WHEN THE RIVER ROARS

FLOODING IN THE WALKER RIVER BASIN

This publication is sponsored by the University of Nevada Cooperative Extension
When the River Floods

During the New Year’s Flood of 1997, approximately 14,000 acres or 21.8 square miles were flooded along the West Walker and main Walker River channels in Nevada. The West Walker River caused extensive flood damage in Tonopah, Coleville, and Walker, California and in Smith, Wellington, and Yerington, Nevada. Through Walker Canyon, California, 12 miles of US Highway 95 were damaged or destroyed causing closure for seven months for repairs. As the West Walker River entered Wilson Canyon between Smith and Mason Valleys, it destroyed Highway 208, the main transportation artery between the two valleys. The heavy damage to State Route 208 in Wilson Canyon resulted in a costly two-month closure for repairs.

In Yerington and throughout Mason Valley, almost 500 homes were damaged with about 250 of these damaged extensively. Public and private property damage in Yerington was substantial. The greatest monetary damages in Lyon County were to agricultural property and facilities. Floodwaters deposited debris on farmland and damaged irrigation gates, ditches, and canals. The cost of repairs to Walker River irrigation facilities were estimated at about $6.4 million, with damage to farmland in Mason Valley estimated at $19.5 million.

Downstream of Mason Valley, Weber Dam on the Walker River Inland Reservation was used to regulate floodwaters downstream. The dam and undeveloped riparian stretches along the river helped to reduce flood damage on the reservation. Mineral County sustained losses estimated at around $2.4 million.

What Caused the Flood?

The flooding of the Walker River in 1997 was caused by the following factors:

- In late December 1996 there was significant snowfall from two storm systems creating a build up of snow.
- In early January of 1997, a series of heavy warm rains melted the significant amount of heavy snow pack at or below 7,000 feet.

This type of flood, often referred to as a wet-mantle event, results from a combination of heavy, warm rains falling on several feet of fresh snow. A wet-mantle event produces large amounts of runoff and is often difficult to predict, but generally occurs between November and April.

Two other types of floods that can occur in the Walker River Basin are:
- Thunderstorms (June to November) which can result in flash flooding, and
- Rapid snowmelt (March to June).

Floods in the Walker River Basin

Flooding has occurred over the history of settlement in the Walker River Basin. Recorded flood events occurred in 1907, 1928, 1937, 1950, 1955, 1956, and 1997. By far, the most common type of flooding event of the seven documented floods has been wet mantle events.

The New Year’s Flood of 1997, is still fresh on the minds of many residents in the Walker River Basin. Many remain concerned about future floods. Western Nevada, in spite of its arid climate, experiences both heavy snowfall and rainfall. The chances are good that warm, subtropical rain will follow heavy snowfall again in the Sierra Nevada and in western Nevada. Floods of significant proportions may occur. Regardless of additional flood control efforts and investments, personal property will be lost for those individuals located along floodplains. It is important to understand why rivers flood and to prepare for the next flood event.

In Mason Valley, below the confluence of the west and east forks of the river, flooding along the mainstem of the Walker caused extensive damage, particularly in the town of Yerington. Floodwater breached levees in Mason Valley, inundating farmland and residential property as well as downtown Yerington. The flood covered about 3,000 acres and in some places was up to 6 feet deep.

[Graph showing annual flow of the West Walker River recorded at the Coleville gauging station. Notice that the 1997 flood was almost twice as large as any previously recorded flood event. Original graph from the US Geological Service.]
Prehistoric Walker River Basin

Many underestimate the potential for river flooding in desert river basins such as the Walker River Basin. It is ironic that Nevada, the driest state in the nation, was once covered by oceans. More than 200 million years ago, block faulting in the earth's crust created the basin and rangeland forms that we see today.

