The UBC designates different earthquake hazard zones (Zones 0-4), and within each zone different building design and construction features are required to ensure



1994 Uniform Building Code zone map. Zones are identified by the numbers from 0 to 4.

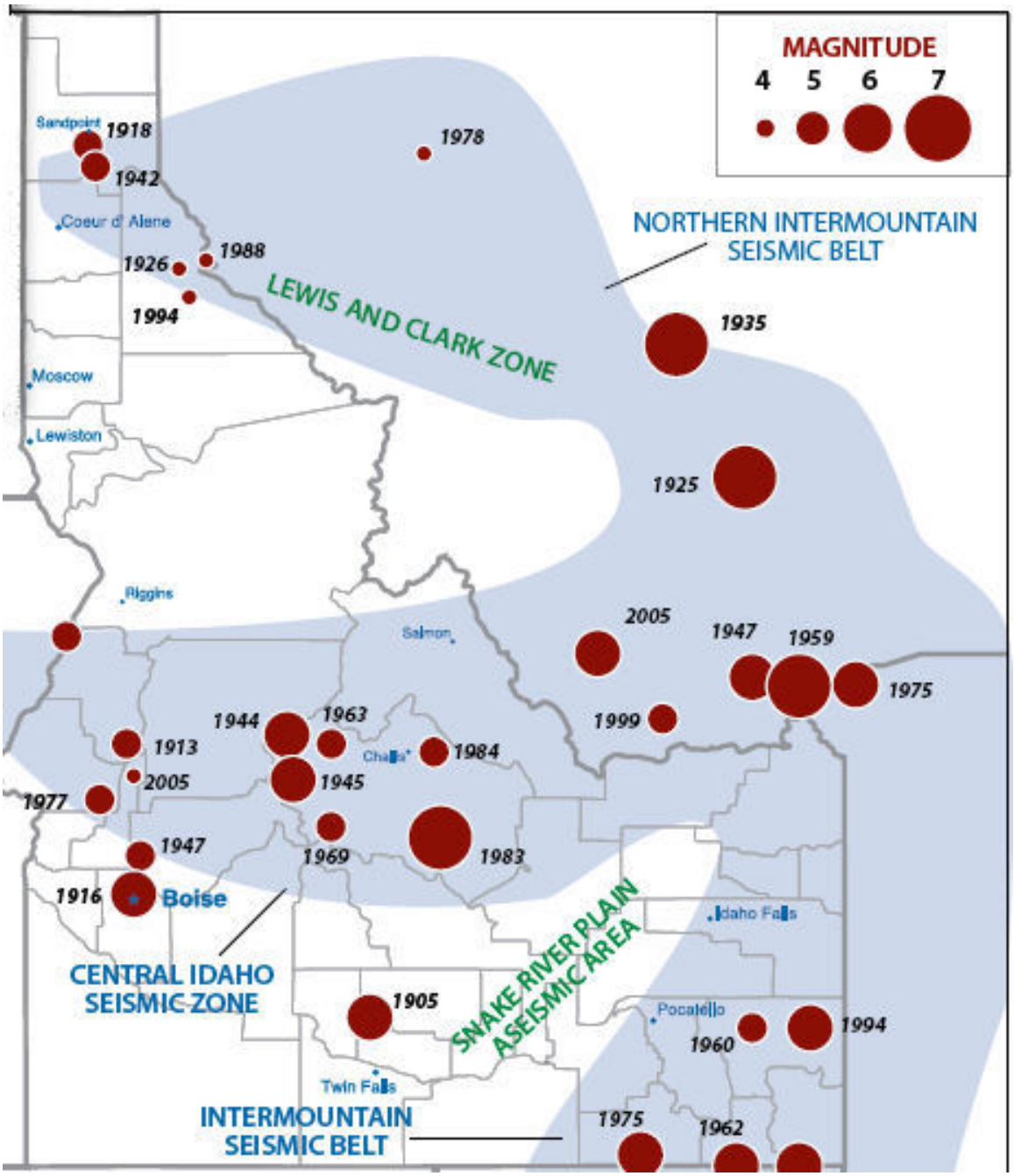
earthquake resistance. The UBC seismic zone ranking for Ada County is: 2b – moderate.

Some areas in Idaho are ranked: 3 – high. In general, buildings constructed prior to 1988 did not give much consideration to seismic factors. Older multistory structures and unreinforced masonry buildings may sustain considerable damage or even collapse during a moderate to severe earthquake. However the structural elements of many older buildings can be reinforced to reduce their earthquake vulnerability.



Ada County could incur serious damage and disruption of normal activity for some period of time. There are really no formulas to estimate damage. Areas of high vulnerability are:

Boise Front and Foothills including all hilltop and hillside development. The earth structure in this area is a sand or gravel type loam over sandstone or other relatively solid rock formation. This is a questionable soil structure if subjected to severe movement. Slides, liquefaction and subsidence are all possibilities. Slope failures would interrupt utilities and road access to some areas and consequently delay or reduce emergency response.



Downtown Boise can expect some structural failure of older multistory buildings. Cornices, friezes and other heavy decorative portions of these structures may fail. Brick veneer exteriors may collapse and utility interruption should be expected. In some cases whole structures may collapse. Vehicular travel may be very difficult and congestion could prevent timely emergency response.

South Bench and Rural Ada County will run the risk of soil failures, structural damage and utility interruptions. Traffic should move more freely in this area but there is a fair risk of blockage of the Interstate due to overpass failure.

Risk
Earthquake risk is: low.

History
According to a study conducted by the United States Geological Survey in 2003, Idaho ranked 6th highest in terms of earthquake activity greater than magnitude 3.5. Earthquakes have affected Ada County on a random periodic basis since the first records were kept in the area. The earthquake history of the area, although less frequent than some other natural hazards, is pronounced. Listed below are some notable earthquakes that have affected Ada County.

February 21, 2008. Magnitude 6.0, Intensity VIII
At Wells, Nevada three people were injured, more than 20 buildings heavily damaged, almost 700 buildings slightly damaged and a water main broken. Felt Intensity VI at Wells, with maximum intensity VIII in the Historic District. Many Ada County residents noticed the ground shaking, although damage was almost non-existent. The earthquake was felt in much of Idaho and Nevada, in southeastern Oregon and northwestern Utah, in parts of California, Wyoming, and Washington.

October 28, 1983. Magnitude 6.9, Intensity IX
The Borah Peak earthquake is the largest ever recorded in Idaho – both in terms of magnitude and in amount of property damage. It caused two deaths in Challis, about 125 miles northeast of Boise, and an estimated $12.5 million in damage in the Challis-Mackay area. A maximum Intensity IX was assigned to this earthquake on the basis of surface faulting. Vibrational damage to structure was assigned intensities in the VI to VII range. Although felt in Ada County no significant damage was attributed to the quake. Aftershocks occurred through 1983. Also felt in parts in Montana, Nevada, Oregon, Utah, Washington, Wyoming, and in the Provinces of Alberta, British Columbia, and Saskatchewan, Canada.

August 18, 1959. Magnitude 7.5, Intensity X
This Montana-centered earthquake caused 28 fatalities and about $11 million in damage to highways and timber. The most spectacular and disastrous effect of the quake was the huge avalanche of rock and soil that cascaded down into the Madison River Canyon and blocked the flow of the river, creating Earthquake Lake. Most of the deaths were caused by rockslides that covered the Rock Creek public campground on the Madison River below Hebgen Dam. Felt in nine Western States and three Canadian Provinces. Large aftershocks continued for several months. Ada County residents reported some broken dishes and cracked plaster.

September 24, 1947. Magnitude 4.7, Intensity VI
This earthquake with an epicenter in Idaho's Salmon River Mountains northeast of Boise caused slight damage. Cracks appeared in a brick building in Boise.

July 12, 1944. Magnitude 6.1, Intensity VII
This earthquake apparently was most severe near Sheep Mountain, in southwest Idaho, where buildings were shaken so severely that occupants thought the structures were falling apart. A new cabin set on concrete piers was displaced on its foundation. This shock was felt over 70,000

square miles, including all of central Idaho, and parts of Washington, Oregon, and Montana. Seventeen shocks were reported felt, the first of which was the strongest.

May 12, 1916. Magnitude 6.1
Earthquake centered near Cascade shook Boise with enough force to tipple chimneys, shake elevators and buildings, and send people into the streets. Reclamation ditches were damaged and the flow of natural gas altered. This quake was felt from Anaconda Montana to Reno Nevada, an area of over 50,000 square miles.

Other Recent Earthquakes
February 27, 2010. Near Santiago Chile, magnitude 8.8, death toll exceeded 800 people.

January 12, 2010. Centered 16 miles west of Port-au-Prince, Haiti, magnitude 7.0, death toll exceeded 220,000.

May 12, 2008. Sichuan, China, magnitude 7.9, more than 87,000 dead.

October 8, 2005. Pakistan, magnitude 7.6, over 73,000 dead.

December 26, 2004. Known as the Sumatra-Andaman earthquake, this was an undersea megathrust earthquake of magnitude 9.3, the second largest earthquake ever recorded on a seismograph. It triggered a series of devastating tsunamis along the coasts of countries bordering the Indian Ocean, killing nearly 230,000 people in fourteen countries, and inundating coastal communities with waves up to 100 feet high. It was one of the deadliest natural disasters in recorded history.

December 26, 2003. Bam, Iran. A magnitude 6.6 quake killed an estimated 26,000 people.

Websites:
http://earthquake.usgs.gov/earthquakes/
http://earthquake.usgs.gov/regional/neic/
http://www.fema.gov/hazard/earthquake/index.shtm
http://earthquake.usgs.gov/

Source: Much of the text information and some illustrations in this section are courtesy of the United States Geological Survey.

FLOOD

A flood is the inundation of a normally dry area caused by an increased water level in an established watercourse, such as a river or stream, or pooling of water at or near the point where the rain fell. In Ada County there are many potential sources of flooding.

Boise River

The Boise River is about 200 miles long, drains over 4,000 square miles, and flows generally from east to west. The watershed below Lucky Peak Dam is about 1,485 square miles and is composed of river bottoms, terraces, and low rolling to steep hills. The bottomland adjoining the main stream constitutes the floodplain and varies from one to three miles in width. Water gradient of the river in the stretch between Barber Dam and the Ada-Canyon County line is about 11.5 feet per mile.

The natural runoff of the Boise River usually consists of low flows from July through February, increasing flows during March, and high flows in April, May, and June. Occasionally this pattern is interrupted by high flows of short duration during the winter months caused by rainstorms.

There are several dams on the Boise River, but the principal ones are Anderson Ranch, Arrowrock, and Lucky Peak. These dams have greatly reduced the magnitude and frequency of Boise River floods. However, major floods still cannot be fully controlled.

In fact, the Boise River poses a frequent flood threat because water levels reach the bank-full stage of 6,500 cubic feet per second (cfs), virtually every year. This imposes some modest inconveniences and results in minor damage every time it happens. Damage is usually confined to minor inundation of the Boise River Greenbelt and rural agricultural lands, rechanneling, bank erosion and water damage to possessions left along the floodway. Government agencies monitor the river and slight added expenses are incurred.

Above 7,000 cfs, flooding becomes much more extensive, erosion is widespread, and substantial commitment must be made by government and private citizens. In 1983 (maximum flow 9,500 cfs) livestock had to be moved from pastures, newly seeded crops were lost, sandbagging was necessary to protect public and private property from the current, and water damage to buildings and possessions was common. Short term river flow increases do not seem to have nearly as much impact as those that last for weeks. Intermittent levees, normal banks, road grades, etc. erode far more rapidly when thoroughly saturated.

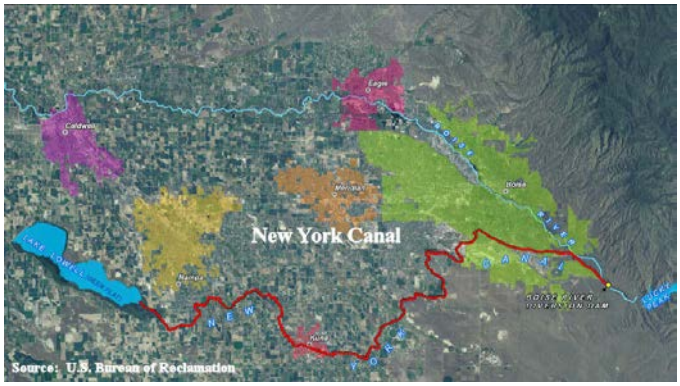
Any future flood above the 9,500 cfs level will multiply the expense to the community. As the river rises, the threat to utilities increases. Sewage movement and processing may be curtailed or completely stopped for sections of Boise and Garden City.

Information is available from the U.S. Geological Survey stream gage at Glenwood Bridge in Garden City. This gage record along with historical measurements upstream provides a means of evaluating and comparing stream flows back to January 1895.

- The greatest flood of known magnitude on the Boise River occurred June 14, 1896. Peak flow was estimated at 35,500 cubic feet per second.
- The second largest flood known on the Boise River occurred on April 19, 1897. Its peak discharge is estimated at 29,500 cubic feet per second.
- A recent large flood occurred in April 1943. This was the third largest flood on the Boise River. Peak flow was estimated at 21,000 cubic feet per second.
- The highest flow with existing flood control storage in the Boise River was 9,500 cubic feet per second in June 1983. The reservoirs were over 98% full when the inflow subsided in 1983 and normal regulation was resumed. Irrigation canals at maximum flow took 3,700 cubic feet per second from the total discharge or flooding would have been worse.

Canals

There are more than two dozen canals in Ada County; the largest is the New York Canal. They run through many residential neighborhoods as well as rural areas in the county. These canals draw water from the Boise River. Canal diversions generally occur from about the first day of April to the last day of October. This is the time of year when canals present the greatest flood threat.



Miscellaneous

Miscellaneous types of flooding that could occur include problems with water mains, water towers, sewers, fire hydrants, localized rain, etc. Miscellaneous flooding may occur anywhere in the county at any time of the year. Miscellaneous flooding is usually localized and not life threatening, although any flood has the potential to take life.

Snake River

The Snake River forms part of the southern boundary of Ada County, running approximately from Castle Butte in the east to Gaffey Butte in the west. The river flows east to west through a deep canyon bordered by high, steep hills. There is very little development along this part of the Snake River. The main residential area is near Swan Falls Dam. Depending on the time of year varying numbers of recreationists may be on the river.

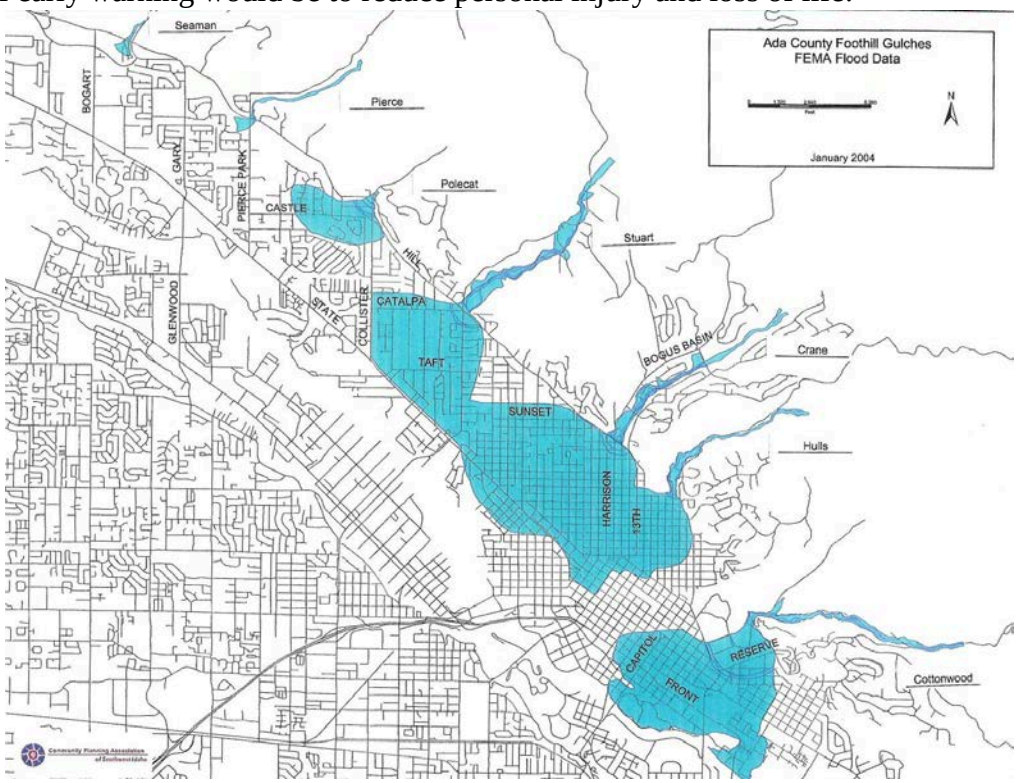
Tributaries

Aside from the Boise River more than two dozen streams flow through Ada County. Some sort of tributary flooding occurs three out of every five years.

The most hazardous streams in Ada County are the Boise River tributaries that have their headwaters in the Boise Foothills. The danger these streams present is flash flooding. A flash flood is a flood caused by heavy or excessive rainfall in a short period of time, generally less than six hours. These tributaries include: Seaman Gulch, Pierce Gulch, Polecat Gulch, Stuart Gulch, Crane Creek, Hulls Gulch, and Cottonwood Creek. These streams flow in a southwesterly direction and are dry most of the year. Only after periods of heavy rainfall or snowmelt do they have significant flows. Cottonwood Creek is the largest of these seven drainages and probably carries the greatest threat for extensive flash flooding.

- The largest flood in recent history from these foothills streams occurred on August 20, 1959, when Cottonwood Creek flooded inundating about 50 blocks in Boise and several hundred acres of farmland with water, rocks and mud.

Between August 26 and September 2, 1996, approximately 15,300 acres of the Boise Foothills were burned by the Eighth Street Fire. Following this fire a variety of treatments were applied in an effort to reduce the flood risk. The Cottonwood Creek ponds were enlarged, a 35 acre-feet catch basin was installed on Hulls Gulch, two small dams were built on Crane Gulch, and Bogus Basin Road was altered to act as a small dam on Stuart Gulch. In 1997 an outdoor warning system consisting of seven sirens was installed along the four burned drainages. The principal benefit of early warning would be to reduce personal injury and loss of life.



Precipitation normally varies from 12 inches in Boise to about 22 inches a year in the higher elevations. Both frontal storms and thunderstorms can be sufficiently heavy to cause flooding.

The maximum recorded 24-hour rainfall in Boise is 2.7 inches, although the maximum short duration rainfall is a rate of over four inches per hour. Peaks for both of these types of floods occur in a rather short time: from 15 minutes to several hours.

In addition to the seven drainages mentioned above there are many other streams in Ada County that may be subject to flooding or flash flooding. These include: Big Gulch Creek, Black's Creek, Bryans Creek, Corder Creek, Council Spring Creek, Current Creek, Dry Creek, Eightmile Creek, Fivemile Creek, Highland Valley Gulch, Indian Creek, Little Gulch Creek, Maynard Gulch, Ninemile Creek, Rabbit Creek, Sand Creek, Sheep Creek, Spring Valley Creek, Tenmile Creek, Threemile Creek, Warm Springs Creek, and Willow Creek. The majority of these streams are dry most of the year, nevertheless the flash flood potential remains.

Agricultural lands, which are changing to residential areas, have experienced periodic flooding. The situation usually occurs in winter with deeply frozen soils, frozen small waterways (some natural, some surplus irrigation water recovery channels), and rain on snow or just rain alone.

The change in evaluation is usually small across these one mile sections. Agricultural irrigation and drainage patterns have been disturbed or no longer function due to street layout, structural obstructions, and poorly planned reshaping of the land.

Since each section is bordered on all four sides by elevated roadways, each becomes a potential flood zone of its own. Reasons vary from reduction in permeable surface areas to clogged channels trying to carry far more than designed drainage. Some cases have been caused by weed, cattail, and debris that have clogged channels, which trap ice fragments released from frozen surfaces along the waterway.

In 2005 the Homestead wildfire burned approximately 75% of the Council Spring Creek watershed (formerly known as Squaw Creek). This may increase the potential of a flash flood for some years.

Vulnerability

Some important changes have taken place in recent years which affect flooding along the Boise River. One critical development is that the river's ability to carry a flood has been significantly reduced as a result of siltation. The buildup of silt is the result of controlled water flows on the river. Before the upstream dams regulated flows, spring runoff flushed and scoured the river channel. Since the large dams went into operation the capacity of the river has been gradually reduced. Other factors that affect flooding on the Boise River include the proliferation of plant growth and the construction of homes and other structures in or near the floodway.

There are several types of flood threats posed by canals. The first type is through a break or breach in the canal. This has the potential for significant flooding, especially if the canal is elevated or located on a hillside. Another possibility would be from an obstruction in a canal that causes water to overtop the canal bank. Other potential risks include vandalism, piping of water, gopher holes, etc. The onset of flooding due to a canal problem would probably be extremely fast because a break or blockage is usually completely unexpected.

The main threat of flooding on the Snake River is from ice jams. The potential for other types of flooding is limited since large upstream dams control the river.

There are two conditions which may cause floods in the drainages on the Boise Front. The first condition is the combination of a rainstorm with snowmelt on frozen ground in the winter or early spring months. The second is a high intensity thunderstorm, usually during the summer months. Thunderstorms may occur at any time of the year, although they usually happen from March through September.

Sandy soil and sparse vegetation combine to foster flash floods when intense thunderstorms hit the area. Floods from thunderstorms do not occur as frequently as those from general rain and snowmelt conditions, but are far more severe. The possibility of injury and death from flash floods is heightened because they are so uncommon that people do not recognize or accept the potential danger.

The lower portions of most of the gulches contain residential developments including single-family homes, mobile home parks, and apartment complexes. A large portion of the older residential district in the City of Boise is located within the floodplains of these gulches, as are many commercial and public businesses and facilities.

Risk

Risk of flooding is: moderate.

History

Ada County has a long and very extensive history of flooding. This flooding has been caused by a variety of sources and has affected the county throughout, however the most common problem areas for flooding are the Boise River and the Boise Foothills streams. As cited below, flows are measured in cubic feet per second (cfs). Unless otherwise noted the following flooding history items were taken from the Idaho Statesman newspaper.

May 20, 2008. High water flows on the Boise Rivers forced Boise Parks & Recreation to close three sections of the Greenbelt. The walking-only pedestrian area is under water from the Cottonwoods Apartments past River Run in southeast Boise. Two other areas are also closed down: Broadway Avenue tunnel on the north side of the river and Loggers Creek footbridge from Leadville Avenue east to the ParkCenter Bridge. Source: Aidan Brezonick/KTVB.

June 5, 2006. A breach in the Kuna-Mora Canal flooded parts of a south Kuna subdivision about a mile away and came close to compromising a sewage pump about 2.5 miles away. Thirty to forty homeowners reported flooding. The canal broke about one quarter south of King Road. It started as a six foot breach and quickly became a 40 foot breach.

May 25, 2006. High water levels along the Boise River created a breach in the riverbank near Eagle Island. About 8- 10 homes along Artesian and Trout Roads were affected. The State of Idaho repaired the breach. For the affected residents Ada County provided sandbags, portable toilets, sump pumps and diesel for tractors.

May 11, 2006. High water flows on the Boise River eroded a Greenbelt bridge near Garden City and nearly caused it to collapse into the river.

April 5 – 7, 2006. Flooding along Fivemile Creek and Lake Patricia flooded two homes and threatened several others as well as a small, private dam, southeast of Boise. Ada County inmate crews assisted in sandbagging.


2006 Flooding, Fivemile Creek. Source: R. Carino

July 7, 2004. The Idaho State Capital building was inundated by a flash flood. The flood occurred in the basement, displacing about 20 workers. Repairs are estimated to be between $70,000 and $100,000. The State is self-insured.

March 7, 1999. High water levels released from Lucky Peak Reservoir caused flooding in low lying areas. Segments of the Greenbelt were closed and areas in southeast Boise near Logger's Creek and Cottonwood Apartments were flooded. Also a 200' section of riverbank near Eagle's Starwood subdivision collapsed.

May – June 1998. Increased flows in the Boise River due to snowmelt and reservoir discharge caused flooding along the Greenbelt. Two sections of the Greenbelt were closed, from Leadville to the old theater, and between River Run and Powerline Corridor. Homes in subdivisions along the river flooded, such as at River Run and Wood Duck Island. Barber Park was closed and softball games at Willow Lane Athletic Complex were cancelled. Two large trees that fell into the Boise River caused a breach in the levee at the head of Eagle Island. Sixty residents were evacuated, and the Riviera Mobile Home Park and nearby homes and farmlands were flooded with a foot of water. The Idaho Statesman May 15, 17, 28, June 2, 4, 1998.

September 11, 1997. Cloudburst dropped .40" of rain in nine minutes on the Foothills area burned by the 1996 Eighth Street Fire, flooding homes, Highlands Elementary School, and streets in the Crane Creek and Hulls Gulch areas. Floodwaters were contained in several holding ponds. Fifteen people were evacuated and sheltered at Les Bois Junior High. Cost: $57,000. The Idaho Statesman September 12 and 13, 1997, January 25, 1998.

March – July 1997. Increased flows on the Boise River damaged sections of the Greenbelt, eroding riverbanks and destroying about a 100 foot section at Logger's Creek.

January 1 – 5, 1997. Increased flows on the Boise River to make room in reservoirs flooded homes and businesses along Eagle Island. Two feet of snow in the mountains over the weekend put the snow pack at 183% of normal, the highest level since 1943. A dike near South Eagle Road broke, flooding the road and surrounding fields with one foot of water. Residents were evacuated as two homes were flooded and others threatened. Parts of the Greenbelt along the Boise River were closed, from the Logger's Creek Footbridge to the Shakespeare Festival Theater and near Veterans Memorial Park.

May 1993. Boise River floodwaters soaked 10 Eagle homes, 1 woman drowned.

June 25, 1992. A severe thunderstorm moving from the southeast towards the northwest struck Boise, Idaho. More than 1 inch of rain fell in less than one hour over the Boise urban area and produced flash flooding. Unofficial storm totals were measured at 1.6 inches in southeast Boise. Many streets in the downtown area were flooded with water one to two feet deep. The storm and flash flood occurred during the Boise River Festival and impacted thousands of people who had gathered in downtown Boise for a parade and other festival activities.

February 1986. Melting snow flooded North Boise from creeks in the Foothills. Streets in downtown Boise were closed to form a temporary diversion canal to channel water from Cottonwood Creek to the Boise River. The canal carried an estimated 800,000 gallons of water an hour.

