

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION**

**MEETING OF JULY 23 AND 24, 2008
TRUCKEE**

ITEM: 21

SUBJECT: **CARSON RIVER WATERSHED REGIONAL FLOODPLAIN
MANAGEMENT PLAN, ALPINE COUNTY**

DISCUSSION: A number of agencies in the Carson River watershed, working with a larger stakeholder group, have collaboratively developed a draft Floodplain Management Plan. Its purpose is to review historical events and recommend actions to reduce the effects of future high water events in the watershed. The Carson Water Subconservancy District provided oversight of the development of the draft Plan.

The Carson Water Subconservancy District is a unique multi-county, bi-state agency dedicated to establishing a balance between the needs of the communities within the Carson River Watershed and the function of the river system. The Subconservancy Board consists of representatives from each of the five counties within the watershed plus two representatives from the agricultural community.

“The purpose of the Plan is to create a long-term vision for flood hazard management and floodplain protection for the watershed including the following:

- Manage economic development without sacrificing floodplain and river form and function;
- Ensuring public safety upstream and downstream;
- Protection of property rights while conserving our natural resources;
- Protection and improvement of wildlife habitat and water quality; and,
- Promote conservation of lands with river corridor.”

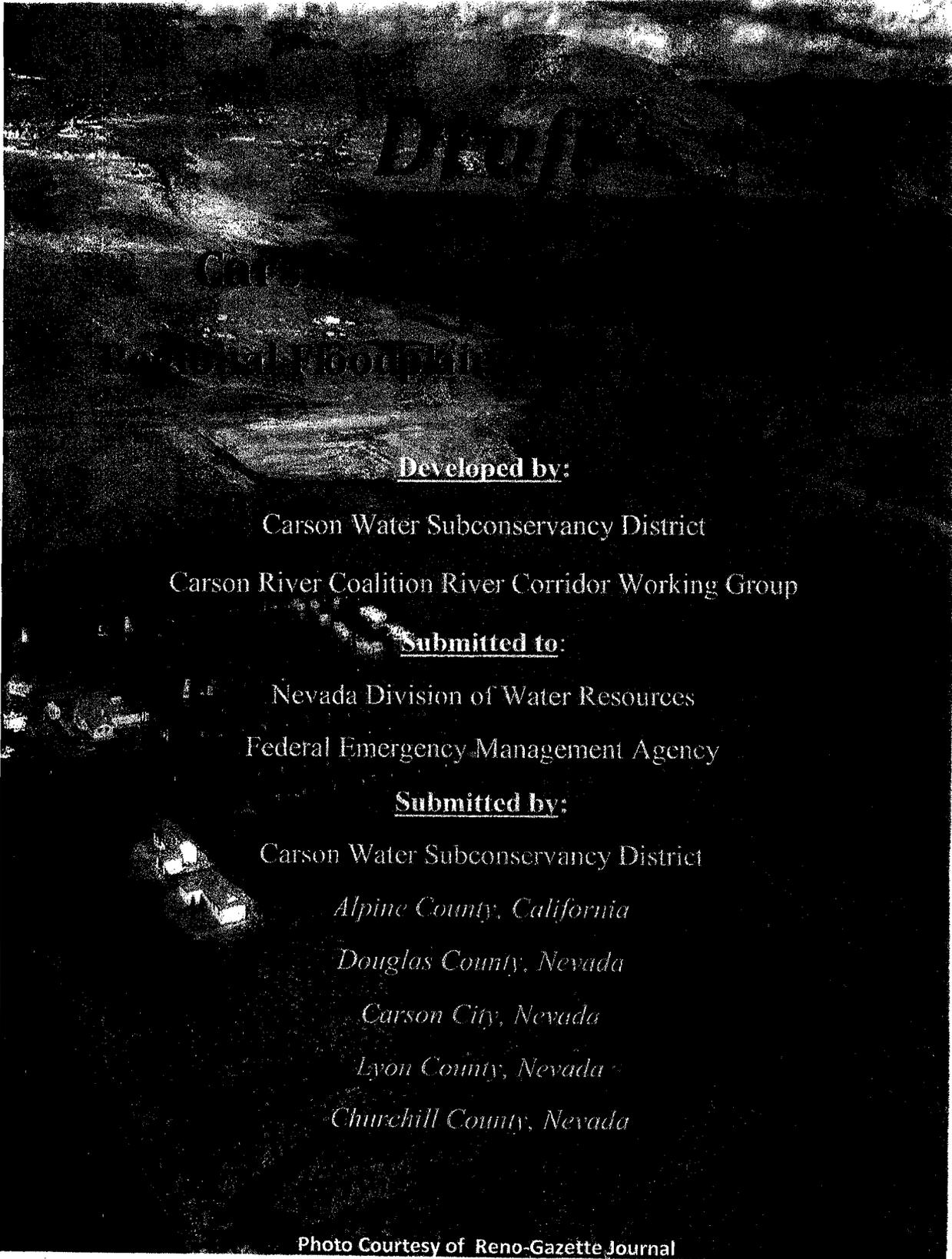
District staff will provide the Water Board with an overview of the draft Plan.