As recently as 10,000 years ago, the state was wetter than it is today. It contained ancient lakes and grasslands—remnants of a previous Ice Age. At that time many of northeastern Nevada's valleys were filled with water. The largest of these lakes was ancient Lake Lahontan, which covered a series of basins totaling 8,000 square miles. As the Ice Age ended, the area's climate became drier. Today only the terminus lakes of the Truckee River (Pyramid Lake) and Walker River (Walker Lake) remain in western Nevada. These lakes remain as visible proof of prehistoric Lake Lahontan and the Ice Age. If you stop at any of the overlooks on US Highway 95 alongside Walker Lake you can see the wave cut terraces high above the present lake level. These marks are historic weather reports of climate change in the area over geologic time. Scientific evidence indicates that as recently as 4,700 and again 2,600 years ago, Walker Lake dried up completely. It is not known if these events were caused by excessively dry periods or natural re-channelization of Walker River flows away from the lake.

The Sierra Nevada prevent much of the Pacific Ocean's eastbound storm systems from saturating the area with precipitation. This "rain shadow" created by the mountains is responsible for Nevada's arid climate. The "Great Basin" is an area of high elevation desert valleys stretching from Reno to Salt Lake City and from Oregon to Death Valley. The ranges surrounding the basin prevent any surface waters from flowing outward to sea. Surface waters, including the Walker River, are comprised of perennial rivers fed by the annual melting of snow pack in the Sierra Nevada. Streams emerging from steep canyons have, over geologic time, created the massive alluvial fans at the bases of mountain faces and filled the flat floodplains on the valley floors with alluvial deposits.

The Walker River Basin Today

The Walker River drains the Sierra Nevada southeast of Lake Tahoe, flowing approximately 160 miles from its headwaters in California to its terminus at Walker Lake. The entire river basin, including both California and Nevada, covers approximately 4,030 square miles with about 3,048 square miles in Nevada. The river is comprised of two forks, the East and West Walker Rivers. Both river forks originate in Mono County, California in the Sierra Nevada Mountains.

The West Walker River, the larger of the two forks, originates on the eastern side of the Sierran crest south of Sonora Pass. The West Walker River then flows into Hope Canyon, Smith Valley, and Wilson Canyon before it joins the East Walker to form the main stem of the Walker River.

Walker. The West Walker River then flows into Hope Canyon, Smith Valley, and Wilson Canyon before it joins the East Walker to form the main stem of the Walker River. The East Walker River originates in the southwestern Walker River and its headwaters include a section of the Hooper Wilderness Area. Recreational Twin Lakes, is situated on Robinson Creek, an East Walker tributary. Other tributaries of the upper watershed join in Bridgeport Valley. The East Walker and its tributaries in the valley are used primarily for irrigation water for pasture. Bridgeport Reservoir, situated at the north end of the valley, is the East Walker's only large reservoir and is used to store water for irrigation on agricultural lands in Nevada. Like Topaz Reservoir, the Walker River Irrigation District constructed the Bridgeport Reservoir in 1924. Water that is released from the reservoir flows about 7 miles down the East Walker until it reaches the Nevada state line.

The East Walker travels through a narrow valley floor in Lyon County, supporting agriculture along the way. It joins the West Walker to form the mainstem in lower Mason Valley. Together Mason and Smith Valleys comprise the largest portion of irrigated agricultural land in Nevada's Walker River watershed.

The mainstem of the Walker River flows through Mason Valley, Walukwa, and the Mason Wildlife Refuge before reaching Weber Reservoir on the Walker River Paiute Reservation. The River flows through farmlands and the community of Schurz before it leaves the reservation to reach its terminus, Walker Lake.

Much of the Walker River Basin features steep narrow canyons opening onto flat valleys that are attractive for agriculture. The Walker River floodplain offers rich soils with good access to irrigation sources. The floodplain is attractive also to residential development as the location enables views of the surrounding mountains as well as the river.
What is a Floodplain?

Floodplains include water, plants and animals, soils, and nutrients. The river, over geologic time, creates a landscape of gravel, sand, silt, and clay to form a floodplain. The area surrounding the river channel is the floodplain and is characterized by its hydrology or water movement. The ability to accept overbank flow is important to maintaining floodplain ecosystems. Flooding helps to determine the type and extent of riparian vegetation and wetlands, and the extent of soil saturation.