June 1983. Melting snow caused by high temperatures over Memorial Day weekend led to the raising of the Boise River to a peak runoff of 24,294 cfs, considered a 50 yr flood, and incurring a cost of $146,900. Flooding damaged the Greenbelt and river banks along Barber Park, Parkcenter, Garden City and Eagle Island. Homes along the river were flooded, and residents of Eagle Island used boats to travel. Cottonwood trees fell into the river as it cut out the banks, causing damming and further flooding. Municipal Park lost a chunk of land 300' long and 55' deep. Damage amounts include $20,000 for personal property damage, $45,000 for government employee overtime and $51,000 for erosion repair and flood prevention work. Stacy, Susan M.; the Idaho Statesman 6/10 and 6/13, 1983.

February 1982. Erosion from floodwaters caused damage to numerous streets in the Boise Foothills.

January 5-12, 1979. In Boise, rain and melting snow caused flooding in North and West Boise from Foothills creeks. Over a dozen homes in the Highlands near Crane Creek were hardest hit, flooding basements, yards and streets despite sandbagging efforts. Flooding was also seen along Polecat Gulch, Stewart Gulch and Cottonwood Creek north of Boise, and Threemile, Fivemile, Eightmile and Tenmile Creeks south of the airport, flooding homes, businesses and farmlands. Eckert Road Bridge was closed. The Idaho Statesman, Jan. 12, 13 and 16, 1979; USGS "Winter Water - the Flooding at Boise, Idaho 11/12/79."

May 26, 1973. A 30' wide break in the Ridenbaugh Canal flooded the Triangle Dairy and 15 houses in SE Boise with muddy, waist-deep water. The affected area was between Broadway/Linden/Leadville. The Idaho Statesman May 27 and 29, 1973.

January 17, 1971. Heavy rain and snow over four days caused flooding in southwest Idaho. Basements, yards and low-lying roads were flooded. In Orchard, 3 of 30 homes were evacuated by rowboat. Floodwaters covered approximately 160 acres in the town. The Idaho Statesman 1/18/71.

January 22, 1969. Heavy rain and snow over five days caused creeks and rivers to rise rapidly, leading to flooding in the Boise watershed. Crane Creek, Cottonwood Creek, and other drainages in the Foothills flooded, with the Cottonwood Creek flow being measured at 30%

above normal. The Boise River reached 3,643 cfs, three times normal. Flooding was mostly confined to roads and yards in North Boise. The Idaho Statesman 1/22/69.

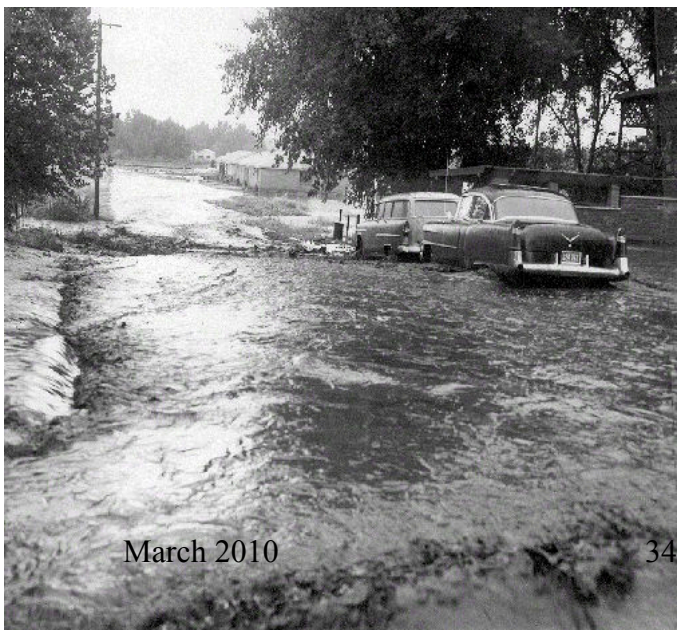
May 22, 1965. Flooding caused by break in levee near Eagle Island, cost: $15,000.00. 300 acres of farmland and several houses near Eagle Island were flooded by the Boise River when a levee broke. The Idaho Statesman, USACE "Flood Plain Information Boise, Idaho and Vicinity."

January 29, 1965. Flooding from Cottonwood and Dry Creeks, Crane, Stuart and Hulls Gulch. Damage mostly was for repair to bridges and cleanup, cost $110,000. The Idaho Statesman 9/14/81; USACE "Preliminary Post-Flood Report, January 1965 floods."

December 21-23, 1964. During the end of December 1964, warm weather combined with heavy rains and melting snow, caused flooding along the Boise River and other drainages. Highways 21 and 30E were closed. Over 100 homes were damaged, numerous bridges were washed out, and thousands of acres of farmlands were flooded. 2 deaths were attributed to the flood. A state of emergency was declared. Boise was isolated as surrounding roads and highways were closed, train and bus service cut off. The peak discharge of the Boise River was estimated to be a 100-year flood.

February, 1 – 3, 1963. Heavy snowfall followed by heavy rain caused snowmelt that led to flooding. In Ada County, Meridian streets and homes were flooded, farmland along Hwy 20-26 flooded. Canals in the area were running 3' above normal. Several highways were closed, bridges were washed away, and homes had basements and yards flooded. The Idaho Statesman Feb. 2, 3, 8, 1963.

September 22 & 26, 1959. Additional flash flooding from storms in the Foothills led to Boise's second flood in one month. East Boise suffered two more floods caused when heavy storms caused flooding along Cottonwood Creek and other Foothill drainages, cost: $46,000. This flood brought more water and less mud than the August 20 flood. The force of the water broke dikes across from the Armory on Reserve Street. Hwy 21 was closed because of debris flows. The area affected was mainly in the North End, from Fourth to Eighth Streets and Thatcher to Resseguie; also from Reserve Street to MK Plaza to Eighth Street. After these floods, several local and federal agencies cooperated in the "Boise Front Watershed Restoration Project" involving contour trenching, furrowing, seeding with trees and grasses and building protective fences, at a cost of approx. $165,000. The Idaho Statesman 12/15/59, 7/14/60, USDA "Report on the Boise, Idaho Flood August 20, 1959" and The Boise, Idaho Floods 1959"; Our Public Lands, Winter 1966.



August 20, 1959. Severe thunderstorms in the Boise Foothills, already bare of vegetation from the Lucky Peak Fire, led to flash flooding and mud flows into Boise. Called "The Cloudburst Floods" or

"The Big Mud Bath of 1959," this event was caused by severe thunderstorms in the NE Boise Foothills, cost: $500,000. Estimated to be a 50-100 yr rainfall event, .30" of rain fell in 5 minutes at Deer Point. Peak flow on Cottonwood Creek estimated at 3,000 cfs, floodwaters were carried by other Foothills creeks draining Shaw Mountain and Aldape Summit. Also a factor in the flooding and mudslides were the earlier Lucky Peak fires, which had denuded the Foothills of vegetation. Debris flows over 10" deep filled basements and yards in north and east Boise. Floodwaters were diverted along Broadway Avenue to the Boise River. Approximately 500 houses were damaged by mud up to 10" deep; over 160 acres were covered by silt and debris flows. Hardest hit areas were Reserve Street, East Jefferson, East State, Krall and East Bannock, and Avenues D and E and Warm Springs Avenue. The agriculture area between Lucky Peak Dam and East Boise suffered extensive property, crop and livestock losses. The Boise police clubhouse on Mountain Cove road was destroyed, and the Idaho National Guard headquarters on Reserve Street was inundated, breaking out the windows, filling the basement with several feet of water, and destroying equipment and records. The Idaho Statesman 8/21/59, 12/15/59, 7/14/80, 9/12/96; USDA "Report on the Boise, Idaho Flood August 20, 1959" and The Boise, Idaho Floods 1959" USACE "Flood Plain Info Boise, Idaho and Vicinity."

June 12, 1958. A rainstorm that dumped 2.23" of rain in Boise in a 12 hour period caused extensive flooding and heavy crop damage. Homes, roads and storm basins were flooded, several families were evacuated. The Boise Bench was hit hardest, with one family on Atlantic Street evacuated when their house was flooded with over a foot of water. The Idaho Statesman 6/13/58.

February 25, 1957. Heavy rain combined with ice breakup on rivers caused flooding. Parts of Eagle were flooded by Dry Creek. The Idaho Statesman 2/27/57.

August 1, 1955. A 200' section of the New York Canal broke 7 miles SE of Boise and flooded 200-300 acres of farmland with water, mud and rock. A dozen homes near the break were flooded with 3' of water and families were evacuated. The Idaho Statesman 8/2/55.

1949. North End of Boise flooded from Sand Creek.

April-June 1943. Throughout the area families were evacuated, some highway bridges across the Boise River were closed for five days or more. Hwy 21 was closed for over a week because of washouts from flooding creeks, isolating Idaho City and Boise Basin communities. Overall damages in the hundreds of thousands of dollars, mostly agricultural. This flood provided the final impetus to build Lucky Peak Dam. Swelled with snowmelt and rain, the Boise River reached a peak flow of 21,000 cfs, the third largest recorded flood, and channel capacity was exceeded for 45 days. 150 people were evacuated in Eagle; military reinforcements were called in to shore up bridges, the Chinese Gardens, and levees along the river valley. Flooded areas in Ada County included the Plantation Golf Course; the Old Soldiers Home at Veterans Park; the Idaho Fish and Game Hatchery access road, and numerous businesses. Basements along the river were flooded when sewer systems took in water at their riverbank outlets. Stacy, Susan M.; the Idaho Statesman 4/20/43, 6/10/83; USACE "Flood Plain Information Boise, Idaho and Vicinity" and "Flood Damage Report: the Boise River Flood."

May 2, 1938. Warmer weather and heavy rains that dropped over 1.18" of water in Boise in 24 hours led to flooding along the Boise River and its tributaries. Peak flow was estimated at 19,000 cfs. Numerous dikes were breached, hundreds of acres of farmland were flooded, but according to officials, "no appreciable damage" was done outside of the agricultural sector. Stacy, Susan M.; the Idaho Statesman, 5/2/38; USACE "Flood Plain Information Payette, Idaho and Vicinity."

April 25, 1936. Rain and melting snow combined to cause the Boise River to flood with a peak discharge estimated at 19,700 cfs, the sixth largest recorded flood. On the river an estimated 1,100 WPA workers manned the dikes through Boise. Two deaths were reported caused by the flood. One man drowned at the Broadway Bridge and one WPA worker was struck by lightning (two coworker received burns, but survived). The Strawberry Glen Bridge was washed out, and the highway east of Linder Bridge was destroyed by floodwaters. Roads along the river in Boise were washed out, and the Davis Meat Packing Plant was inundated by water, damaging goods stored there. Hundreds of acres of agricultural land in the valley were flooded along the river, through Eagle, Star, Linder and beyond. After the flood, the legislature appropriated $10,000 to improve the river channel, modify the bridges, and clean out timber and debris from the river and its banks. Stacy, Susan M.; the Idaho Statesman, 4/21/36, 4/22/36, 4/26/36, 4/27/36, 5/2/38; USACE "Flood Plain Information Boise, Idaho and Vicinity."

April 23, 1934. High water during spring runoff led to flooding along the Boise River; riverbanks through Boise bolstered with sandbag levees. The Idaho Statesman 3/21/66.

March 20, 1932. Highways and streets in Boise flooded. USACE "Flood Plain Information Boise, Idaho and Vicinity."

May 10, 1928. Boise River flooded, with an estimated peak discharge of 16,000 cfs. USACE "Flood Plain Information Boise, Idaho and Vicinity."

June 2, 1925. Cloudburst caused flooding of homes along Warm Springs Avenue with debris, silt and brush. USACE "Flood Plain Information Boise, Idaho and Vicinity."

July 14, 1923. Cottonwood Creek flooded, washing out part of Boise City roads and flooding houses on Warm Springs Avenue. USACE "Flood Plain Information Boise, Idaho and Vicinity." 1921. Boise River flood, peak discharge estimated at 18,700 cfs; no injuries. The Idaho Statesman 4/21/21.

August 1920. Cottonwood Creek flooded from sudden storm, discharge estimated 3000 cfs, 160 acres flooded.

July 24, 1913. Flash flood at Hulls Gulch and 8th Street flooded 25 blocks of homes with water and 6" of mud; washed out Boise City Water Corp reservoir (500,000 gal). USACE "Flood Plain Information Boise, Idaho and Vicinity."

June 20, 1909. Cloudbursts cause flooding in East Boise and military reservation in Foothills from flooded creeks, "thousands" in damages. USACE "Flood Plain Information Boise, Idaho and Vicinity."

February 6 - April 15, 1907. Boise River flood, peak discharge estimated 16,100 cfs. Houses flooded along Warm Springs Avenue. USACE "Flood Plain Information Boise, Idaho and Vicinity."

April 15, 1904. Heavy rains and spring runoff swelled the Boise River to estimated 19,200 cfs. In Boise, businesses and goods damaged; basements flooded.

April 19, 1897. Boise River flooded following spring runoff; peak discharge estimated at 29,500 cfs, the second largest known flood. USACE "Flood Plain Information Boise, Idaho and Vicinity."

April 1897. Spring runoff caused flooding of Cottonwood Creek, washed out 40' of the new flume above Warm Springs Avenue. Floodwaters did "considerable" damage to private property, forced streetcars out of service. The Idaho Statesman 6/26/72 and 10/6/75.

May 14 - June 17, 1896. Peak spring runoff of Boise River was 35,500 cfs. Considered the greatest flood of known magnitude on the Boise River; however, damage was limited to bridges and agricultural land and structures. Stacy, Susan M.; USACE "Flood Plain Information Boise, Idaho and Vicinity"; the Idaho Statesman, April 21.

January-March 1894. During a high water year, Cottonwood Creek flooded twice. During the January flood, the flume held, but during the March flood, with heavy runoff, floodwaters tore out 200' of the flume south of Warm Springs Avenue. USACE "Flood Plain Information Boise, Idaho and Vicinity"; the Idaho Statesman 10/6/75.

May 1892. Cottonwood Creek experienced a heavy flood, breaking the wood and stone flume built in 1881 at a cost of $523.50. In September 1892, the City Council authorized building a stone aqueduct for $5,000 ($1.97 per foot), that would carry water from the creek to the river. The Idaho Statesman 10/6/75.

March 19, 1883. Cottonwood Creek flooded downtown Boise following heavy spring runoff.

February 2 - March 17, 1881. Cottonwood Creek flooded streets and houses in Boise from 6th Street to Main Street; sand deposits at Grove Street 8' deep.

Spring 1876. Boise River (estimated 15,200 cfs) flooded lowlands in Boise following spring runoff; destroyed Ninth Street Bridge; agricultural damage consisted of erosion, loss of topsoil, deposition of debris, and loss of fencing. Cost: $6,000. Stacy, Susan M.

1872. Following heavy spring runoff, flooding occurred from Boise River (estimated 50,000 cfs) and Cottonwood Creek. The Idaho Statesman, 9/14/81 and 6/10/83.

December 1871. Boise River's first recorded flood, runoff believed to have been approx. 5,500,000 acre feet; lowlands from Foothills to Bench flooded; Cottonwood Creek also flooded. Stacy, Susan M.

March 1871. Boise flooded from Cottonwood Creek following heavy spring runoff.

January 1870. Following 36 hours of "incessant rain" Cottonwood Creek flooded Main Street in Boise. The Idaho Statesman, 9/14/81.

1869. Flooding in Boise from Cottonwood Creek following heavy spring runoff.

1866. Flooding from Cottonwood Creek ran down to Main Street in Boise. The Idaho Statesman, 9/14/81.

1865. Flooding of downtown Boise from Cottonwood Creek following heavy runoff. The Idaho Statesman, 9/14/81.

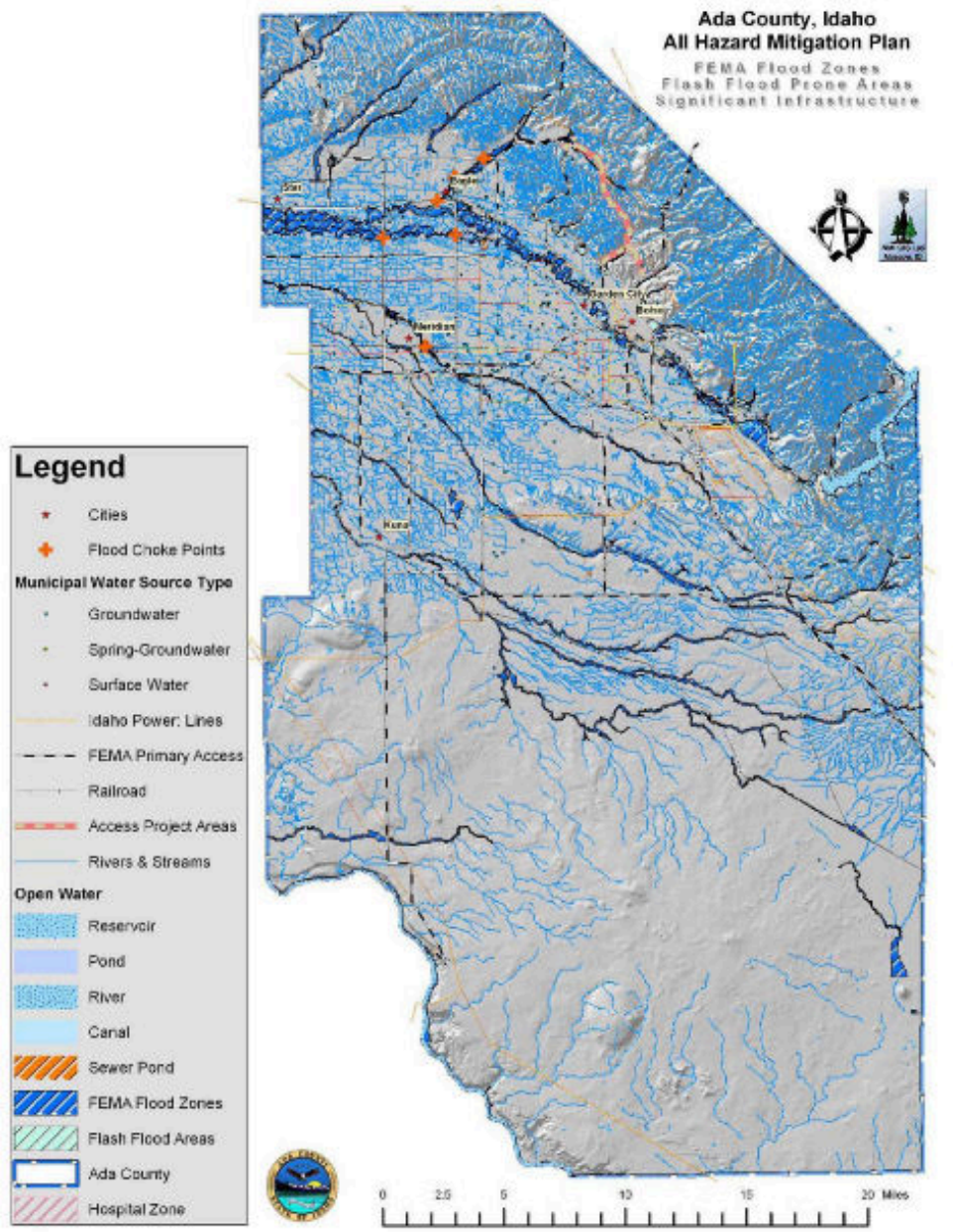
1864. Flash flood from Cottonwood Creek following heavy rains; 4' of water at Main Street. The Idaho Statesman, 9/14/81.

July 4, 1862. Boise River flood from extremely high runoff; believed to be one of the highest water years, possibly four times the amount of the 1943 flood (100,000 second feet or greater) Floodwaters ranged "a couple of miles wide" from the Foothills to the Bench.

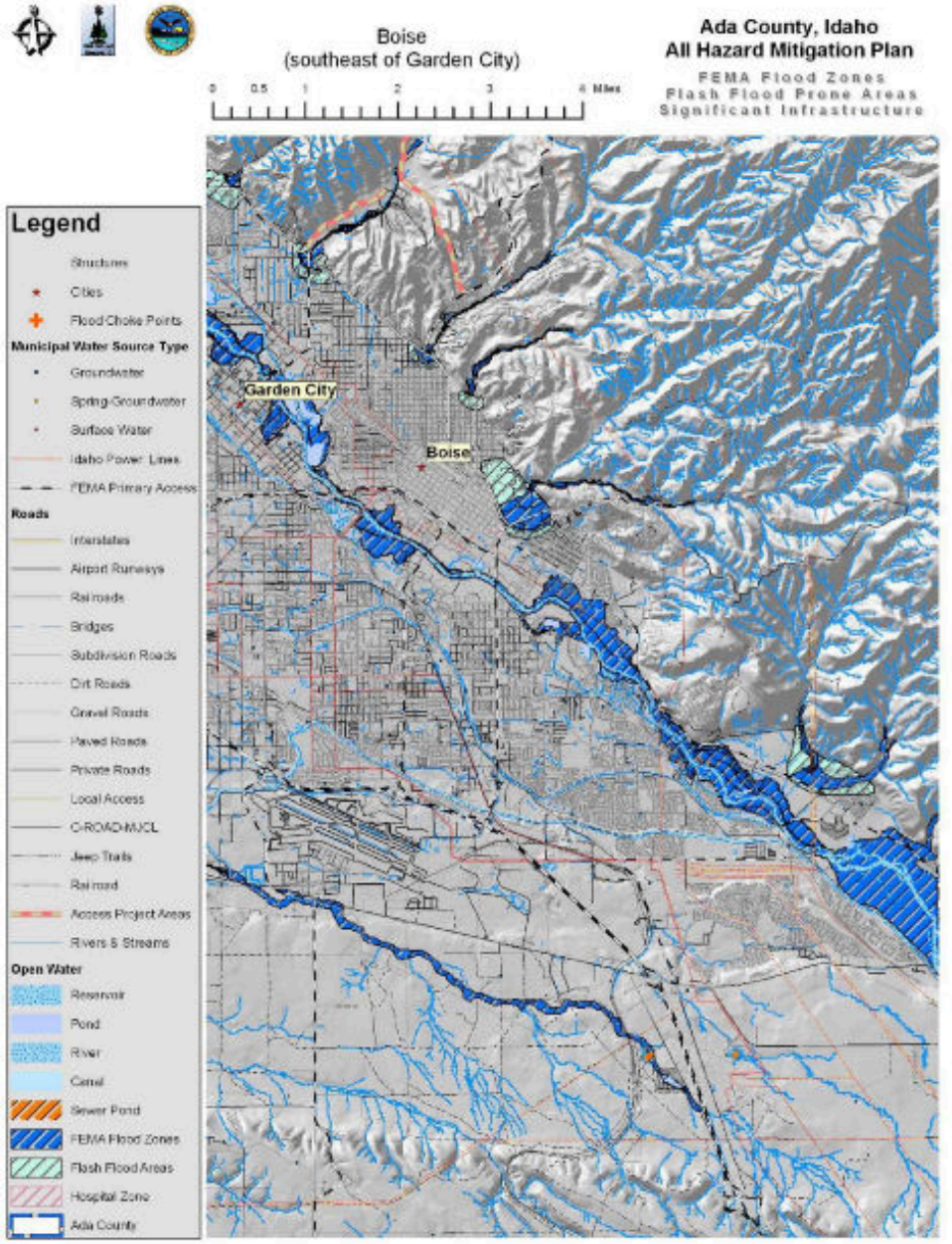
Websites:
http://www.floodsmart.gov/floodsmart/
http://www.fema.gov/hazard/flood/index.shtm
http://www.usgs.gov/hazards/floods/
http://www.bt.cdc.gov/disasters/floods/

Source: Flood history provided by Ada County government.