RECOMMENDATION:

This is an informational item. No action is being recommended. The Water Board may provide direction to staff.

Enclosure: Portions of the draft Report (Executive Summary and Recommended Actions)

21-0001



Developed by:

Carson Water Subconservancy District

Carson River Coalition River Corridor Working Group

Submitted to:

Nevada Division of Water Resources

Federal Emergency Management Agency

Submitted by:

Carson Water Subconservancy District

Alpine County, California

Douglas County, Nevada

Carson City, Nevada

Lyon County, Nevada

Churchill County, Nevada

Photo Courtesy of Reno-Gazette Journal

21-0002

Funding for plan development has been provided by the Federal Emergency Management Agency, Flood Mitigation Assistant Grant (administrated by the Nevada Division of Water Resources); Carson Water Subconservancy District, and the Nevada Division of Environmental Protection Water Quality Planning through 319(h) funding.

This plan has been developed through the cooperation of the following:

Carson Water Subconservancy District Board of Directors providing oversight during plan development

Andy Aldax, Douglas County Agricultural Representative
Jim Baushke, Douglas County Commissioner
Donald Jardine, Alpine County Supervisor
Doug Johnson, Douglas County Commissioner
Gunter Kaiser, Alpine County Supervisor
Kelly Kite, Douglas County Commissioner
Pete Livermore, Carson City Supervisor
Robert Milz, Lyon County Commissioner
Tom Minor, Lyon County Agricultural Representative
Ernie Schank, Truckee-Carson Irrigation District Representative
Fred Stodieck, Douglas County Agricultural Representative
Willis Swan, City of Fallon Councilman, Churchill County Representative
Gwen Washburn, Churchill County Commissioner
Robin Williamson, Carson City Supervisor

Core Working Group conducting research and outreach, providing input to development of floodplain management strategies and drafting of plan language:

Jay Aldean, HDR
Genie Azad, CFM, Carson Water Subconservancy District, Working Group Chair and FMA Project Coordinator
John Cobourn, University of Nevada Reno Cooperative Extension
Robb Fellows, Carson City, Floodplain Administrator
Kim Groenewold, Nevada Division of Water Resources
Dan Greytak, Washoe Tribe of Nevada and California
Ed James, Carson Water Subconservancy District, FMA Project Director
Dan Kaffer, Western Nevada Resource Conservation & Development, NRCS
Steve Lewis, University of Nevada Reno Cooperative Extension
Brian Peters, Alpine County Planning Department
Duane Petite, The Nature Conservancy
Paul Pugsley, Carson Valley Conservation District
Jeanmarie Stone, Nevada Department of Environmental Protection
Anne Thomas, The Nature Conservancy
Richard Wilkenson, Dayton Valley Conservation District

Organizations providing approval and/or recommendation for approval:

Alpine County Board of Supervisors	Carson Water Subconservancy District
Alpine County Planning Commission	Churchill County Commissioners
Carson City Board of Supervisors	Douglas County Commissioners
Carson City Open Space Committee	Douglas County Planning Commission
Carson City Planning Commission	Lyon County Commissioners
Carson River Advisory Committee	Lyon County Planning Commission
Carson Valley Conservation District	

Special Thanks to Linda Wimberly of Lyon County GIS Department & Anne Jeton of USGS

For questions or comments regarding this plan contact Genie Azad, Carson Water Subconservancy District, at 775-887-9005 or genie@cwsd.org.