Evolution of Floodplain Management

Floodplains are now recognized as a valuable part of an interconnected ecosystem, which has the potential to greatly increase quality of life in a community. A functioning floodplain provides several benefits, including storage and transportation of floodwater; groundwater recharge; quality maintenance of surface water, and wildlife and fish habitat. Functioning floodplains and rivers provide communities with economic base, plain management, water was considered only one component in putting land to productive use. Flood hazards were dealt with by individual property owners or through cooperative local efforts.

As population and settlement increased, floods continued to occur but were more noticeably disastrous. More homes existed to be destroyed and more lives were at risk. From 1917 through the 1950s, the Federal government responded to a series of flood disasters in the United States by funding flood control structures such as levees and dams. This period is referred to as the Structural Era of floodplain management.

Illustration showing a typical valley in the Walker River Basin. The river (1) usually flows in the lowest part of the valley; however during flooding can rise to flood the plain. This drawing shows the hypothetical 100 year (2) and 500 year (3) floodplains. Alluvial fan flooding (4) can be the result of a violent thunderstorm (5) many miles away.

Floodplains can be managed for multiple uses. Sometimes the choices a community makes about its floodplain management are limited by past land use patterns and decisions. In rural areas, there is plentiful open space so that strategies to manage floods can focus on erosion control and stream bank vegetation, and proper functioning of the river ecosystem. Land uses that encourage desirable vegetation and help to stabilize soil are good for the floodplain. Agricultural activities that provide open space and encourage coexistence of natural habitat help to maintain flood storage capacity on the floodplain. Urban, commercial, and industrial development on floodplains should be limited, and in some cases prevented. Agriculture is the best land use for a floodplain.

recreation, scenery, and a sense of place or identity that says "who we are."

Early American settlers were initially attracted to floodplains for many advantages they offered. These included water supply, transportation, trade opportunities, energy, soil fertility, and even waste disposal. Today's citizens have transformed their perceptions of the values floodplains offer to include a more comprehensive view of the resource, in terms of both functions and benefits.

From the 1860's when the first pioneers arrived in western Nevada, through the early 1900's, federal policies promoted land development. During the Frontier Era of flood-

Cultural perceptions born in the 1960s and 1970s, however, gave rise to a different way of considering natural resources. Natural resources were looked at as complex, interconnected ecosystems rather than distinct pieces or individual parcels. This realization ushered in the Stewardship Era. In spite of the improvement in engineered flood control measures, losses due to floods increased. The Federal government responded by creating programs such as the National Flood Insurance Program, to provide relief. More recently, the Stewardship Era has influenced thinking about what a naturally functioning floodplain is and how floodplains can be managed to achieve a multiple set of objectives and uses. Floodplain uses once considered desirable during the Frontier Era are now controversial in the Stewardship Era.
The evolution of floodplain management has led to a renewed emphasis on local responsibility and involvement in achieving functioning floodplains. This stewardship goal emphasizes planning that helps communities prevent flood disasters, as well as effective management of the natural functions that floodplains offer.

Suggestions for a stewardship approach to floodplain management include:
- Identify the planning area to encompass at least the 100-year floodplain but considerably the entire watershed.
- Conduct a land use inventory for the watershed as a whole. This includes looking at the role of riparian vegetation, water quality, and quantity as it moves through the system and the health of the entire watershed.
- Define the management boundary of the flood corridor.
- Considering all issues and possibilities, plan the strategy to best manage the floodplain or watershed. The plan should be based on the philosophy of the local stakeholders.
- Implement and monitor the plan and if necessary, make adjustments.

Scientific data will have to be collected on the geology, hydrology, and vegetation as well as cultural and historical information from local long time residents of the area. Existing land use and future trends for growth should be considered in developing a floodplain management plan. These considerations should include the potential for industrial growth, commercial development, suburban expansion, and resource development such as agriculture mining or recreation, as well as general economic and social trends. Recent and projected development trends that may impact the floodplain need to be considered carefully.

States, multiple counties, and a Native American Reservation provides challenges in terms of jurisdictional boundaries and resulting approaches and policies to create and implement a basin wide floodplain management plan.