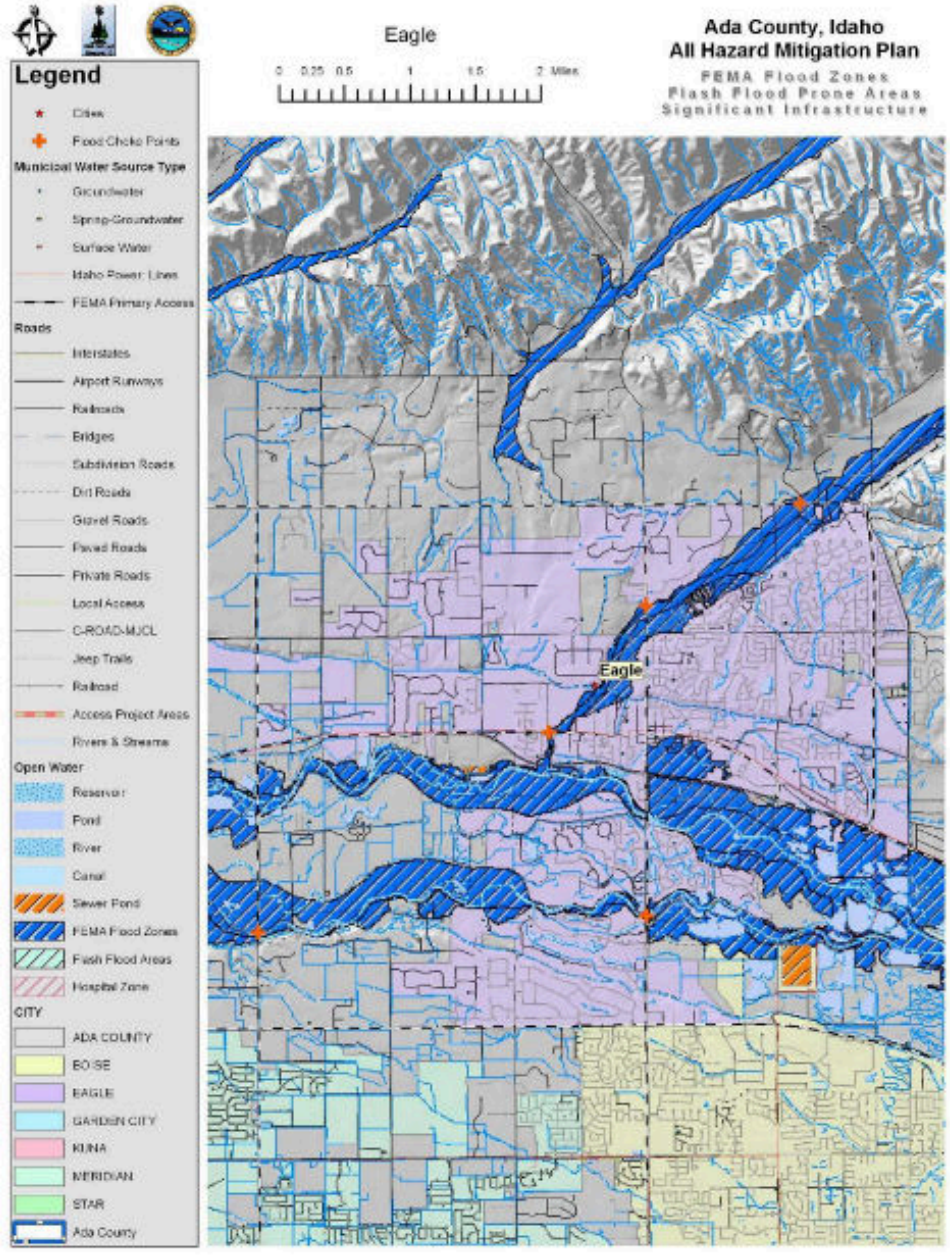
Ada County Flood Zones



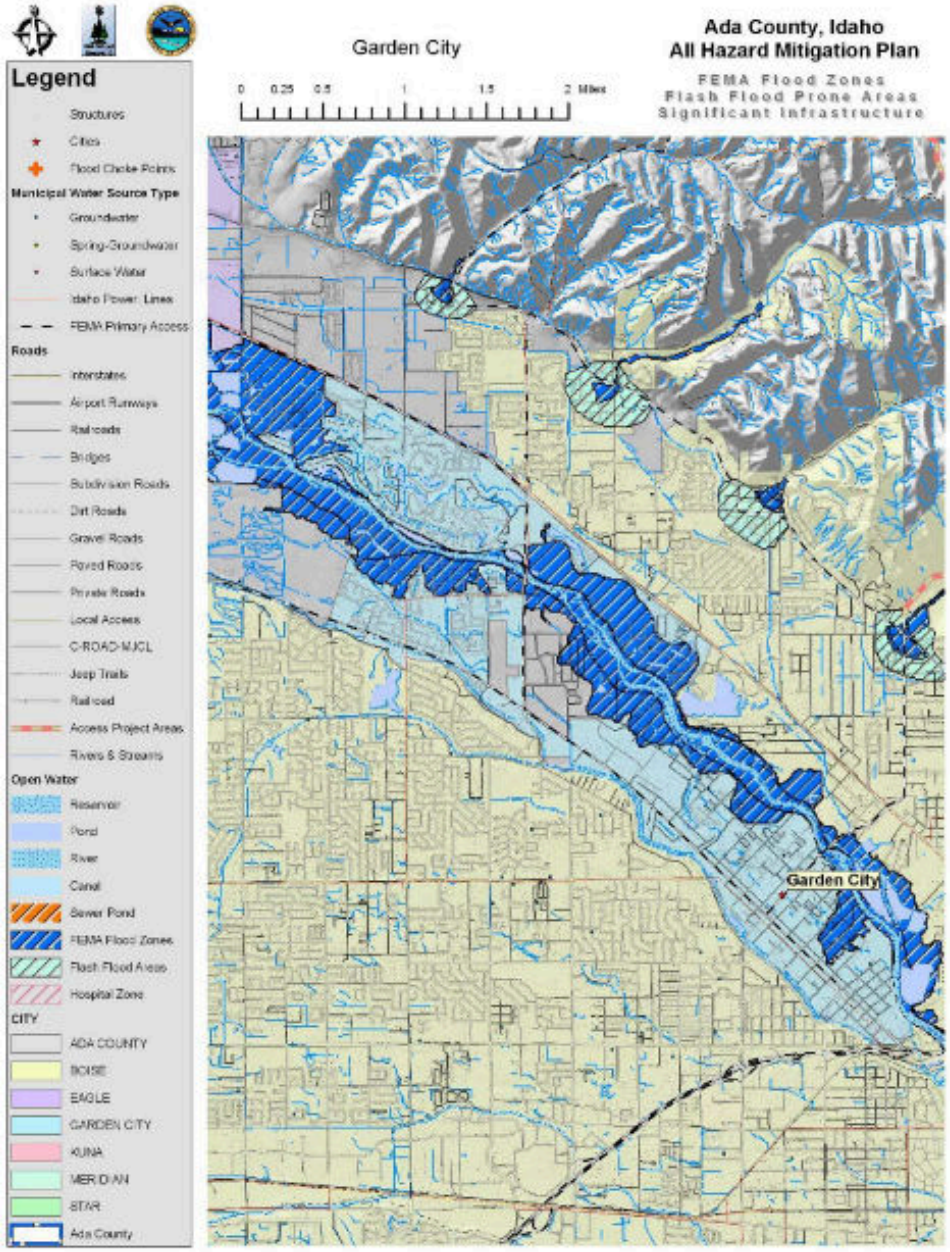
Flood Zones at Boise, Ada County, Idaho



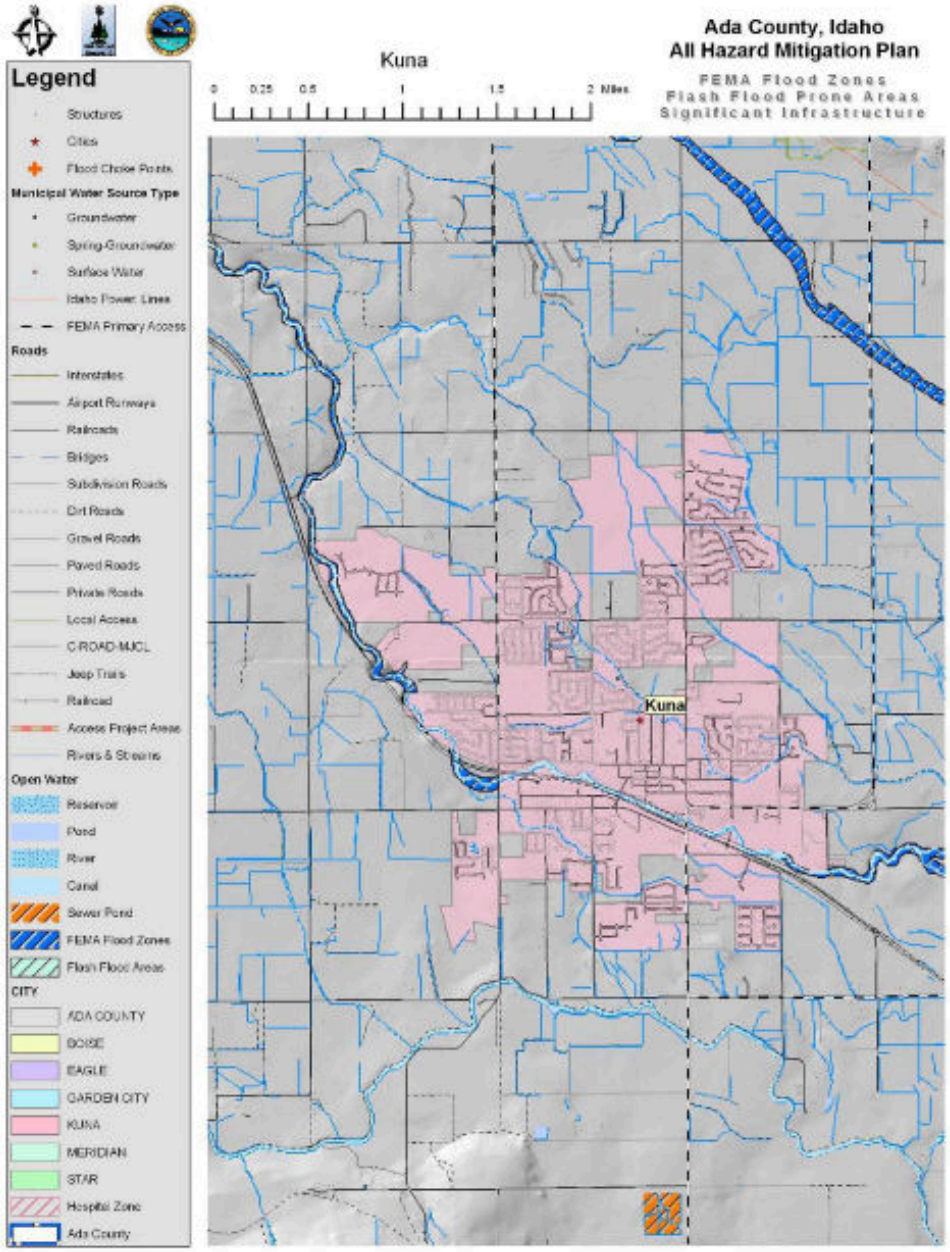
Flood Zones at Eagle, Ada County, Idaho



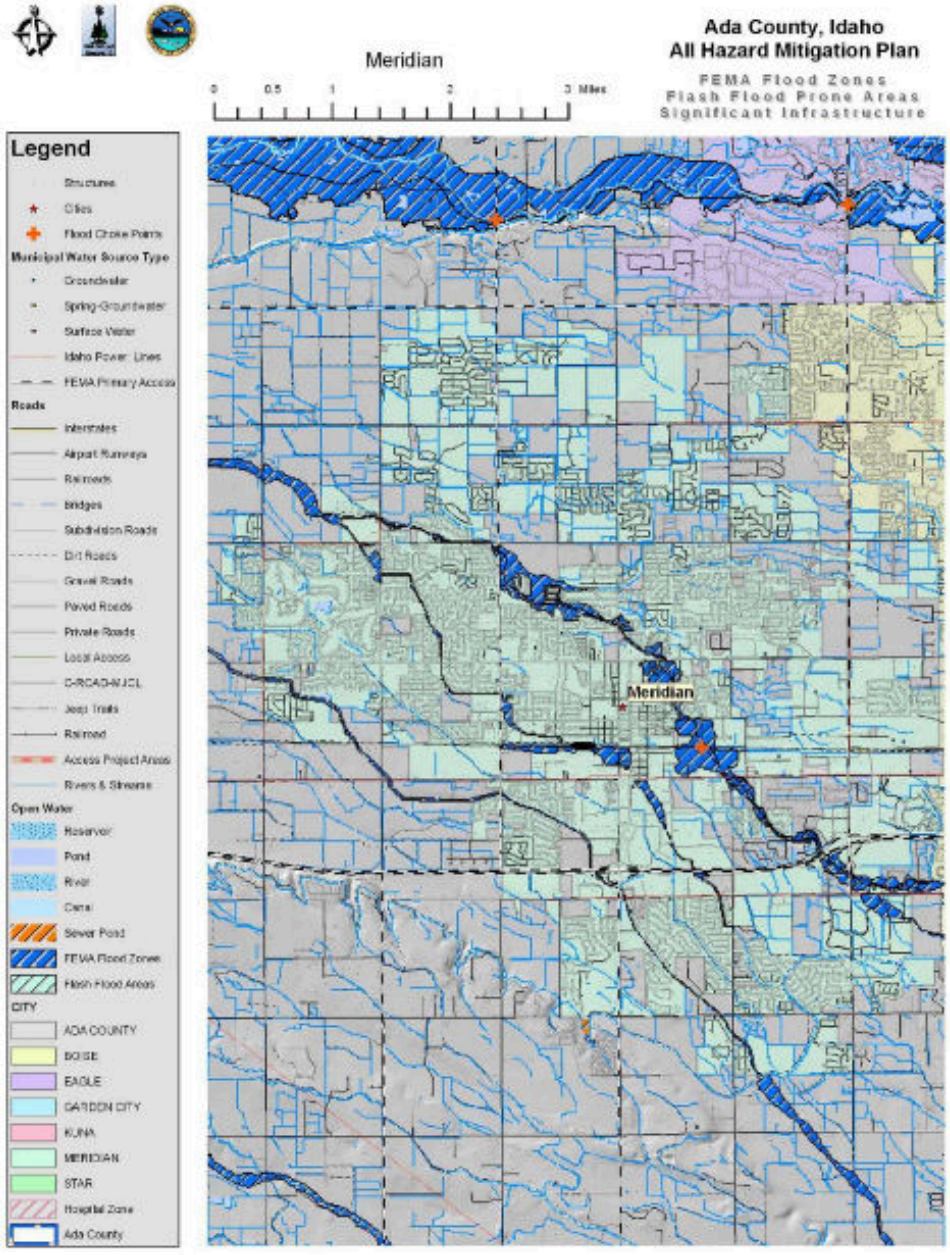
Flood Zones at Garden City, Ada County, Idaho



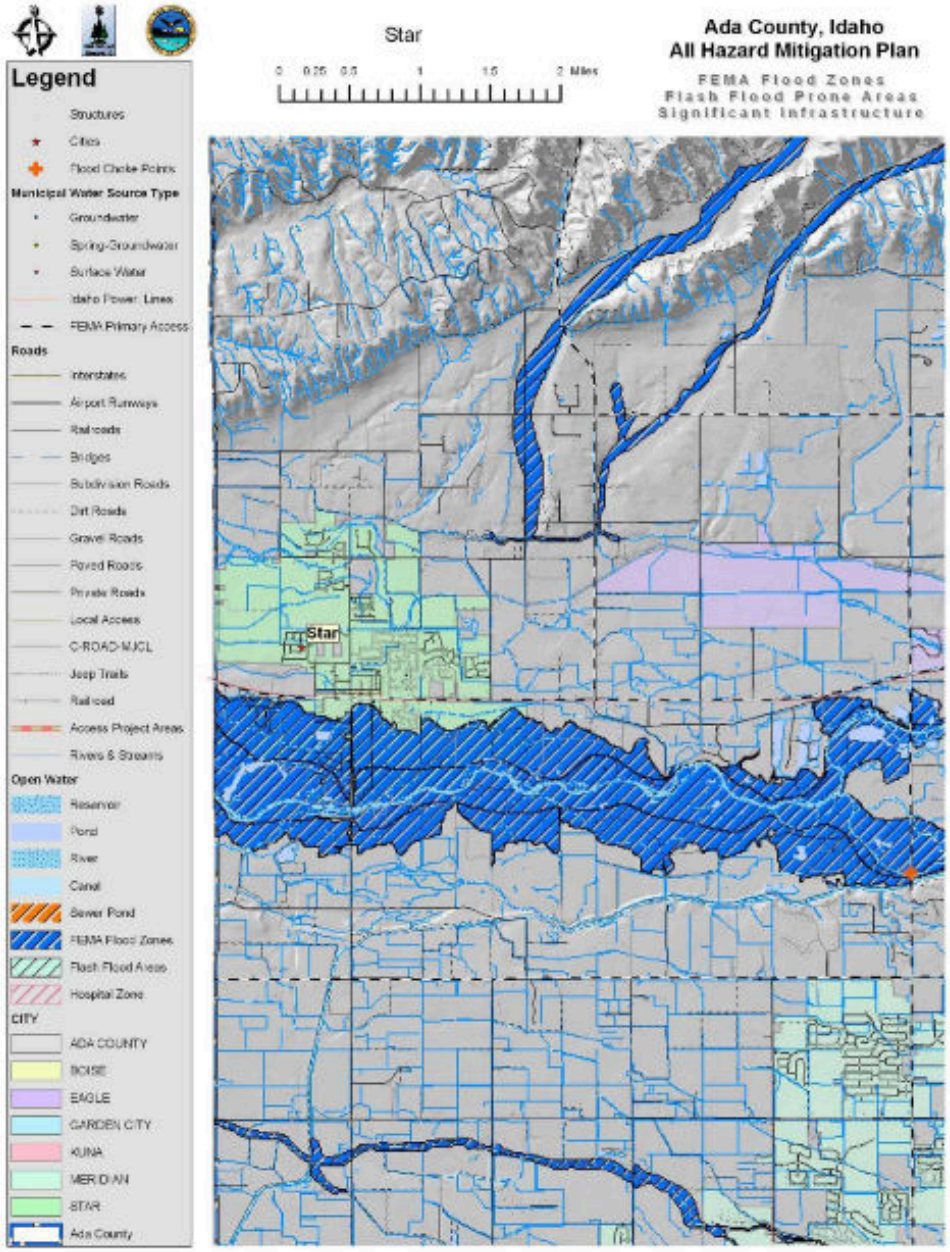
Flood Zones at Kuna, Ada County, Idaho



Flood Zones at Meridian, Ada County, Idaho



Flood Zones at Star, Ada County, Idaho



HAZARDOUS MATERIALS

A chemical or substance that may present a substantial threat to people, wildlife, or the environment if released, is considered a hazardous material. Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. This includes products or wastes and may be further classified as chemical, biological, radiological, or explosives substances.

Hazardous substances permeate modern American society. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced. Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States – from major industrial plants to local dry cleaning establishments or gardening supply stores.

In most households there are chemicals labeled *Warning*, *Danger*, *Poison* and *Caution*. Most victims of chemical accidents are injured at home. These incidents usually result from ignorance or carelessness in using flammable or combustible materials. In an average city of 100,000 residents, 24 tons of toilet bowl cleaner, 14 tons of liquid household cleaners, and 4 tons of motor oil are discharged into city drains each month.

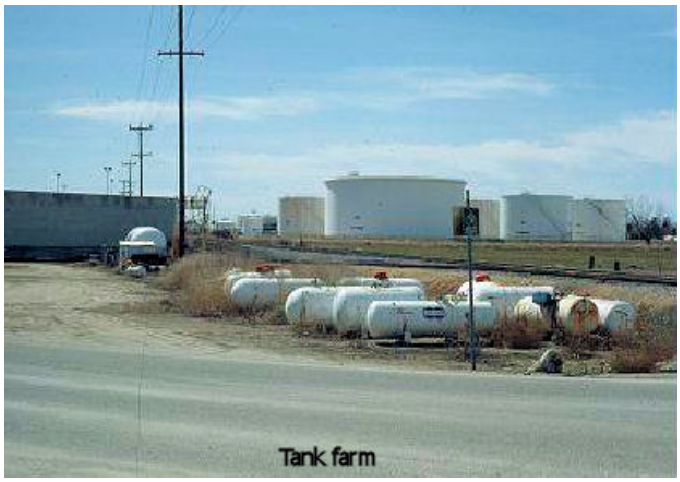
Incidents such as Love Canal in New York State and the Union Carbide Bhopal incident in India have led to the passage of federal laws regulating these materials. Included in these regulations is SARA Title III, also known as the Emergency Planning and Community Right to Know Act (EPCRA). Under federal law local communities must create a Local Emergency Planning Committee (LEPC) to plan for hazardous materials emergencies. Each state must create a State Emergency Response Commission to oversee the LEPCs. The Idaho Hazardous Substance Emergency Response Act also regulates hazmat response. Idaho also has five Regional Hazardous Materials Response Teams to assist local responders.

Natural Gas

Natural gas (methane) is an energy source that is supplied to Ada County by underground pipeline from Utah. These large diameter transmission pipelines transport far greater volume and operate at much higher pressure than smaller local distribution lines. A local provider distributes the gas to its customers. Natural gas lines elsewhere have failed due to soil failures, sabotage, and accidents. But the systems in Ada County have a high reliability.

Above ground pipeline markers are used to alert the public of the presence of the high pressure pipelines. By Idaho State law excavators must call Digline (800-342-1585) before digging more than 15 inches below the surface. Because natural gas is generally odorless, local distributors add a substance called mercaptan (which smells like rotting-cabbage), so that leaks can be detected before a fire or explosion occurs.

Petroleum Pipeline / Tank Farm
Petroleum products, including gasoline, diesel, heating oil, and aviation fuel are delivered to Ada County by a pipeline from Utah. These products are stored mainly in the Curtis Road tank farm. Trucks deliver these products to local users such as gas stations.


Tank farm

When the tank farm was originally constructed it was in a fairly isolated rural area. Since that time development has encircled the storage area. Structures adjacent to or nearby include a nursing home, one of the area's largest medical centers, numerous other medical offices, office buildings, and some homes. In the past there were some underground leaks from the tanks that are believed to be corrected now. Above ground pipeline markers are used to alert the public to the presence of these pipelines. By Idaho State law excavators must call Digline (800-342-1585) before digging more than 15 inches below the surface.

Vulnerability

Hazardous Materials Vulnerability
Hazardous materials are produced, stored and used in Ada County. They are also routinely transported through the county on federal and state highways and on local roads. The Boise metropolitan area is the most frequently listed destination for hazardous materials shipments in Idaho. Routes I-84, US-26, and US-20 are major shipping routes through the county. Commonly shipped materials include: gasoline and diesel fuel, paint-related material, phosphoric acid, propane, and wet batteries. Hazardous materials are also transported in the county by railroad and air carriers, as well as pipelines. Agricultural activities use herbicides, pesticides, and other toxic substances. Minor to moderate sized hazardous materials incidents occur on a fairly regular basis in Ada County. One of the Hazardous Materials Regional Response Teams is located in Boise City.

Fixed Facilities
SARA Title III regulations require fixed facilities to document, notify, and report information about the chemicals they store and use on-site. In Ada County about 120 facilities file reports each year. There are also around two dozen Extremely Hazardous Substance facilities in the county. An extremely hazardous substance is defined as chemicals that can cause both severe short and long term health effects after a single, brief exposure.

Natural Gas Vulnerability
Natural gas distribution systems will occasionally cause leak initiated explosions, some respiratory deaths, and frequently add to the flammable material in a structural fire. Construction is the most common cause of problems with gas distribution. Earthquakes can also rupture gas lines. Lack of heat and cooking may be an inconvenience to residents. During severe freezing

loss of heat may lead to other problems, such as burst water lines, damaged house plants, etc. Natural gas is not poisonous. However if natural gas displaces air in an enclosed space, suffocation can occur because of lack of oxygen. Natural gas is one-third lighter than air and will not accumulate in low areas.

Petroleum Pipeline / Tank Farm Vulnerability
Damage by ground movement, uninformed excavation or deliberate act could cause a loss of product with some inherent danger at the spot. The most concentrated accumulation of hazardous materials in Ada County is the Tank Farm. The tank farm spill-dikes, pumping system, and structural integrity are believed to meet current standards. The tanks, trucks and fill stands are all above ground and inside a chain link fence. They may be vulnerable to criminal or terrorist activity, accident, or natural events such as earthquakes. The system has a shutdown and alerting system which should limit the amount released.

Risk
Risk of hazardous materials is: high.

History
In Ada County hazardous materials incidents occur regularly. Most of these incidents are minor.

May 9, 2007. A gas leak at Boise State University forced the evacuation of several buildings. The incident occurred when workers accidentally punctured a gas line.

June 1998. At Tele-Communications Inc., of Boise, 104 employees were taken to area hospitals after being sickened by an unknown chemical circulating in the building. Another 100 employees were evacuated.

July 30, 1998. About 350 workers had to evacuate the Federal Building in Boise when irritating fumes began to circulate. The fumes were determined to be from chlorine dioxide, a substance created when chemicals used for cleaning reacted with the concrete floors.

January 1993. An incident at Viking Trucking in southeast Boise required the evacuation of a dozen Boise businesses and customers in response to an arsine leak.

1982. Petroleum vapors originating from the Curtis Road tank farm were discovered during construction of the Medical Arts Building next to Saint Alphonsus Hospital. Subsequently more than 900,000 gallons of gasoline were recovered from the soils and ground water under the area.

Websites:
http://www.rtknet.org/
http://www.epa.gov/epawaste/index.htm
http://www.legislature.idaho.gov/idstat/Title39/T39CH71.htm

HEALTH

Seasonal influenza

Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. It can cause mild to severe illness, and at times can lead to death. Seasonal influenza is highly infectious and spreads in humans around the world in seasonal epidemics, affecting 10% to 20% of the total population. The most important strains of human influenza virus are A and B.

Pandemic Influenza

An influenza pandemic is a global outbreak of disease that occurs when a new influenza A virus appears or "emerges" in the human population, causes serious illness, and then spreads easily from person to person worldwide. Pandemics are different from seasonal outbreaks or "epidemics" of influenza. Seasonal outbreaks are caused by subtypes of influenza viruses that already circulate among people, whereas pandemic outbreaks are caused by new subtypes, by subtypes that have never circulated among people, or by subtypes that have not circulated among people for a long time. Past influenza pandemics have led to high levels of illness, death, social disruption, and economic loss.

Avian Influenza

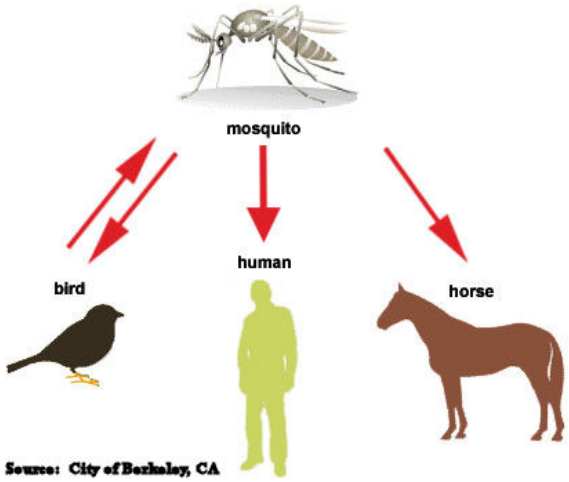
Avian Influenza – also called "H5N1 virus" – is an influenza virus subtype that occurs mainly in birds. It is naturally occurring and highly contagious among birds, and can be deadly to them. H5N1 virus does not usually infect people, but infections with these viruses have occurred in humans. Most of these cases have resulted from people having direct or close contact with H5N1-infected poultry or H5N1-contaminated surfaces.

SARS

Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus. SARS was first reported in Asia in February 2003. Over the next few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

West Nile Virus

West Nile virus (WNV) is a potentially serious illness. The first case of WNV infection in the United States was identified in New York in 1999. West Nile infections have steadily spread westward across the United States. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. WNV lives in



infected birds. Mosquitoes become infected when they feed on those birds. The infected mosquito can then transmit the virus to humans and other animals while biting to take blood. Once in the bloodstream, the virus may multiply and cause illness.

Radon

Radon is a cancer-causing, natural radioactive gas without odor, color or taste. It cannot be detected without special equipment. Radon occurs as a product of uranium decay. Uranium is a natural radioactive material found in varying amounts in all rocks, soil, concrete and bricks. It occurs everywhere on earth, especially in rocky and mountainous areas. Radon is an unstable radionuclide that disintegrates through short lived decay products before eventually reaching the end product of stable lead. The short lived decay products of radon are responsible for most of the hazard by inhalation.

Vulnerability

Seasonal Influenza

The CDC estimates that in the United States around 36,000 people die each year from influenza or influenza-like-illnesses. Some people, such as older people, young children, and people with certain health conditions, are at high risk for serious flu complications.

Pandemic Influenza

There's no simple answer to the question of how serious a pandemic might be. It all depends on how virulent (severe) the virus is, how rapidly it can spread from population to population, and the effectiveness of pandemic prevention and response efforts. The impact of a pandemic isn't measured only by how many people will die. If millions of people get sick at the same time, major social consequences will occur. If many doctors and nurses become ill, it will be difficult to care for the sick. If the majority of a local police force is infected, the safety of the community might be at risk. If air traffic controllers are all sick at once, air travel could grind to a halt, interrupting not only business and personal travel, but also the transport of life-saving vaccines or anti-viral drugs.

Avian Influenza

Since November 2003, over 400 cases of human infection with highly pathogenic avian influenza A (H5N1) viruses have been reported by more than a dozen countries in Asia, Africa, the Pacific, Europe and the Near East. With 263 deaths this disease has a high mortality rate for the reported cases.