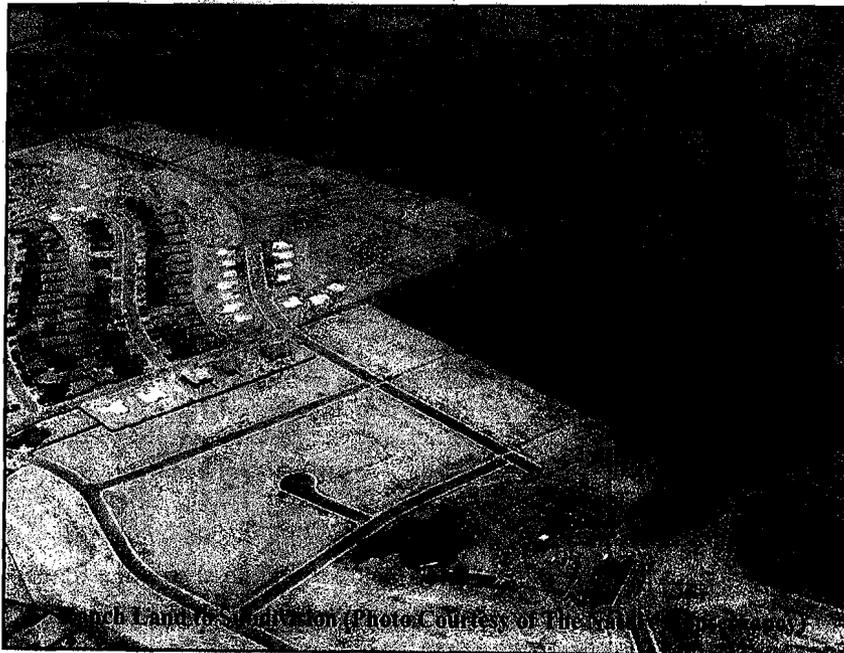
Executive Summary

“Rivers were here long before man, and for untold ages every stream has periodically exercised its right to expand when carrying more than normal flow. Man’s error has not been the neglect of flood control measures, but his refusal to recognize the right of rivers to their floodplain.”

(Engineering News-Record 1937)

According to the Federal Emergency Management Agency (FEMA) floods have caused a greater loss of life and property, and have devastated more families and communities across the United States than all other natural hazards combined. Past efforts to reduce flood losses usually relied on trying to control floodwaters with costly flood control infrastructure, instead of encouraging people to avoid flood hazard areas. Despite the expenditure of billions of tax dollars to construct flood control structures such as dams, levees, and stream channelization, flood losses continue to rise. In addition, this structural approach frequently has adverse impacts on the natural resources and ecological integrity of our rivers and floodplains. Today, people and communities across the United States have come to recognize that protecting the natural resources and functions of floodplains, has proven to be effective in reducing flood losses. *FEMA now encourages and provides incentives to communities to adopt and implement programs that preserve the integrity of floodplain resources and functions.*

The Carson River Watershed (watershed) is experiencing development pressures at an unprecedented rate. Much of the development is aimed at areas within the floodplain and river corridor and on alluvial fans. Former open-range and agricultural lands are being converted to subdivisions, some of them right to the river’s edge. Large homes are being built in the low-lying valley bottom floodplains by elevating the housing pads above the base flood elevation. This practice places these homes in a



dangerous position with the potential for significant damage or destruction due to channel migration risks. It also increases the risk of flooding to other homes at the flood margin and downstream because it changes the flooding routes, elevates flood stage, and reduces the storage capacity of the floodplain. It is anticipated that similar land uses and development patterns will continue. This causes great concern for natural resource and public safety planners.