Broad participation of local interests is critical to each step of a stewardship approach. Local citizens understand best what issues to address and are best suited for creating workable options. With local leadership and participation of stakeholders within the basin, it is more likely that the resulting floodplain management plan will be suitable and therefore successful.

Since 1959, population growth has been steady in the Mono and Lyon County portions of the Walker River Basin. Steady population growth in the basin will increase residential and commercial construction. If construction occurs on floodplains and alluvial fans, there will be greater opportunities for damages and losses due to future floods.

---

**Floodplain Management in the Walker River Basin**

Since the flood of '97, several local initiatives in the Walker River Basin have begun to assess potential for future flood damages and to begin managing the floodplain accordingly. The fact that the basin spans two states, multiple counties, and a Native American Reservation provides challenges in terms of jurisdictional boundaries and resulting approaches and policies to create and implement a basin wide floodplain management plan.

**Walker River Flood Preparedness**

After the '97 flood, Lyon County officials determined that there was a significant need for:
- Improved access to flood forecasts;
- Improved understanding of how forecasted water runoff translates into flood stage and timing in the Smith and Mason Valleys; and
- An integrated flood preparedness plan.

There is a need to develop an organizational system to accurately forecast potential for flooding throughout Lyon County. This would improve response times to reduce property and life losses. It involves identifying existing systems of the upstream flood control in terms of their location, condition and operational constraints. It involves also looking at systems used to forecast resulting downstream flows for Smith and Mason Valleys, and their potential to impact levee systems in these valleys.

There are eight continuous snow pack recorders in the upper Walker River watershed. They are at Leavitt Lake, Leavitt Meadows, Lobsell Lake, Sonora Pass, Sonora Pass Bridge, Willow Flat, Virginia, Lake Ridge, and Sawmill Ridge. Gages are also at Bridgeport, Straussler Ditches, Little Walker River, Coleville, Hoye Canyon, Bridge, and Hudson. These gages are critical to the National Weather Service for river flow forecasts.

The Walker River Federal Watermaster has recommended that at least five additional data collection platforms (DCPs) be improved and/or installed in the basin. The key locations are: West Walker River near Coleville below Little Walker River; West Walker River at Coleville; Bridgeport Reservoir (both discharge and lake-level gages); Topaz Reservoir (both discharge and lake-level gages) and West Walker River at Hoye Canyon Bridge.
Beginning in the early fall of 1997, Mono County Board of Supervisors began organizing a series of "town meetings" to bring together flood victims of Bridgeport, Walker and Coleville, California with resource agency officials. Agencies in attendance included: the Natural Resources Conservation Service (NRCS); US Army Corps of Engineers; Bureau of Land Management (BLM); US Forest Service; and California Department of Fish and Game (CDFG). Victims' issues were heard and efforts to restore damaged communities began in earnest. Discussions and coordinated efforts thus far have resulted in three primary post-flood projects. These are:

- Stream channel reconstruction to improve channel flow capacity,
- Stream bank restoration and stabilization to develop and maintain a functional flood corridor, and
- Flood hazard mitigation.

town meetings were organized to bring together flood victims and agency officials

The flood hazard mitigation project involves $3.5 million in funding from FEMA in coordination with the Natural Resource Conservation Service Emergency Watershed Protection (NRCS EWP) Program to mitigate damages suffered as a direct result of the flood of '97. The funds are used to reduce future flood losses through:

- Acquiring structures lost to floodwater by purchasing them at 75 percent of their pre-flood value,
- Elevating existing structures to prevent future damages, and
- Relocating flood damaged structures away from hazardous flood prone areas.