SARS

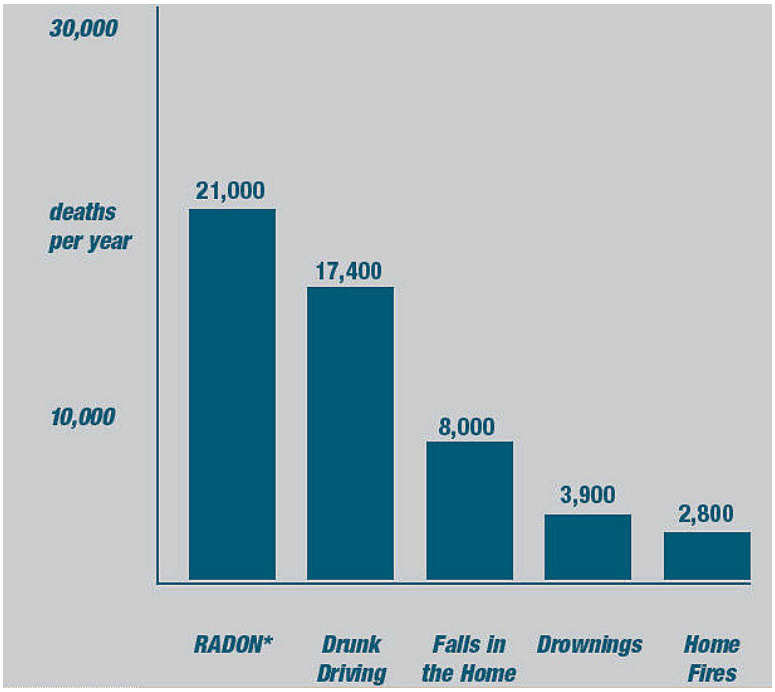
According to the World Health Organization (WHO), a total of 8,098 people worldwide became sick with SARS during the 2003 outbreak. Of these, 774 died. In the United States, only eight people had laboratory evidence of SARS infection.

West Nile Virus

Among those with severe illness due to West Nile virus, fatality rates range from 3% to 15% and are highest among the elderly. Less than 1% of people who become infected with West Nile virus will develop severe illness – most people who get infected do not develop any disease at all.

Radon

Exposure to radon in the home is responsible for an estimated 20,000 lung cancer deaths each year. Radon gas enters houses from the ground through cracks in concrete floors and walls, through gaps between floor and slab, and around drains and pipes, and small pores of hollow-block walls. Consequently, radon levels are usually higher in basements, cellars and ground floors. Depending on a number of factors, the concentration of radon indoors varies with the time of the year, from day to day, and from hour to hour. Testing for radon is easy and inexpensive.



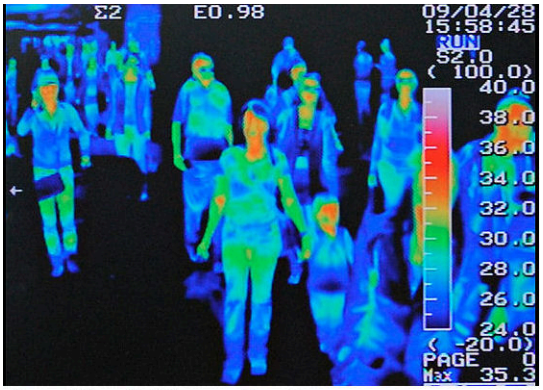
Risk

Health risks are very difficult to assess and can change significantly in a short time. Risk of influenza is: high. Risk of Avian Influenza and SARS is very low. Risk of West Nile Virus is: low. Risk of radon is: moderate.

History

During the 20th century, the emergence of several new influenza A virus subtypes caused four pandemics, all of which spread around the world within a year of being detected.

2009-10, “Swine flu,” [A (H1N1)], first reported in Mexico in the spring of 2009, this flu spread to 200 countries. Worldwide through December 2009 there have been over 14,000 deaths that have been laboratory-confirmed, many of these deaths occurred in young, previously healthy people.



Seoul South Korea airort passengers scanned for temperature, possibly indicating Swine Flu, 2009. Source: Jung Yean-je, Reuters.

1968-69, "Hong Kong flu," [A (H3N2)], caused about 34,000 deaths in the United States. This virus was first detected in Hong Kong in early 1968 and spread to the United States later that year. Influenza A (H3N2) viruses still circulate today.

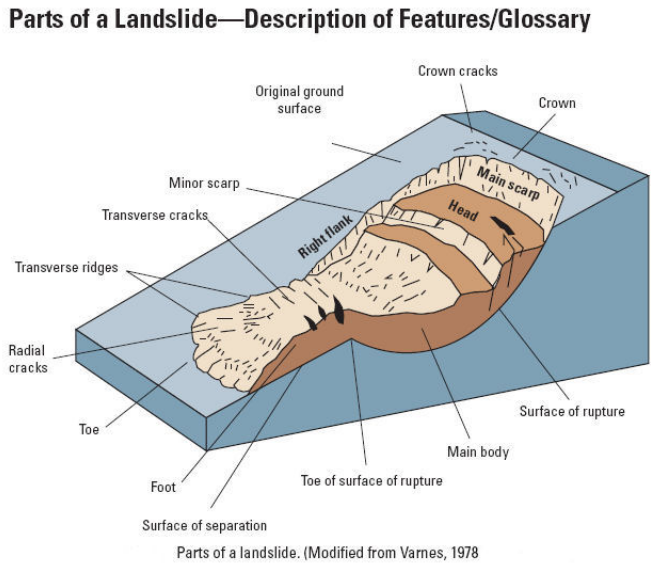
1957-58, "Asian flu," [A (H2N2)], caused about 70,000 deaths in the United States. First identified in China in late February 1957, the Asian flu spread to the United States by June 1957.

1918-19, "Spanish flu," [A (H1N1)], caused the highest number of known influenza deaths. (However, the actual influenza virus subtype was not detected in the 1918-19 pandemic). More than 500,000 people died in the United States, and up to 50 million people may have died worldwide. Many people died within the first few days after infection, and others died of secondary complications. Nearly half of those who died were young, healthy adults. Influenza A (H1N1) viruses still circulate today after being introduced again into the human population in 1977.

Websites:
http://www.pandemicflu.gov/
http://www.cdc.gov/flu/avian/
http://www.cdc.gov/ncidod/dvbid/westnile/
http://www.epa.gov/iaq/states/idaho.html

LANDSLIDE

Landslide is a general term used to describe the downslope movement of soil, rock, and organic materials under the effects of gravity and also the landform that results from such movement. Landslides constitute a major geologic hazard because they occur in all 50 states and annually cause an average of $1-2 billion in damages and more than 25 fatalities. Many debris-flow fatalities occur when people are sleeping.



Parts of a landslide. (Modified from Varnes, 1978

The traditional view that landslides are restricted to extremely steep slopes and inhospitable terrain does not accurately reflect the real nature of the problem. The reason for such wide geographic coverage has much to do with the many different triggering mechanisms for landslides. Excessive precipitation, earthquakes, volcanoes, wildfires and other mechanisms, and more recently, certain dangerous human activities are just some of the key causes that can trigger landslides.

Compared with other geological hazards, landslide zones are very narrow, very specific, and relatively easy to avoid. Unfortunately, they're often also attractive places to live. Populations expanding onto new land and creating neighborhoods, towns, and cities is the primary means by which humans contribute to the occurrence of landslides. Disturbing or changing drainage patterns, destabilizing slopes, and removing vegetation are common human-induced factors that may initiate landslides. Other examples include over-steepening of slopes by undercutting the bottom and loading the top of a slope to exceed the bearing strength of the soil or other component material.

The debris-flow scenario depends on numerous factors: soil depth and composition, the kind of vegetation and the size of tree roots, subtle variations in slope shape, road cuts, drainage pipes, incongruities in underlying bedrock, even the presence of small animal burrows. Water can collapse a slope after traveling beneath the surface from miles away.

However, landslides may also occur in once-stable areas due to other human activities such as irrigation, lawn watering, draining of reservoirs (or creating them), leaking pipes, and improper excavating or grading on slopes. Although the physical cause of many landslides cannot be removed, geologic investigations, good engineering practices, and effective enforcement of land-use management regulations can reduce landslide hazards.

Vulnerability

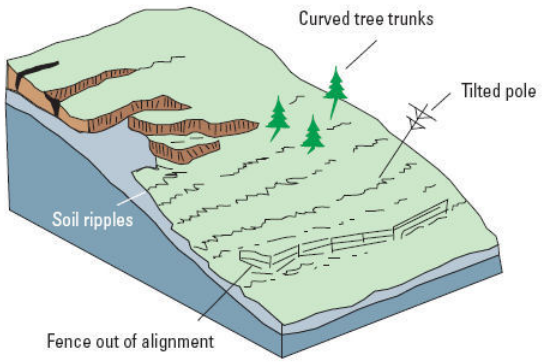
Thus far in Ada County landslides have been an inconvenience. No lives have been lost and little property damaged. Landslides and mudflows are part of the natural process of hillside erosion. The first axiom of debris flows is that where one has occurred, others will inevitably follow. Any development in areas having a naturally steep gradient or where sub-soil saturation occurs due to water input may be potentially at risk.

Risk

Risk of landslide is: low.

History

On August 20, 1959, following a wildfire in the Cottonwood Creek drainage an event known as "The Big Mud Bath" occurred. According to the Idaho Statesman: "Approximately 500 houses were damaged by mud up to 10" deep; over 160 acres were covered by silt and debris flows. Hardest hit areas were Reserve Street, East Jefferson, East State, Krall and East Bannock, and Avenues D and E and Warm Springs Avenue. The agriculture area between Lucky Peak Dam and East Boise suffered extensive property, crop and livestock losses. The Boise police clubhouse on Mountain Cove road was destroyed, and the Idaho National Guard headquarters on Reserve Street was inundated, breaking out the windows, filling the basement with several feet of water, and destroying equipment and records."



Schematic of a slow earthflow, often called creep.

There have been small landslides along Highway 21 where steep embankments flank the road, primarily in the Warm Springs Mesa area. There is a gradually moving area of unstable ground in the foothills near the old Penitentiary and several small sites along Cottonwood Creek drainage.

Mudflows occur on a relatively small scale as a part of natural geologic processes along the Boise Ridge. In 1982 two small flows released in the steep foothills and flowed into the canyon behind houses along the extension of Collister Drive. Protective channel structures diverted the flow onto the road and most of the mud became a cleanup issue for the Ada County Highway District and one or two homeowners.

There is a possible land subsidence problem in some areas of the county, particularly with areas of old landfills or badly compacted fill. While there have been gradual creeping soils in the Warm Springs Mesa area there is no actual subsidence reported. Subsidence due to withdrawal of ground water has not been reported. Should a structure be sited over a lava tube there is always a chance that natural subsidence could occur.

Expansive soils are those which tend to swell or shrink due to changes in moisture content. Failed roadbeds, cracked building slabs and basements may be attributable to these soils in Ada County, but no analysis or damage estimate has been made to determine the actual impact.

In 2003 two Boise families were forced to evacuate their duplex following a mudslide in their backyard. The slide occurred on the 3800 block of McGonigull Street just west of 36th Street and Hill Road. A broken underground irrigation pipe supersaturated the embankment in the property above the duplex. This caused a large section of the embankment to break loose and slide downhill, damaging a fence and part of the back door. No one was injured.


2003 Boise neighborhood landslide. Source: R. Carino

Other Landslides

January 10, 2005. La Conchita in Ventura County, California. A landslide struck the community destroying or seriously damaging 36 houses and killing 10 people.

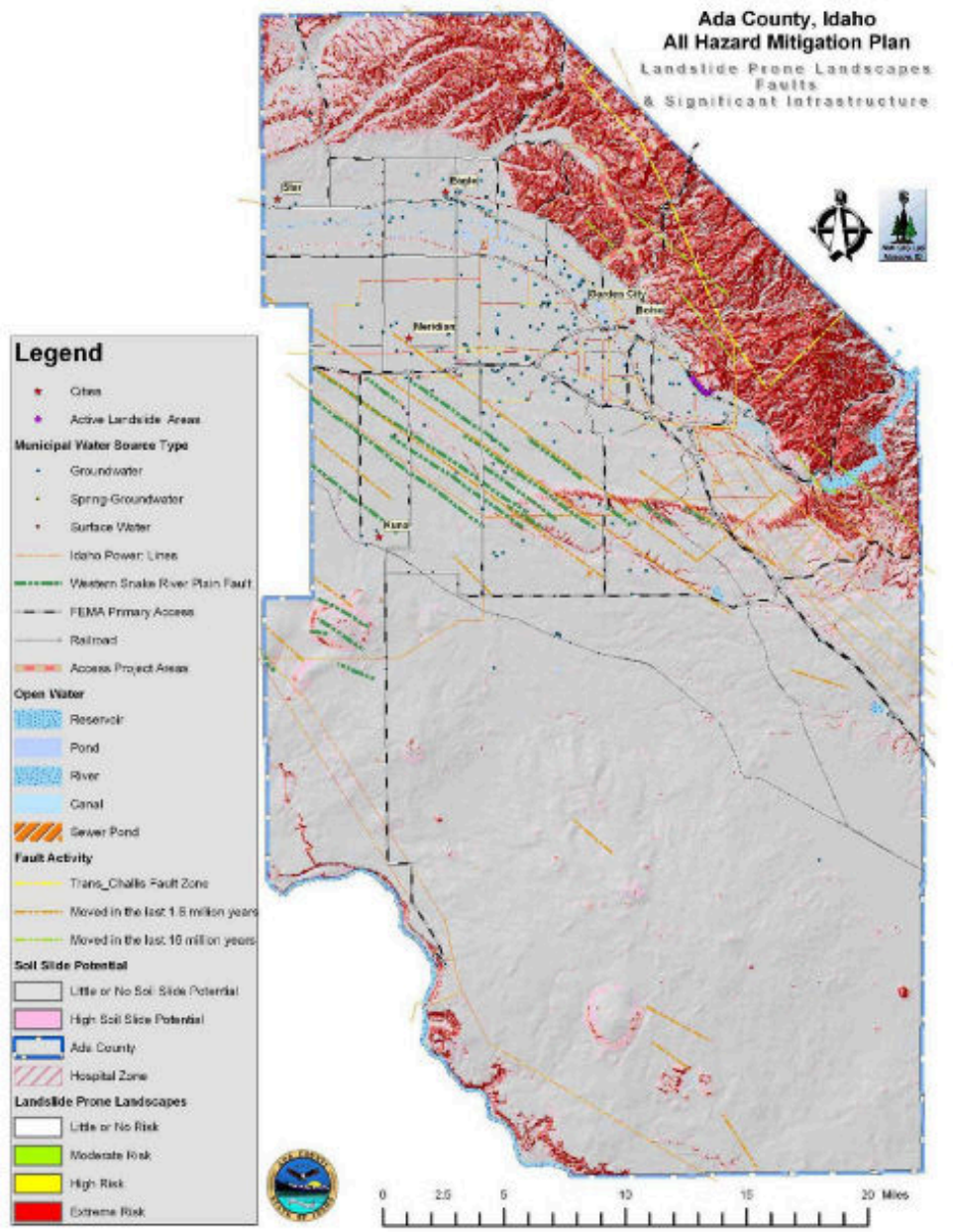

La Conchita, CA, 2005. Source: Mark Reid, U.S. Geological Survey

December 1999. Caracas, Venezuela. Perhaps the deadliest landslide in history occurred after torrential rains caused flash floods and mudslides. The death toll was estimated at about 30,000. In addition more than 20,000 homes were destroyed, and 140,000 people made homeless.

Websites:
http://landslides.usgs.gov/
http://landslides.usgs.gov/recent/
http://www.fema.gov/hazard/landslide/index.shtm
http://www.nationalatlas.gov/articles/geology/a_landslide.html

Source: Much of the text information and some illustrations in this section are courtesy of the United States Geological Survey.

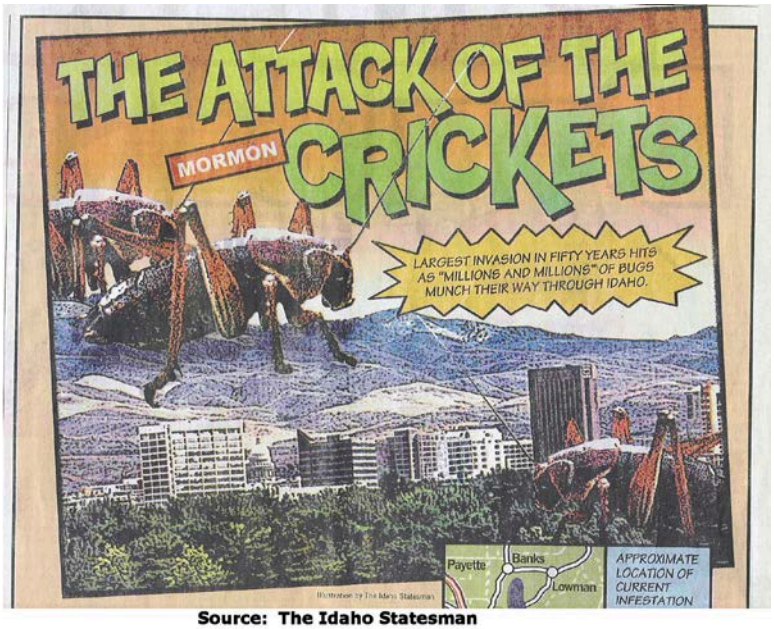
Ada County Landslide Prone Landscapes and Fault Zones



MORMON CRICKETS

Mormon crickets are not true crickets. They are a shieldbacked katydid. Their scientific name is Anabrus simplex Haldeman. The crickets got their nickname when they devoured the Mormon settler's crops in Utah. Seagulls saved the settlers when they feasted on the crickets.

Mormon crickets live in western North America in rangeland dominated by sagebrush and other native plants. Their habitat begins in southern Canada and ranges south to northern New Mexico, Arizona, Nevada and California.



Source: The Idaho Statesman

These insects may live from 60 to 90 days, and undergo seven stages of development. These stages are called "instars." The adult Mormon cricket is a large insect and may grow to around two inches in length. Females are generally larger than the males. Most of the insects are brown, but green, black and other colors may be observed. Older instars and adults can migrate from one half to one mile a day, and cover 25 to 50 miles in a season. They move primarily by crawling or hopping. Their wings do not work well for flight. They move mostly in the daytime.

The crickets hatch in the spring when soil temperatures reach 40 degrees F. They reach maturity by late summer, at which time they mate, lay eggs and then die. A female may lay up to 80 eggs. The periodic proliferation Mormon Cricket is just a part of their natural cycle. Many insects, as well as other animals such as lemmings, experience the same boon and bust cycle. These cycles can last several years.

Vulnerability

Mormon crickets damage forage plants and cultivated crops in their path. Although their natural diet consists of a wide variety of indigenous plants, they relish cultivated plants such as wheat, barley, alfalfa, clover and vegetable gardens.

To help farmers and ranchers combat the crickets the Idaho Department of Agriculture may provide bags of poisoned bait. The bait is rolled wheat that contains a poison called Carbyl.

For homeowners the crickets are more of a nuisance than a danger. Homeowners may purchase commercial insect (grasshopper) bait at most garden supply stores. It is very important to follow the instructions on the package because if too much is applied it could endanger pets, birds and

other small animals. Only a small amount is needed to kill the crickets. The crickets are cannibalistic, so others may eat those killed by the poison, and they will also die.

Risk

Risk of Mormon Crickets is: low.

Websites:
http://en.wikipedia.org/wiki/Mormon_cricket
http://animals.howstuffworks.com/insects/mormon-cricket-info.htm

NUCLEAR WAR

Nuclear war is not a comfortable subject because a nuclear war would be a catastrophe. Even a "limited" nuclear attack could be expected to kill large numbers of people and inflict property and economic damage on a scale unprecedented in American experience. A large-scale nuclear exchange would be a calamity unprecedented in human history. But the fact remains that nuclear war is possible, and that possibility has formed part of the underpinning of international politics ever since nuclear weapons were developed in 1945.

From the late 1940s until the end of the Cold War in the early 1990s, the world lived with the constant threat of nuclear war between the United States and the Soviet Union. With the collapse of the Soviet Union in 1991 and the end of the Cold War, the threat of global thermonuclear war between the superpowers has greatly diminished. Since then, concern over nuclear weapons has shifted to the prevention of localized nuclear conflicts resulting from nuclear proliferation, and the threat of nuclear terrorism.

The following is a list of nations that have, or may have, nuclear weapons, and the approximate number of warheads under their control in 2009. With the exception of Russia and the United States (which have subjected their nuclear forces to independent verification under various treaties) these figures are estimates, in some cases quite unreliable estimates.

Country	Number of Warheads Active / Total
China	~180 / 240
France	300 / 300
India	n. a. / 60-80
Israel	n. a. / 80
North Korea	n. a. / <10
Pakistan	n. a. / 70-90
Russia	4,650 / 12,000
United Kingdom	<160 / 185
United States	2,626 / 9,400
Source: Natural Resources Defense Council, via http://en.wikipedia.org/wiki/List_of_states_with_nuclear_weapons	

From a high of 65,000 active weapons in 1985, there are now nearly 8,000 active nuclear warheads and about 23,300 total nuclear warheads in the world in 2009. Many of the "decommissioned" weapons were simply stored or partially dismantled, not destroyed.

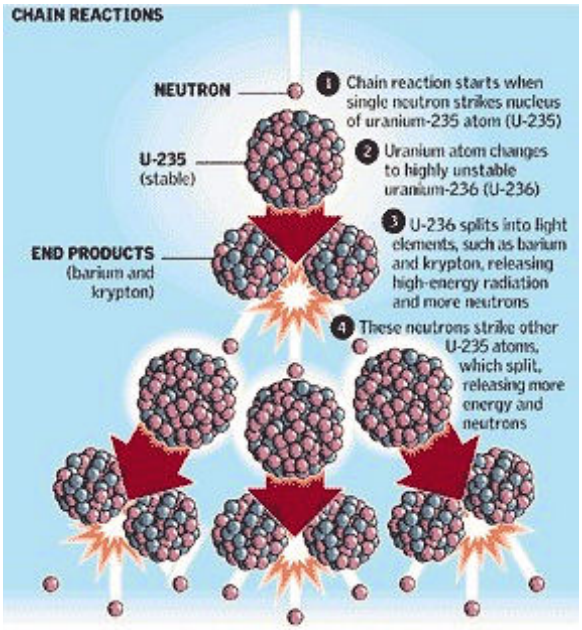
Civil Defense, previously known as Civilian Defense, had existed in the United States for many years, but took on a new importance and urgency after World War II. The Civil Defense Act of 1950 formally established a national peacetime civil defense. The Civil Defense program consisted of the following key elements:

- educating people about the dangers of nuclear attack and how to survive
- developing evacuation plans for cities and large metropolitan areas
- ensuring the continuity of government at all levels

- identifying and stocking large fallout shelters and encouraging people to build their own
- developing the means to alert and warn the people.

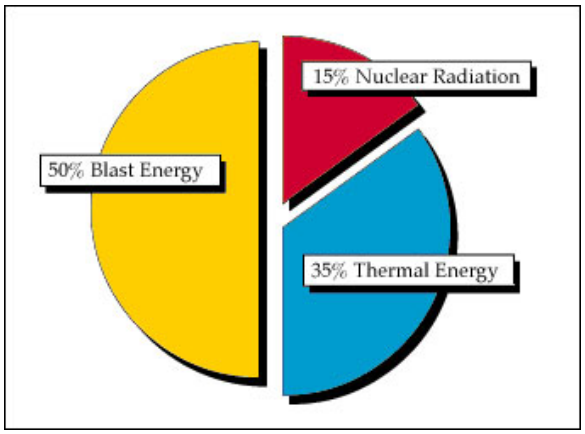
As a result of the Cuban Missile Crisis of 1962 the Federal contribution to state and local Civil Defense was increased to include shelter supplies, fallout shelter surveys, training, and radiological detection equipment. As time passed shelter supplies were disposed of as they reached their safe storage limit. Reduced budgets, a lack or urgency and a policy of Mutually Assured Destruction reduced the program to a shell. With the end of the cold war in the early 1990s the Civil Defense program was gradually phased out and replaced by an all-hazards approach known as Emergency Management, sometimes more recently called Homeland Security. This new approach put greater emphasis on preparing for more commonly occurring natural and technological disasters, and less on preparing for war.

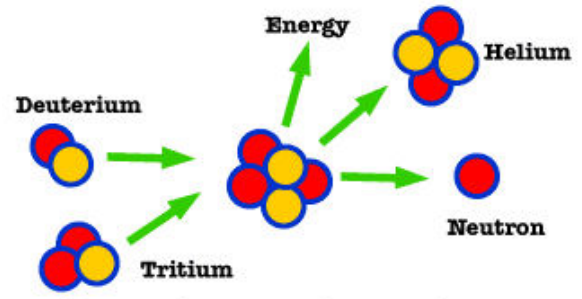
The "yield" of a nuclear weapon is a measure of the amount of explosive energy it can produce. The yield is given in terms of the quantity of TNT that would generate the same amount of energy when it explodes. The explosive energy yields of fission bombs are equivalent to some thousands of tons (i.e., kilotons) of TNT. With the development of thermonuclear (fusion) weapons, energy yields are in the range of millions of tons (i.e., megatons) of TNT.



The power of an atom bomb comes from the release of energy holding together each individual atom of uranium. When sufficient fuel is brought together, a chain reaction occurs: energy released is a hundred million times greater than that from a chemical reaction.

A large proportion of the energy in a nuclear explosion is emitted in the form of light and heat. This energy is capable of causing skin burns and of starting fires at considerable distances. Nuclear explosions are also accompanied by various forms of radiation, some lasting a few seconds, other types remaining dangerous over an extended period of time.





How fusion works. Heat and pressure force tritium & deuterium to fuse into an unstable mass which immediately splits into helium, and a neutron, releasing a great amount of energy.

Vulnerability

Nuclear explosions produce both immediate and delayed destructive effects. Blast, thermal radiation, and prompt ionizing radiation cause significant destruction within seconds or minutes of a nuclear detonation. The delayed effects, such as radioactive fallout and other possible environmental effects, inflict damage over an extended period of time ranging from hours to years. The range and severity of these effects vary with weapon design, height of detonation, weapon yield, and protective barriers between the weapon and the individual.

- Most damage comes from the explosive blast shock wave.
- Approximately one third of the energy from a nuclear explosion is an intense burst of thermal radiation (heat and light). Skin burns result from higher intensities of light, and therefore take place closer to the point of explosion. First-degree, second-degree and third-degree burns can occur at distances of five miles or more from the blast. The degree of injury from the thermal pulse will depend greatly on clothing and skin color. Darker clothing and skin will absorb more of the energy, giving a more severe burn.
- The visible light will produce "flash-blindness" (usually temporary) in people who are looking in the direction of the explosion.
- Direct radiation occurs at the time of the explosion. In the case of smaller weapons, direct radiation may be the lethal effect with the greatest range.
- Fallout radiation is received from particles that are made radioactive by the effects of the explosion, and subsequently distributed at varying distances from the site of the blast. The intensity, direction, and distance of the fallout are strongly influenced by local weather conditions.