History shows repeated incidents of flooding with 33 documented flooding events in the watershed since 1852, on an average of every five years. At least 17 of these events have caused major flooding and extensive damage. Since the upper watershed is not regulated to provide flood control and there is extremely limited reservoir storage capability, large flows occur downstream. During a major flood event Carson and Dayton Valleys are inundated and over-bank flows can reach a depth of many feet. Continued development within critical floodplain areas and the river corridor will intensify future flooding events and cause areas that were not previously prone to flooding to flood. While raising building pads, foundations and first floors above the 100 year flood level may appear to protect the inhabitants, it can actually reduce the area that the floodwaters can occupy on the floodplain, meaning that the water will flood somewhere else. It is also predicted that the western states will experience more extreme events of flooding, making it even more important to plan well now.

We are very fortunate in this Watershed that we still have open floodplain lands and have an opportunity to protect these lands and thus protect ourselves.



Historic Flooding on Carson River – 1903 Empire Flood
(Photo courtesy of the Nevada Historical Society)

Economic impacts to communities from flooding events can be devastating. The News Years Flood of 1997 provides a good example. The following table shows the damages estimates for the watershed as compared to the estimates from Washoe County. It is difficult to find exact dollar figures related to the damages incurred by the 1997 flood event as the impacts were far spread affecting many organizations and individuals. It is probable that we will never know what the true costs were. The following table provides some estimates to give an idea of the economic impacts. The table does not include estimates from Truckee River communities other than Washoe County, so the true numbers for the Truckee River Watershed would be much greater than what is represented here. However, the table does show the differences in economic impacts between a watershed that has been built out versus one that has not.

Table 1: 1997 New Years Flood Damage Estimates

County	Estimates of Flood Damages
Alpine County, California ¹	\$331,372
Douglas County, Nevada ²	\$13,100,000
Carson City, Nevada ²	\$5,300,000
Lyon County, Nevada ²	\$685,000
Churchill County, Nevada ²	\$315,000
Total Estimates for Counties along Carson River	\$19,731,372
Total Estimate for Washoe County	\$686,000,000

Sources: 1-Alpine County Auditor's Office; 2-NBMG 1998

Communities in the Truckee River Watershed, our neighbors to the north, have built out their floodplains. Taxpayers are currently spending in excess of \$1 billion dollars to fix past mistakes by attempting to return more floodplain to an accessible level. Even if successful, they will not achieve a state similar to that which we currently enjoy in this watershed.

Currently, the watershed is fortunate to have many stewards of floodplain lands. Long time ranchers and other landowners that have been on their properties for decades and generations have experienced first-hand the power of the river and uncertainties of the channel's stability during flooding events. It is interesting to note that their homes are not built in the low-lying areas on their properties or next to the river channel. Most of these homes have never experienced flooding impacts even during the major events - yet. These stewards know and intimately understand many of the concepts presented in this plan. However, we are experiencing an influx of people from outside of this area that are not necessarily aware of the flooding hazards and the complex river system.

As our watershed continues to urbanize it is critical that we recognize the changing patterns of flooding and plan well for future events. Local and tribal governments have recognized this and many are in the process of addressing these critical issues. Douglas County, which contains some of the most critically important floodplains in the watershed, is proposing enhanced flood ordinance language and drainage plans to address these issues, in addition to supporting conservation easements, land acquisitions and other programs. Carson City, Lyon and Churchill Counties have become very active in supporting conservation easements and land acquisition of sensitive river corridor lands. Alpine County, the headwaters for the river system, actively seeks to protect the river corridor which serves as an economic resource for the county. Visitors from all over the world come to that area to experience one of the last remaining natural rivers. The Washoe Tribe of Nevada and California has implemented floodplain protection strategies on their properties along the Carson River to protect the floodplain's natural function and values, and to protect their culture and heritage. Many landowners are working with non-government

organizations like The Nature Conservancy and others to conserve critical lands through conservation easements on their properties.

Stakeholders from throughout the watershed are recognizing the critical need to protect these natural resources. By working together on a watershed level we can add protection and strength for everyone. Consistency on a watershed level in our planning and programs benefits us all and provides local & tribal governments with additional resources and support to address issues such as litigation and development pressure.