Walker River Coordinated Resource Management Program

The extensive damages in Mason Valley from the flood of '97 inspired the re-establishment of the Walker River Coordinated Resource Management Plan (CRMP). This group is sponsored and guided by the parent Board of Supervisors of the Mason Valley Conservation District. It is involved in the development of an engineering study of the entire system to coordinate efforts for improving the system. CRMP's goal is to develop a long-range plan for the Walker River system as a viable and valuable resource. CRMP has developed its goals based on input from Lyon County officials and citizens. They have suggested:

- Developing an overall Walker River management plan to minimize future flood damage;
- Re-engineering the Walker River levee system and channel grading to better manage water volumes at the same velocity;
- Investigating legislation to create a flood control district for the Walker River funded through a levy on affected land owners;
- Determining whether Walker River bridges restrict water flows and how to address the problem if any exists;
- Redesigning irrigation turnout systems along the system to offer stability under high flows;
- Creating and implementing an annual river maintenance plan;
- Identifying potential sources of funding and to secure funding;
- Maintaining and enhancing water quality and riparian habitat by employing Best Management Practices (BMPs) and ecologically sound projects.

Currently, CRMP is implementing a grant-funded project to remove tamarisk (salt cedar) in sections of the Walker River and restore native riparian vegetation. Salt cedar is a hardy, aggressive non-native plant that out competes nearby native vegetation. It concentrates salt in the soil and does not allow native vegetation to thrive in riparian zones. It degrades water quality by producing and depositing large quantities of salt onto the floodplain. Salt cedar also provides a non-conductive habitat to nearly all of the native wildlife species in the basin.

Due to the flood of '97, the Mason Valley Conservation District (MVCD) and Smith Valley Conservation District (SVCD) have coordinated efforts with the NRCS EWP program in both Mason and Smith Valleys. This program is used primarily for:

- Stream channel restoration to improve channel flow capacity;
- Stream bank stabilization projects.

To date, five of eight projects have been completed, and remaining projects are scheduled for completion by December, 1999. The MVCD and SVCD will continue to seek funding for restoration and stabilization projects that have been identified and prioritized but do not fit into the NRCS EWP program.

Walker River Paiute Tribe Restoration, Protection and Improvement Projects

On Oct. 12, 1996, Water Resources Development Act of 1996 (Public Law 104-363) was passed. Section 215 of this law established the National Dam Safety Program and named the Director of FEMA as its coordinator. The purpose of the program is to reduce the risks to life and property from dam failure in the United States through the establishment and maintenance of an effective national dam safety program and bring together the expertise and resources of the Federal and non-Federal communities in achieving national dam safety hazard reduction. The law offers grant assistance to states to improve dam safety programs; provides funds for research and education; creates a national dam Safety Review Board to monitor state assistance programs; and funds a National Inventory of Dams supervised by the US Army Corp of Engineers.

The Walker River Paiute Tribe has acquired funding for a Safety of Dams (SOD) project for Weber Reservoir. Weber Dam is a facility used to regulate the amount of water released onto reservation lands. During the flood of '97, the dam was instrumental in reducing flood damage to homes, roads and farmlands downstream of the Weber Reservoir. The dam, situated on an earthquake fault, is considered to be an extremely high hazard structure.

The dam, situated on an earthquake fault, is considered to be an extremely high hazard structure.
Through directed flood recovery grant moneys from the Bureau of Indian Affairs with cooperative funding through an EWP program, the Tribe is performing work on the river channel below the Reservoir around the community of Schuyl. The activities are to shore up riverbanks to protect community and private facilities from future flooding. The completed work will protect communication, utility and transportation services from future floods. It will also stabilize areas impacted by recent floods. Additionally, the Tribe is working with FEMA, the Bureau of Reclamation, Army Corps of Engineers, and US Fish and Wildlife Service on the design and protection of irrigation facilities, such as a diversion weir and a ditch system crossing the river channel.

Additional flood-loss prevention efforts include a study on the Lower Walker River above Walker Lake to assess the effects of erosion "head cutting" in that river stretch due to recent high water events. Sites will be identified that are best suited for structures to alleviate erosion.

Floodplain Management at the Watershed Level

Flood preparation requires both individual as well as collective steps. Local initiatives are well underway in Mono, Lyon and Mineral Counties to recover from the Flood of '97 and prepare for future flooding.

Creating a floodplain management plan at the watershed level is one way to prepare for future floods. The Walker River watershed spans several jurisdictions, however, which challenges management and planning initiatives. In the Walker River Basin, two states, three counties, and a Native American reservation are involved, combining both private and publicly owned lands. Planning goals will have to be coordinated among the various local entities including county government officials, resource agencies, and citizens groups.