Dose-rem*	**Effects**
5-20	Possible late effects; possible chromosomal damage.
20-100	Temporary reduction in white blood cells.
100-200	Mild radiation sickness within a few hours: vomiting, diarrhea, fatigue; reduction in resistance to infection.
200-300	Serious radiation sickness effects as in 100-200 rem and hemorrhage; exposure is a Lethal Dose to 10-35% of the population after 30 days (LD 10-35/30).
300-400	Serious radiation sickness; also marrow and intestine destruction; LD 50-70/30.
400-1000	Acute illness, early death; LD 60-95/30.
1000-5000	Acute illness, early death in days; LD 100/10.

* rem = a unit of absorbed dose that accounts for the relative biological effectiveness of ionizing radiation.

Electro-magnetic pulse (EMP) effects could result in extensive electronics disruption, complicating the function of communications, computers, and other essential electronic equipment.

In terms of nuclear war, both Boise City and Mountain Home Air Force Base (AFB) were determined to be potential targets. There are two scenarios concerning a nuclear blast. In a no-notice attack, Boise could lose most of its people and Ada County could perhaps lose most of its population as well, depending on the size and type of weapon. With a prior warning the survival percentage increases in direct proportion to the evacuation lead time. Ada County does have a general plan to evacuate its residents to counties north and west. Due to generally prevailing winds and the position of Mt. Home AFB, we would not attempt to evacuate to the east. Exercising a large scale evacuation plan is difficult if not impossible. Also, the host counties have no specific plans in place for receiving and providing shelter and mass care for the incoming population.

Admiral Blandy and his wife celebrate the success of Castle Bravo, the detonation of the world's first practical hydrogen bomb - and the largest nuclear explosion ever set off by the United States - at Bikini Atoll, Marshall Islands, on March 1, 1954. Source: http://www.ectomo.com/.../2008/08/12/a-job-well-done

Emergency response is principally a local function. However, response to a nuclear detonation is beyond the capability of any local jurisdiction or even any state. An immense level of Federal assistance and resources would be needed to respond to a nuclear detonation. There will be no significant Federal response at the scene for 24-hours and the full extent of Federal assets will not be available for at least 72 hours.

Federal response to a nuclear incident would be led by the Department of Energy's National Nuclear Security Administration (NNSA). This DOE program is prepared to respond to a radiological incident anywhere in the world with the following elements.

- Aerial Measuring System detects, measures and tracks radioactive material to determine contamination levels.

- Atmospheric Release Advisory Capability develops predictive plots generated by sophisticated computer models.
- Accident Response Group is deployed to manage or support the successful resolution of a US nuclear weapon accident.
- Federal Radiological Monitoring and Assessment Center coordinates Federal radiological monitoring and assessment activities with those of state and local agencies.
- Nuclear Emergency Support Team provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents.
- Radiological Assistance Program is usually the first NNSA responder for assessing the emergency situation and deciding what further steps should be taken.
- Radiation Emergency Assistance Center/Training Site provides treatment and medical consultation for injuries resulting from radiation exposure and contamination.

The lessons from multi-hazard planning and response will be applicable to the response to a nuclear detonation. While fallout and the scale of damage presented by a nuclear detonation present significantly complicating hazards, most aspects of multi-hazard planning and many of the response capabilities are still useful.

Risk

Risk of nuclear war is: very low.

Websites:
https://narac.llnl.gov/
http://www.bt.cdc.gov/radiation/
http://nnsa.energy.gov/
http://www.nti.org/index.php

Some of the information and some images in this section are courtesy of:
http://www.atomicarchive.com/index.shtml

STRUCTURAL FIRE

Structural fire in the urban environment is not considered a major threat. Several factors, including the adherence to fire codes, fire inspections, and changes in home heating and lighting methods have combined to reduce the threat of structural fire. However, structural fires do occur and deaths from fires and burns are the fifth most common cause of unintentional injury deaths in the United States and the third leading cause of fatal home injury. The national fire death rate is 13.2 deaths per million of the population. In Idaho the rate is 16.4 deaths per million.

Ada County fire departments possess an abundance of firefighting apparatus and related resources. Local fire agencies are also staffed with well-trained professional and volunteer firefighters.

Occurrence and Consequences

- Four out of five U.S. fire deaths in 2008 occurred in homes
- In 2008, fire departments responded to 403,000 home fires in the United States, which claimed the lives of 2,755 people (not including firefighters) and injured another 13,560, not including firefighters.
- Most victims of fires die from smoke or toxic gases and not from burns.
- Smoking is the leading cause of fire-related deaths.
- Cooking is the primary cause of residential fires.

Groups at increased risk of fire-related injuries and deaths include:

- Children 4 and under;
- Older Adults ages 65 and older;
- African Americans and Native Americans;
- The poorest Americans;
- Persons living in rural areas;
- Persons living in manufactured homes or substandard housing.

Risk Factors

- Approximately 4 out of 10 home fire deaths occur in homes without smoke alarms.
- Most residential fires occur during the winter months.
- Alcohol use contributes to an estimated 40% of residential fire deaths.

Vulnerability

Although the number of fatalities and injuries caused by residential fires has declined gradually over the past several decades, many residential fire-related deaths remain preventable and continue to pose a significant public health problem.

Besides deaths fires cause a tremendous amount of damage. In 2006 alone, residential fires cost nearly $7 billion in property damage. The sentimental value of lost personal items and keepsakes cannot be estimated.

Cooking is the leading cause of residential fires and the leading cause of fire injuries in the home. Cooking fires often result from leaving a stove unattended and from human error, rather than a mechanical failure of stoves or ovens.

Careless smoking is the leading cause of fire deaths in the home. Working smoke detectors and fire-resistant bedding and upholstery can significantly reduce the risk of death from cigarette fires. Keeping children from playing with the matches and lighters of smokers will also significantly reduce the risk of fires.

Arson, candles, and home heating systems (including space heaters) are the leading causes of residential fires and the second leading causes of fire deaths. Heating fires are actually a larger problem in single family homes than in apartment buildings. Unlike apartments, heating systems in single family homes are often not professionally maintained.

In commercial properties, arson is the major cause of deaths, injuries, and damages.

Risk

Risk of structural fire is: high.

History

June 29, 2008. A 25-gallon propane tank left in 105° Fahrenheit heat exploded destroying two residences at 3987 & 4013 Iriondo Way. The explosion also damaged a gas line into one of the homes accelerating the fire.

May 21, 2006. A three-alarm fire destroyed a three story senior residential building that was under construction at 15th and Hill Road. At one point the building was close to fully involved. Losses were estimated at $3.1 million.

March 21, 2004. A fire at the Idaho Statesman newspaper pressroom located at 1200 N. Curtis Road; went to three-alarms and resulted in two workers being transported to the hospital with burn injuries.

July 10, 1999. A propane tank on a barbeque exploded in near 100 degree F and spread to two apartments on the third floor of the Quads apartment complex at 915 Sherwood St. The fire rapidly escalated to three alarms. In all 16 units suffered damages.

1995 September 14th – Four stores in the Vista Village Shopping Center were completely destroyed by fire. Damages were listed over $500,000.

February 11, 1992. Arsonist and murderer Robin Rowe burned down her house killing her two children and husband. Mrs. Rowe was convicted of the murders and sentenced to death. As of 2005, she is the only woman on Death Row in Idaho.

January 1, 1992. A multiple alarm fire tore through the second and third floors of the Idaho State Capital Building at 700 W Jefferson St., destroying the offices of the State Attorney General. The blaze caused 3.2 million dollars in damages. The fire was started by a cigarette dropped in a waste basket.

June 20, 1991. A major fire struck the Beehive Honey and Processing plant located at 4241 Hill Road. The plant was completely destroyed. The fire was ruled arson.

July 3, 1989. Two major alarm fires started 15 minutes apart and caused over $750,000 in damages. The first fire at the Emerald Club located in the old Hotel Mitchell at 10th and Front streets caused $100,000 in damages. The second fire did $650,000 to the Albertson's Shopping Center at 1744 W. State Street destroying seven businesses.

July 27, 1980. A massive fire destroyed the Boise Cascade Barber Mill located on Warm Springs Ave. Burning lumber smoldered and flared up for days after the fire.

November 14, 1976. The fire was at the 1902 Saint Alphonsus Hospital building located at 410 N. 5th Street. The building once saved from the wrecking ball by the State Legislature couldn't be saved from a fire that caused over $250,000 in damages.

September 22, 1974. An arson fire caused over $100,000 in damages to Capital High School. A 16 year-old male was arrested for that fire and seven others.

October 17, 1966. An explosion ripped through the vehicle license plate plant at the Idaho State Penitentiary south of the Airport. Initially guards and trustees attempted to extinguish the fire. Two fire departments and nine apparatus were eventually required to control the fire.


Mode Department Store
Source: The Idaho Statesman

1961. For the third time in the history of the department, fire damages exceeded $1 million when fires destroyed the Jordan-Wilcomb warehouse (Jan 27th), Idaho Power Warehouse, and numerous other smaller buildings.

June 18, 1958. The Mode Department store was destroyed in a spectacular fire that caused over $395,000 in damages and injured one man. The fire originated in the basement and quickly spread through a dumb waiter shaft.

August 9, 1956. Over $200,000 in damage was done when the Continental Lumber Company was destroyed by fire.

1951. Two fires in close proximity caused $1.1 million in damages. The first, on September 9th, caused $600,000 in damage to the 1888 Sonna building and Idanha Hotel annex. Five days later on the 14th, an early morning fire in the Tennyson Transfer and Storage warehouse at 6th and Broad Streets heavily damaged and taxed firefighters resulting in $500,000 in damages.

December 17, 1945. Spontaneous combustion ignited a fire in the basement of the McCarty Building on the northeast corner of 9th & Idaho St. The fire rapidly spread to the first floor destroying the Ballow-Latimer Drug store and Sid Kleffners Sporting Goods as well as heavily damaging the Boise Cyclery and Buttler's Barber shop. A General Alarm was rapidly called summoning all apparatus to the scene and calling in off-duty personnel. After 7½hrs the fire was declared under control in the 4-story office building.

January 18, 1942. A two-alarm fire is caused by leaking gas resulted in an explosion in the Shang Hai Pow Café causing heavy damages that required firefighters to use over 24,000-gallons of water to extinguish the blaze in 3½hrs.

August 10, 1939. A general alarm fire burned four-square blocks between Fairview Avenue and the Railroad tracks from 25th to 27th Streets. Damages were listed over $300,000 as numerous buildings and six businesses are destroyed. Boxing fans watching a prizefight at the Boise Athletic Club barely escaped the rapidly spreading inferno. The fire burned for over 16-hours and required 900,000 gallons of water to extinguish the blaze. This is the worst fire in the history of Boise to this date.

April 3, 1938. A general alarm was required for a middle of the night fire that started in the Men Mar Theatre building at 810 Main St. The massive fire rapidly extended to the Woolworths 5-10c Store, Falk's Department Store located next door and Economy Hotel at 811½ Idaho St. All five businesses in the Men Mar Theatre building were destroyed but firefighters were able to keep damage to a minimum in the other three buildings. The fire took over 4-hrs to control and required the response of all BFD personnel and mutual aid from the U.S. Veterans Hospital FD.

September 13, 1933. A General Alarm was called when a fire destroyed the L.P. Kieldson building at 111-121 S 10th St. Once again every piece of apparatus and 15 off-duty firefighters are requested but this time due to the intensity of the fire mutual-aid is also requested from the US Veteran Hospital Fire Department. Fire crews worked for over 6-hours and poured over 800,000 gallons of water on the fire. The businesses, The Bertram Motor Co, Union Seed Co and Northrup-King Co lose everything in the fire.

August 4, 1933. A General Alarm was required to extinguish a fire that extensively damaged the Standard Furniture Store at 817 W Bannock St. Every piece of apparatus and 13 off-duty firefighters respond and work for 2½-hours to control the blaze.

February 29, 1932. It took over 7-hours to control a fire at the Boise Valley Packing Company slaughter house in Eagle.

January 22, 1929. Firefighters work for over 3hrs at the County Operative Creamery in Meridian on a fire started by hot tar.

January 9, 1928. A devastating fire destroyed the stable at the Boise Barracks killing 32 military horses. Firefighters worked for over 4-hrs to control the fire.

December 11, 1926. Mutual aid crews responded to Star for a large fire. It took over 3-hrs to bring the blaze under control.

March 8, 1924. Fire broke out around midnight in the Manitou Hotel at 1008 Main St and rapidly spread throughout the 4-story building destroying the offices of George Cordes, the Strand Theatre and heavily damaging the hotel, Cash Bazaar and extending to the Alaska Building before firefighters are able to control it. A general alarm is called requiring all

personnel and department equipment be put into service. Firefighters battled the fire for six hours and use over 440,000 gallons of water to extinguish the blaze.

November 4, 1920. Mutual aid resources were required to battle a large lumber yard fire at Boise-Payette Lumber Company located in Eagle. The companies operated for 11½-hrs while fighting the fire.

October 26, 1914. A delayed alarm caused a devastating fire and death at the Parkinson Livery Stable. Forty-seven horses were killed in the fire, some of them running back into the building after being led out. The livery stable was eventually rebuilt and today is the El Korah Shrine at 12th and Idaho Streets.

1899. The Pioneer building at 8th and Grove Streets burned in a spectacular midday fire that attracted nearly every resident in town to watch.

May 16, 1881. A conflagration wiped out between 8 and 10 buildings on the south side of Main St between 6th and 8th Streets for a loss of $20,000.

Websites:
http://www.cdc.gov/ncipc/factsheets/fireprevention.htm
http://www.firesafety.gov/
http://en.wikipedia.org/wiki/Structure_fire

Source: A lot of the fire information and statistical data are courtesy of the US Centers for Disease Control and Prevention. The fire history of Boise and the surrounding area was provided by the Boise Fire Department.

TERRORISM

Terrorism is defined in the US Code of Federal Regulations as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 C.F.R. Section 0.85). Terrorism then, is the premeditated use or threat of violence to achieve political or social ends, to intimidate opponents, or to publicize grievances.

Terrorism is a worldwide phenomenon with a lamentably long and bloody history. One of the oldest types of terrorism is political assassination. To name just a few, Julius Caesar, Abraham Lincoln, Archduke Ferdinand, John Kennedy, Anwar Sadat, and Indira Gandhi were all assassinated.

As is continually demonstrated, small groups or even single individuals can cause massive damage and terrible human suffering without any warning. Weapons that terrorists have at their disposal may be classified into four categories. These are:

- Conventional arms and explosives
- Chemical weapons
- Nuclear and radiological weapons
- Biological weapons

These weapons are known as Weapons of Mass Destruction (WMD) because they have the potential to kill large numbers of people and destroy buildings and other property. Nuclear, biological and chemical weapons also present a downwind hazard from the point of detonation in the direction the wind is blowing. Some would add cyber weapons to this list as well.

An improvised explosive devise or IED, is the most commonly used WMD. Although they can vary greatly in size and shape all IEDs share a common set of components:

- An initiating fuse
- Explosive material
- A detonator
- A power supply for the detonator
- A container.

Explosives are substances that, through chemical reaction, rapidly and violently change to gas, accompanied by high temperatures, extreme shock and a loud noise. An explosion is the process of the substance transforming into the gaseous state.

Explosives are classified as low or high according to the detonating velocity or speed at which this change takes place and other pertinent characteristics such as their shattering effect. An arbitrary figure of 3300 fps is used to distinguish between burning/ deflagration (low explosive) and detonation (high explosive).

The explosive material may be cannibalized from unexploded or abandoned military ordnance, stolen from some legitimate user, or it may be created from scratch by mixing its chemical constituents. Surprisingly powerful explosives can be created from chemicals found in many homes. Dynamite and plastic explosives such as Semtex and C-4 are often employed by terrorist bombers and suicide bombers. On a larger scale ammonium nitrate and fuel oil were used to destroy the Federal Building in Oklahoma City, OK.

Chemicals that might be used by terrorists range from warfare agents to toxic chemicals used by industry. Typical categories of these agents include:

- Nerve agents. These agents are related to the organophosphates used in pesticides. They attack the victim's nervous system. Some examples are Tabun, Sarin, Soman, and VX. Sarin gas was used in the attack on the Japanese subway system.
- Blood agents. These agents, including hydrogen cyanide, and cyanogens chloride, attack the blood's ability to carry oxygen, thus suffocating the victim.
- Blister agents. Known also as Mustard gas or Lewisite, these agents were used extensively in World War I and have been used in many other conflicts since then.
- Pulmonary agents. Also know as choking agents, these substances cause the lungs to fill with fluid.
- Incapacitating agents. These agents include pepper spray, tear gas, and riot gas, usually irritate the skin, mucous membranes, eyes, nose, lips and mouth. Generally they are not designed to kill but to incapacitate or force those exposed to withdraw from an area.

One of the most catastrophic incidents that could befall the United States, causing enormous loss of life and property and severely damaging economic viability, is a nuclear detonation in a US city. There is great concern around the globe that terrorists might acquire and use either a nuclear bomb or a radiological dispersion device. A radiological dispersion device (RDD) is designed to spread radioactive material into the environment, either to kill, or to deny the use of an area. This so-called 'dirty bomb' would consist of radiological material wrapped around conventional explosives, which upon detonation would spew deadly radioactive particles into the environment. A radiological weapon is not a nuclear weapon. The blast effect of a radiological bomb is therefore the same as the blast effect of a conventional bomb using the same amount of explosive.

The threat from radiological dispersion dims in comparison to the possibility that terrorists could build or obtain an actual atomic bomb. An explosion of even low yield could kill hundreds of thousands of people. A relatively small bomb, say 15-kilotons, detonated in a large, densely packed city could immediately kill upwards of 100,000 inhabitants, followed by a comparable number of deaths in the lingering aftermath. Fortunately, bomb-grade nuclear fissile material (highly enriched uranium or plutonium) is guarded relatively well.

The hurdles for terrorists to get a nuclear weapon are extremely high. The probability of terrorist use of such a weapon is therefore extremely low. To build nuclear weapons is a difficult task, even for countries. Moreover, the Non-Proliferation Treaty, the main pillar of nuclear non-proliferation, has been strengthened and safeguards have been improved. The secret development of a nuclear weapon by a sub-state group is even more unlikely. For details on the effects of a nuclear explosion see the Nuclear War section.

In contrast to the nuclear weapon case, there are in principle no insurmountable obstacles to the acquisition and use of radiological weapons by a well-organized terrorist group, even though such an action remains high-tech and thus very difficult. Experts estimate the probability of such an attack occurring somewhere in the world within the next 10 years at 40%. Few communities have comprehensive programs for the management of an RDD attack. These would include public education, contingency planning, and first responder preparedness. Also needed are standards defining the levels of contamination we can live with if that attack were to occur. Should such an event take place the repercussions would be enormous and worldwide. All around the globe people's desire to live in cities and their civil liberties would be drastically affected.

Biological terrorism, or bioterrorism, is the deliberate release of viruses, bacteria, or other germs (agents) used to cause illness or death in people, animals, or plants. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment. Biological agents can be spread through the air, through water, or in food. Terrorists may use biological agents because they can be extremely difficult to detect and do not cause illness for several hours to several days. Some bioterrorism agents, like the smallpox virus, can be spread from person to person, while others like anthrax, can not.

Bioterrorism agents can be separated into three categories, depending on how easily they can be spread and the severity of illness or death they cause. Category A agents are considered the highest risk and Category C agents are those that are considered emerging threats for disease.

Category A
These high-priority agents include organisms or toxins that pose the highest risk to the public and national security because:

- They can be easily spread or transmitted from person to person
- They result in high death rates and have the potential for major public health impact
- They might cause public panic and social disruption
- They require special action for public health preparedness.
- Examples include: Smallpox, Anthrax, and Plague.

Category B
These agents are the second highest priority because:

- They are moderately easy to spread
- They result in moderate illness rates and low death rates
- They require specific enhancements of CDC's laboratory capacity and enhanced disease monitoring.
- Examples include: Q Fever, Brucellosis, and Salmonella.

Category C
These third highest priority agents include emerging pathogens that could be engineered for mass spread in the future because:

- They are easily available
- They are easily produced and spread

- They have potential for high morbidity and mortality rates and major health impact.
- Examples include: Hanta Virus, Hemorrhagic Fever, and Yellow Fever.

Biological agents are undetectable to the five human senses. Unlike other WMD attacks, in a biological attack there is an incubation period, and for this reason not all casualties would occur at the same time. Ultimately the panic or concern associated with a bioterrorist attack may result in far more havoc than the attack itself. This is partly due to the fact that in a terrorist attack involving explosives or chemical weapons, individuals not near the incident scene would not be unduly concerned for their own safety. However in a biological weapons attack no one can be sure of their own safety because the areas, methods used, and length of time disseminating the biological agents would likely not be known.

Vulnerability

Boise City is the state capital as well as the county seat. The Idaho Governor's Office, the State Legislature and the Idaho Supreme Court are all potential targets for terrorists. The Federal Building in Boise and other federal agencies that have a presence in Ada County could be targets as well. The Idaho State Prison is also in Ada County.

A number of large businesses, some with overseas interests, have their corporate headquarters located in Boise. There are also several large banks with local offices. Some of these businesses have been the scene of various demonstrations and could be the target of a terrorist incident.

Any large assembly of people presents a potential target for a terrorist attack. Boise State University, the Pavilion, the Morrison Center, the Fairgrounds, and other large venues are areas for concern. Hijacked aircraft and air terminals around the world have been targeted in numerous terrorist incidents.

Since the events of September 11, 2001, the nation has taken a series of steps to address threats against our safety and security. Additional steps, including those at the local level, remain to be taken.

On February 20, 2002, a bomb scare forced the evacuation of the Ada County Courthouse. And on October 29 of the same year an anthrax scare resulted in SCP Global Technologies plant being shut down.

Risk

Risk of terrorism is: moderate.


DAILY NEWS

ANTHRAX NATION

Spores found in Pataki's offices
31 exposed at U.S. Senate
House shuts down for tests
New York & Florida strains match

History

Attacks against the US:

October-November 2001. Anthrax Attacks. On October 7 the U.S. Centers for Disease Control and Prevention (CDC) reported that investigators had detected evidence that the deadly anthrax bacterium was present in the building where a Florida man who died of anthrax on October 5 had worked. Discovery of a second anthrax case triggered a major

investigation by the Federal Bureau of Investigation (FBI). The two anthrax cases were the first to appear in the United States in 25 years. Anthrax subsequently appeared in mail received by television networks in New York and by the offices in Washington of the Senate Majority Leader and other members of Congress.

September 11, 2001. Terrorist Attacks on U.S. Homeland. Two hijacked airliners crashed into the twin towers of the World Trade Center. Soon thereafter, the Pentagon was struck by a third hijacked plane. A fourth hijacked plane, suspected to be bound for a high-profile target in Washington, crashed into a field in southern Pennsylvania. The attacks killed 3,025 U.S. citizens and other nationals. The President and other officials indicated that Osama Bin Laden was the prime suspect and that they considered the United States in a state of war with international terrorism.

October 12, 2000. Attack on U.S.S. Cole. In Aden, Yemen, a small dingy carrying explosives rammed the destroyer U.S.S. Cole, killing 17 sailors and injuring 39 others. Supporters of Osama Bin Laden were suspected.

August 7, 1998. U.S. Embassy Bombings in East Africa. A bomb exploded at the rear entrance of the U.S. Embassy in Nairobi, Kenya, killing 12 U.S. citizens, 32 Foreign Service Nationals (FSNs), and 247 Kenyan citizens. Approximately 5,000 Kenyans, 6 U.S. citizens, and 13 FSNs were injured. Almost simultaneously, a bomb detonated outside the U.S. Embassy in Dar es Salaam, Tanzania, killing 7 FSNs and 3 Tanzanian citizens, and injuring 1 U.S. citizen and 76 Tanzanians. The explosion caused major structural damage to the U.S. Embassy facility. The U.S. Government held Osama Bin Laden responsible.

June 25, 1996. Khobar Towers Bombing. A fuel truck carrying a bomb exploded outside the US military's Khobar Towers housing facility in Dhahran, killing 19 U.S. military personnel and wounding 515 persons, including 240 U.S. personnel. Several groups claimed responsibility for the attack.

April 19, 1995. Bombing of the Federal Building in Oklahoma City. Right-wing extremists Timothy McVeigh and Terry Nichols destroyed the Federal Building in Oklahoma City with a massive truck bomb that killed 166 and injured hundreds more in what was up to then the largest terrorist attack on American soil. The bombing was in retaliation for the 4/19/93 Waco incident.


Federal Building, Oklahoma City, 1995

February 26, 1993. World Trade Center Bombing. The World Trade Center in New York City was badly damaged when a car bomb planted by Islamic terrorists exploded in an underground garage. The bomb left 6 people dead and 1,000 injured. The men carrying out the attack were followers of Umar Abd al-Rahman, an Egyptian cleric who preached in the New York City area.

December 21, 1988. Pan Am Flight 103 Bombing. Pan American Airlines Flight 103 was blown up over Lockerbie, Scotland, by a bomb believed to have been placed on the aircraft by Libyan terrorists in Frankfurt, West Germany. All 259 people on board were killed.

April 5, 1986. Berlin Discothèque Bombing. Two U.S. soldiers were killed and 79 American servicemen were injured in a Libyan bomb attack on a nightclub in West Berlin, West Germany. In retaliation U.S. military jets bombed targets in and around Tripoli and Benghazi.

1984. Antelope Oregon bio-terrorism. Members of the Bhagwan Rajneesh cult, 10,000 strong, spread salmonella in 10 different restaurants, on doorknobs & urinal handles in the courthouse, plus 2 commissioners were given contaminated water, 751 people affected. The incident was the first known bioterrorism attack in the United States

October 23, 1983. Bombing of Marine Barracks, Beirut. Simultaneous suicide truck-bomb attacks were made on American and French compounds in Beirut, Lebanon. A 12,000-pound bomb destroyed the U.S. compound, killing 242 Americans, while 58 French troops were killed when a 400-pound device destroyed a French base. Islamic Jihad claimed responsibility.

April 18, 1983. Bombing of U.S. Embassy in Beirut. Sixty-three people, including the CIA's Middle East director, were killed and 120 were injured in a 400-pound suicide truck-bomb attack on the U.S. Embassy in Beirut, Lebanon. The Islamic Jihad claimed responsibility.

January 27-29, 1975. Domestic Terrorism. Puerto Rican nationalists bombed a Wall Street bar, killing four and injuring 60; two days later, the Weather Underground claims responsibility for an explosion in a bathroom at the U.S. Department of State in Washington.

Attacks against foreign nations:
September 1, 2004. Beslan School Attack. A school in the town of Beslan, North Ossetia, was attacked by a group of armed mostly Ingush and Chechen militants who took more than 1,100 people (including 777 children) hostage. On the third day of the standoff, Russian security forces stormed the building. Ultimately, at least 334 hostages were killed, including 186 children; hundreds more were injured and many were reported missing. Perhaps the third worst terrorist event.