Planning Process

The CWSD is the responsible entity for watershed management and planning for the watershed. CWSD was originally formed in 1959 and in 1989 the Nevada Legislature passed legislation that recreated the CWSD pursuant to Chapter 541 of the Nevada Revised Statutes. The legislature gave CWSD the responsibility for management and development of the water resources of the Carson River to alleviate reductions or loss of water supply, to assume responsibility for conservation and supply of water, and protect against threats to the health, safety and welfare of the people of the watershed. The 14 member Board of Directors consists of elected and non-elected officials from the five counties along the Carson River as well as two agricultural representatives. These counties are: Alpine County, California, Douglas, Carson City, Lyon, and Churchill Counties in Nevada.

The CWSD is the lead agency for integrated watershed planning within the watershed and the coordinating agency for the Carson River Coalition (CRC). The CRC, formed in 1998, is a diverse group of dedicated citizens, Federal, State and local agencies and organization, universities, environmental groups and private citizens representing all regions of the watershed. The purpose of the CRC is to form relationships so that problems, threats and issues are addressed in a spirit of communication and cooperation. The CRC provides a format for cooperation on projects and programs with the numerous entities working in the watershed. Within the CRC are working groups that address specific issues. The River Corridor Working Group (Working Group) was formed specifically to investigate strategies and opportunities for regional non-structural floodplain management and reduction of flooding hazards, and to raise awareness of the importance of natural floodplain function. The core working group participants represent 13 organizations from all regions of the watershed. Over 50 additional individuals received information via email list-serve during the planning process. Community workshops were held throughout the planning process and to gain feedback from members of general public. Section 6.0 provides detailed information on the planning and stakeholder process.

In 2004, the CRC held a conference entitled "Preserving Our Lifeline in the Desert", attended by over 130 stakeholders from all regions of the Watershed, including landowners and elected officials. The goal of the conference was to provide a forum to discuss floodplain protection. The main recommendation from this conference was that a regional floodplain management plan should be developed that would provide strategies for protecting the remaining floodplains and the river corridor to the extent possible.

In 2005, the CWSD received a FEMA Flood Mitigation Assistance (FMA) grant from the Nevada Division of Water Resources for the purposes of developing a Regional Floodplain Management Plan (Plan). The Working Group serves as the steering committee for the development of this Plan. By

working with floodplain administrators and county staff from each of the counties along the Carson River plus many other stakeholders, the floodplain protection and flood hazard reduction strategies presented in this Plan have been developed. These strategies are in support of the guiding principles and Stewardship Plan (CWSD 2007) that were developed by stakeholders from throughout the watershed and were adopted by all five counties along the Carson River and numerous other entities:

- Acknowledge and respect the watershed's natural processes in land use decisions.
Implemented through the encouragement of open space preservation of floodplains, possible through easement dedication or acquisition.
- Maintain the riverine and alluvial fan floodplains of the Carson River Watershed to accommodate flood events
Implemented by working with stakeholders to reduce development burden within the river corridor and alluvial fan floodplains
- Encourage management of growth that considers water quality and quantity, open space preservation, and maintenance of agriculture in floodplains
Implemented by bringing local planners (and county officials) into the process so that decisions made through the integrated watershed planning process will be embraced by local planners (and county officials).

The purpose of the Plan is to create a long-term vision for flood hazard management and floodplain protection for the watershed including the following:

- Manage economic development without sacrificing floodplain and river form and function;
- Ensuring public safety upstream and downstream;
- Protection of property rights while conserving our natural resources;
- Protection and improvement of wildlife habitat and water quality; and,
- Promote conservation of lands with river corridor.

As part of the FMA grant a process for identifying additional flood hazards and critical protection areas had to be developed. The Working Group accomplished this by conducting a rapid evaluation of the river system in order to identify hazards and critical floodplain areas that are not necessarily represented on FEMA flood insurance rate maps (FIRMs). The FIRMs are the main tools that local governments and developers have to determine the floodways and 100- year floodplains. The problem is that these maps are very outdated and the information represented on them is inaccurate in many instances. The rapid evaluation of the river system from headwaters to terminus was conducted using aerial and other photographs, flood extent and other maps and on-the ground knowledge of flooding events. The full evaluation is included in the appendices. The strategies for flood risk reduction and floodplain protection have been developed largely from the results of this evaluation and with input from floodplain administrators, county and tribal staff, and other stakeholders. The strategies have been divided into the following components:

- Protection of Natural Floodplain Function and Values. Keeping lands in a more natural state, where possible, within the river corridor and other special flood hazard areas, will allow the river to access its floodplain and provide natural, no cost, flood protection. This approach is often referred to as the "Living River" concept and has numerous benefits such as:

- Connects river with its floodplain
- Minimizes disruption & alteration of river and riparian habitat
- Conveys variable flows and restores habitat in floodplain
- Balances sediment input with sediment transport
- Provides fish and wildlife habitat
- Enhances water quality and supply
- Maintains aesthetic and recreational qualities
- Keeps structures out of unstable, unsafe areas near valley bottom channels
- Generally enhances the human environment

In areas along the Carson River that require streambank stabilization due to existing infrastructure or the designated Superfund Site, bioengineering techniques should be utilized. This “soft” engineering approach provides stabilization while keeping in line with a Living River approach.

Agricultural and ranch lands are consistent with a living river approach and most appropriate for critical floodplain lands. Providing ways to protect and sustain these lands is a top priority of this plan. Landowner equity programs are critical for this plan to be successful. Conservation easements, land acquisition, and floodplain leasing programs are methods that should be utilized in order to compensate willing landowners for their critical contribution to the community’s safety.

- Higher Regulatory Standards. FEMA recommends that local governments go beyond the minimum regulatory standards. Typically, engineering practices, as well as community enforcement, has limited its concern to the study of impacts to the immediate area adjacent to a proposed development or reach. Cumulative impacts to downstream communities, and loss of floodwater storage volume is not typically included with this approach. Through the enhancement of ordinances this concern can be addressed. This Plan recommends that local governments go beyond the minimum requirements and provide additional protection to their residents and to the natural resources.
- Flood Data Information and Maintenance. Technical information used for the analysis of flood risks and risk reduction needs to be managed in a manner that is consistent throughout the watershed and is readily accessible and allows for new or updated information to be easily integrated. These data include flood risk studies, hazard mapping, updating of FIRMs, elevation reference marks and photo-monitoring.
- Channel Migration and Bank Erosion Monitoring. The flooding history of the Carson River indicates that floods have been altering channel alignments and stability every five to twenty-five years since the turn of the 20th century. The river is incised in many places, especially on valley floors. The river is then in a gully that will widen over time in a well documented process known as “channel evolution”. Because of being trapped within a gully, the high velocity flood flows are concentrated rather than being dispersed over a floodplain. The deep confined flows have more power and often result in severe bank erosion and channel movement. Land near an incised channel is an extremely dangerous place for any development. Yet channel migration is part of the healing process of channel evolution by which rivers gain space for flooding and riparian vegetation to again provide multiple functions and benefits.

Some areas of the Carson River system, such as the reach through Dayton, cannot be allowed to migrate so freely. Because of the mercury contamination from the Comstock Mining Era this area requires a certain amount of bank stabilization. This plan recommends that in these areas bio-engineering techniques be used in combination with allowing the river to access its floodplain.

- Floodplain and Flood Hazard Outreach and Education. Outreach and education is a critical and low-cost tool that can be used to raise awareness of the importance of floodplains, increase public safety and reduce flood risks. A watershed wide outreach program could assist the counties with local programs and reinforce the flood hazard message in a consistent format.
- Reduction of Infrastructure Impacts. There are opportunities throughout the watershed for the enhancement and/or design and maintenance of roads, culverts, grade controls, and bridges to accommodate floodwaters better, protect floodplains and decrease harmful erosion.

Suggested actions for implementing these components can be found in Section 4.0. Actual implementation is dependent upon available resources and staff of various entities. A cooperative process will need to continue in order to implement components of this Plan in a beneficial, organized manner.

Regional Approach and Plan Adoption

Flooding affects the watershed as a whole. Potential solutions for reducing flooding damages, protecting public safety and natural resources will be most effective if developed with the entire watershed in mind.