Local efforts currently underway recognize the importance of working together to begin a comprehensive planning process for the Walker River Basin, that includes both structural and stewardship approaches. These groups each recognize the inherent value of the waters and lands within the Basin in terms of both the scenic beauty and sense of identity they provide to Basin residents. Local programs anticipate expanding and coordinating their management goals to ensure that the river and its resources continue to provide beauty, recreation, wildlife habitat, and the economic foundation for Basin communities.

The National Flood Insurance Program (NFIP) was created in 1968 to provide federally backed insurance for property owners with existing homes on floodplains. The program is administered by the Federal Emergency Management Agency (FEMA). FEMA is the Federal agency established to respond to hazards in an effort to reduce loss of property and life. According to FEMA, there are ten easy steps consumers need to know about flood insurance:

1. Everyone lives in a flood zone—when there is water nearby. Floods can occur due to storms, water back-up, melting snow, and failure of dams and levees.
2. Flood damage is not covered by homeowner's policies; however, homes can be insured for up to $250,000 for the structure and $100,000 for contents under the NFIP.
3. You can buy flood insurance no matter what your flood risk is, as long as your community participates in the National Flood Insurance Program.
4. There is a low-cost policy for homes in low-risk to moderate-risk areas; preferred risk policy is just over $100 per year.
5. Flood insurance is affordable; averaging just over $300 per year for $100,000 coverage.

6. Flood insurance is easy to get. It can be purchased from private companies and agents. It may be possible to purchase it with a credit card or as part of an escrow account.
7. Contents coverage is separate, so renters can insure their belongings for up to $100,000.
8. Up to a total of $1 million of flood insurance coverage is available for non-residential buildings and contents, $500,000 for nonresidential buildings and $500,000 for contents of nonresidential buildings.
9. There is usually a 30-day waiting period before coverage goes into effect.
10. Federal disaster assistance is not the answer; more than 90% of all disasters that occur in the US are not declared disasters by the President.

Flood losses are generally either private or public. Private losses are individual losses including life, property, business disruptions, health care costs, temporary housing costs and travel-related expenses. Public losses are those that affect everyone and are absorbed by the public budget. These include emergency protection and response; flood debris removal and repairs made to streets, roads, utilities, buildings, equipment, parks, and water control structures.

The requirements of the National Flood Insurance Program are:

- New structures and improvements in a...
damaged structures that are above 50% of the original value must be 
flash-resistant.

- Certain types of development are not 
allowed in "floodway" or most hazardous 
area of floodplain. This includes the 
stream/river channel and land adjacent to 
it.

For homes in flood hazard areas, flood 
insurance is required in order to receive 
Federal financial assistance in the case of 
flood damage unless it is a Presidential 
declared disaster. FEMA maintains a 
regularly updated web site for homeowners, 
insurance/agents, and engineers and surveyors 
that addresses questions often asked 
about the National Flood insurance Program, 
Flash Rate Insurance Maps, and Floodplain 
Management. The web site address is: 
(www.fema.gov/ml/td).

To simplify claims purchase flood insurance 
through your homeowner policy. If your 
homeowner policy agent cannot write 
insurance, call the National Flood Insurance 
Programs toll free number 1-888-CALL 
FLOOD, ext. #45, they can provide the name 
of an agent in your area that writes flood 
insurance.

---

The flood of 1997 was severe and property damage was great; however, not all damage was in the 
older sections of Yerington where modern codes and building restrictions are not in place. If you plan 
on purchasing a new or older home or business be sure to check with FEMA and find out if the 
budding is in a flood zone. Photo: The Mason Valley News.

---

**How Do I Protect My Property from Flooding?**

**Protecting your property from flooding involves changes that range in cost and complexity.** While some changes can be 
made yourself, large-scale or structural and 
electrical changes usually require a professional licensed contractor. FEMA provides 
information on property protection from 
floods in FEMA H14: Design Manual 
for Retrofitting Flood-Prone Residential 
Structures. Call FEMA Publications at 1-800-480-
2520 or use their Web site at (www.fema.gov/ 
unit).