October 23-26, 2002. Chechen Rebels Seize a Moscow Theater. Fifty Chechen rebels seized the Palace of Culture Theater in Moscow, Russia, to demand an end to the war in Chechnya. They seized more than 800 hostages from 13 countries and threatened to blow up the theater. On October 26, Russian Special Forces pumped an anesthetic gas through the ventilation system and then stormed the theater. All of the rebels were killed, but 94 hostages (including one American) also died, many from the effects of the gas.

March 20, 1995. Tokyo Subway Station Attack. Twelve persons were killed and 5,700 were injured in a Sarin nerve gas attack on a crowded subway station in the center of Tokyo, Japan. A similar attack occurred nearly simultaneously in the Yokohama subway system. The Aum Shinri-kyo cult was blamed for the attacks.

June 23, 1985. Air India Bombing. A bomb destroyed an Air India Boeing 747 over the Atlantic, killing all 329 people aboard. Both Sikh and Kashmiri terrorists were blamed for the attack. Two cargo handlers were killed at Tokyo Airport in Japan, when another Sikh bomb exploded in an Air Canada aircraft en route to India.

June 27, 1976. Entebbe Hostage Crisis. Members of the Baader-Meinhof Group and the Popular Front for the Liberation of Palestine (PFLP) seized an Air France airliner and its 258 passengers. They forced the plane to land in Uganda. On July 3, Israeli commandos successfully rescued the passengers.

September 5, 1972. Munich Olympic Massacre. Eight Palestinian "Black September" terrorists seized eleven Israeli athletes in the Olympic Village in Munich, West Germany. In a bungled rescue attempt by West German authorities, nine of the hostages and five terrorists were killed.

Websites:
http://www.fema.gov/hazard/terrorism/index.shtm
https://narac.llnl.gov/
http://www.bt.cdc.gov/radiation/
http://nnsa.energy.gov/
http://en.wikipedia.org/wiki/Terrorism
http://www.nuclearterror.org/index.html

TRANSPORTATION

Transportation issues will be addressed from the perspective of multiple patient (5 or more) or mass casualty (10 or more) incidents, property damage and indirect effects on the community.

Aircraft

Boise Air Terminal is served by more than a dozen commercial airlines. Passenger traffic is approximately 3,000,000 persons a year. Currently the largest regularly scheduled passenger aircraft to land at Boise airport is the Boeing 737-800. Several dozen businesses are located on or about the airport. There is also a large fleet of private and corporate aircraft based at the airport.

Collocated with Boise Air Terminal is the Gowen Field Air National Guard Base. Gowen Field primarily refers to the military facilities which include Air National Guard, Army National Guard, and reserve units of the Army, Navy, and Marine Corps. The National Guard uses a variety of fixed wing and rotary aircraft. In addition, many other types of aircraft not assigned there periodically use Gowen Field facilities.

The National Interagency Fire Center is based in Boise City and the Boise Airport is used for logistical support. The United States Forest Service also uses Boise Airport as a base for firefighting air tankers during the wildfire season

Railroad

The mainline for the Union Pacific Railroad passes through the sparsely populated center of the county and Kuna City on its way to and from northwestern cities. Spurs permit access to Boise and Meridian. Ada County has roughly 110 miles of railroad track.

Motor Vehicles

There are more than 200 miles of federal and state highways and 1,500 miles of local roads in Ada County. There are 19 motor vehicle bridges over the Boise River, as well as numerous other overpasses and smaller bridges over creeks, canals, railroad tracks and other obstructions. Relative to the size of the area, commuter traffic in the mornings and afternoons is heavy, with a large volume of vehicles originating in Canyon County.

The busiest intersections in Ada County have been moving west along with the population growth. In 2008 the busiest intersection, Eagle Road / Fairview Avenue, had 6,700 vehicles negotiating the intersection during the busiest hour for traffic volume. That's a six percent increase since 2005. In the fifteen years of comparing intersection counts, the volumes have

increased from a single intersection with an hourly traffic volume over 5000 vehicles (Franklin & Milwaukee in 1993) to a dozen intersections with a volume over 5000. Among the most dangerous intersections in Ada County in terms of the number of collisions are: Eagle Road / Fairview Avenue, Cole Road / Overland Road, and Fairview Avenue / Curtis Road. Data courtesy of Ada County Highway District.

Bus systems from transcontinental carriers to single unit operations by private groups operate through and within the county. The three area school districts own or contract for many of these buses. Valley Regional Transit (VRT) is the regional public transportation authority for Ada and Canyon Counties. VRT bus services are operated under the name ValleyRide.

Vulnerability

Aircraft Vulnerability

Boise is the primary air travel hub in Idaho and also serves parts of northern Nevada and eastern Oregon. The area serviced through commercial aviation at Boise airport is over one million people. Weather is always a factor in flying, but in Boise it is not as much of a factor as it is in many other locations. The runway flight paths do extend over populated areas in Boise and Meridian.

Railroad Vulnerability

At this time there is no Amtrak passenger service to Boise. Previously when Amtrak did service Boise there were no serious accidents or incidents. The Union Pacific Railroad averages one to two dozen trains a day through Ada County. Many of these trains carry some hazardous materials cargo. The main area of concern is Kuna, since the tracks pass close to the center of the city. A large accident or derailment in that area might make it difficult for emergency responders to reach areas south of the train tracks. Although usually not mass casualty incidents, there are occasional collisions between trains and motor vehicles at railroad crossings. Often these collisions are fatal.

Motor Vehicle Vulnerability

Roads and other transportation infrastructure are often hit hard by flash floods, and sometimes by landslides. Earthquakes have the potential to disrupt traffic over a wide area by buckling the roadbed and causing overpasses and bridges to fail. Power outages can cause large traffic jams when traffic lights are not working. Also the aging of infrastructure items such as bridges can cause failures. On August 1, 2007 during the evening rush hour, the eight-lane I-35W Mississippi River Bridge suddenly collapsed, killing 13 people and injuring 145. The bridge was Minnesota's fifth busiest, carrying more than 140,000 vehicles daily. The investigation by the NTSB cited a design flaw as the likely cause. This incident prompted a nationwide review of bridge safety.

Most of the ValleyRide busses run on natural gas. As with diesel or gasoline powered vehicles, occasionally these natural gas buses catch fire.

Perhaps the greatest exposure involves school buses. The number of buses, number of passengers, number of trips, route exposure and weather susceptibility are all factors in this exposure. Another area of concern is the busloads of skiers and snow-boarders traveling to and from the Bogus Basin ski area. The weather, road characteristics, and nighttime driving are all reasons for concern.

Risk

Aircraft risk is: low. Railroad risk is: low. Motor vehicle risk is: moderate.

History

Local Aviation History

There have been no mass casualty aircraft losses within Ada County at least since World War II. However, as at every major airport some incidents and fatalities have occurred. Briefly: A small twin engine plane crashed near Micron, 2 fatalities. A commercial OV-10 crashed and took out three other aircraft, 1 fatality. A military A-10 crashed some miles west of the airport, 1 fatality. There have been at least a dozen blown tires on the runway and an equal number of gear-up landings. Several unknown white powder incidents have occurred, prompting full hazardous materials responses. At least three hard helicopter landings that destroyed the aircraft have occurred, with one injury. The following crashes also occurred.

May 17, 2002. A Grumman G-4 twin engine airplane took off headed west from the airport when it suddenly lost power and fell. It smashed into a residence on S. Hilton St in Boise, destroying the plane and house. The pilot and passenger were seriously injured and trapped in the aircraft for three hours. A resident in the house suffered only minor injuries.

December 9, 1996. A DC-3 cargo plane enroute to Salt Lake City crashed on take off killing both the pilots just east of the airport runway.

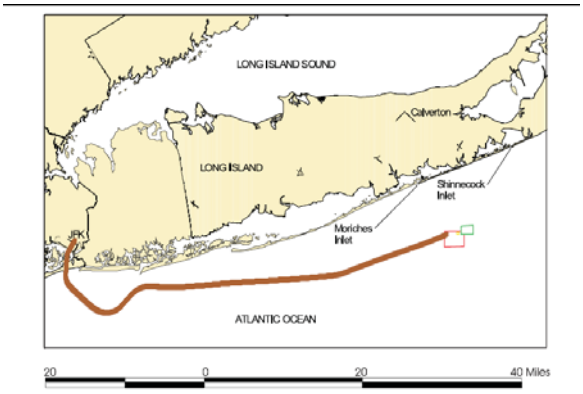
August 1, 1975. Two planes, a B-26 Air Tanker and a Beechcraft Sierra, collided and burst into flames on the runway at Gowen Field. The pilot of the Beechcraft died immediately. The pilot of the B-26 was rescued from his cockpit by firefighters but died four days later.
Excluding the attacks of September 11, 2001 (see the Terrorism section), the following list provides some details on the world's worst aviation accident/incidents to date.

July 4, 1930 – An airplane crashes and burst into flames killing the pilot. This was the first plane crash recorded in the history of Boise and happened at the Varney Air Strip where Boise State University is now located.

World Aviation History

November 12, 1996. An Ilyushin IL-76 cargo plane from Kazakhstan collided in midair with a Saudia 747 near Delhi; all 349 aboard both planes were killed. The Kazakh crew had disobeyed instructions, and neither airplane was equipped with collision-avoidance technology.

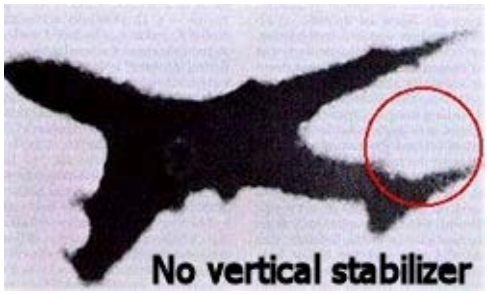
July 17, 1996, TWA Flight 800, a Boeing 747 destined for Paris France, exploded and crashed into the Atlantic Ocean about 12 minutes after takeoff, killing all 230 on board. Amid speculation that it was a terrorist incident, the NTSB investigation concluded that the probable cause of the accident was an explosion of fuel vapors in the center wing fuel tank, most likely as a result of a short circuit.



December 21, 1988. Two Libyan agents were later held responsible (one was convicted) for planting a bomb aboard Pan American flight 103, which blows up in the night sky over Lockerbie, Scotland killing 270 people, including 11 on the ground.

July 3, 1988. An Airbus A300 operated by Iran Air was shot down over the Straits of Hormuz by the USS Navy destroyer Vincennes. The crew of the Vincennes, distracted by an ongoing gun battle, mistook the A300 for a hostile military aircraft and destroyed it with two surface-to-air missiles. The 290 occupants all perished.

August 12, 1985. A Japan Air Lines 747 crashed near Mt. Fuji after takeoff from Tokyo on a domestic flight killing 520, 4 survived. The rupture of an aft bulkhead, which had undergone faulty repairs following a mishap seven years earlier, caused destruction of part of the airplane's tail and rendered the jet uncontrollable. A JAL maintenance supervisor later committed suicide, while the president of the airline resigned, accepting full, formal responsibility for the crash and visiting victims' families to offer a personal apology. To date this is the world's most deadly single aircraft accident.



June 23, 1985. A bomb planted by a Sikh extremist blew up an Air India 747 en route between Toronto and Bombay (with stops in Montreal and London). The airplane fell into the sea east of Ireland killing 329. Investigators in Canada cited shortcomings in baggage screening procedures, screening equipment, and employee training. A second bomb, intended to blow up another Air India 747 on the same day, detonated prematurely in a luggage facility in Tokyo before being loaded aboard.

September 1, 1983. Korean Air Lines flight KL007, a 747 carrying 269 passengers and crew from New York to Seoul (with a technical stop in Anchorage) was shot down by a Soviet fighter after drifting off course – and into Soviet airspace – near Sakhalin Island in the North Pacific. The International Civil Aviation Organization (ICAO) later attributed the mysterious deviation to "A considerable degree of lack of alertness and attentiveness on the part of the flight crew."

August 19, 1980. A Saudia L-1011 bound for Karachi returns to Riyadh, Saudi Arabia, following an in-flight fire that broke out just after departure. For reasons never understood, the

crew took its time after a safe touchdown and rolled to the far end of the runway before finally stopping. No evacuation was commenced, and the airplane then sat with its engines running for more than three minutes. Before any doors could be opened by the inadequately-equipped rescue workers at Riyadh, all 301 people on the plane died when the passenger cabin was consumed by a flash-fire.

May 25, 1979. As an American Airlines DC-10 lifted from the runway at Chicago's O'Hare airport, an engine detached and seriously damaged a wing. Before its crew could make sense of the situation, the airplane rolled 90 degrees and disintegrated in a huge fireball about a mile beyond the runway. With 273 fatalities, this remains the worst-ever crash on US soil. Both the engine pylon design and airline maintenance procedures were faulted by NTSB investigators, and all DC-10s were temporarily grounded.

March 27, 1977. Two Boeing 747s, operated by KLM (Dutch) and Pan Am, collided on a foggy runway at Tenerife, in Spain's Canary Islands killing 583 people. The KLM jet departed without permission and struck the Pan Am jet as it taxied along the same runway. Confusion over instructions and a blockage of radio transmissions contributed to the crash.

March 3, 1974. A THY (Turkish Airlines) DC-10 crashed near Orly airport killing all 346 passengers and crew. A poorly designed cargo door had burst from its latches, and the subsequent depressurization caused failure of the cabin floor and impaired cables to the rudders and elevators. Out of control, the plane slammed into the woods northeast of Paris. McDonnell Douglas, maker of the DC-10, was forced to redesign its cargo door system.

Local Bus History

Early 1980s. A bus carrying a choir group near Mountain Home, Idaho was struck from behind by a truck. In another incident a bus load of school children was struck by a gravel truck in Canyon County. In both incidents several children were injured and sent to local hospitals.

December 17, 2009. A Greyhound bus driver took evasive actions that kept a bus loaded with 48 passengers from rolling after it was struck by a pick up on icy Interstate 84 just east of Boise. Nine fire and six EMS units responded to accident that required six patients be transported to the hospital.

Other Bus History

May 21, 1976. Yuba City, California. A bus carrying the Yuba City High School choir plunged off a cliff. 28 people were killed.

May 14, 1988. Carrolton, Kentucky. The church bus collided head on with a truck. 27 people died and 34 were injured.

Feb. 28, 1958. Prestonsburg, Kentucky. A school bus with 46 students struck a wrecker and plunged into the Big Sandy River. 26 children and the bus driver drowned.

September 23, 2005. Wilmer, Texas. A bus on Interstate 45 near Dallas, TX, carrying nursing home residents fleeing the predicted path of Hurricane Rita caught fire and burned. 24 elderly people died.

June 5, 1980. Jasper, Arkansas. A tour bus rolled off the highway and killed 22 people, 19 were injured.

May 9, 1999. New Orleans, Louisiana. A tour bus crashed into a concrete wall. 22 people were killed and 24 were injured.

May 30, 1986. Walker, California. A tour buss crashed into the West Walker river. 21 people were killed, and 19 injured.

Websites:
http://www.planecrashinfo.com/
http://www.baaa-acro.com/
http://www.ntsb.gov/ntsb/month.asp

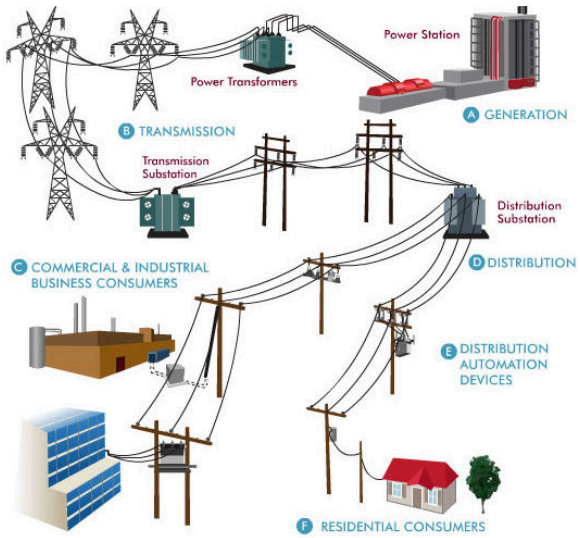
Source: Part of the aviation history was supplied by the Boise Airport and the Boise Fire Department.

UTILITY FAILURE

In modern American life we are all dependent on a variety of utilities to maintain our lifestyle and health. These utilities include: water, electric power, natural gas, sewage disposal, telephone, and the Internet.

Electric Power

A power grid consists of a cluster of large power plants all connected together by transmission lines. The purpose of a grid is to share power between grid members. Therefore power can be shifted around. This allows a power plant to go offline for maintenance while the other parts of the grid can pick up the slack. A power grid cannot store any power anywhere in the system. Power is generated as it is needed and is usually consumed less than a second after being produced.



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This system is very reliable, but not fool-proof. The biggest power grid failure in U.S. history occurred on August 14, 2003 (see below). As with most systems the power grid is most likely to fail when subjected to the most stress. Sometimes this stress is brought about by mechanical failure, human or computer error, extreme weather conditions, or natural disasters.

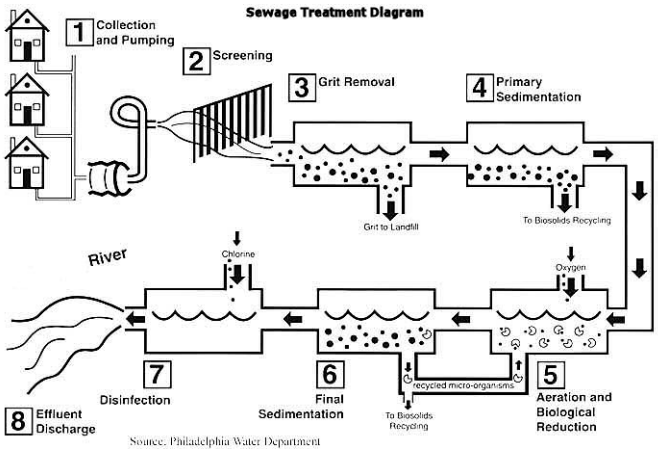
Water System

United Water Idaho has developed a multi-well system with the capability for routing flow around trouble spots. Unsuitable water at any given point could be isolated soon after detection. All water systems require pumps for drawing the water and pressurizing the systems. A few artesian wells are located primarily to the west of Eagle and are used by farms. Water can be drawn from the Boise River at various pump stations for processing and then used in the United Water Idaho lines. No fully gravity feed water systems exist in the county. In addition to United Water Idaho there are a few other small water utilities in Ada County. Capitol Water serves about 2,300 residential and 400 commercial and industrial customers in an area bounded roughly by Northview Street north to Ustick Road and from North Maple Grove east to Curtis Road. Eagle Water Company, Inc. founded in 1974, provides water supply services primarily to the City of Eagle.

The Water Cycle
Source: American Water Works Association

Wastewater Treatment

Sewage treatment, or wastewater treatment, is the process of removing contaminants from wastewater and household sewage. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment.



Telephone System

The modern telecommunications network is a complex affair with elements including landline systems, cellular systems, Internet components, and satellite relays. To operate successfully, most large distributed systems depend on software, hardware, and human operators and maintainers to function correctly. Failure of any one of these elements can disrupt or bring down an entire system. The prevalence of cell phones has continued to rise at the expense of traditional landlines. Overall, as of December 2009, 23 percent of U.S. homes have only cell phones, up from 11 percent in 2006. Telephone systems traditionally have a high level of reliability.

Internet

The Internet is used to an astonishing degree every hour of every day on a worldwide basis. Although there are many standards and protocols that apply to the Internet to enable it to function, it is not functionally regulated by any organization or government. Denial of service attacks and distributed denial of service attacks, website and computer system hacking, and other forms of computer crime, sometimes committed from halfway around the world, can cause websites and computer systems to crash.

<u>Vulnerability</u>

Electric Power Vulnerability

A prolonged electric power outage has a paralyzing effect on a community, particularly if it is widespread. Many other utilities depend on electric power in order to function. Water systems, fuel delivery systems, sewage lift pumps and processing facilities, business and home security systems, and traffic lights and traffic control systems all depend on electricity.

Smaller local power failures occur sporadically and are corrected routinely. These outages may be caused by transformer overload, lightning strikes, downed trees across power lines, or power poles knocked down by accidents, etc.

Since electricity cannot be stored, large and prolonged power outages can totally disrupt the lives of those affected. If an outage occurs during times of extreme heat, lack of air conditioning could primarily affect the elderly and those with certain health conditions. In cold weather the inability to heat buildings and homes can result in broken pipes and other plumbing problems.

Many businesses now use VOIP phones which require power to function. At home people will need to find substitutes for heating, cooking, lighting, and other power consuming activities. In particular computers and the Internet, used for communicating, banking, etc., are almost indispensible to most people. Most cordless phones will not work without power. Charged cell phones should work, provided the cell phone provider's network equipment is still functioning. However cell phone services may be overtaxed during emergency situations. Portable or standby generators, properly used, may provide electric power, although it's unlikely they will completely substitute for utility supplied power.

Water System Vulnerability

People can live several weeks without food, but only a few days without water. Very little of the United Water Idaho system is exposed above ground. Failure or defects in the system will most likely be the result of electrical outage since it is pump pressurized, or from breaks in major distribution lines. A significant earthquake in or near Ada County could cause water distribution lines to rupture. The main threats would stem from inability to properly fight fires and the lack of water for sewage disposal and processing. As a last resort water use could be rationed, optional water uses such as lawns and car washes temporarily suspended, and above ground water could be boiled or treated for use.

Wastewater Treatment Vulnerability

Sewage systems for the cities have occasional line, pump, and system malfunctions, but overall they have an excellent record of reliability. Some line seepage is found from time to time and could pollute groundwater.

- Water and wastewater utilities should identify local resources, particularly potential suppliers of portable electric generators, in order to expeditiously obtain emergency assistance. In addition, utilities may want to contact sister utilities in neighboring areas to learn of each others' resources.
- Every water and wastewater utility should have a written emergency response plan and have its personnel review that plan on a regular basis. In addition utility personnel must be adequately trained in crisis management. Local emergency management organizations regularly hold table-top and practical training missions in which utility personnel could participate and become better prepared for catastrophic events.
- In order to prevent discharges of untreated wastewater in the event of power outages, all wastewater systems should consider the feasibility of upgrading pump stations to include detention capability and connections for bypass pumps or generators.
- Dissemination of information during power outages is often difficult and unreliable. It may be impossible to issue boil water advisories using the normal procedure. Water utilities should consider issuing consumer advisories prior to events that create a high potential for service disruptions. Such an advisory can act as a public service announcement and should be worded properly to ensure accurate information is conveyed without eroding consumer confidence or heightening stress.

Telephone System Vulnerability
Telephone systems may be affected by high winds, lightning strikes, and other weather events, in much the same way as the electrical grid. Cellular phone towers in particular are subject to damage or toppling in windstorms. Limited areas may be without service for short periods. Telephone systems are vulnerable to power outages because some ringers and lights are powered by household electric circuits.

- Landline telephone utilities should consider expanding the availability of fixed, on-site, back-up generators at critical network service nodes in order to alleviate the immediate impact on utility services from loss of commercial power for extended periods.
- Telephone utilities should ensure that vegetation management (tree-trimming) practices are sufficient to effectively control damage to aerial facilities and consider underground facilities where practical.
- Wireless providers should consider expanding the number of cell sites equipped with permanent, on-site, back-up generators, where such generators are technically feasible. This could alleviate some of the immediate impact on a wireless carrier's network from the loss of commercial power.
- Enhancing the redundancy of interconnecting facilities, whether owned or leased from third-party providers, between cell sites and central switching offices would help ensure the integrity of the wireless network.

Internet Vulnerability
Exactly how vulnerable the Internet as a whole is to disruption or failure is not known at this time. It is probably safe to say that additional safeguards and redundancies should be added to the system.

Risk
Risk of electricity loss is: moderate. Risk of water, wastewater, telephone, and Internet loss is: low.

Electric Power History
The following is a list of some major power outages that have occurred in the United States. Source: Wikipedia.com.

January 26 – 28 , 2009. An ice storm hit Kentucky knocking out power to about 769,000. Approximately 10,600 utility poles were toppled by the ice. As of February 15 about 12,000 were still without power from this storm.

December 8 - 12, 2007. A series of ice events cut power to over 1 million homes and businesses across the Great Plains from Oklahoma to Nebraska.

December 15, 2006. The Hanukkah Eve Wind Storm of 2006 caused a power failure throughout the Seattle area, causing one million people to lose power. Areas including Tacoma, Seattle, Federal Way, Bremerton, Everett, Olympia and Bellevue were affected. Some areas were without service for 4–5 days.

November 30, 2006. As a result of a winter storm in St. Louis, about 500,000 people lost power due to outages which lasted from 1 day to 2 weeks.

August 29, 2005. Hurricane Katrina badly damaged the power grid resulting in millions of Louisiana, Mississippi and Alabama residents losing power.

September 4, 2004. Hurricane Frances knocked out power to five million people in Florida, one of the most widespread outages ever due to a hurricane.

September 19, 2003. Hurricane Isabel knocked out electricity for 4.3 million people across nine US states and parts of Ontario, Canada.

2000 – 2001. During the 12 months of the California electricity crisis there were regular power failures due to energy shortages.

November 19, 1996. A severe ice storm affected the region around Spokane, Washington, and Coeur d'Alene, Idaho, causing power outages lasting up to two weeks.

August 10, 1996. During a period of high temperatures and high demand for electricity, a major transmission line failure knocked out power to 4 million people in eight West Coast states.

July 2, 1996. This blackout resulted from a voltage instability that was caused by loss of steady state equilibrium conditions. The power failure affected parts of Alberta and British Columbia in Canada, western Mexico, as well as Idaho, Montana, Utah, New Mexico, California and Arizona.

October 4, 1995. Hurricane Opal knocked out power to over 2 million customers across eastern and southern North America.

July 13 – 14, 1977. New York City blackout resulted in looting and rioting.