The benefits of addressing this issue with a regional approach include the following:

- Enhance public safety by reducing flooding risk to all communities
- Reduce flood damage costs to all communities
- Enhance awareness of flooding issues throughout watershed
- Provide watershed-wide consistency and resources to local floodplain programs
- Provide support to local floodplain administrators
- Receive Community Rating System credit
- Lower community flood insurance rates
- Increase funding leverage and opportunities

Although this plan has been developed on a watershed, or regional basis, it must be adopted by each of the counties along the Carson River. Adoption of the plan is NOT adopting an ordinance and any other regulatory component. Actual implementation of strategies suggested in this plan may be implemented a variety of organizations, including counties, state and federal entities, and non-governments organizations. Implementation is dependent upon available funding and staff resources.

Adoption of this plan means: We agree on a regional approach and will work together to implement the suggested actions.

With careful consideration, planning and ongoing cooperation, the Carson River and its floodplains can be aesthetic and functional assets that reflect our communities' pride and ingenuity. If we ignore the importance of natural floodplain function, we face increased flood losses, economic impacts from flood damages, plus deteriorating water quality, supply and habitat. It is less costly to plan well now. The consequences of unplanned floodplain loss through collective individual actions would be permanent.

This plan is intended to be a "living document" that may be amended or revised as conditions change. This plan addresses the Federal Emergency Management Agency (FEMA) requirements for floodplain management planning and outlines potential credit for the National Flood Insurance Program (NFIP) within the Community Rating System (CRS). The plan is also consistent with the State of Nevada Multi-Hazard Mitigation Plan in that State strategies for flood mitigation include avoiding future damages by acquisition of land within the floodway and guiding future development away from floodplains.

Table 4.7-1

Summary of Suggested Actions

Plan Element	Suggested Action	Responsible (or suggested responsible) Party	Existing or Potential Funding Source*
Protect Floodplain Natural Functions and Values			
SA-1	Adopt Living River approach to retain river system in a more natural state that allows the river to access its floodplain. Recognize that not all areas of the river system can be allowed to migrate freely due to special designation (i.e. Superfund area) and/or existing infrastructure.	All entities	n/a
SA-2	Adopt a good neighbor floodplain management policy that recognizes that actions by one property owner can impact adjacent and downstream property owners.	All entities	n/a
SA-3	Floodplain & flood hazards should be considered with open space program objectives when selecting acquisition targets and establishing management strategies for open spaces.	Local and tribal governments, NGOs, CWSD	n/a
SA-4	Investigate areas where the implementation of stream zone buffers would provide multi-objective benefits for river system and downstream communities.	Local and tribal governments	n/a
SA-5	Plan for and mitigate cumulative effects of watershed urbanization.	All entities	n/a
SA-6	Manage development in special flood hazard areas and other flood hazard areas (those known flood hazard areas not included on most current FIRMs) to provide public safety and protect the natural functions and benefits of floodplain lands.	Local and tribal governments; CWSD	n/a
SA-7	Retain lands that provide floodplain storage and maintain or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods.	Local and tribal governments, NGOs, landowners	Question 1; SNPLMA; NGOs; local governments
SA-8	Encourage the incorporation of low impact development principles into sub-division development proposals for floodplain lands to decrease run-off and minimize loss of floodplain storage capacity.	Local governments	n/a
SA-9	Identify and promote options for landowner incentive programs such as floodplain leasing program and conservation easements that provide compensation to landowners providing	Local & tribal governments, NGOs, CWSD, CRC,	Federal, State and local sources,

21-0012

Plan Element	Suggested Action	Responsible (or suggested responsible) Party	Existing or Potential Funding Source*
	ecosystem services.	landowners	Question 1, SNPLMA
SA-10	Promote and utilize best management practices as means for protecting riparian habitat.	All entities	n/a
Higher Regulatory Standards			
SA-11	Implement or enhance county ordinances that account for the loss of floodplain storage volume and mitigate losses through a variety of methods.	Local governments	n/a
SA-12	Investigate feasibility of implementing additional measures that go beyond minimum FMEA requirements	Local governments	
SA-13	Develop model watershed floodplain management ordinance language that can be adopted by counties to provide watershed wide consistency.	CWSD, CRC, local governments	n/a
Flood Data Information and Maintenance			
SA-14	Secure funding for, and conduct watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development.	Local & state governments, CWSD	NDEP, CWSD, other local & state entities
SA-15	Support FEMA's Map Modernization Program & encourage FEMA to update FIRMs with current and future conditions.	Local governments, FEMA, CWSD	n/a
SA-16	CWSD continue to participate in FEMA's Cooperating Technical Partner Program	CWSD, FEMA	n/a
SA-17	Strive for up-to-date and consistent data collection and maintenance to include: Updating of flood studies where necessary; conduct studies for significant water courses and alluvial fan areas that have not been analyzed. This data should be used to update FEMA maps and fill data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs.	CWSD Local governments	Federal, state and local grant sources
SA-18	Flood studies & maps should be updated after significant flooding events.	CWSD, Local governments	Federal, state and local grant sources