**Flood protection strategies:**

**Anchor fuel tanks.** The unexpected force of 
floodwaters can move unanchored fuel tanks, 
posing a threat to you, your family, property, 
and the environment. It is not uncommon for 
unanchored tanks to be driven into the walls 
of homes or swept downstream. Unanchored 
tanks in basements can be torn from the 
supply line and contaminate basements with 
oil. When cells become saturated with 
floodwater, buried tanks can be pushed to the 
surface. To anchor your fuel tank, whether it 
is or outside the home, attach it to a concrete 
slab with weight heavy enough to resist 

**Install Sewer Back Flow Valves.** Flooding 
can result in sewer line back up into houses 
via drains, causing damage and creating 
health hazards. Back flow valves are 
designed to block drainage temporarily to 
prevent flow of sewage into the home. They 
must be installed on all pipes that leave 
the house or are connected to equipment below 
potential flood levels. Examples of equip-
ment needing valves include washing ma-
chine drain lines, fuel oil lines, sump pumps; 
sewer/septic connections; and laundry sinks. 
Any changes to your plumbing must be done 
by a licensed plumber who follows safety 
codes. Some designs are a combination 
of both gate and flap. Your contractor can 
advise you on the merits of the various valve 
designs.

**Raise or Floodproof HVAC Equipment.** 
HVAC equipment includes heating, ventilat-
ing and cooling equipment, such as furnaces, 
hot water heaters, and air conditioning units. 
These can be damaged by floodwater if 
incubated for a significant period of time. In 
homes prone to flood water, it is best to move 
HVAC equipment from the lower level of 
your property to an upper level, including the 
attic. Although constructing a floodwall is an 
alternative to moving the equipment, this is 
less desirable. Any changes involving your 

**HVAC equipment should be done by a 
licensed contractor.**

**Raise Electrical System Components.** 
Electrical service panels, meters, switches 
and outlets are prone to flooding damage. 
Even short periods of inundation can result in 
these components needing replacement. 
Short circuits caused by floodwater can also 
increase the potential for fires. FEMA 
recommends that all electrical system compo-
nents, including wiring be raised to at least 1 
foot above the 100-year flood level. A 
licensed contractor should do the work to 
clear all safety codes are followed.

**Add Waterproof Veneer to Exterior Walls.** 
Homes and business can be damaged exces-
sively when water reaches the interior. 
Dampness into interior walls and floors can be 
created by floodwater that is not clean or 
untreated. Adding a waterproof veneer to the 
exterior walls will help protect 

---

Page 8
Predicting Floods

The National Weather Service (NWS) is part of the National Oceanic and Atmospheic Administration, a Federal agency which forecast weather and issues weather warnings for the United States. The NWS is required by law to report river forecasts and issue flood warnings. River flood forecasts are prepared by NWS forecasters and reported to the public. During periods of river flooding, NWS centers issue statements about flood crest height, when the river is predicted to overflow (date and time), and when the river overflow is expected to recede within its banks. Forecasts are updated when new information is received by the center.

The NWS uses several data sources in preparing flood forecasts. The Walker River Federal Water Master contract with the United States Geological Survey (USGS) to provide information about rivers and streams useful for hazard mitigation associated with floods. The USGS is the main data source for providing measurements on river flow and depth. The major source of this data is the USGS streamflow-gaging station network.

The Walker River will flood again. Awareness of the potential for flooding and how to prepare for it will help to reduce loss of property and life.

Stream Gaging

Stage and flow are the two most basic aspects of hydrologic information about a river. Stage, measured usually in feet, refers to water depth above some arbitrarily set baseline. Flow (or discharge) is total water volume that flows past a river point for a period of time. Flow is usually measured in cubic feet of water per second (CFS). Both factors are measured at stream-gaging stations located on rivers and streams. Automated equipment at some stations allows continuous monitoring of stage within an accuracy of about 1/8 inch. The data is transmitted to computers at NWS and USGS facilities so that hydrologists there can access river stages even at remote locations and report how fast water in a river is falling or rising. Normally, dry channels can also be instrumental to provide flood warning for any given community.