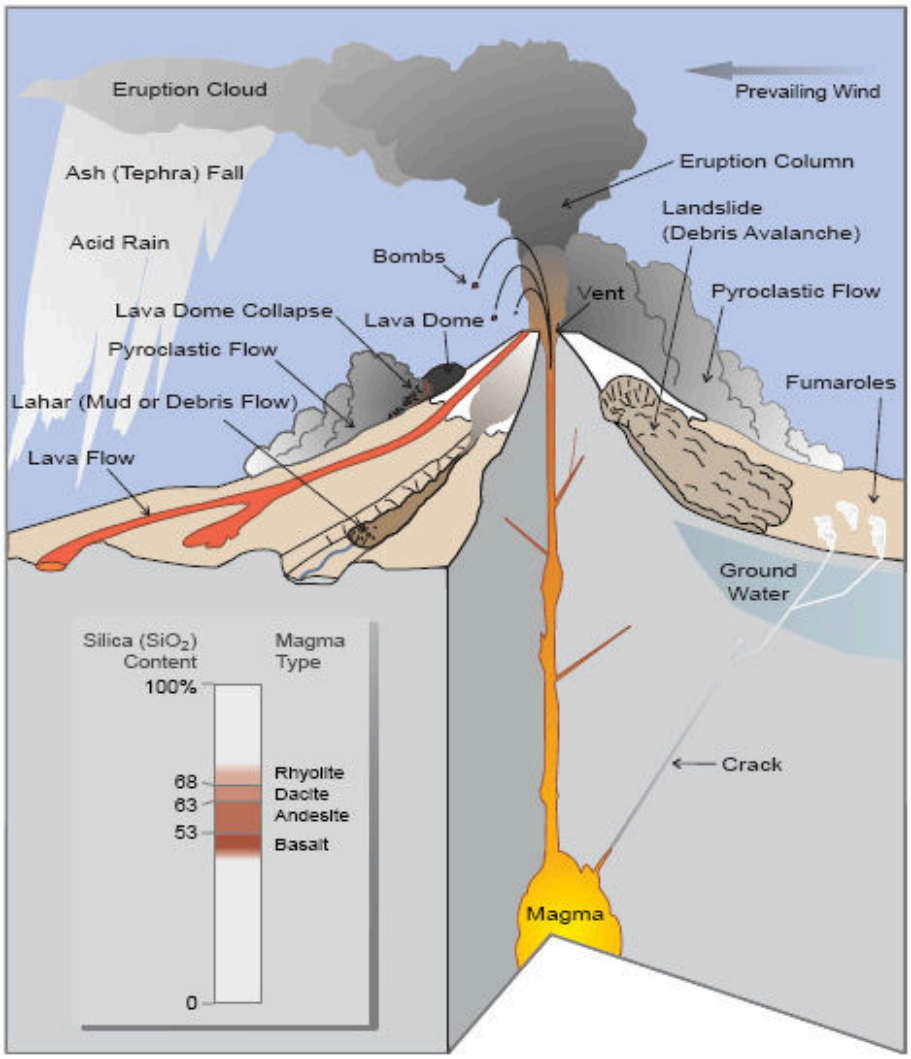
November 9, 1965. The Northeast Blackout of 1965 in the northeastern USA and in Ontario, Canada. Around 30 million people and 80,000 square miles were left without electricity for up to 12 hours.

Websites:
http://en.wikipedia.org/wiki/Electric_power
http://www.energy.gov/energysources/electricpower.htm

VOLCANO

A volcano is an opening in the earth's crust from which lava, ash, and hot gases, etc., are expelled from the earth's interior. Unlike other mountains, which are pushed up from below, volcanoes are built by surface accumulation of the lava and ash they eject. Their shape is directly related to the type of lava that flows from them, the more viscous the lava, the steeper the sides of the volcano, less viscous lava results in more gentle slopes.

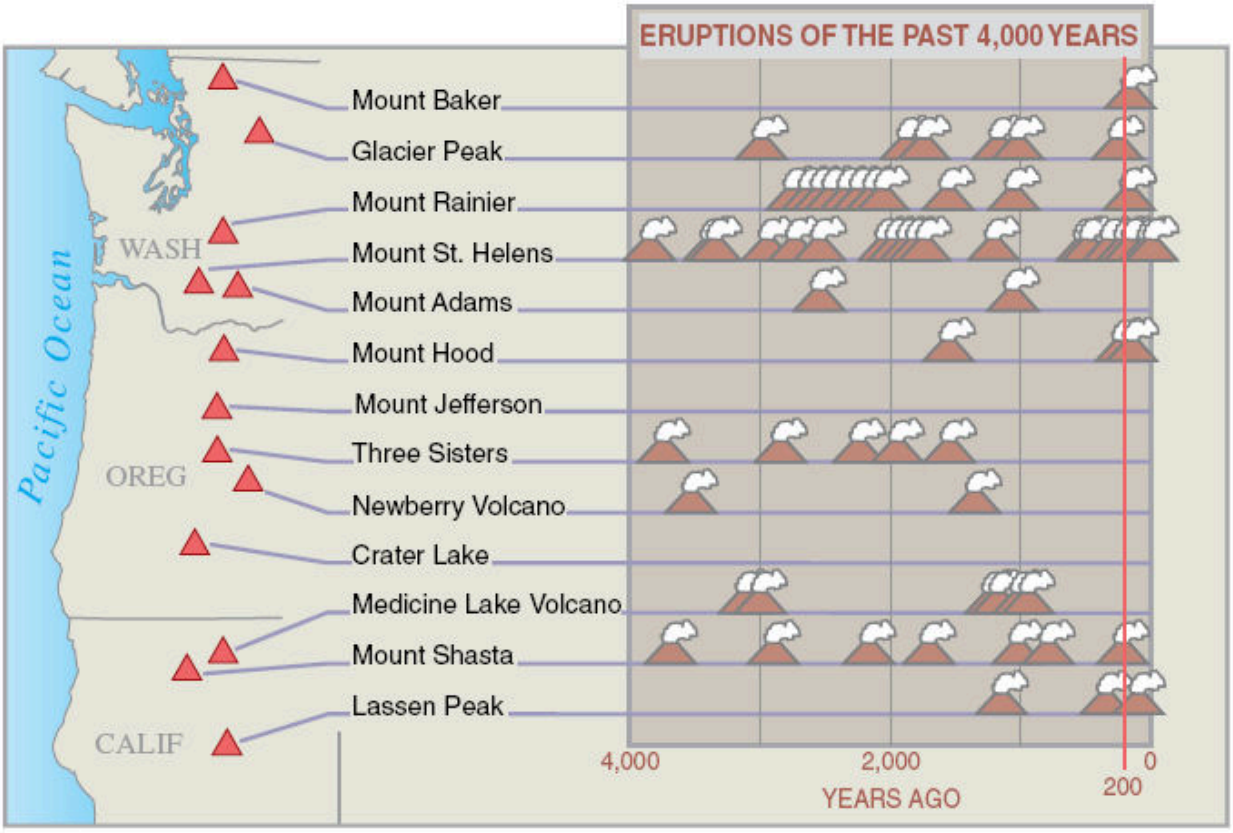
Worldwide there are about 1,500 active volcanoes; about 500 of these have erupted in historic times. A volcano is judged to be active if it has erupted in the last 10,000 years. The United States is third in the world, after Japan and Indonesia, for the number of active volcanoes. At any given moment there are probably at least 20 volcanoes erupting somewhere on the earth. These figures do not include the large number of eruptions taking place on the deep sea floor.



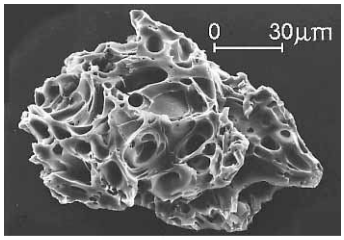
Volcanoes produce a wide variety of natural hazards that can kill people and destroy property. This simplified sketch shows a volcano typical of those found in the Western United States and Alaska, but many of these hazards also pose risks at other volcanoes, such as those in Hawaii. Some hazards, such as lahars and landslides, can occur even when a volcano is not erupting.

Large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate. It is estimated that in the last 300 years more than 260,000 people have died from volcanic eruptions and their aftermath. In August 1883, Mount Krakatoa in Indonesia exploded killing around 36,000 people, and Mount Pelee on the island of Martinique erupted in May 1902, killing about 30,000 people. Since 1980, volcanic activity has killed more than 29,000 people worldwide. Closer to home, on April 18, 1980, Mount Saint Helens volcano in Washington State erupted with explosive force, killing 57 people.

West of Idaho the Cascade Range stretches from northern California into British Columbia. The activity of the Cascade Range volcanoes is the result of tectonic plate movement, as one plate slides over another. In the past few thousand years the volcanoes in this range have erupted more than 100 times. Volcanoes may remain dormant for many centuries between eruptions, disguising the actual risk they pose to nearby populations. When the Cascade Range volcanoes do erupt it is usually with tremendous explosive force. High-speed avalanches of hot ash and rock (pyroclastic flows), lava flows, and landslides can devastate areas ten or more miles away, and huge mudflows of volcanic ash and debris (lahars) can inundate valleys more than 50 miles downstream. Volcanoes also emit gases such as carbon dioxide, hydrogen sulfide, hydrogen and fluorine, and huge quantities of ash.



Volcanic Ash



Ash particle mag 200x

Small jagged pieces of rocks, minerals and volcanic glass the size of sand and silt (less than 1/12 inch in diameter) erupted by a volcano are called volcanic ash. Very small ash particles can be less than 1/25,000th of an inch across. Though called "ash," volcanic ash is not the product of combustion, like the soft fluffy material created by burning wood, leaves, or paper. Volcanic ash is hard, does not dissolve in water, is extremely abrasive and mildly corrosive, and conducts electricity when wet.

Volcanic ash is formed during explosive volcanic eruptions. Explosive eruptions occur when gases dissolved in molten rock (magma) expand and escape violently into the air, and also when water is heated by magma and abruptly flashes into steam. The force of the escaping gas violently shatters solid rocks. Expanding gas also shreds magma and blasts it into the air, where it solidifies into fragments of volcanic rock and glass.

The hot ash and gas rise quickly to a towering column. As the ash cloud drifts downwind from the erupting volcano, the ash that falls from the cloud typically becomes smaller in size and forms a thinner layer. Ash clouds can travel thousands of miles, and some even circle the earth. The ash from Mount Saint Helen's 1980 eruption rose to a height of 60,000 feet and covered an area of 22,000 square miles.

Because wet ash conducts electricity, it can cause short circuits and failure of electronic components, especially high-voltage circuits and transformers. Power outages are common in ash fall areas, making backup power systems important for critical facilities, such as hospitals. Eruption clouds and ash fall commonly interrupt or prevent telephone and radio communications in several ways, including physical damage to equipment, frequent lightning, and either scattering or absorption of radio signals by the heated and electrically charges ash particles.

Volcanic ash can cause problems for motor vehicles by clogging air filters and damaging bearings and gears, etc. Ash fall can also make driving dangerous or impossible by coating roads and making them very slippery or reducing visibility to near zero. Aircraft and airport runways can also be affected in the same manner.

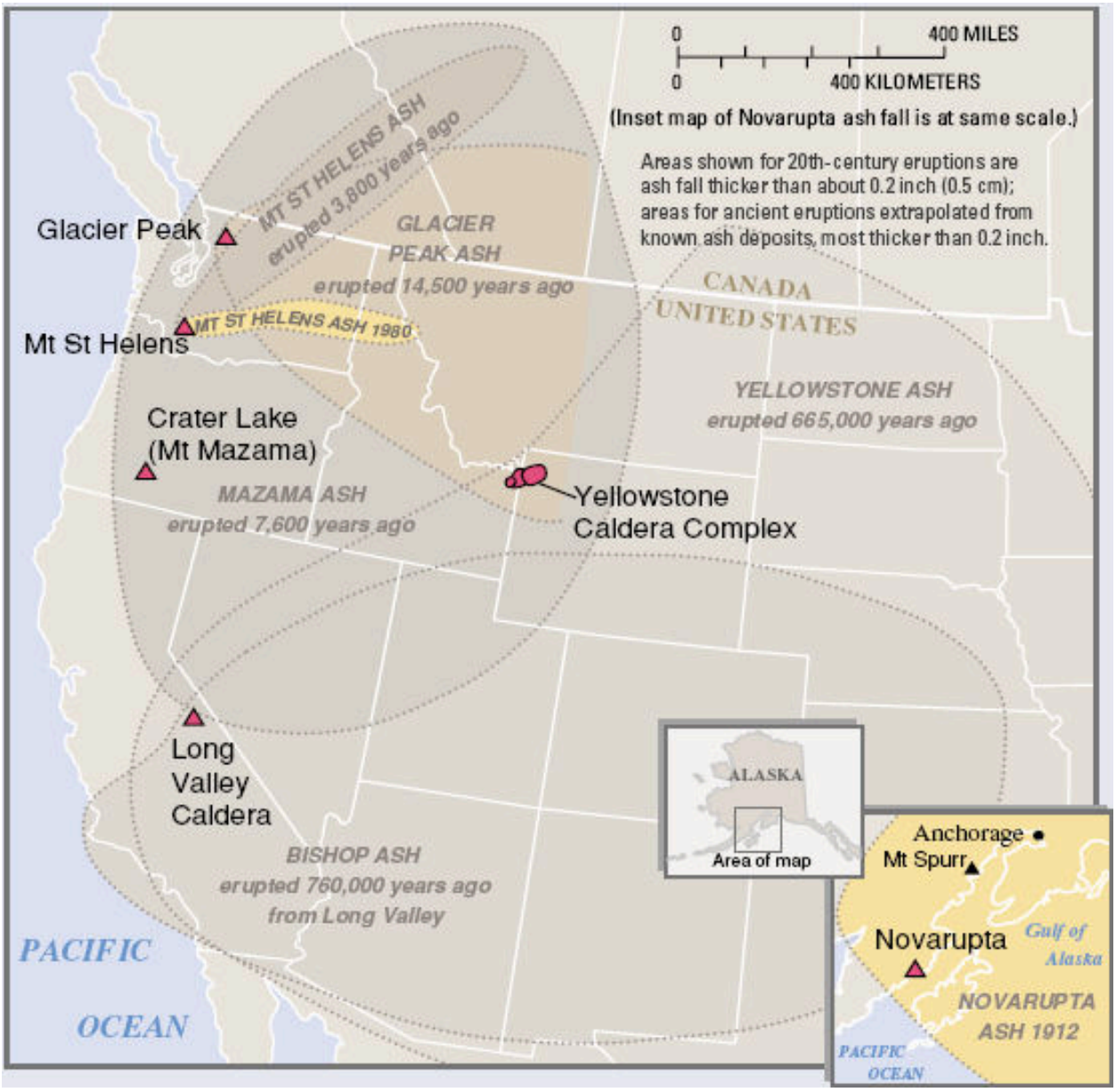
When volcanic ash accumulates on buildings its weight can cause roofs to collapse, killing and injuring people. A dry layer of ash four inches thick weighs 120 to 200 pounds per square yard, and wet ash can weigh twice as much. Flat roofs are most as risk. Filters in building ventilation systems can become completely clogged.

Agriculture can be affected by ash fall as well. Crop damage can range from negligible to severe, depending on the thickness of ash and other factors. For farm animals, especially grazing livestock, ash can lead to dehydration, starvation and poisoning.

Finally, ash fall can be a severe risk for humans, especially children, the elderly, and people with cardiac or respiratory problems, such as asthma, chronic bronchitis, and emphysema.

Vulnerability

The Boise area is about 70 miles further from Mount Saint Helens than Plummer, Idaho, which received about an inch of ash from the 1980 eruption. Mount Lassen and Mount Shasta are about the same distance from Boise. It is impossible to predict exactly how much ash will be ejected in a volcanic eruption, the predominant size of the ash particles, or where the prevailing winds will deposit the ash layer. Ash that has settled may be stirred up again by wind and human activity and can disrupt lives for months after an eruption.



Risk

Risk of volcano is: very low.

History

November 13, 1985. Nevado del Ruiz, Columbia. A minor volcanic eruption melted part of the ice cap. This created a huge mudslide that buried the city of Armero. 23,000 people were killed.

April 25 – May 8, 1902. Mount Pelee, Martinique, Caribbean. When the volcano erupted pyroclastic flows (fast-moving currents of super hot gas and rock traveling at several hundred miles per hour) covered the city killing around 30,000 people. Only 2 people survived.

August 26–27, 1883. Mount Krakatoa, Indonesia. The Krakatoa explosion was among the most violent volcanic events in recorded history. The sound of the explosion was heard 3,000 miles away. 165 villages and towns were destroyed and another 132 were seriously damaged. More than 36,400 people died, and many thousands many were injured, mostly from the tsunamis triggered by the explosion.


Anak Krakatau (son of Krakatoa) erupting, November 2007

April 10-15, 1816. Mount Tambora, Indonesia. The explosion of Mt. Tambora could be heard a thousand miles away. The height of the volcano was reduced from 13,000 down to 9,000 feet as 93 cubic miles of debris was ejected into the atmosphere. The year 1816 became known as the "year without a summer" because the volcanic ash lowered temperatures worldwide. An estimated 92,000 people were killed, many from the tsunamis generated by the explosion.

August 24, 79 AD. Mount Vesuvius, Italy. This might be the most famous volcanic eruption in history. The eruption destroyed the Italian towns of Pompeii and Herculaneum, killing between 10,000 and 25,000 people. Pompeii was buried in ten feet of ash.

Websites:
http://volcanoes.usgs.gov/
http://www.fema.gov/hazard/volcano/index.shtm
http://en.wikipedia.org/wiki/Volcano

Source: Much of the text information and some illustrations in this section are courtesy of the United States Geological Survey.

WEATHER

A variety of storms occur in Ada County including thunderstorms that may be accompanied by heavy rain, hail, fog, high winds and winter storms that include snow and cold temperatures. In addition to direct effects, violent storms of this nature may be the cause of secondary destruction such as loss of utilities, automobile accidents due to low visibility or slippery roads, and flash floods. Extreme heat may also occur.

Thunderstorm

A thunderstorm is a rain shower which generates thunder. Since thunder comes from lightning, all thunderstorms have lightning. All thunderstorms are dangerous because they bring heavy rains (which can cause flash flooding), strong winds, hail, lightning and tornadoes.

Thunderstorms affect relatively small areas when compared to a hurricane or winter storm. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least one inch in diameter, winds of 58 miles per hour or stronger, or a tornado.

Three basic ingredients are required for a thunderstorm to form: moisture, rising unstable air (air that keeps rising when given a nudge), and a lifting mechanism to provide the "nudge." The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise, by hills or mountains or other factors, it will continue to rise as long as it weighs less and stays warmer than the air around it. Eventually the water vapor it contains begins to cool and condenses into a cloud. The cloud grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder.

Lightning

Lightning is an electrical discharge that results from the build-up of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a bolt. This flash of light usually occurs within the clouds or between the clouds and the ground. In a split second a bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit, hotter than the surface of the sun. Because light travels much faster than sound lightning flashes can be seen long before the resulting thunder is heard. It is a myth that lightning never strikes twice in the same place.

Wind

Straight-line winds are responsible for most thunderstorm wind damage. Wind speeds can exceed 125 mph. A downburst is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation. A "dry microburst" is a downburst that occurs with little or no rain. These destructive winds are most common in the western United States. A windstorm in Star caused $50,000 in damages in 1995.

A windstorm on 4/24/1998 caused 25 downed power lines, damaged fences and roofs, downed several large trees, and contributed to seven motor vehicle accidents on I-84. A storm on 6/30/2004 caused flash floods, power outages and event cancellations, including a Boise Hawks baseball game. Another storm on 12/16/2000 caused trees to fall and about 15,000 homes and businesses to lose power. Winds speeds were measured at 63 miles per hour.

Hail

Hail forms when updrafts in thunderclouds carry raindrops upwards into extremely cold areas of the atmosphere. The raindrops freeze and are bounced around in the powerful winds within thunderclouds while new layers of ice are added. Eventually, the hailstones grow too heavy to be supported by the updrafts and fall to the ground. Some hailstones are the size of peas while others can be as big as five inches in diameter, the size of a softball. Large stones fall at speeds faster than 100 mph.

Flash Floods / Floods

Flash floods and floods are the #1 cause of deaths associated with thunderstorms, with more than 70 fatalities each year. Many flash flood fatalities occur at night. More than half of all flood-related drownings occur when a vehicle is driven into hazardous flood water. Six inches of fast-moving water can knock you off your feet; a depth of two feet will cause most vehicles to float. Flash floods are discussed in more detail in the Flooding section of this document.

Tornadoes

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. Tornadoes are the number one cause of death associated with thunderstorms. In an average year 1,200 tornadoes cause 62 fatalities and 1,500 injuries nationwide. Tornadoes generally move from southwest to northeast, but they can move in any direction, and suddenly change their direction of motion. The average forward

speed is 30 mph but may vary from nearly stationary to 70 mph. Winds can exceed 125 mph, and the strongest tornadoes have rotating winds of more than 250 mph. Tornadoes can occur at any time of day, any day of the year. Although tornadoes occur in many parts of the world, they are found most frequently in the United States.

Winter Storms

A winter storm can range from a moderate snow over a few hours to blizzard conditions with blinding wind-driven snow that lasts several days. The National Weather Service defines a blizzard as: winds of 35 mph or more with snow and blowing snow reducing visibility to less than ¼ mile for 3 hours or more. Some winter storms may be large enough to affect several states, while others may affect only a single community. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely reduce visibility. Heavy snow can immobilize a region and paralyze a city, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Homes and farms may be isolated for days and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns.

Extreme Heat

Heat kills by taxing the human body beyond its abilities. Heat-related deaths and illness are preventable yet annually many people succumb to extreme heat. In a normal year, about 175 Americans succumb to the demands of summer heat. Historically, heat has long been a prodigious killer. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed. More recently, from 1979 to 1999, excessive heat exposure caused 8,015 deaths in the United States. During this 20 year period, more people in this country died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes combined. In 2001, 300 deaths were caused by excessive heat exposure.

Vulnerability

Thunderstorm Vulnerability

The large amount of water associated with thunderstorms can be the cause of flash flooding along tributaries of the Boise River. Minor flooding from storm drain overloading and pooling behind debris dams are annual occurrences. It is usually a combination of high wind, water and lightning which causes damage. Thunderstorms occur virtually every year and at least one incident of thunderstorm-related damage occurs each year in Ada County. The average number of incidents is two to five per year.

Lightning Vulnerability

Lightning is one of the most deadly weather phenomena in the U.S. From 1990 to 2003, 756 Americans were hit and killed by lightning. Idaho had seven lightning deaths in this period. However, factoring in its small population, Idaho ranked as the eighth most dangerous state for lightning deaths. Individuals struck by lightning are subject to severe injuries or death. Power outages and damage from lightning strikes occur annually. Usually the affected neighborhood is localized, and these residents are inconvenienced. Occasionally the effects are more widespread such as the example of the wrecked radio tower in 1975 or when the power to the mountain

repeaters was put out and all the television stations were off the air for a period of time. Strikes will occur several times each year and will not create a community disaster situation by itself, although loss of the Emergency Alert System would cause concern. Alternate power sources and the number of alternate broadcast stations should permit quick restoration of a degraded system. Lightning strikes are also the cause of many wildfires, locally, statewide and nationally. The most serious concern about lightning is human deaths. In recent years almost all lightning deaths have occurred outdoors. Fatal activities have included:

- boating
- standing under a tree
- riding horses
- swimming
- riding on a lawnmower
- playing soccer
- golfing
- watching the storm
- walking
- loading a truck
- mountain climbing
- fishing
- camping
- running to shelter

Wind Vulnerability

Falling trees or blowing debris cause most wind-related fatalities, and also cause severe damage to buildings and vehicles. Roof failure can lead to additional damage and entry of wind and rain into the house. Garage doors are usually the weakest link in the outer structure of a house. Weathered, loose window frames are exceptionally vulnerable during severe wind storms. A light metal building can totally collapse.

Power pole and line damage can cause widespread power outages. Office buildings are generally structurally sound, but broken windows cause injuries inside and outside the building and lead to water damage. Bus stop shelters and other common areas where people seek shelter are vulnerable and could collapse, resulting in significant injuries and fatalities.

Hail Vulnerability

Hail can cause serious damage, notably to automobiles, aircraft, skylights, glass-roofed structures, livestock, and most commonly, farmers' crops. Hail damage to roofs often goes unnoticed until further structural damage is seen, such as leaks or cracks. It is hardest to recognize hail damage on shingled roofs and flat roofs, but all roofs have their own hail damage detection problems.

Hail is one of the most significant thunderstorm hazards to aircrafts. When hail stones exceed 0.5 inches in diameter, planes can be seriously damaged within seconds. The hailstones accumulating on the ground can also be hazardous to landing aircraft. Hail is also a common nuisance to drivers of automobiles, severely denting the vehicle and cracking or even shattering windshields and windows. Wheat, corn, soybeans, and leafy plants are the most sensitive crops to hail damage. Nationally hail causes more than $1 billion in damage to property and crops each year. Rarely, massive hailstones have been known to cause concussions or fatal head trauma. The largest hailstone in terms of maximum circumference and length ever recorded in the United States fell on June 22, 2003 in Aurora, Nebraska. The hailstone had a diameter of 7 inches and a circumference of 18.75 inches.

Tornado Vulnerability

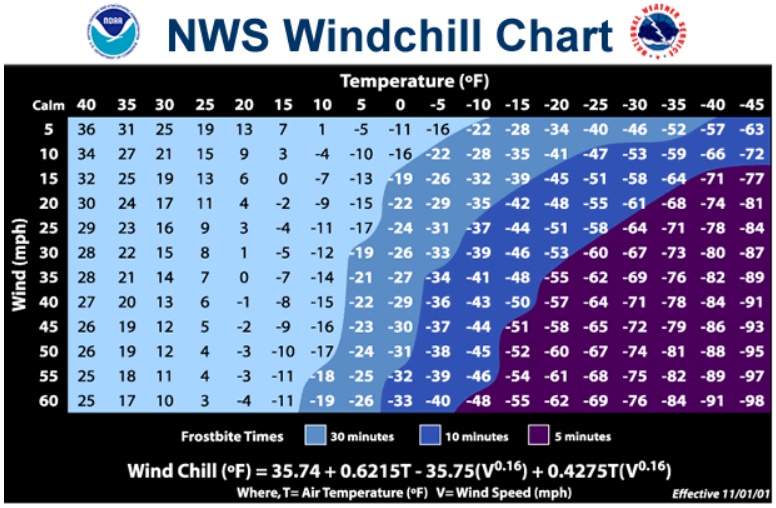
In most years Idaho averages three tornadoes a year; most are reported along the Snake River Plain from Idaho Falls to Weiser. It is recognized that there may be many more than those

reported since the area is sparsely populated. Tornadoes are most common from April through August. Ada County does experience tornados, but rarely. In 2004 a thunderstorm rolled through Ada County spawning two tornadoes. Both occurred south of the airport where one was observed to be moving at 35 mph. The potential for damage in the flat areas of the county is growing as the land use is changing from agricultural to housing and commerce. On June 2, 1967 a tornado touched down in Boise near the airport. It tore off a patio and damaged several roofs as well as McKinley School. Windows, cars and power lines were also damaged. Source: Idaho Statesman. On April 20, 1997 a small tornado hit neighborhoods in southeast Boise near Bergeson and Apple Streets, causing minor property damage in an area 400 yards long and 30 yards wide. Source: Idaho Statesman.

Winter Storm Vulnerability

Snow kills hundreds of people in the United States each year. The primary snow-related deaths are from traffic accidents, overexertion, and exposure, but deaths from avalanches have been steadily increasing. Each year an average of 105 snow-producing storms affect the continental United States. A typical storm will have a snow-producing lifetime of two to five days and will bring snow to portions of several states. Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice or snow on Ada County roads can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.