Plan Element	Suggested Action	Responsible (or suggested responsible) Party	Existing or Potential Funding Source*
SA-19	Elevation Reference Marks (ERM) should be permanent monuments and updated on regular basis.	Local governments	n/a
SA-20	ERMs should be in same datum as base flood elevations on FIRMs or a datum that is readily convertible to FIRM datum. Move towards FEMA recommended NAVD 88 datum.	Local governments	n/a
SA-21	A master list of ERMs should be developed, maintained and made available to interested parties	Local governments; CWSD	n/a
SA-22	Photo-Monitoring program (on-the-ground and aerial) should be developed and coordinated on a watershed level to document flooding and flood hazards in a consistent matter.	CWSD	n/a
Channel Migration and Bank Erosion Monitoring			
SA-23	Known and projected hazard areas including channel migration hazards should continue to be documented and updated information incorporated into planning processes.	Conservation Districts, CWSD, NDEP, WNRC&D, FEMA, local & tribal governments	Federal, state and local resources
SA-24	LiDAR and/or aerial photography (on a watershed level) should be conducted on a 5 year basis, or as needed, to provide updated information on channel movement and floodplain condition	CWSD, NDEP, CVCD, DVCD, WNRC&D, NGOs, BOR, local governments	Federal, state and local grant sources
SA-25	Establish building set-backs in flood hazard areas, where appropriate, to reduce severe hazards from channel migration.	Local and state entities	n/a
SA-26	Channel cross-sectional surveys should be conducted and well documented to track long term changes in river channel.	CWSD, conservation districts, WNRC&D	Federal, state and local grant sources
SA-27	Identify unstable stream banks and areas with high potential for erosion.	Conservation districts, WNRC&D, NDEP, CWSD	n/a
SA-28	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects	All entities	n/a

Plan Element	Suggested Action	Responsible (or suggested responsible) Party	Existing or Potential Funding Source*
SA-29	Update the 1996 Fluvial Geomorphic Assessment.	WNRC&D, CWSD, NDEP, cons. districts	Federal, state and local grant sources
Floodplain and Flood Hazard Outreach and Education			
SA-30	Develop watershed wide outreach and education program about floodplain importance and flooding hazards.	CWSD, CRC	Federal, state and local grant sources
SA-31	Brochures should be developed for distribution on a watershed level with consistent messages and information for general public.	CWSD, CRC	n/a
SA-32	CWSD website will provide information on the regional floodplain management plan and provide emergency contact information. Local governments and other entities can link to this website to increase distribution.	CWSD	n/a
SA-33	Annual Flood Awareness Week will be established with the objective of providing information about flooding and flood hazards to the general public.	CWSD, CRC Local & tribal governments	n/a
SA-34	Special Events, River Work Days and other outreach opportunities should be utilized to help raise awareness of flooding hazards and importance of floodplains.	CRC, WNRC&D and other local & tribal entities	Federal, state and local grant sources
Reduce Infrastructure Impacts			
SA-35	Investigate opportunities to remove existing restrictions, such as berms, to allow flood waters to access floodplain.	Local & tribal government organizations, landowners	Federal, state and local sources
SA-36	Limit the use of future management measures such as dams, levees, and floodwalls.	Local & tribal government organizations, landowners,	n/a
SA-37	Design future bridges and roads to protect floodplain, accommodate and not restrict changing river course, and minimize back up of flood water.	NDOT, local governments	Federal, state and local sources
SA-38	Investigate opportunities to enhance grade control structures	Local governments, CWSD	n/a

21-0015