Many cities and towns in America were started by early settlers who needed to be near a source of water. Yerupamo is one of those towns. As the town grew so did the danger of flood damage. Today we have the knowledge and tools to prevent future flood damage to new structures. Photo, The Mason Valley News.

Hydrologic Forecasts

The NWS issues river statements daily. There are six classifications of statements:

- River Statements (RVS) are issued when the midstream river is forecast to remain below flood stage.
- Flood Warnings (FW) are issued when flooding of mainstem rivers is occurring or imminent.
- Flood Warnings (FW) are issued when flooding of mainstem rivers is occurring or imminent.
- The FW can also be used to issue Small River and Stream Flood Warnings for smaller rivers/streams, which do not have forecast points.
- Flood Statements (FLS) are follow-up statements to keep the public fully informed of the most current information. Statements can be used to remove geographical areas covered by the original Flood Warning when flooding is no longer a threat or has ended in that area.
- Statements are NOT used to extend the length of time or add an area to a warning. In those cases, a new Flood Warning will be issued.
- Flood Potential Outlooks are issued when forecast meteorological conditions indicate that a significantly heavy precipitation episode may occur that would cause or aggravate flooding. It is generally issued for events expected to occur beyond 36 hours and out to three days from now.

What about El Niño and Flooding?

Many victims of the Walker River '97 flood felt that El Niño was largely responsible. There is a good deal of speculation in general about what causes El Niño and whether it provokes flood conditions.

Page 9
El Niño is a largely unpredictable yet natural weather condition resulting from complex interaction of storms, clouds, regional winds, ocean currents and oceanic temperatures along the equatorial Pacific Ocean. It is an important source of annual climate variation in the western United States.

This climatological event was first identified in the early 20th century as the “Southern Oscillation” of global atmosphere. El Niño results from changes in trade winds and ocean temperatures. It is difficult to determine which comes first—the change in wind or change in ocean temperature—but the changes work together without establishing which is clearly the instigator of El Niño. The complexity of this interaction and its uncertain origins make El Niño conditions difficult to predict. The notable effects of El Niño conditions, however, include an increase in moisture and storms in the western US and northern Mexico. For generations, fishermen off the coasts of Ecuador and Peru have attributed poor catches to the effects of weakened trade winds occurring between December and January. Due to the timing of the occurrence near Christmas, fishermen called the occurrence El Niño after the “Christ child.”

El Niño events last for several seasons usually and interrupt normal seasonal cycles of tropical climates. Sometimes, moisture rich, warm El Niños are followed by strong trade winds and cold sea temperatures that bring about a condition called La Niña. La Niñas can also begin on their own without an introduction by El Niño. La Niñas affect global climates also. In the western US La Niña produces drought conditions rather than precipitation.

Flood Awareness

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. Floods are responsible for as much as 90 percent of damages related to natural disasters. In the United States, most communities experience floods at some time or another.

In the Walker River Basin, significant floods have occurred in early spring from heavy rains or warm rains falling on a heavy winter snowpack in the Sierra Nevada. Nevada has also experienced destructive flash floods in the summer producing brief but extensive flooding at canyon mouths and on alluvial fans.

The Walker River will flood again. Awareness of the potential for flooding and how to prepare for it will help to reduce loss of property and life.

References:


FEMA, Protecting Your Home from Flooding, FEMA 1994.


McGowan, K., Walker River Riparian Habitat Restoration and Tamarisk Removal Project, Grant Proposal Submitted to: Nevada Division of Environmental Protection Clean Water Act 319(h) Funds.


Interviews:


Technical Reviewer:

Roger Beyrasyiff, Walker River Federal Water Master

Leo Hansen, Walker River Irrigation District

Terry Katzer, Katzer and Associates

Kelly McGowan, Mason and Smith Valley Conservation Districts, CRMP

Jeanne Reeder, Nevada Division of Water Planning

Jane Schmidt, Natural Resource Conservation Service