Exposure to cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. What constitutes extreme cold varies in different parts of the country. Freezing temperatures can cause severe damage to certain crops and other vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat. Ada County has occasional prolonged spells of cold weather. In December 1924 in Boise it got to -20 degrees F, in December 1983 it got to minus 15º degrees F, and in December 1990 it got down to minus 25 degrees F, perhaps the record low temperature for Boise. On January 12, 1888, a severe winter storm struck Ada County. Hundreds of livestock and a number of people froze to death. Source: Idaho World.

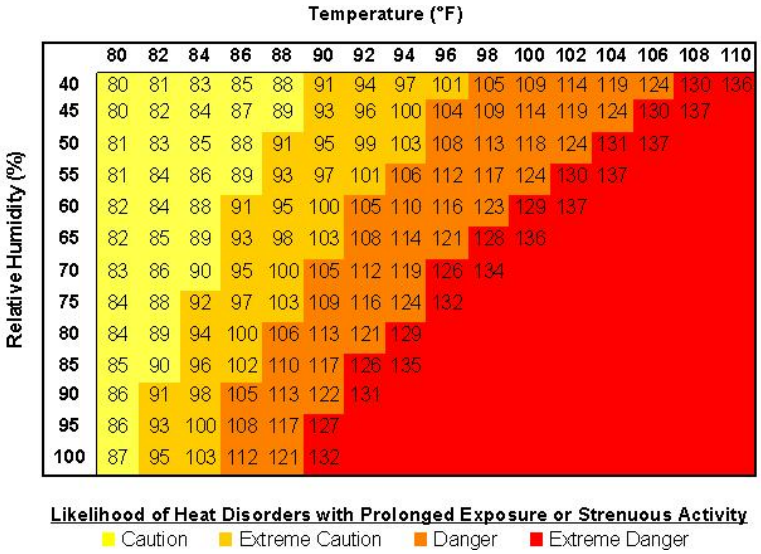


Wind Chill is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill; however, cars, plants and other objects are not.

Extreme Heat Vulnerability

Several factors affect the body's ability to cool itself during extremely hot weather. When the humidity is high, sweat will not evaporate as quickly, preventing the body from releasing heat quickly. Other conditions related to risk include age, obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and prescription drug and alcohol use.

Because heat-related deaths are preventable, people need to be aware of who is at greatest risk and what actions can be taken to prevent a heat-related illness or death. The elderly, the very young, and people with mental illness and chronic diseases are at highest risk. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Air-conditioning is the number one protective factor against heat-related illness and death. If a home is not air-conditioned, people can reduce their risk for heat-related illness by spending time in public facilities that are air-conditioned.



The stagnant atmospheric conditions of the heat wave trap pollutants in urban areas and add the stresses of severe pollution and resulting respiratory problems to the already dangerous stresses of hot weather, creating a health problem of undiscovered dimensions.

Risk

Risk of thunderstorm (including lightning, wind, or hail) is: high. Risk of tornado is: low. Risk of winter storm is: moderate. Risk of extreme heat is: high.

Climate Data

The following climate data are based upon a thirty-year average from 1971 – 2000. Additional data may be generated by visiting the National Weather Service webpage: http://www.weather.gov/climate/xmacis.php?wfo=boi

Maximum Temperature (degrees F), monthly averages - Boise Area, Years: 1971-2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	37.0	44.8	53.8	62.1	71.1	80.9	89.9	88.8	77.8	64.9	48.0	37.6	63.0

Minimum Temperature (degrees F), monthly averages - Boise Area, Years: 1971-2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	22.3	27.6	32.7	37.8	44.5	51.7	57.6	57.2	48.7	39.1	30.3	22.3	39.3

Average Temperature (degrees F), monthly averages - Boise Area, Years: 1971-2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	29.6	36.2	43.2	49.9	57.8	66.3	73.8	73.0	63.3	52.0	39.1	30.0	51.2

Precipitation (inches), monthly averages - Boise Area, Years: 1971-2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	1.39	1.14	1.41	1.27	1.27	0.74	0.40	0.30	0.76	0.76	1.38	1.38	12.20

Snowfall (inches), monthly averages - Boise Area, Years: 1971-2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	5.0	3.3	1.5	0.3	0.1	0.0	0.0	0.0	0.0	0.1	2.9	6.4	19.6

StormReady

Ada County is a StormReady Community. StormReady is a nationwide community preparedness program that helps communities develop plans to handle all types of severe weather. To be officially StormReady, Ada County satisfied the following criteria:

- Established a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Created a system that monitors weather conditions locally
- Promoted the importance of public readiness through community seminars
- Developed a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

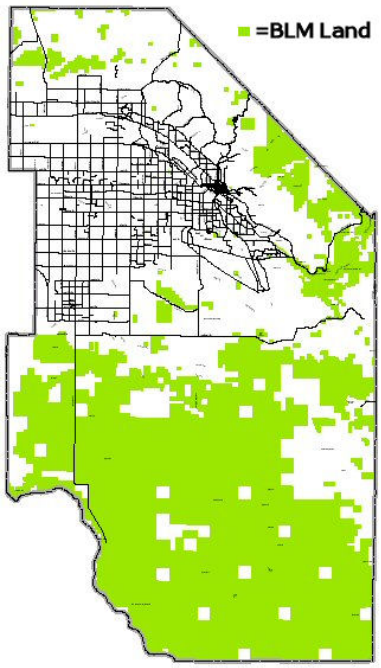
Websites

http://www.wrh.noaa.gov/boi/
http://www.wrh.noaa.gov/boi/awareness/weatherawareness.php
http://emergency.cdc.gov/disasters/extremeheat/
http://www.stormready.noaa.gov/com-maps/id-com.htm
http://nsidc.org/index.html

Source: Much of the text information and some illustrations in this section are courtesy of the United States National Weather Service.

WILDFIRE

A wildfire is any unplanned and uncontrolled fire that occurs in terrain outside of an urban or city environment. Until the beginning of the last century, fire burned through the forests and plains of the west at regular intervals and was a natural component of the ecosystem. Early in the 20th century, federal and state agencies began suppressing wildfire as a response to catastrophic events such as the 1910 "Big Blowup" (see photo at end of this section) in northern Idaho (which burned 3 million acres and took 86 lives), and as an effort to protect timber values. This effort became increasingly effective after World War II as planes, helicopters, and other modern equipment and technologies were added to the battle against wildfire. The irony of wildfire control is that every success in suppressing fire has resulted in growing fuel supplies. When these enhanced fuel supplies ignite it may result in fires of extraordinary heat and intensity.



The migration of people from urban to rural areas has created a unique environment, an interface, between the developed urban areas and rural areas dense with vegetation. The vegetation (trees, shrubs, and herbaceous plants) is abundant and flammable. These interface areas where manmade structures are integrated into abundant, flammable vegetation, have created a fire protection challenge that increases in complexity annually. The probability of more fires and greater losses increases as interface areas grow both in size and number. When the firefighting effort shifts from putting out the wildfire to structural protection undeveloped areas may have to be ignored. The end result of this is an increased risk to firefighters, an increase in response costs, and a reduction in wild land acreage protected.

Wildfires may be caused by natural or human actions. The primary natural ignition source is lightning. Human sources include campfires, smoking, fireworks, power lines, motor vehicles and machinery (chain saws, lawnmowers, etc.). Another significant human source is arson.

Vulnerability

Ada County contains a great deal of Bureau of Land Management land as well as State, local and private lands. The county includes many acres of grassland/sagebrush and a small amount of timbered land. Wildfires occur with varying frequency and intensity every year in Ada County.

Ada County can expect wildfires every year which destroy ground cover and forage. Most will be confined to areas less than 500 acres. About half of these fires will be lightning caused and the other half will be human caused. Drought will increase the likelihood of large fires.

Those who live in the urban-wild land interface enjoy the beauty of the environment but face the very real danger of wildfire, which can destroy property and kill people, pets, and livestock. Smoke from large wildfires can affect the health, recreation and daily life of many communities. In addition, smoke from wildfires may travel hundreds of miles, affecting many people far downwind. Property owners share a responsibility to protect their residences and businesses and minimize danger by creating defensible areas around them and taking other measures to minimize the risks to their structures.

Risk

Risk of wildfire is: high.

History

August 25, 2008. Oregon Trail/Sweetwater Fire. This was probably the biggest fire in Boise's history. Near Amity and Holcomb roads in southeast Boise an Idaho Power electrical line overheated and melted a small aluminum clamp. The molten aluminum dripped on the grass below and started the fire. Gusty winds carried the flames into the nearby homes. This was a General Alarm fire, where all available Boise firefighters respond. Forty-five companies, including all Boise Fire companies and mutual aid companies from surrounding communities, were involved. At the height of the fire over 400 people from many disciplines were supporting the incident. One woman was killed when she could not escape the fast moving fire. Ten homes were totally destroyed, many others damaged, and over 50 homes were evacuated. At least 19 police officers suffered smoke inhalation.

July 26, 2005. Homestead Fire. This fire burned approximately 1,200 acres, most of which was in the Squaw Creek (now Council Spring Creek) watershed. Roughly 75% of the watershed was burned. The fire has decreased the watersheds ability to absorb moisture and has elevated the risk of flash flooding, including debris flows.


Blackened foothills, Homestead fire 2005
Source: R. Carino

July 12, 2004. Wildfire burned about 75 acres near Warm Springs Boulevard in Boise. Air dropped fire retardant was used to contain the blaze.

July 6, 2003. Across from Crow Inn, Warm Springs Avenue; a human caused fire began on private property across from the Crow Inn on Warm Springs Avenue and eventually burned 864 acres before it was contained about twelve hours later.

July 4, 2002. Pierce Park and Seaman's Gulch Roads; Fire broke out on Seaman's Gulch Road just south of Hidden Springs. Fire crews from Boise, North Ada County, Eagle, the Forest Service, and BLM responded along with two helicopters from the Forest Service and one from BLM. Several homes were evacuated in the Hill Road/Pierce Park area and police blocked off Pierce Park and Seaman's Gulch Roads. Although the fire did not cause any serious loss of personal property, it did consume 500 acres of grass and brush in the foothills before it was extinguished. No cause was ever determined.

September 24, 2000. Hilltop Fire. The Hilltop Fire ran along Highway 21 toward Lucky Peak. It was started when a vehicle lost an axle sending sparks into the dry grass just south of the Hilltop Café along Highway 21. Included in the response were sixty firefighters from the Idaho Correctional Institution. 2,600 acres burned, one small structure was destroyed and ten homes were evacuated.

July 2, 2000. Bogus Basin Road near Crane Creek Country Club; a 50 acre foothill blaze was started by two 19yr old men driving off-road in a gully between Bogus Basin Road and the hills north of Crane Creek Country Club. Winds quickly spread the flames. 45 firefighters, 13 fire engines, an air tanker dropping fire retardant, and a helicopter filling a dip-bucket from a pond on the golf course contained the blaze. There were no injuries and no structures burned, but the fire came within 200 yards of homes in the area.

July 26, 1999. Rocky Canyon; Seaman's Gulch. A thunderstorm with high winds swept through the Treasure Valley causing five wildfires throughout the Boise area. The fire along Rocky Canyon burned approximately 100 acres. Another fire was near Dry Creek and Seaman's Gulch six miles northeast of Boise. Aside from 300 acres, a small storage shed was also destroyed.

July 16, 1999. Table Rock. This fire that burned 25 acres at Table Rock was attributed to arson.

August 26, 1996. Eighth Street Fire. This was the most devastating fire to occur in the Boise Foothills in at least the last 100 years. The fire started near Mountain Cove Road and exploded into a massive range fire in less than an hour, pushed along by erratic 50 mph winds. Between 100 and 200 homes were evacuated in the Robie Creek area and residents in the Highlands and Table Rock subdivisions were put on alert. One home in the Nines Ridge subdivision, valued at approximately $700,000, burned to the ground. Due to the fact that nearly a total of 320,000 acres were burning elsewhere across the West, including 12,000 acres in Kuna, it was difficult to get adequate reinforcements. Eventually, a total of 820 firefighters extinguished the blaze on September 1st, five days after it started. The fire had burned 15,300 acres (22 sq. miles) along with one home, and over two million dollars was spent. The cause of the fire was determined to be a spark created by an off-duty policeman using tracer bullets at a firing range near Mountain Cove Road.

July 28, 1995. Initial Point Fire. A lightning storm started a range fire about 16 miles southwest of Boise, near the City of Kuna. Wind gusts exceeded 40 miles per hour. A Kuna Rural Fire District engine with mechanical problems stalled in the path of the flames and two volunteer Kuna firefighters were killed. This fire burned 11,622 acres, threatened numerous homes and caused $50,000 in damages.

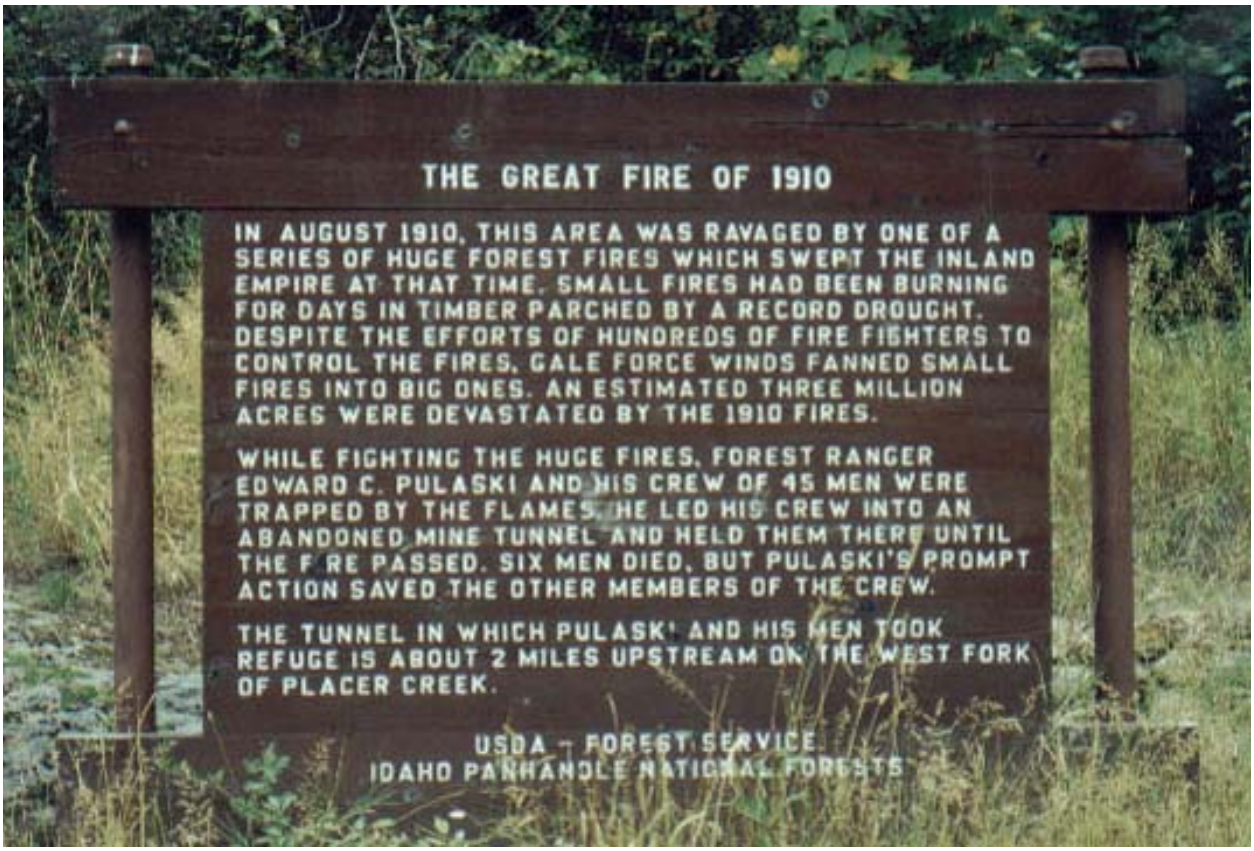
August 1992. Foothills Fire. The Foothills Fire of 1992 did not occur in the Boise Foothills. This substantial fire burned along the north side of Interstate 84 between Boise and Mountain Home and into the foothills of Bennett Mountain. Five lightning fires combined to blacken 257,000 acres of rangeland in and around Ada County.

August 2, 1988. Bogus Basin Fire. At around 5pm fire broke-out along Bogus Basin Road approximately three miles north of the Hill Road intersection. By the time it was contained the next day, it had burned 2,300 acres. The blackened strip along the Boise Front was three miles long and about one and a half miles wide.

June 29, 1987. Picket Pin Fire, Cottonwood Fire, Warm Springs Fire. An arsonist started three separate fires in the Boise Foothills. The Picket Pin Fire was the largest of the three totaling 1,300 acres, and was particularly devastating. Starting next to Rocky Canyon Road, the fire quickly spread into Picket Pin Draw and moved into a residential area on Promontory Road. The fire claimed one home, a neighboring garage, a number of vehicles, and a Boise Fire engine. Three firefighters and one resident were taken to the hospital.

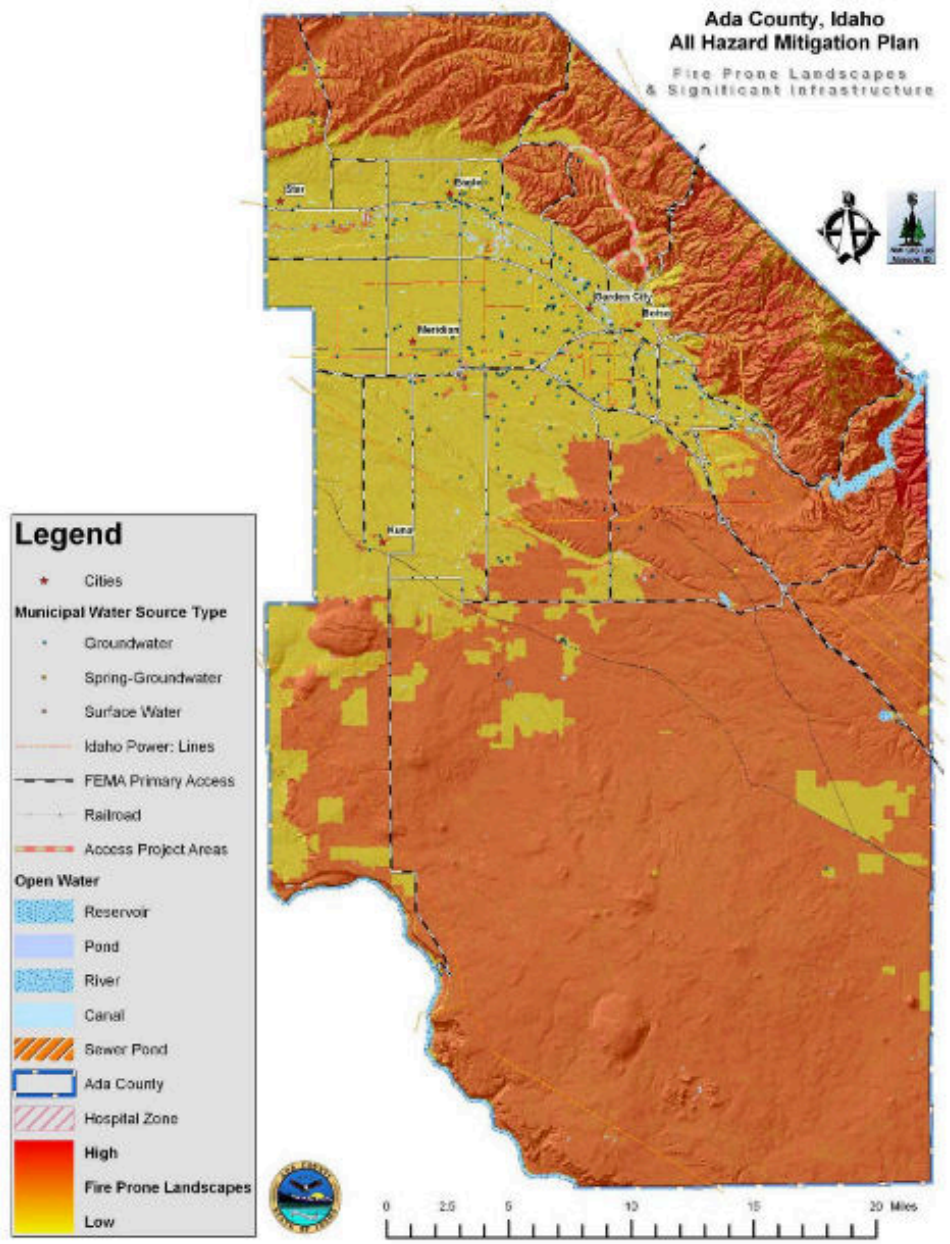
July 22, 1957. Rocky Canyon Fire. The fire started at Rocky Canyon Road along Cottonwood Creek and quickly spread over the area to the north of the road and to the east of Five Mile Creek. Over 200 firefighters from BLM and 75 from the Forest Service battled the blaze. After consuming 2,000 acres, the wind changed direction and diverted the flames toward residential

neighborhoods northeast of Boise. The blaze was eventually contained on July 25th after burning a total of approximately 3,000 acres. Arson was found to be the cause.

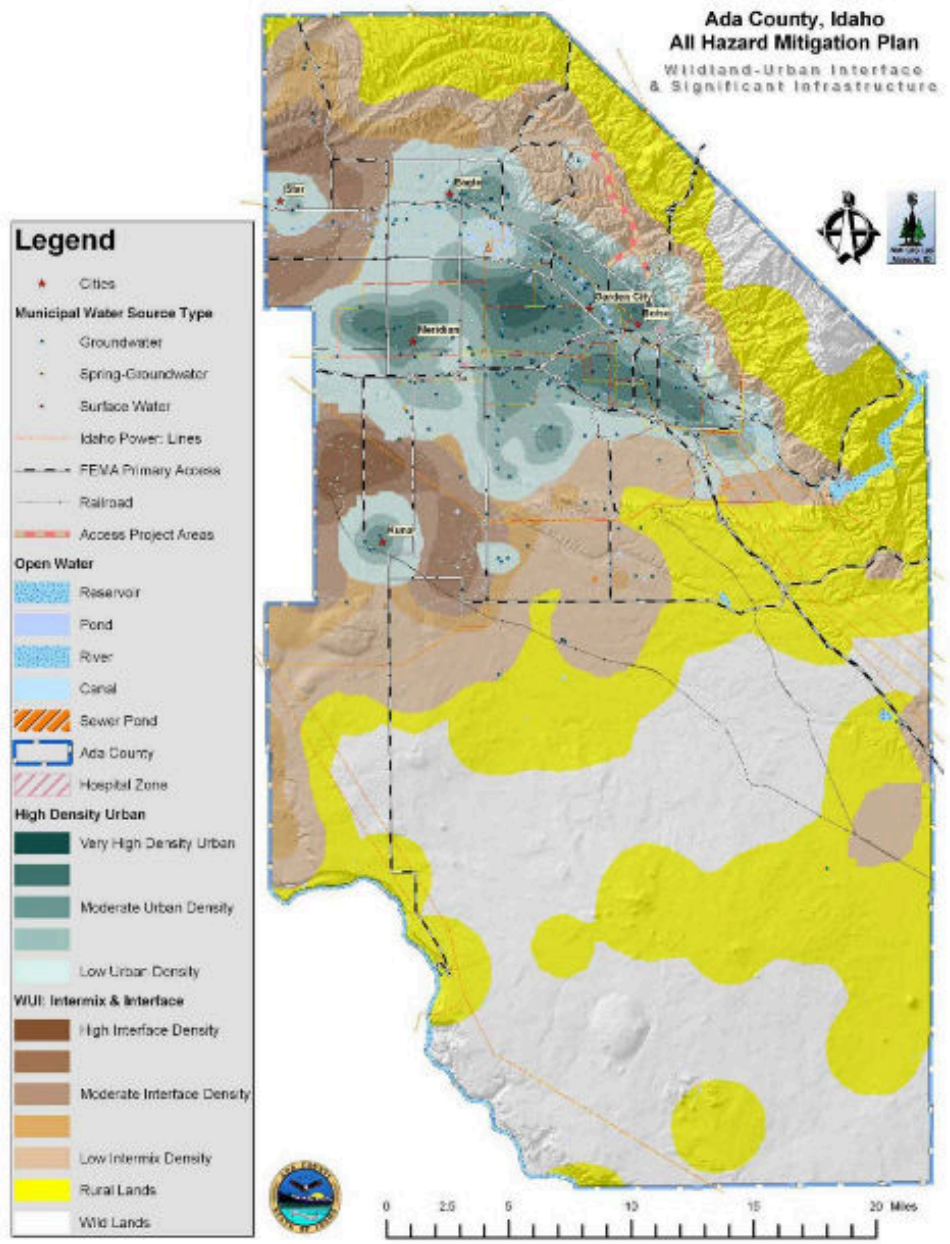


Websites:
http://www.firewise.org/
http://www.fws.gov/mountain-prairie/fire/guides/Living_With_Fire/
http://www.fema.gov/hazard/wildfire/index.shtm
http://en.wikipedia.org/wiki/Great_Fire_of_1910

Fire Prone Landscapes in Ada County



Wildland-Urban Interface and Significant Infrastructure



HAZARD VULNERABILITY & RISK ASSESSMENT TOOL

HAZARD VULNERABILITY AND RISK ASSESSMENT TOOL
COMMUNITY HAZARD EVENTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE – MITIGATION)						ADJUSTED RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	LOCAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Economic Impact*	*Planning & Exercising*	*Time, effectivness, resouces*	*Federal/State staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Weather	3	3	3	2	2	2	2	**88%**
Structural Fire	3	3	3	2	1	1	2	**75%**
Hazmat	3	3	2	2	1	1	2	**69%**
Terrorism	2	3	3	3	2	2	1	**58%**
Wildfire	3	2	3	1	1	1	1	**56%**
Flood	2	2	3	2	2	2	2	**54%**
Drought	2	0	0	2	3	3	3	**46%**
Health	2	3	0	2	2	2	2	**46%**
Utility Failure	2	1	1	2	2	2	2	**42%**
Transportation	2	3	1	1	1	1	2	**38%**
Nuclear War	1	3	3	3	3	3	2	**35%**
Dam Failure	1	3	3	3	2	3	2	**33%**
Earthquake >7	1	3	3	3	2	2	2	**31%**
Landslide	1	2	2	1	2	1	3	**23%**
Volcano	1	1	1	1	3	2	2	**21%**
Mormon Crickets	1	0	0	1	3	2	2	**17%**
AVERAGE SCORE	**1.88**	**2.19**	**1.94**	**1.94**	**2.00**	**1.88**	**2.00**	**41%**

**Threat increases with percentage.*

RISK = PROBABILITY * SEVERITY		
0.41	**0.63**	**0.66**